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: **DC013**

DATE VERIFIED: **May 18, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: March 15, 2010

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

FROM: Jo Anna Ripley, Stormwater

PO: 270712

RE: Files Approved for Scanning

General File ID or BMP ID: DC013

PIN: 1240600001A

Subdivision, Tract, Business or Owner Name (if known): Toano Business Center

Property Description: Common Area

Site Address: 8105 Richmond Road

(For internal use only)	**Box**	25	**Drawer:**	N/A	
Agreements: (in file as of scan date)	**Y**	**Book or Doc#:**	980007276	**Page:**	
			745		447

Comments

DC-013

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 DRAINAGE SYSTEM

THIS DECLARATION, made this 26th day of March, 1998, between Michael C. Brown LTD and all successors in interest, hereinafter referred to as the "COVENANTOR(S)," owner(s) of the following property: Parcels 9 & 9A on J.C.C. tax map, page 12-4 (8101 Richmond Road, Toano), Deed Book 745 (MCB), Page No. 447 (MCB) or Instrument No. _____, 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 drainage system including any runoff control facilities, conveyance systems and associated easements, hereinafter referred to as the "SYSTEM," located on and serving the above-described property to ensure that the SYSTEM is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations. The SYSTEM shall not include any elements located within any Virginia Department of Transportation rights-of-way.

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

3. The COVENANTOR(S) shall provide and maintain perpetual access from public right-of-ways to the SYSTEM 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 SYSTEM for the purpose of inspecting, operating, installing, constructing, reconstructing, maintaining or repairing the SYSTEM.

5. If, after reasonable notice by the COUNTY, the COVENANTOR(S) shall fail to maintain the SYSTEM 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 SYSTEM 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 SYSTEM.

7. The COVENANTOR(s) shall promptly notify the COUNTY when the COVENANTOR(S) legally transfers any of the COVENANTOR(S)' responsibilities for the SYSTEM. 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 SYSTEM.

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

Instrument # 980007276
Recorded on April 22, 1998

COPY

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of this 31st day of March, 1998.

COVENANTOR(S)

MICHAEL C. BROWN, LTD

Print Name/Title MICHAEL C. BROWN/PRESIDENT

ATTEST:

Joan Williamson, J.C.C.

COVENANTOR(S)

Print Name/Title

ATTEST:

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF James City

I hereby certify that on this 31 day of March, 1998, before the subscribed, a Notary Public of the State of Virginia, and for the City/County of James City, aforesaid personally appeared Michael C Brown and did acknowledge the aforegoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 31 day of March, 1998.

Mary S. Cashen
Notary Public

My Commission expires: 8-31-2000

Approved as to form:

Deputy County Attorney

This Declaration of Covenants prepared by:

MICHAEL C. BROWN
(Print Name)

PRESIDENT
(Title)

P.O. BOX 1105
(Address)

WILLIAMSBURG / VA / 23187-1105
(City) (State) (Zip)

drainage.pre
Revised 2/97

James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities
Record Drawing and Construction Certification Forms

(Note: In accordance with the requirements of the Chesapeake Bay Preservation Ordinance, Chapter 23, Section 23-10(4), BMP's shall be designed and constructed in accordance with the manual entitled James City County Guidelines for Design and Construction of Stormwater Management BMP's. Erosion and sediment control policy and approved plans generally require that at the completion of the project and prior to release of surety, an "as-built" plan prepared by a registered Professional Engineer or Certified Land Surveyor must be provided for the drainage system for the project, including any Best Management Practice (BMP) facilities. In addition, for BMP facilities involving the construction of an impounding structure or dam embankment, certification is required by a Professional Engineer who has inspected the structure during its construction. Currently there are over 20 water quality type BMP's accepted by the County.)

Section 1 - Site Information:

Project Name: Toano Business Center
Structure/BMP Name: Basin #1
Project Location: Richmond Road, Between Bldg's 3 and 4
BMP Location:
County Plan No.: ____ - ____ - ____

Project Type: ☐ Residential ☑ Business ☐ Commercial ☐ Office ☐ Institutional ☐ Industrial ☐ Public ☐ Roadway ☐ Other ____

Tax Map/Parcel No.:
BMP ID Code (if known): DC013
Zoning District::
Land Use:
Site Area (sf or acres):

Brief Description of Stormwater Management/BMP Facility: Dry Pond

Nearest Visible Landmark to SWM/BMP Facility:

Nearest Vertical Ground Control (if known):
☐ JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☐ Arbitrary ☐ Other
Station Number or Name:
Datum or Reference Elevation:
Control Description:
Control Location from Subject Facility:

Section 4 - Professional Certifications:

Certifying Professionals: *(Note: A Registered Professional Engineer or Certified Land Surveyor is responsible for preparation of a Record Drawing, sometimes referred to as an As-Built plan, for the drainage system for the project including any Stormwater Management/BMP Facilities. A Registered Professional Engineer is responsible for the inspection, monitoring and certification of Stormwater Management / BMP facilities during its construction.)*

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

Firm Name: _____
Mailing Address: _____
_____
Business Phone: _____
Fax: _____

Name: _____
Title: _____

Signature: _____
Date: _____

I hereby certify to the best of my knowledge and belief that this record drawing represents the actual condition of the Stormwater Management / BMP facility. The facility appears to conform with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

_____ (Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: ECS, Ltd.
Mailing Address: 108 Ingram Rd, Suite 1
Williamsburg, VA 23188
Business Phone: (757) 229-6677
Fax: (757) 229-9978

Name: Michael J. Galli, P.E.
Title: Principal Engineer

Signature: M J Galli, P.E.
Date: 5/28/04

I hereby certify to the best of my knowledge and belief that this Stormwater Management/BMP facility was monitored and constructed in accordance with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted. Please see attached letter dated May 28, 2004 for additional information.

COMMONWEALTH OF VIRGINIA
MICHAEL J. GALLI
No. 030684
5/28/04
PROFESSIONAL ENGINEER

_____ (Seal)

Virginia Registered Professional Engineer

Certification for each of the BMP's can be in letter format or by use of the certification statements in Section 4 of the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions*. A copy of these requirements are attached.

Record Drawing: REV AB RECEIVED NOV 4 '03

2. ✓ 4-8-04 Along with the record drawing set, submit completed record drawing and construction certification forms, Sections 1 through 5, from the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions* (packet). The Environmental Division began use of the forms and checklists in this packet effective February 1st 2001.

3. ✓ 4-8-04 The record drawing requires a certification statement. In addition, the professional seal on the record drawing set requires signature. Refer to pages 3 and 4 of the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions* (packet) for record drawing certification statements.

4. ✓ 4-8-04 If constructed, provide asbuilt information for the VDOT Infiltration Trench BMP. In addition to the dry pond BMP, this was a second BMP as proposed onsite in order to achieve 10 BMP points for the site. The proposed infiltration trench BMP was to be a 135 ft. long subsurface stone trench with triple 48-inch diameter perforated underground storm pipes. The BMP is situated between Richmond Road and the parking area for Building 1. No asbuilt information was shown for the Infiltration Trench BMP as elevation and dimensional data on the record drawing set matches the approved design plan exactly.

5. ✓ 4-8-04 Provide asbuilt spot elevation data to show that design top of dam elevation (El. 94.0) was achieved for dry detention basin BMP # 1.

6. ✓ 04-8-04 If possible add the following County identifiers to the lower right hand corner of the record drawing: County Plan Number SP-14-98 and BMP ID Code: DC 013.

Construction - Related Items: Reinspect 5/28

✓ 5-28-04 Remove silt fence from along the downstream (west) toe of the dam.

✓ 8. 5-28-04 Based on field observations, it does not appear that the VDOT Infiltration Trench BMP was constructed on the site. This infiltration BMP was a proposed 135 ft. long subsurface stone trench with triple 48-inch diameter perforated underground storm pipes. The BMP is situated between Richmond Road and the parking area for Building 1. Provide documentation to substantiate construction per approved plan Sheets 2 and 11.

✓ 9. 5-28-04 The facility is intended to be a dry-type detention practice. Based on our field observations, standing water approximately 5 ft. deep was present within the facility. This is indicative of improper conversion from a temporary sediment basin mode to BMP mode (ie. removal of the dewatering orifice) or clogging of the low flow water quality control orifice. The water quality (or BMP) control orifice intended for this structure is a 2-inch at Elevation 84. The basin must be properly converted to a BMP device prior to release of bond.

10. An excessive amount of large and small size trash (cardboard, cups, construction debris, paper, plastic, foam, insulation, tires, etc.) is situated within the interior side slopes and shoreline of the dry detention pond. This trash could pose a significant threat to the function of the principal spillway device. Clean and remove all trash from the interior of the BMP.

5-28-04

11. Clean and remove all trash and debris from within storm drainage structure SS # 2. This inlet is a curb-type inlet situated near the southeast corner of the basin.

5-28-04

12. The stormwater conveyance channel which enters into the basin at the northwest corner (near Building # 4) is extremely eroded and EC-3 matting was not installed per the approved plan. Regrade the channel and install matting per the approved plan.

5-28-04

13. Once drained, observe the locations of pipes which flow into the basin. Clean and remove any trash, debris or sediment from the pipe outfalls. Due to water depth in the pond, these outfalls were submerged and not visible for inspection. Pipe inflows consist of a 36-inch storm pipe which enters the southeast corner of the basin from storm inlet structure SS # 2 and a 24-inch storm pipe which enters the northeast corner of the basin from storm inlet structure SS # 8.

5-28-04

Once this work is satisfactorily completed, contact our office appropriately for reinspection. We can then proceed with final release of the surety and/or closing out the project. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed.

Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Jim Rudnicky at 757-259-4026 if you have any further comments or questions.

Sincerely,

Scott J. Thomas, P.E.
Civil Engineer
Environmental Division

Attachments
SJT/sjt

cc: Arch Marston, AES Consulting Engineers - via fax
J.H. Pruden, C.A. Barrs - via fax
Jim Rudnicky, JCC Environmental Division Inspector

G:\AsBuilts\SP1498.dc013

1240100009
8105 Richmond Road
Toano VA 23168
7.269 AC.
M1 – Office Warehouse

James City County, Virginia
Environmental Division

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

County Plan No.: SP-14-98
Project Name: TOANO Business Center
Stormwater Management Facility: DRY POND BMP (Between Bldg #3 + #4 Back)
Phase: ☐ I ☒ II ☐ III

- ☑ Information Received. Date/By: 4/4/03 AES/OWNER
- ☐ Administrative Check.
  - ☑ Record Drawing Date/By: 12/13/02 AES
  - ☑ Construction Certification Date/By: 5/28/04 ECS
  - ☑ RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001 Only) OK
  - ☑ Insp/Maint Agreement #/Date: #980007276 4/22/96
  - ☐ BMP Maintenance Plan Location: NO
  - ☐ Other:
- ☑ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review file.
  ☑ Yes ☐ No Location: Note 1 Sheet 11 CC
- ☑ Assign **County BMP ID Code**: Code: DC013
- ☑ Preliminary Input into Division's "As-Built Tracking Log"
- ☑ Add Location to GIS Database Map. Obtain site information (GPIN, Owner, Site Area, Address, etc.)
- ☑ Preliminary Log into Access BMP Database (BMP ID #, Plan No., GPIN, Project Name, etc.)
- ☑ Active Project File Review (correspondence, H&H, etc.).
- ☑ Initial As-Built File setup (Label, copy hydraulics, BMP plan and detail information, etc.).
- ☑ Inspector Check of RD/CC (forward to inspector using transmittal for cursory review). GEL/PTM?
- ☑ Pre-Inspection Drawing Review - Approved Plan (Quick look prior to Field Inspection).
- ☑ Final Inspection (FI) Performed Date: 4/14/03 SJT
- ☑ Record Drawing (RD) Review (***) Date: 4/11/03 SJT
- ☑ Construction Certification (CC) Review Date: 4/11/03 SJT
- ☐ Actions:
  - ☐ No comments.
  - ☑ Comments. Letter Forwarded. Date: 4/14/04
    - ☑ Record Drawing (RD) Resub 11/3/03
    - ☑ Construction Certification (CC) ECS Received 5/26/04
    - ☑ Construction-Related (CR) Reinspect 5/26/04.
    - ☐ Site Issues (SI)
    - ☐ Other :
- ☐ Second Submission: AB resub 11/3/03.
- ☑ Reinspection (if necessary): 5/28/04
- ☑ Acceptable for stormwater managment facility purposes (RD/CC/CR/Other). Proceed with bond release.
- ☑ If ok for full release, notify Inspector and Inspector Supervisor using "Surety Request Form".
- ☑ 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). II
- ☑ Copy Final Inspection Report into County BMP Inspection Program file.
- ☑ Obtain Digital Photographs of BMP and log into computer.
- ☐ Add to JCC Hydrology & Hydraulic database (optional).
- ☑ Complete "As-built Tracking Log".

Note 18 Sheet 10 AB + CC
Note 5 Sheet 11 AB
Note 4 Sheet 11 CC
Note 1 Sheet 11.

BMP Certification Information Acceptable

Plan Reviewer: [signature] Date: 6/14/04

*** See separate checklist.

2ND INFIL Trench BMP?

James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities Record Drawing and Construction Certification

Standard Forms & Instructions

Contents — Page

Record Drawing and Construction Certification Forms

	Section 1 – Site Information	1
	Section 2 – Construction Information	2
	Section 3 – Owner / Designer / Contractor Information	2
	Section 4 – Professional Certifications	3
	Section 5 – Certification Requirements and Instructions	4

Record Drawing Checklist

I.	Methods and Presentation	(Required for All Facilities)	6
II.	Minimum Standards	(Required for All Facilities)	6
III.	Group A – Wet Ponds		8
IV.	Group B – Wetlands		9
V.	Group C – Infiltration Practices		10
VI.	Group D – Filtering Systems		11
VII.	Group E – Open Channel Systems		12
VIII.	Group F – Extended Dry Detention		13
IX.	Group G – Open Spaces		14
X.	Storm Drainage Systems	(Associated with BMP's Only)	15
XII.	Other Systems		15
XIII.	References		16

Issue Date
February 1, 2001

James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities
Record Drawing and Construction Certification Forms

(Note: In accordance with the requirements of the Chesapeake Bay Preservation Ordinance, Chapter 23, Section 23-10(4), BMP's shall be designed and constructed in accordance with the manual entitled James City County Guidelines for Design and Construction of Stormwater Management BMP's. Erosion and sediment control policy and approved plans generally require that at the completion of the project and prior to release of surety, an "as-built" plan prepared by a registered Professional Engineer or Certified Land Surveyor must be provided for the drainage system for the project, including any Best Management Practice (BMP) facilities. In addition, for BMP facilities involving the construction of an impounding structure or dam embankment, certification is required by a Professional Engineer who has inspected the structure during its construction. Currently there are over 20 water quality type BMP's accepted by the County.)

Section 1 – Site Information:

Project Name: Toano Business Center
Structure/BMP Name:
Project Location: Toano area off Rt. 60 (8105 Richmond Rd.)
BMP Location: The rear of site and front of site
County Plan No.: SP - 14 - 98

Project Type:
- ☐ Residential
- ☐ Business
- ☐ Commercial
- ☐ Office
- ☐ Institutional
- ☐ Industrial
- ☐ Public
- ☐ Roadway
- ☒ Other Office Warehouse

Tax Map/Parcel No.: (12-4)(1-9, 9A)
BMP ID Code (if known): DC013
Zoning District: M-1 with Proffers
Land Use: Office Warehouse
Site Area (sf or acres): 7.27 ac.

Brief Description of Stormwater Management/BMP Facility: The facilities on site are comprised of an Extended Detention Dry Pond in the rear of the site and an Infiltration trench located at the front of the site.

Nearest Visible Landmark to SWM/BMP Facility: Dry Detention between buildings 3 & 4; Infiltration in front of parking lot to building 1.

Nearest Vertical Ground Control (if known):
- ☒ JCC Geodetic Ground Control
- ☐ USGS
- ☐ Temporary
- ☐ Arbitrary
- ☐ Other

Station Number or Name:
Datum or Reference Elevation:
Control Description: Top of SS#2 and SS#8 on site
Control Location from Subject Facility: _____

Section 2 – Stormwater Management / BMP Facility Construction Information:

PreConstruction Meeting Held for Construction of SWM/BMP Facility: ☐ Yes ☐ No ☒ Unknown
Approx. Construction Start Date for SWM/BMP Facility: _____
Facility Monitored by County Representative during Construction: ☐ Yes ☐ No ☒ Unknown
Name of Site Work Contractor Who Constructed Facility: C. A. Barrs Contractors
Name of Professional Firm Who Routinely Monitored Construction: _____
Date of Completion for SWM/BMP Facility: _____
Date of Record Drawing/Construction Certification Submittal: _____

(Note: Record Drawing and Construction Certifications are required within thirty (30) days of the completion of Stormwater Management and/or BMP facility construction. Record Drawings and Construction Certifications must be reviewed and approved by the James City County Environmental Division prior to final inspection, acceptance and bond or surety release.)

Section 3 – Owner / Designer / Contractor Information:

Owner/Developer: *(Note: Site Owner or Applicant responsible for development of the project.)*

Name: Michael C. Brown
Mailing Address: P.O. Box 1105
Williamsburg, VA 23187-1105
Business Phone: 757-566-8900 Fax: 757-566-8990
Contact Person: Michael C. Brown Title: President

Design Professional: *(Note: Professional Engineer or Certified Land Surveyor responsible for the design and preparation of plans and specifications for the Stormwater Management / BMP facility.)*

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Rd., Suite 1
Williamsburg, VA 23188-1986
Business Phone: 757-253-0040
Fax: 757-220-8994
Responsible Plan Preparer: G. Archer Marston, III, P.E.
Title: Vice President
Plan Name: Toano Business Center
Firm's Project No. 8003
Plan Date: 1/15/98
Sheet No.'s Applicable to SWM/BMP Facility: 2 / 11 / ____ / ____ / ____

BMP Contractor: *(Note: Site Work Contractor directly responsible for construction of the Stormwater Management / BMP facility.)*

Name: C. A. Barrs Contractors
Mailing Address: P.O. Box 1489
Yorktown, VA 23692-1489
Business Phone: 757-898-7282
Fax: 757-898-1282
Contact Person: Scott St. Clair
Site Foreman/Supervisor: Scott St. Clair
Specialty Subcontractors & Purpose (for BMP Construction Only):
N/A

Section 4 – Professional Certifications:

Certifying Professionals: *(Note: A Registered Professional Engineer of Certified Land Surveyor is responsible for preparation of a Record Drawing, sometimes referred to as an As-Built plan, for the drainage system for the project including any Stormwater Management/BMP Facilities. A Registered Professional Engineer is responsible for the inspection, monitoring and certification of Stormwater Management / BMP facilities during its construction.)*

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Rd., Suite 1
Williamsburg, VA 23188-1986
Business Phone: 757-253-0040
Fax: 757-220-8994

Name: G. Archer Marston, III, P.E.
Title: Vice President

Signature:
Date: 9/22/03

I hereby certify to the best of my knowledge and belief that this record drawing represents the actual condition of the Stormwater Management / BMP facility. The facility appears to conform with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON III
No. 018282
9/22/03
PROFESSIONAL ENGINEER

_____ (Seal)

Virginia Registered Professional Engineer
Or Certified Land Surveyor

Construction Certification

Firm Name: _____
Mailing Address: _____

Business Phone: _____
Fax: _____

Name: _____
Title: _____

Signature: _____
Date: _____

I hereby certify to the best of my knowledge and belief that this Stormwater Management / BMP facility was monitored and constructed in accordance with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

_____ (Seal)

Virginia Registered
Professional Engineer

James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities
Record Drawing and Construction Certification Forms

(Note: In accordance with the requirements of the Chesapeake Bay Preservation Ordinance, Chapter 23, Section 23-10(4), BMP's shall be designed and constructed in accordance with the manual entitled James City County Guidelines for Design and Construction of Stormwater Management BMP's. Erosion and sediment control policy and approved plans generally require that at the completion of the project and prior to release of surety, an "as-built" plan prepared by a registered Professional Engineer or Certified Land Surveyor must be provided for the drainage system for the project, including any Best Management Practice (BMP) facilities. In addition, for BMP facilities involving the construction of an impounding structure or dam embankment, certification is required by a Professional Engineer who has inspected the structure during its construction. Currently there are over 20 water quality type BMP's accepted by the County.)

Section 1 - Site Information:

Project Name: Toano Business Center
Structure/BMP Name: Basin #1
Project Location: Richmond Road, Between Bldg's 3 and 4
BMP Location:
County Plan No.: ____ - ____ - ____

Project Type: ☐ Residential ☑ Business ☐ Commercial ☐ Office ☐ Institutional ☐ Industrial ☐ Public ☐ Roadway ☐ Other ____

Tax Map/Parcel No.:
BMP ID Code (if known):
Zoning District::
Land Use:
Site Area (sf or acres):

Brief Description of Stormwater Management/BMP Facility: Dry Pond

Nearest Visible Landmark to SWM/BMP Facility:

Nearest Vertical Ground Control (if known):
☐ JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☐ Arbitrary ☐ Other
Station Number or Name:
Datum or Reference Elevation:
Control Description:
Control Location from Subject Facility:

Section 4 - Professional Certifications:

Certifying Professionals: *(Note: A Registered Professional Engineer or Certified Land Surveyor is responsible for preparation of a Record Drawing, sometimes referred to as an As-Built plan, for the drainage system for the project including any Stormwater Management/BMP Facilities. A Registered Professional Engineer is responsible for the inspection, monitoring and certification of Stormwater Management / BMP facilities during its construction.)*

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

Firm Name: _____
Mailing Address: _____
_____
Business Phone: _____
Fax: _____

Name: _____
Title: _____

Signature: _____
Date: _____

I hereby certify to the best of my knowledge and belief that this record drawing represents the actual condition of the Stormwater Management / BMP facility. The facility appears to conform with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

_____ (Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: ECS, Ltd.
Mailing Address: 108 Ingram Rd, Suite 1
Williamsburg, VA 23188
Business Phone: (757) 229-6677
Fax: (757) 229-9978

Name: Michael J. Galli, P.E.
Title: Principal Engineer

Signature: M. J. Galli, P.E.
Date: 5/28/04

I hereby certify to the best of my knowledge and belief that this Stormwater Management/BMP facility was monitored and constructed in accordance with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted. Please see attached letter dated May 28, 2004 for additional information.

COMMONWEALTH OF VIRGINIA
MICHAEL J. GALLI
No. 030684
5/28/04
PROFESSIONAL ENGINEER

_____ (Seal)

Virginia Registered Professional Engineer

CONSULTING ENGINEERS

5248 Olde Towne Road • Suite 1 • Williamsburg, Virginia 23188
(757) 253-0040 • Fax (757) 220-8994 • E-mail aes@aesva.com

November 3, 2003

NOV 2003
RECEIVED
ENVIRONMENTAL DIVISION

Mr. Scott Thomas
James City County
Environmental Division
P.O. Box 8784
Williamsburg, Virginia 23187-8784

RE: Toano Business Center – Record Drawing Certification
AES project No. 8003

Dear Scott:

This letter is written in response to your letter dated April 14, 2003, which includes your comments concerning the record drawings prepared by AES. Please find below our responses, which are related to the *record drawing* section only of your letter, items 3, 5, and 6.

3. AES has prepared pages 1- 3 of the construction certification package for this project and has signed and sealed same.

5. The as-built elevation (93.95) has been added to sheets 2 and 11 of the record drawings.

6. The JCC plan number and BMP code number have been added to the record drawing note in the lower right corner of each drawing.

Also, in response to item 4, AES personnel have visually inspected the infiltration trench through SS# 15 and have determined that three 48" perforated pipes have been installed.

This concludes AES' response to the record drawing comments. Please find attached two (2) copies each of the Record Drawing Certification and the Record Drawings for your review and approval. Scott St. Clair of C. A. Barrs and Michael C. Brown will be responding to the remainder of the comments. Please feel free to contact me if you have further questions or comments.

Sincerely,

AES Consulting Engineers

G. Archer Marston, III, P.E.
amarson@aesva.com

cc: Michael C. Brown, Michael C. Brown, Ltd.
M. Scott St.Clair, C.A. Barrs

S:\JOBS\8003\00\WORDPROC\Document\800300L08-gam.doc

ENGINEERING CONSULTING SERVICES, LTD.
108 Ingram Road
Suite 1
Williamsburg, VA 23188
(757) 229-6677

Fax Cover Sheet

Date: May 28, 2004

# of Pages (incl. cover) 6

To:

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

Phone: (757) 253-6639 **Fax:** (757) 259-4032

From: Mike Galli

Re: BMP Certification
ECS Job # 07:6914 — Toano Buisness Center BMP

Originals to Follow Via:
[X] Mail [ ] FedEx/UPS [ ] Courier [ ] N/A

Remarks: [ ] Urgent [ ] Reply ASAP [X] For Your Review [ ] Please Comment

Scott, we are submitting this as requested by Scott St. Claire with C.A. Barrs Contractor. Please call if you have any questions.

MIKE

copy: Scott St. Claire - CA Barrs

DC 013
SP-14-98

GRAPHIC SCALE
30' 0' 30' 60'
SCALE: 1" = 30'

N/F FERGUSON, ET ALS TAX MAP # (12-3)(1-10 & 1-10A) DB 767, PG 8 ZONED A-1

N/F WILLIAM W. & PATRICIA A. STEWART PART OF TAX MAP #(12-4)(1-9A) DB 324, PG 22 PB 44, PG 20 ZONED A-1

N/F MICHAEL C. BROWN, LLC PART OF TAX MAP # (12-4)(1-9) ZONED B-1

CSX RAILROAD

100' R/W

ZONED A-1

15' DRAINAGE EASEMENT

PROVIDE 8' WIDE X 12' LONG X 18" DEER CLASS I RIP-RAP OUTLET PROTECTION (20 CY REQ'D)

MIN. 33' LONG x 10' WIDE OF CONCRETE LINED EMERGENCY SPILLWAY @ 36.00% (CREST EL.=92.0 W/ 20' LEVEL SECTION AT CREST (SEE DETAIL, SHEET 10)
TOP OF CONC. SPILLWAY=92.10

PROVIDE EC-2 LINER ALONG FILL SLOPE

PROVIDE EC-3 LINER ALONG DRAINAGE SWALE

END CONSTRUCTION STA 14+42

62 LF OF 30" ALUMINIZED CMP OUTLET PIPE @ 1.61%

TOP OF TRASH RACK=91.5
TOP OF RISER=89.70

BUILDING #3
FF=94.50

BMP DRY POND
POND BOTTOM=83.80

TOP OF DAM=94.0 93.95

CMP RISER (SEE DETAIL SHT 11)

45 LF OF 36" HDPE @ 0.78%

GUTTER PAN TO RISE OVER A LENGTH OF 15' TO BE FLUSH WITH TOP OF CURB

PROVIDE EC-3 LINER ALONG POND SLOPE

BUILDING #4
FF=97.14 FF=97.83 FF=98.50

45 LF OF 24" HDPE @ 1.10%

PAVEMENT TO RISE FROM RADIUS POINT TO BE FLUSH WITH TOP OF CURB

177 LF OF 15" HDPE @ 2.82%

102 LF OF 18" HDPE @ 1.96% 2.24%

89 LF OF 36" HDPE @ 0.67% 1.10%

44 LF OF 18" HDPE @ 9.20%

1-1/2" PVC FM

3"W

8"W

2"W

DC013

BUILDING #2
FF=98.00

220 LF OF 30" HDPE @ 1.39% 1.12%

SEE CONTINUATION BELOW

SEE GRADING DETAIL SHT. 11

BUILDING #1
FF=100.0

175 LF OF 18" HDPE @ 1.88%

248 LF OF 18" HDPE @ 2.02%

10 LF OF 30" HDPE @ 0.0%

115 LF OF 18" RCP @ 4.35% (INCLUDING 1-FES)

CONC. PAVED DITCH

4" PVC FM

80' 11' RAW INDUSTRIAL BOULDEVARD WEST

PROVIDE EC-2 LINER ON CUT SLOPE

62 LF OF 15" RCP @ 3.22%

41 LF OF 15" RCP @ 4.88%

SEE CONTINUATION ABOVE

BUILDING #2
FF=98.00

30 LF OF 30" HDPE @ 10.00% 9.27%

SS#15 MODIFIED DI-7A WITH INTERNAL WEIR STRUCTURE TOP=97.28 INV=90.72 (SEE DETAIL SHEET 11)

PROPOSED INFILTRATION TRENCH 24'x135'x7' DEEP 390 LF OF 48" PERFORATED ALUMINIZED TYPE II CMP @ 0.0% INV.=91.00 (SEE DETAIL SHEET 11)

100' INTERVALS (TYP)

270 LF OF 24" HDPE @ 1.3%

38 LF OF 24" RCP @ 16.7%

SS#14 MODIFIED DI-7 W/DROP INVERT (SEE DETAIL SHT 11) TOP=97.5 INV.=94.0

RICHMOND ROAD U.S. ROUTE 60

160' R / W

CONTRACTOR SHALL SAWCUT AND TACK EXISTING EDGE OF PAVEMENT TO ENSURE SMOOTH TIE IN TO EXISTING PAVEMENT

APPROVED
James City County
Environmental Division
By:
Date: 04-08-04

SEE RIGHT TURN LANE DETAIL SHT 10

DRAINAGE/BMP RECORD DRAWING BASED ON INFORMATION AS SUPPLIED BY C.A. BARRS CONTRACTOR, INC. AND AES CONSULTING ENGINEERS
JCC PLAN #SP-14-98
BMP ID #DC-013

RECORD DRAWING BASED ON INFORMATION AS SUPPLIED BY C.A. BARRS CONTRACTOR, INC.

RECEIVED MAY 2005 ENVIRONMENTAL DIVISION

No.	DATE	REVISION / COMMENT / NOTE	BY
5	9/22/03	RECORD DRAWING	GAM
2	6/98	REVISED PER JCC COMMENTS 6/10/98	RMO
1	5/98	REVISED PER JCC COMMENTS 3/10/98	RMO

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994
CONSULTING ENGINEERS

GRADING AND DRAINAGE PLAN
TOANO BUSINESS CENTER
OWNER/DEVELOPER: MICHAEL C. BROWN, L.L.C.
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
RMO/GAM	EAW
Scale	Date
1"=30'	1/5/98
Project No.	
8003	
Drawing No.	
2 OF 14	

DRAINAGE/BMP UTILITY RECORD DRAWING-9/22/03 DRAINAGE/BMP UTILITY RECORD DRAWING-12/13/02 RECORD DRAWING-1/27/99

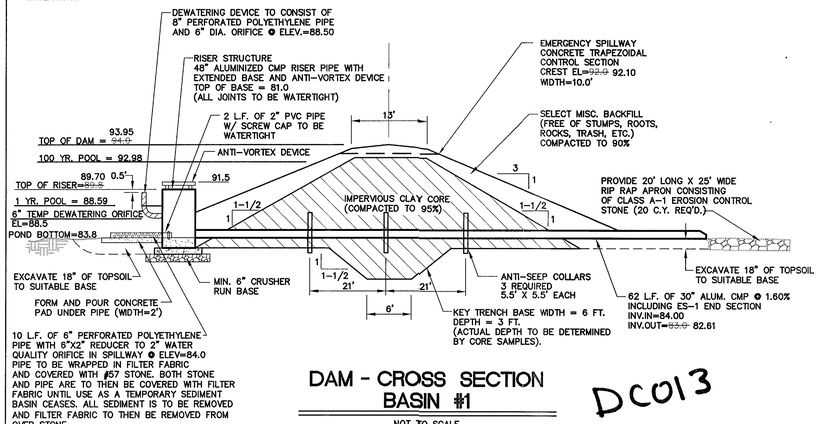
SP-14-98; DC013

09-26-03-09:17 8003DR02.dwg HEB

DC013_TOANO_BUSINESS_CENTER_DRY_POND_BMP - 019

NOTE:
AFTER ALL DISTURBED AREAS WITHIN THE BASIN'S DRAINAGE AREA ARE STABILIZED AND OPERATION AS TEMPORARY SEDIMENT BASIN CEASES, THE SCREW CAP ON THE 2" PVC PIPE ATTACHED TO THE WATER QUALITY ORIFICE IS TO BE OPENED, THE DEWATERING DEVICE REMOVED, AND THE DEWATERING ORIFICE SEALED TO BE WATERTIGHT.

NOTE:
SEDIMENT CLEANOUT POINT DURING OPERATION AS TEMPORARY SEDIMENT BASIN AS AT 12,256 C.F. OF STORAGE OR ELEV.=86.6



DAM - CROSS SECTION BASIN #1

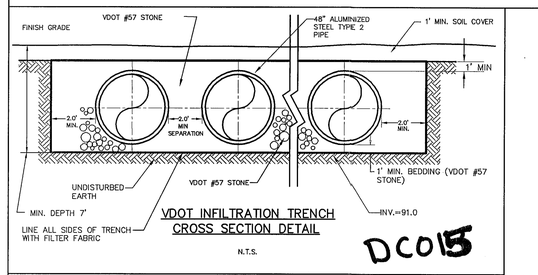
NOT TO SCALE

D-8003

DC013

NOTES:

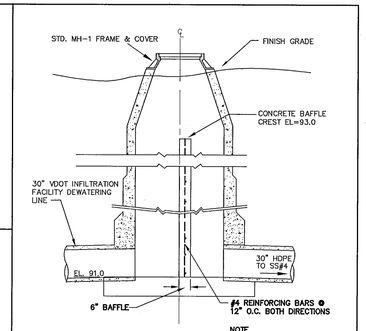
1. PROPOSED SWM/BMP "DRY" POND #1 SHALL ACT AS A TEMPORARY SEDIMENT BASIN DURING CONSTRUCTION. SEE TEMPORARY RISER STRUCTURE THIS SHEET.
2. SEDIMENT CLEAN OUT POINT DURING OPERATION AS TEMPORARY SEDIMENT BASIN IS @ EL.=86.6'
3. AFTER ALL DISTURBED AREAS ARE STABILIZED AND OPERATION AS TEMPORARY SEDIMENT BASIN CEASES, THE BASIN SHALL BE CLEANED OF SEDIMENT AND THE PERFORATED POLYETHYLENE DEWATERING DEVICE SHALL BE REMOVED. RISER PIPE SHALL THEN BE LOWERED TO ATTAIN A PERMANENT CREST ELEVATION OF 88.3.
4. UPON COMPLETION, THE CONSTRUCTION OF THE DAM SHALL BE CERTIFIED BY A GEOTECHNICALL ENGINEER WHO HAS INSPECTED THE STRUCTURE DURING CONSTRUCTION.
5. CONTRACTOR SHALL PROVIDE AS-BUILT DRAWINGS TO ENGINEER UPON COMPLETION OF BMP FACILITY.



VDOT INFILTRATION TRENCH CROSS SECTION DETAIL

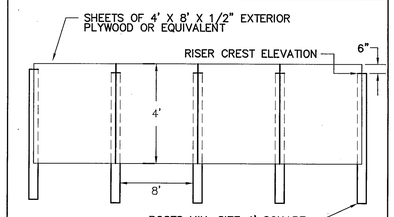
N.T.S.

DC015



MODIFIED MH-1 MANHOLE SS#15

NOT TO SCALE



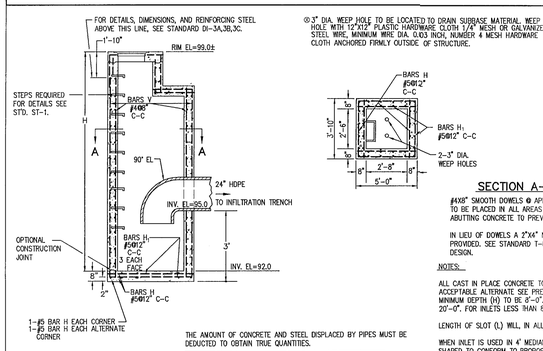
TEMPORARY SEDIMENT BASIN BAFFLE SECTION DETAIL

NOT TO SCALE

D-BAFFLE

DC013

DI-3AA, MODIFIED



@3" DIA. WEEP HOLE TO BE LOCATED TO DRAIN SUBBASE MATERIAL. WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIA. 0.03 INCH, NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY OUTSIDE OF STRUCTURE.

SECTION A-A

#4X8" SMOOTH DOWELS @ APPROX. 12" C-C- TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT.

IN LIEU OF DOWELS A 2"X4" NOTCH MAY BE PROVIDED. SEE STANDARD T-DI-3,4 ALTERNATE DESIGN.

NOTES:

ALL CAST IN PLACE CONCRETE TO BE CLASS A3. FOR ACCEPTABLE ALTERNATE SEE PRECAST STANDARD DESIGNS. MINIMUM DEPTH (H) TO BE 3'-0", MAXIMUM DEPTH TO BE 20'-0". FOR INLETS LESS THAN 6' USE STD. DI-3A,3B,3C.

LENGTH OF SLOT (L) WILL, IN ALL CASES, BE SHOWN ON PLANS.

WHEN INLET IS USED IN 4' MEDIAN, BACK OF INLET IS TO BE SHAPED TO CONFORM TO PROPOSED CURB.

FOR PLAN VIEW OF INLET SEE STD. DI-3A,3B,3C.

IF OPTIONAL CONSTRUCTION IS USED IT IS TO BE KEYED. ALL SPLICES IN BARS Y TO BE A MINIMUM OF 40D (20").

WHEN SPECIFIED ON PLANS INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD PLAN IS-1.

THIS ITEM MAY BE PRECAST OR CAST IN PLACE.

SEE STD. SL-1 FOR APPLICABILITY OF SAFETY SLABS.

THE AMOUNT OF CONCRETE AND STEEL DISPLACED BY PIPES MUST BE DEDUCTED TO OBTAIN TRUE QUANTITIES.

SCHEDULE OF REINFORCING STEEL **					
BARS H		BARS H1		BARS V	
NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH
4X(H+1)	3'-8"	4X(H+1)	3'-8"	36	H-1'4"

IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE.

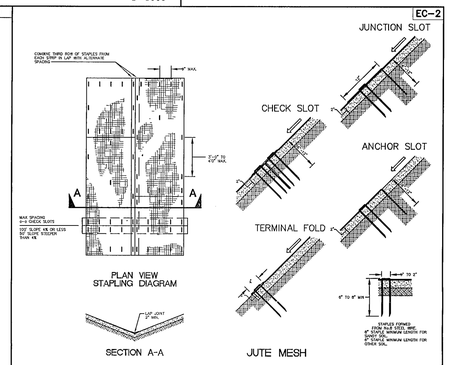
MODIFIED CAST IN PLACE MANHOLE WITH DROP INVERT SEDIMENT TRAP SS #14

12" - 30" PIPE

N.T.S.

D-DI3AA

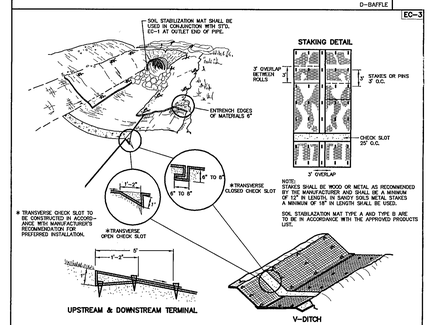
EC-2



PROTECTIVE COVERING INSTALLATION CRITERIA

NOT TO SCALE

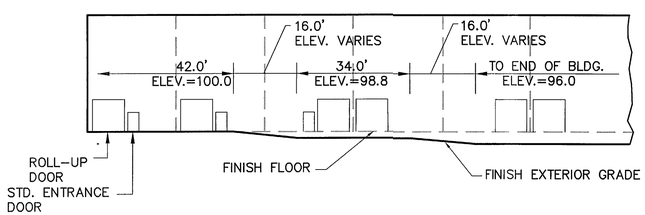
EC-3



SOIL STABILIZATION MAT INSTALLATION

N.T.S

D-EC3DWG



WAREHOUSE #1 REAR GRADE ELEVATION ACCESS DETAIL

N.T.S.

DAM CONSTRUCTION NOTES

1. A GEOTECHNICAL SUBSURFACE EXPLORATION AT THE PROPOSED DAM SITE SHALL BE PERFORMED BY THE OWNERS TESTING AGENCY. THE GEOTECHNICAL ENGINEER SHALL SUBMIT TO THE JAMES CITY COUNTY ENVIRONMENTAL DIVISION FOR APPROVAL, THEIR RECOMMENDATIONS FOR DAM DESIGN, CORE TRENCH WIDTH AND DEPTH, ANTI-SEEPAGE CONTROL , ETC. THE GEOTECHNICAL ENGINEER WILL INSPECT THE DAM DURING CONSTRUCTION. AFTER COMPLETION THE GEOTECHNICAL ENGINEER SHALL SUBMIT TO THE COUNTY A LETTER CERTIFYING THAT THE DAM WAS BUILT IN ACCORDANCE WITH THE PLANS, SPECIFICATIONS AND RECOMMENDATIONS FOR THE PROJECT.

2. SITE PREPARATION: THE CONTRACTOR SHALL STRIP ALL AREAS OF THE PERMANENT CONSTRUCTION TO REMOVE ALL UNSUITABLE MATERIALS. THE UNSUITABLE MATERIALS TO BE REMOVED BY STRIPPING SHALL INCLUDE ALL TOPSOIL, DEBRIS AND VEGETABLE MATTER, INCLUDING STUMPS AND ROOTS, AND ALL OTHER MATERIALS WHICH MAY BE UNSUITABLE FOR USE IN THE PERMANENT CONSTRUCTION.

3. EMBANKMENT: THE EXPOSED SUBGRADE SOILS SHALL BE CAREFULLY INSPECTED BY THE GEOTECHNICAL ENGINEER. ANY UNSUITABLE SUBGRADE MATERIALS THUS EXPOSED SHALL BE REMOVED AND REPLACED WITH A WELL COMPACTED, SUITABLE MATERIAL. DENSITY TESTING AT THE DISCRETION OF THE GEOTECHNICAL ENGINEER SHALL BE PERFORMED AT THIS TIME.

   THE EMBANKMENT SHALL BE KEYED INTO THE UNDISTURBED (EXISTING) SOIL STRATUM. EMBANKMENT SHALL BE KEYED INTO THE STRATUM AS SPECIFIED BY THE GEOTECHNICAL ENGINEER. THE EMBANKMENT FOUNDATION AND ABUTMENTS SHALL BEAR ON FIRM AND STABLE EXISTING SUBGRADE WHICH HAS BEEN PREPARED SO AS TO REMOVE ALL ORGANIC, LOOSE, AND GENERALLY UNSUITABLE MATERIAL.

   ALL MATERIALS TO BE USED FOR BACK FILL OR COMPACTED FILL SHALL BE INSPECTED AND TESTED BY THE SOILS ENGINEER IN ACCORDANCE WITH ASTM D2487 PRIOR TO PLACEMENT TO DETERMINE IF THEY ARE SUITABLE FOR THE INTENDED USE.

   THE FILL MATERIAL SHALL BE TAKEN FROM APPROVED BORROW AREAS. IT SHALL BE CLEAN MINERAL SOIL, FREE OF ROOTS, WOOD VEGETATION, OVERSIZED STONES, ROCKS, OR OTHER OBJECTIONABLE MATERIAL. SOILS WHICH ARE APPROVABLE FOR THE CONSTRUCTION OF THE IMPERVIOUS CLAY CORE, AS DEFINED BY THE UNIFIED SOIL CLASSIFICATION SYSTEM, ARE CH, INORGANIC CLAYS OF HIGH PLASTICITY; CL, INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELY CLAYS, SANDY CLAYS, SILTY CLAYS; SC, (WITH ENGINEERS APPROVAL) CLAYEY SANDS, POORLY GRADED SAND CLAY MIXTURES. MATERIALS TO BE USED FOR THE CONSTRUCTION OF THE SHELL SHALL BE SELECT BACK FILL FREE OF STUMPS, ROOTS, ROCKS, TRASH, ETC. AND SHALL BE MORE PERVIOUS THAN THE IMPERVIOUS CLAY CORE. THE FILL MATERIAL'S MOISTURE CONTENT SHALL BE +3 TO -2 PERCENTAGE POINTS OF OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D2216 (I.E. IN GENERAL THE FILL MATERIAL SHOULD CONTAIN SUFFICIENT MOISTURE SO THAT IT CAN BE FORMED INTO A BALL WITHOUT CRUMBLING. IF WATER CAN BE SQUEEZED OUT OF THE BALL, IT IS TOO WET FOR PROPER COMPACTION). FILL MATERIAL SHALL BE PLACED IN 6 TO 8-INCH CONTINUOUS LAYERS OVER THE ENTIRE LENGTH OF THE FILL. FIRST LIFT ON SUB GRADE MAY BE PLACED AT A DEPTH UP TO 30 INCHES TO BRIDGE SUBGRADE SOILS WITH OVER OPTIMUM MOISTURE CONTENT. COMPACTION, AS NOTED ON PLAN, SHALL BE OBTAINED GENERALLY BY USING A SHEEPSFOOT COMPACTOR. FINISHED GRADES SHALL BE MERGED NATURALLY INTO THE EXISTING GRADES.
   THE OWNER'S TESTING AGENCY SHALL PROVIDE A TESTING PROGRAM TO ENSURE THE DAM WAS CONSTRUCTED IN ACCORDANCE WITH THE GEOTECHNICAL REPORT'S RECOMMENDATIONS. THE LAB SHALL, AT A MINIMUM, TEST EVERY LIFT OF FILL. IF THE LIFT EXCEEDS 15,000 SQUARE FEET THEN A TEST SHALL BE PROVIDED, AT A MINIMUM, FOR EACH 15,000 SQUARE FEET OF FILL IN THE LIFT. THESE TEST RESULTS SHALL BE PROVIDED TO THE OWNER AT AN ONGOING BASIS. AT THE COMPLETION OF THE EMBANKMENT THE TESTING AGENCY SHALL PROVIDE THE OWNER WITH A LETTER TO CERTIFY THAT SUFFICIENT TESTS HAVE BEEN TAKEN TO ENSURE THE CONSTRUCTION IS IN ACCORDANCE WITH GEOTECHNICAL REPORT'S RECOMMENDATIONS. SHELL MATERIAL TO BE SELECT FILL (COMPACTION TO A DRY DENSITY OF 90%). CORE SHALL BE IMPERVIOUS CLAY WITH A COMPACTION TO DRY DENSITY OF 95%.

4. CUTOFF TRENCH/KEY TRENCH: THE TRENCH SHALL BE EXCAVATED ALONG THE CENTERLINE OF THE DAM. THE MINIMUM DEPTH AND WIDTH SHALL BE AS DETERMINED BY THE GEOTECHNICAL ENGINEER. THE MINIMUM BOTTOM WIDTH SHALL BE WIDE ENOUGH TO PERMIT OPERATION OF COMPACTION EQUIPMENT. THE SIDE SLOPES SHALL BE NO STEEPER THAN 1:1. COMPACTION REQUIREMENTS SHALL BE THE SAME AS THOSE FOR THE EMBANKMENT. THE TRENCH SHALL BE KEPT DRAINED DURING THE BACKFILLING-COMPACTING OPERATIONS.

5. PRINCIPAL SPILLWAY: THE BOTTOM OF THE SPILLWAY RISER FOUNDATION BASE EXCAVATION SHALL BE OBSERVED BY THE GEOTECHNICAL ENGINEER TO ENSURE THAT ALL UNSUITABLE AND LOOSE MATERIALS ARE REMOVED AND THAT ACCEPTABLE BEARING CONDITIONS EXIST IN THE EXCAVATION'S BASE.

   ALL JOINTS IN THE PRINCIPAL SPILLWAY RISER STRUCTURE AND BARREL SHALL BE OF WATERTIGHT CONSTRUCTION. THE RISER OF THE PRINCIPAL SPILLWAY SHALL BE SECURELY ATTACHED TO THE BARREL BY A WATERTIGHT CONNECTION. THE BARREL AND RISER SHALL BE PLACED ON A FIRM COMPACTED SOIL FOUNDATION, THE BASE OF THE RISER SHALL BE FIRMLY ANCHORED ACCORDING TO THE DESIGN CRITERIA TO PREVENT ITS FLOATING. PERVIOUS MATERIALS SUCH AS SAND, GRAVEL OR CRUSHED STONE SHALL NOT BE USED AS BACK FILL AROUND THE BARREL. FILL MATERIAL SHALL BE PLACED AROUND THE PIPE IN 4-INCH LAYERS AND COMPACTED BY HAND AT LEAST TO THE SAME DENSITY AS THE EMBANKMENT. A MINIMUM OF TWO FEET OF FILL SHALL BE HAND-COMPACTED OVER THE BARREL BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.

6. EMERGENCY SPILLWAY: EMERGENCY SPILLWAY CONSTRUCTED OVER FILL MATERIAL SHALL BE CONCRETE LINED.

7. VEGETATIVE STABILIZATION: FINAL VEGETATIVE COVER (STABILIZATION) SHALL CONSIST OF TOP SOILING, LIMING, FERTILIZING, SEEDING, AND MULCHING TO ASSURE A FIRM STAND OF GRASS AS SOON AS PRACTICAL. SEDIMENT BASINS AND OTHER TEMPORARY EROSION CONTROL MEASURES ARE TO BE REMOVED ONLY WHEN STABILIZATION IS COMPLETE. FINAL VEGETAL COVER SHALL BE PROVIDED IN ACCORDANCE WITH THE FOLLOWING:

TOPSOIL:	AT LEAST 2" THICKNESS OBTAINED FROM STOCKPILES ON SITE, FREE OF LARGE DEBRIS.
LIME:	4,000#/ACRE (90#/1,000 S.F.)
SEED:	KENTUCKY 31 TALL FESCUE 250#/ACRE (6#/1,000 S.F.)
FERTILIZER:	10/20/10 MIX, 1,000#/ACRE (25#/1,000 S.F.)
MULCH:	STRAW OR HAY (LOCALLY OBTAINED) 4,000#/ACRE (90#/1,000 S.F.)

DRAINAGE/BMP RECORD DRAWING BASED ON INFORMATION AS SUPPLIED BY C.A. BARRS CONTRACTOR, INC. AND AES CONSULTING ENGINEERS JCC PLAN #SP-14-98 BMP ID #DC-013

RECORD DRAWING BASED ON INFORMATION AS SUPPLIED BY C.A. BARRS CONTRACTOR, INC.

No.	DATE	REVISION / COMMENT / NOTE	BY
5	9/22/03	RECORD DRAWING	CAM
4	6/9/98	REVISED PER JCC COMMENTS 6/10/98	RMO
3	5/98	REVISED PER JCC COMMENTS 3/10/98	RMO

COMMONWEALTH OF VIRGINIA
STATE OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
1/21/99
PROFESSIONAL ENGINEER

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(804) 253-0040
Fax (804) 220-8994
AES CONSULTING ENGINEERS

NOTES AND DETAILS

TOANO BUSINESS CENTER

OWNER/DEVELOPER: MICHAEL C. BROWN, L.L.C.

STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
RMO/GAM	EAW
Scale	Date
1"=30'	1/5/98

Project No. 8003

Drawing No. 11 OF 14

09.26.03-09:19 80030R11.dwg

HEB

DRAINAGE/BMP UTILITY RECORD DRAWING-9/22/03 DRAINAGE/BMP UTILITY RECORD DRAWING-12/13/02 RECORD DRAWING-1/27/99

GRAPHIC SCALE
30' 0' 30' 60'
SCALE: 1" = 30'

N/F
FERGUSON, ET ALS
TAX MAP # (12-3)(1-10 & 1-10A)
DB 767, PG 8
ZONED A-1

CSX RAILROAD
100' R/W
ZONED A-1

MIN. 32' LONG x 10' WIDE OF CONCRETE LINED EMERGENCY SPILLWAY @ 36.00% CREST EL.=92.0 W/ 20' LEVEL SECTION AT CREST (SEE DETAIL, SHEET 10)
TOP OF CONC. SPILLWAY=92.10

15' DRAINAGE EASEMENT

PROVIDE 8' WIDE x 12' LONG x 18" DEEP CLASS I RIP-RAP OUTLET PROTECTION (20 CY REQ'D)

INV=82.61

PROVIDE EC-2 LINER ALONG FILL SLOPE

PROVIDE EC-2 LINER ALONG FILL SLOPE

N/F
WILLIAM W. & PATRICIA A. STEWART
PART OF TAX MAP #(12-4)(1-9A)
DB 324, PG 22
PB 14, PG 20
ZONED A-1

PROVIDE EC-3 LINER ALONG DRAINAGE SWALE

END CONSTRUCTION STA 14+42

62 LF OF 30" ALUMINIZED CMP OUTLET PIPE @ 1.61%

TOP OF TRASH RACK=91.5
TOP OF RISER=89.70

BUILDING #3
FF=94.80

45 LF OF 36" HDPE @ 0.78%

CMP RISER (SEE DETAIL SHT. 11)

BMP DRY POND
POND BOTTOM=83.80

DC013

INV=84.11

GUTTER PAN TO RISE OVER A LENGTH OF 15' TO BE FLUSH WITH TOP OF CURB

PROVIDE EC-2 LINER ALONG POND SLOPE

BUILDING #4
FF=97.14 FF=97.83 FF=98.50

INV=84.32

46 LF OF 24" HDPE @ 11.10%

GUTTER PAN TO RISE OVER A LENGTH OF 15' TO BE FLUSH WITH TOP OF CURB

PAVEMENT TO RISE FROM

INV OUT=88.57

INV OUT=83.95

1-1/2" PVC FM

3"W

8"W

2"W

SEE GRADING DETAIL SHT. 11

BUILDING #2
FF=98.00

220 LF OF 30" HDPE @ 1.39%

SEE CONTINUATION BELOW

SS#6
DI-3B, L=4'
TOP=95.3
INV.=91.30

BUILDING #1
FF=100.0

SS#5
DI-3B, L=4'
TOP=97.5
INV.=93.00

10 LF OF 30" HDPE @ 0.0%

WAS THIS BMP BUILT?

PROPOSED INFILTRATION TRENCH 24x1.95x7' DEEP
390 LF OF 48" PERFORATED ALUMINIZED TYPE II CMP @ 0.0%
INV.=91.00 (SEE DETAIL SHEET 11)

SS#15
MODIFIED DI-7A WITH INTERNAL WEIR STRUCTURE
TOP=97.8
INV=91.0
(SEE DETAIL SHEET 11)

30 LF OF 30" HDPE @ 10.00%

CD @ 100' INTERVALS (TYP)

270 LF OF 24" HDPE @ 1.3%

SS#14
MODIFIED DI-7
W/DROP INVERT
(SEE DETAIL SHT. 11)
TOP=97.50
INV.=94.0

INV. 105.0

35 LF OF 24" RCP @ 16.7%

RICHMOND ROAD U.S. ROUTE 60

NO EVIDENCE TO SUGGEST THIS WAS PUT IN.

160' R / W

CONTRACTOR WILL SAWCUT AND TACK EXISTING EDGE OF PAVEMENT TO ENSURE SMOOTH TIE IN TO EXISTING PAVEMENT

SEE RIGHT TURN LANE DETAIL SHT. 10

INDUSTRIAL BOULEVARD WEST
80' R/W

116 LF OF 18" RCP @ 4.35% (INCLUDING 1-FES)

CONC. PAVED DITCH

SS#12
ES-1
INV.=98.0

PROVIDE EC-2 LINER ON CUT SLOPE

62 LF OF 15" RCP @ 3.22%

SS#10
MH-1
TOP=100.1
INV.=96.0

SS#11
ES-1

41 LF OF 15" RCP @ 4.88%

62 LF OF 15" RCP @ 3.22%

PROVIDE EC-2 LINER ON CUT SLOPE

SS#13
ES-1
INV.=98.0

SS#16
ES-1
INV.=99.0

N/F
MICHAEL C. BROWN, LLC
PART OF TAX MAP #(12-4)(1-9)
ZONED B-1

4" PVC FM

SJT REVIEW SET SP-14-98; DC013

SEE CONTINUATION ABOVE

BUILDING #2
FF=98.00

SS#6
DI-3B, L=4'
TOP=95.3
INV.=91.30

DRAINAGE/BMP RECORD DRAWING BASED ON INFORMATION AS SUPPLIED BY C.A. BARRS CONTRACTOR, INC.

RECORD DRAWING BASED ON INFORMATION AS SUPPLIED BY C.A. BARRS CONTRACTOR, INC.

No.	DATE	REVISION / COMMENT / NOTE	BY
2	6/98	REVISED PER JCC COMMENTS 6/10/98	RMO
1	5/98	REVISED PER JCC COMMENTS 3/10/98	RMO

PROFESSIONAL ENGINEER
COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 08232
12/1/98

NO SIGNATURE
NO AB CERT

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994
CONSULTING ENGINEERS

GRADING AND DRAINAGE PLAN
TOANO BUSINESS CENTER
OWNER/DEVELOPER: MICHAEL C. BROWN, L.L.C.
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
RMO/GAM	EAW
Scale	Date
1"=30'	1/5/98
Project No.	
8003	
Drawing No.	
2 OF 14	

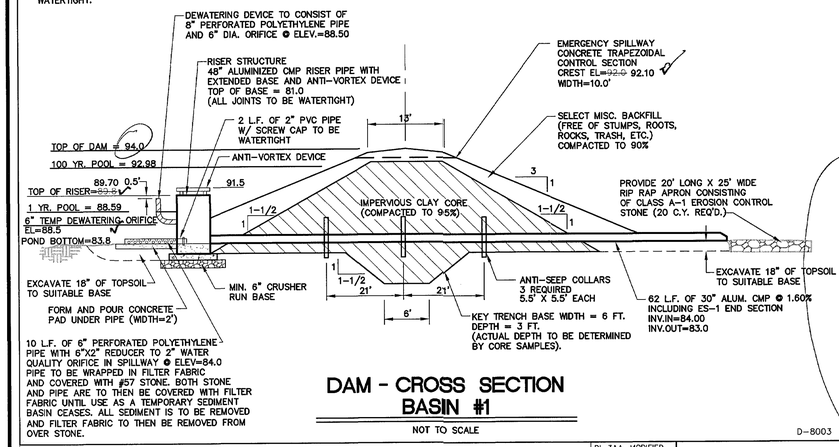
RECORD DRAWING-1/27/99
DRAINAGE/BMP UTILITY RECORD DRAWING-12/13/02

03.26.03-11:36 8003GR02.dwg
rmk

DC013_TOANO_BUSINESS_CENTER_DRY_POND_BMP - 021

NOTE:
AFTER ALL DISTURBED AREAS WITHIN THE BASIN'S DRAINAGE AREA ARE STABILIZED AND OPERATION AS TEMPORARY SEDIMENT BASIN CEASES, THE SCREW CAP ON THE 2" PVC PIPE ATTACHED TO THE WATER QUALITY ORIFICE IS TO BE OPENED, THE DEWATERING DEVICE REMOVED, AND THE DEWATERING ORIFICE SEALED TO BE WATERTIGHT.

NOTE:
SEDIMENT CLEANOUT POINT DURING OPERATION AS TEMPORARY SEDIMENT BASIN AS AT 12,256 C.F. OF STORAGE OR ELEV.=86.6

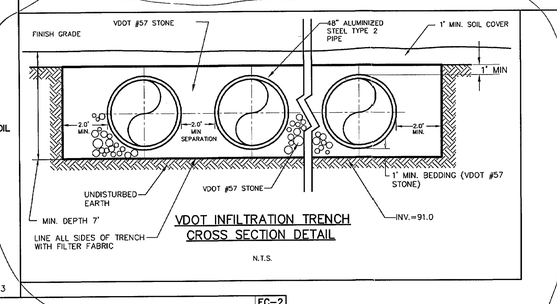


DAM - CROSS SECTION BASIN #1

NOT TO SCALE

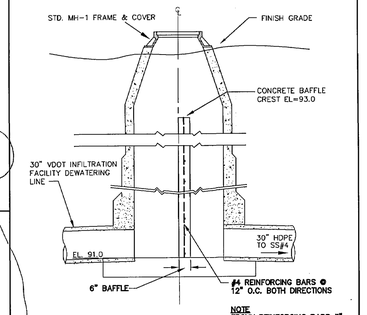
D-8003

NOTES:
1. PROPOSED SWM/BMP "DRY" POND #1 SHALL ACT AS A TEMPORARY SEDIMENT BASIN DURING CONSTRUCTION. SEE TEMPORARY RISER STRUCTURE THIS SHEET.
2. SEDIMENT CLEAN OUT POINT DURING OPERATION AS TEMPORARY SEDIMENT BASIN IS @ EL.=86.6'
3. AFTER ALL DISTURBED AREAS ARE STABILIZED AND OPERATION AS TEMPORARY SEDIMENT BASIN CEASES, THE BASIN SHALL BE CLEANED OF SEDIMENT AND THE PERFORATED POLYETHYLENE DEWATERING DEVICE SHALL BE REMOVED. RISER PIPE SHALL THEN BE LOWERED TO ATTAIN A PERMANENT CREST ELEVATION OF 88.3.
4. UPON COMPLETION, THE CONSTRUCTION OF THE DAM SHALL BE CERTIFIED BY A GEOTECHNICALL ENGINEER WHO HAS INSPECTED THE STRUCTURE DURING CONSTRUCTION.
5. CONTRACTOR SHALL PROVIDE AS-BUILT DRAWINGS TO ENGINEER UPON COMPLETION OF BMP FACILITY.



VDOT INFILTRATION TRENCH CROSS SECTION DETAIL

N.T.S.



MODIFIED MH-1 MANHOLE SS#15

NOT TO SCALE

DAM CONSTRUCTION NOTES

1. A GEOTECHNICAL SUBSURFACE EXPLORATION AT THE PROPOSED DAM SITE SHALL BE PERFORMED BY THE OWNERS TESTING AGENCY. THE GEOTECHNICAL ENGINEER SHALL SUBMIT TO THE JAMES CITY COUNTY ENVIRONMENTAL DIVISION FOR APPROVAL, THEIR RECOMMENDATIONS FOR DAM DESIGN, CORE TRENCH WIDTH AND DEPTH, ANTI-SEEPAGE CONTROL , ETC. THE GEOTECHNICAL ENGINEER WILL INSPECT THE DAM DURING CONSTRUCTION. AFTER COMPLETION THE GEOTECHNICAL ENGINEER SHALL SUBMIT TO THE COUNTY A LETTER CERTIFYING THAT THE DAM WAS BUILT IN ACCORDANCE WITH THE PLANS, SPECIFICATIONS AND RECOMMENDATIONS FOR THE PROJECT.
2. SITE PREPARATION: THE CONTRACTOR SHALL STRIP ALL AREAS OF THE PERMANENT CONSTRUCTION TO REMOVE ALL UNSUITABLE MATERIALS. THE UNSUITABLE MATERIALS TO BE REMOVED BY STRIPPING SHALL INCLUDE ALL TOPSOIL, DEBRIS AND VEGETABLE MATTER, INCLUDING STUMPS AND ROOTS, AND ALL OTHER MATERIALS WHICH MAY BE UNSUITABLE FOR USE IN THE PERMANENT CONSTRUCTION.
3. EMBANKMENT: THE EXPOSED SUBGRADE SOILS SHALL BE CAREFULLY INSPECTED BY THE GEOTECHNICAL ENGINEER. ANY UNSUITABLE SUBGRADE MATERIALS THUS EXPOSED SHALL BE REMOVED AND REPLACED WITH A WELL COMPACTED, SUITABLE MATERIAL. DENSITY TESTING AT THE DISCRETION OF THE GEOTECHNICAL ENGINEER SHALL BE PERFORMED AT THIS TIME.

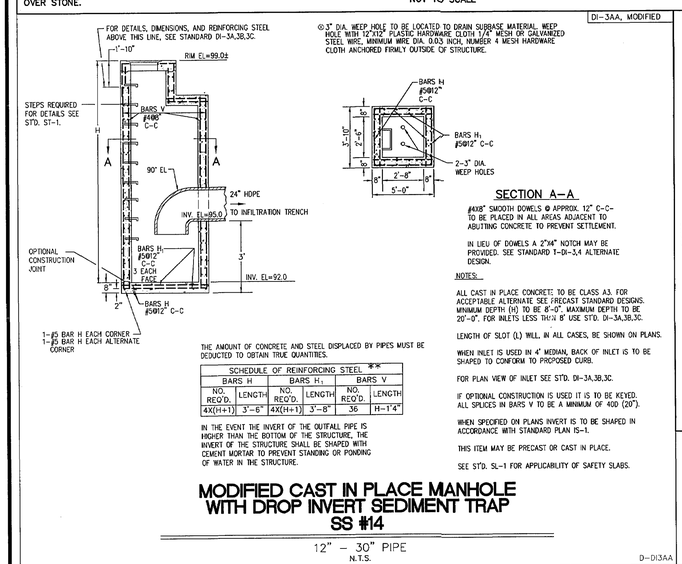
   THE EMBANKMENT SHALL BE KEYED INTO THE UNDISTURBED (EXISTING) SOIL STRATUM. EMBANKMENT SHALL BE KEYED INTO THE STRATUM AS SPECIFIED BY THE GEOTECHNICAL ENGINEER. THE EMBANKMENT FOUNDATION AND ABUTMENTS SHALL BEAR ON FIRM AND STABLE EXISTING SUBGRADE WHICH HAS BEEN PREPARED SO AS TO REMOVE ALL ORGANIC, LOOSE, AND GENERALLY UNSUITABLE MATERIAL.

   ALL MATERIALS TO BE USED FOR BACK FILL OR COMPACTED FILL SHALL BE INSPECTED AND TESTED BY THE SOILS ENGINEER IN ACCORDANCE WITH ASTM D2487 PRIOR TO PLACEMENT TO DETERMINE IF THEY ARE SUITABLE FOR THE INTENDED USE.

   THE FILL MATERIAL SHALL BE TAKEN FROM APPROVED BORROW AREAS. IT SHALL BE CLEAN MINERAL SOIL, FREE OF ROOTS, WOOD VEGETATION, OVERSIZED STONES, ROCKS, OR OTHER OBJECTIONABLE MATERIAL. SOILS WHICH ARE APPROVABLE FOR THE CONSTRUCTION OF THE IMPERVIOUS CLAY CORE, AS DEFINED BY THE UNIFIED SOIL CLASSIFICATION SYSTEM, ARE CH, INORGANIC CLAYS OF HIGH PLASTICITY; CL, INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS; SC, (WITH ENGINEERS APPROVAL) CLAYEY SANDS, POORLY GRADED SAND CLAY MIXTURES. MATERIALS TO BE USED FOR THE CONSTRUCTION OF THE SHELL SHALL BE SELECT BACK FILL FREE OF STUMPS, ROOTS, ROCKS, TRASH, ETC. AND SHALL BE MORE PERVIOUS THAN THE IMPERVIOUS CLAY CORE. THE FILL MATERIAL'S MOISTURE CONTENT SHALL BE +3 TO −2 PERCENTAGE POINTS OF OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D2216 (I.E. IN GENERAL THE FILL MATERIAL SHOULD CONTAIN SUFFICIENT MOISTURE SO THAT IT CAN BE FORMED INTO A BALL WITHOUT CRUMBLING. IF WATER CAN BE SQUEEZED OUT OF THE BALL, IT IS TOO WET FOR PROPER COMPACTION). FILL MATERIAL SHALL BE PLACED IN 6 TO 8-INCH CONTINUOUS LAYERS OVER THE ENTIRE LENGTH OF THE FILL. FIRST LIFT ON SUB GRADE MAY BE PLACED AT A DEPTH UP TO 30 INCHES TO BRIDGE SUBGRADE SOILS WITH OVER OPTIMUM MOISTURE CONTENT. COMPACTION, AS NOTED ON PLAN, SHALL BE OBTAINED GENERALLY BY USING A SHEEPSFOOT COMPACTOR. FINISHED GRADES SHALL BE MERGED NATURALLY INTO THE EXISTING GRADES.
   THE OWNER'S TESTING AGENCY SHALL PROVIDE A TESTING PROGRAM TO ENSURE THE DAM WAS CONSTRUCTED IN ACCORDANCE WITH THE GEOTECHNICAL REPORT'S RECOMMENDATIONS. THE LAB SHALL, AT A MINIMUM, TEST EVERY LIFT OF FILL. IF THE LIFT EXCEEDS 15,000 SQUARE FEET THEN A TEST SHALL BE PROVIDED, AT A MINIMUM, FOR EACH 15,000 SQUARE FEET OF FILL IN THE LIFT. THESE TEST RESULTS SHALL BE PROVIDED TO THE OWNER AT AN ONGOING BASIS. AT THE COMPLETION OF THE EMBANKMENT THE TESTING AGENCY SHALL PROVIDE THE OWNER WITH A LETTER TO CERTIFY THAT SUFFICIENT TESTS HAVE BEEN TAKEN TO ENSURE THE CONSTRUCTION IS IN ACCORDANCE WITH GEOTECHNICAL REPORT'S RECOMMENDATIONS. SHELL MATERIAL TO BE SELECT FILL (COMPACTION TO A DRY DENSITY OF 90%). CORE SHALL BE IMPERVIOUS CLAY WITH A COMPACTION TO DRY DENSITY OF 95%.
4. CUTOFF TRENCH/KEY TRENCH: THE TRENCH SHALL BE EXCAVATED ALONG THE CENTERLINE OF THE DAM. THE MINIMUM DEPTH AND WIDTH SHALL BE AS IDETERMINED BY THE GEOTECHNICAL ENGINEER. THE MINIMUM BOTTOM WIDTH SHALL BE WIDE ENOUGH TO PERMIT OPERATION OF COMPACTION EQUIPMENT. THE SIDE SLOPES SHALL BE NO STEEPER THAN 1:1. COMPACTION REQUIREMENTS SHALL BE THE SAME AS THOSE FOR THE EMBANKMENT. THE TRENCH SHALL BE KEPT DRAINED DURING THE BACKFILLING-COMPACTING OPERATIONS.
5. PRINCIPAL SPILLWAY: THE BOTTOM OF THE SPILLWAY RISER FOUNDATION BASE EXCAVATION SHALL BE OBSERVED BY THE GEOTECHNICAL ENGINEER TO ENSURE THAT ALL UNSUITABLE AND LOOSE MATERIALS ARE REMOVED AND THAT ACCEPTABLE BEARING CONDITIONS EXIST IN THE EXCAVATION'S BASE.

   ALL JOINTS IN THE PRINCIPAL SPILLWAY RISER STRUCTURE AND BARREL SHALL BE OF WATERTIGHT CONSTRUCTION. THE RISER OF THE PRINCIPAL SPILLWAY SHALL BE SECURELY ATTACHED TO THE BARREL BY A WATERTIGHT CONNECTION. THE BARREL AND RISER SHALL BE PLACED ON A FIRM COMPACTED SOIL FOUNDATION. THE BASE OF THE RISER SHALL BE FIRMLY ANCHORED ACCORDING TO THE DESIGN CRITERIA TO PREVENT ITS FLOATING. PERVIOUS MATERIALS SUCH AS SAND, GRAVEL OR CRUSHED STONE SHALL NOT BE USED AS BACK FILL AROUND THE BARREL. FILL MATERIAL SHALL BE PLACED AROUND THE PIPE IN 4-INCH LAYERS AND COMPACTED BY HAND AT LEAST TO THE SAME DENSITY AS THE EMBANKMENT. A MINIMUM OF TWO FEET OF FILL SHALL BE HAND-COMPACTED OVER THE BARREL BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.
6. EMERGENCY SPILLWAY: EMERGENCY SPILLWAY CONSTRUCTED OVER FILL MATERIAL SHALL BE CONCRETE LINED.
7. VEGETATIVE STABILIZATION: FINAL VEGETATIVE COVER (STABILIZATION) SHALL CONSIST OF TOP SOILING, LIMING, FERTILIZING, SEEDING, AND MULCHING TO ASSURE A FIRM STAND OF GRASS AS SOON AS PRACTICAL. SEDIMENT BASINS AND OTHER TEMPORARY EROSION CONTROL MEASURES ARE TO BE REMOVED ONLY WHEN STABILIZATION IS COMPLETE. FINAL VEGETAL COVER SHALL BE PROVIDED IN ACCORDANCE WITH THE FOLLOWING:

TOPSOIL:	AT LEAST 2" THICKNESS OBTAINED FROM STOCKPILES ON SITE, FREE OF LARGE DEBRIS.
LIME:	4,000#/ACRE (90#/1,000 S.F.)
SEED:	KENTUCKY 31 TALL FESCUE 250#/ACRE (6#/1,000 S.F.)
FERTILIZER:	10/20/10 MIX, 1,000#/ACRE (25#/1,000 S.F.)
MULCH:	STRAW OR HAY (LOCALLY OBTAINED) 4,000#/ACRE (90#/1,000 S.F.)



DI-3AA, MODIFIED

SECTION A-A

#4X8" SMOOTH DOWELS @ APPROX. 12" C-C- TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT.

IN LIEU OF DOWELS A 2"X4" NOTCH MAY BE PROVIDED. SEE STANDARD I-DI-3,4 ALTERNATE DESIGN.

NOTES:

ALL CAST IN PLACE CONCRETE TO BE CLASS A3. FOR ACCEPTABLE ALTERNATE SEE PRECAST STANDARD DESIGNS. MINIMUM DEPTH (H) TO BE 8'-0". MAXIMUM DEPTH TO BE 20'-0". FOR INLETS LESS THAN 8' USE STD. DI-3A,3B,3C.

LENGTH OF SLOT (L) WILL, IN ALL CASES, BE SHOWN ON PLANS.

WHEN INLET IS USED IN 4' MEDIAN, BACK OF INLET IS TO BE SHAPED TO CONFORM TO PROPOSED CURB.

FOR PLAN VIEW OF INLET SEE STD. DI-3A,3B,3C.

IF OPTIONAL CONSTRUCTION IS USED IT IS TO BE KEYED. ALL SPLICES IN BARS V TO BE A MINIMUM OF 40D (20").

WHEN SPECIFIED ON PLANS INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD PLAN 15-1.

THIS ITEM MAY BE PRECAST OR CAST IN PLACE.

SEE STD. SL-1 FOR APPLICABILITY OF SAFETY SLABS.

THE AMOUNT OF CONCRETE AND STEEL DISPLACED BY PIPES MUST BE DEDUCTED TO OBTAIN TRUE QUANTITIES.

SCHEDULE OF REINFORCING STEEL **

BARS H		BARS H_1		BARS V	
NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH
4X(H+1)	3'-6"	4X(H+1)	3'-8"	36	H-1'4"

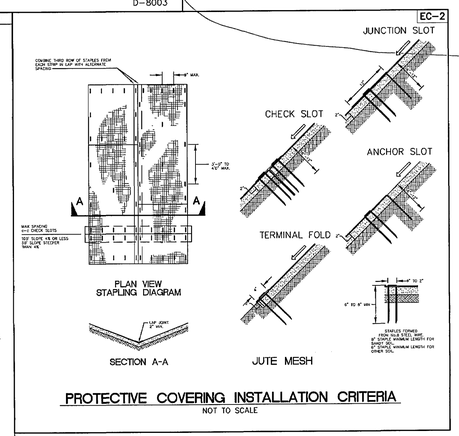
IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE.

MODIFIED CAST IN PLACE MANHOLE WITH DROP INVERT SEDIMENT TRAP SS #14

12" – 30" PIPE
N.T.S.

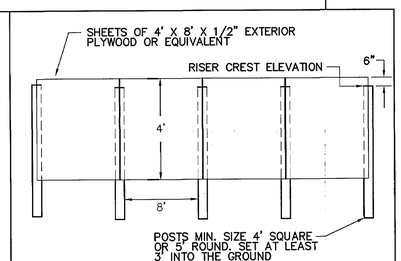
D-DI3AA

EC-2



PROTECTIVE COVERING INSTALLATION CRITERIA

NOT TO SCALE

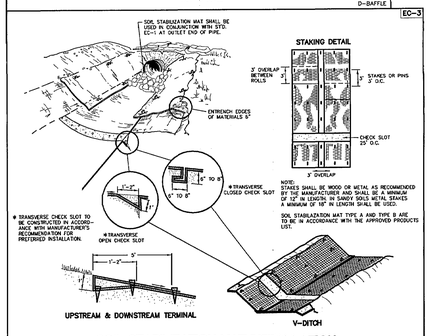


TEMPORARY SEDIMENT BASIN BAFFLE SECTION DETAIL

NOT TO SCALE

D-BAFFLE

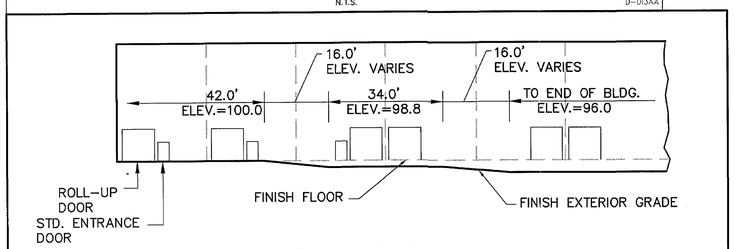
EC-3



SOIL STABILIZATION MAT INSTALLATION

N.T.S

D-EC3.DWG



WAREHOUSE #1 REAR GRADE ELEVATION ACCESS DETAIL

N.T.S.

Same INFO As Design. No Ab Data Provided.

DRAINAGE/BMP RECORD DRAWING BASED ON INFORMATION AS SUPPLIED BY C.A. BARRS CONTRACTOR, INC.

RECORD DRAWING BASED ON INFORMATION AS SUPPLIED BY C.A. BARRS CONTRACTOR, INC.

No.	DATE	REVISION / COMMENT / NOTE	BY
2	6/98	REVISED PER JCC COMMENTS 6/10/98	RMO
1	5/98	REVISED PER JCC COMMENTS 3/10/98	RMO

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(804) 253-0040
Fax (804) 220-9994
CONSULTING ENGINEERS

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
1/2/98
PROFESSIONAL ENGINEER

NOTES AND DETAILS
TOANO BUSINESS CENTER
OWNER/DEVELOPER: MICHAEL C. BROWN, L.L.C.
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
RMO/GAM	EAW
Scale	Date
1"=30'	1/5/98

Project No. 8003

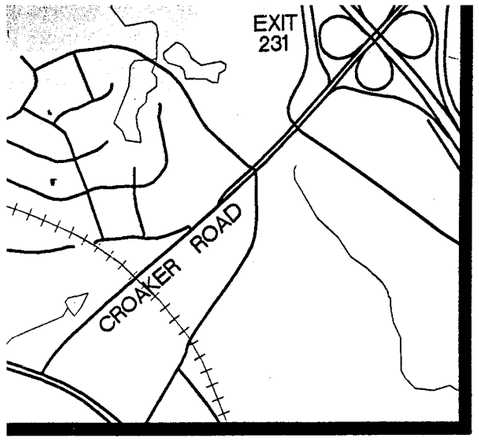
Drawing No. 11 OF 14

RECORD DRAWING-1/27/99

03.26.03-11:38 8003GR11.dwg

rmk

DC013_TOANO_BUSINESS_CENTER_DRY_POND_BMP - 022



2000')

LAND USE SUMMARY TABLE

ITEM	S.F.	AC.	% OF SITE
TOTAL SITE	316,627	7.27	100.00
BUILDING COVERAGE	80,500	1.85	25.4
PARKING, WALKS, & ROADS	108,726	2.49	34.3
OPEN SPACE	127,401	2.92	40.2
TOTAL SITE	316,627	7.27	100.00
TOTAL IMPERVIOUS AREA	189,226	4.34	
TOTAL AREA DISTURBED =	8.51 ACRES		

PROPERTY ZONING

MICHAEL C. BROWN — M-1, LIMITED BUSINESS/ INDUSTRIAL DISTRICT WITH PROFFERS

PARKING CALCULATIONS

PROPOSED USE: OFFICE/WAREHOUSE

PROPOSED BUILDINGS:

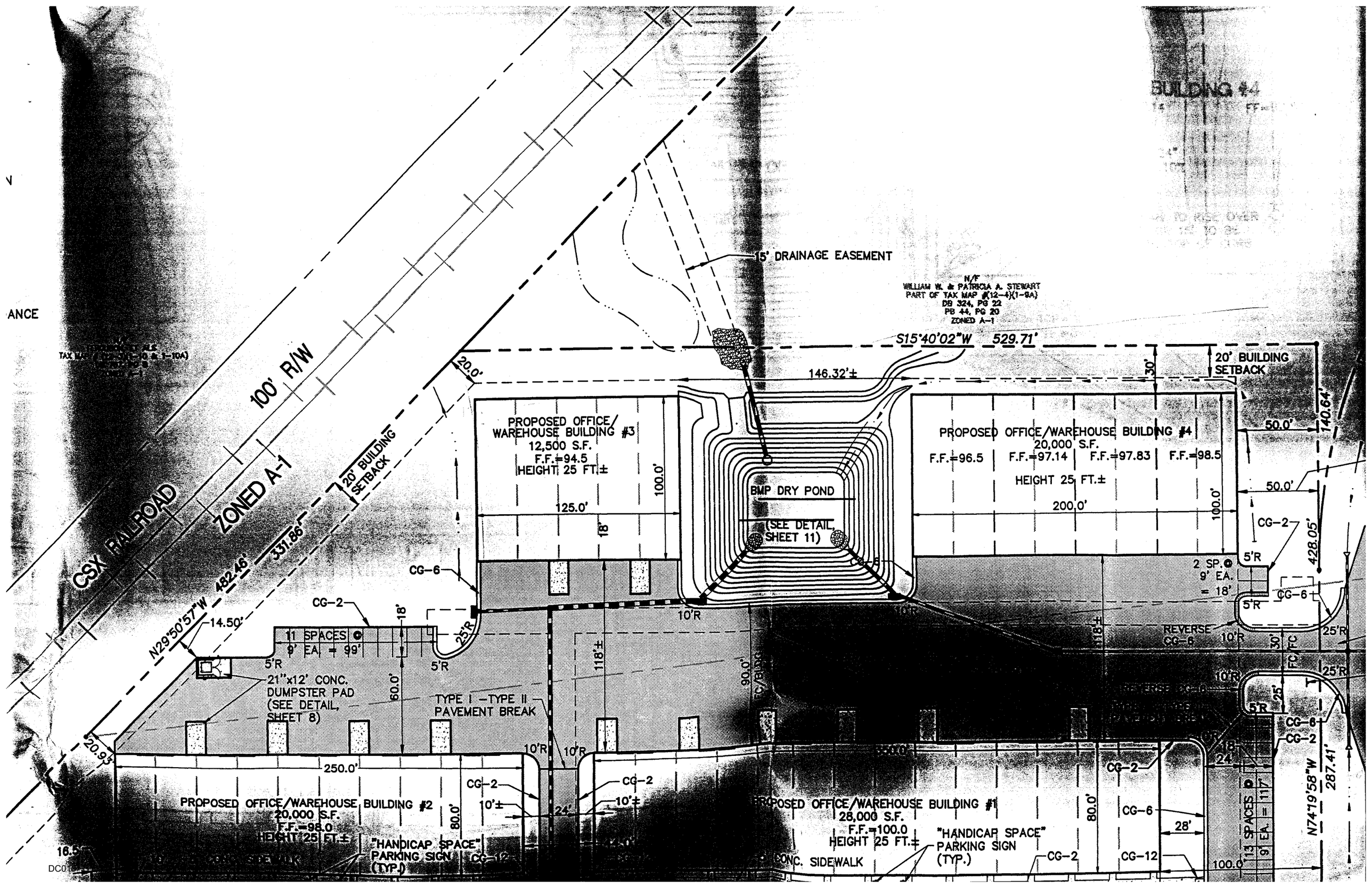
12,000 S.F. OFFICE/RETAIL	48*
68,500 S.F. WAREHOUSE	37**
TOTAL	85

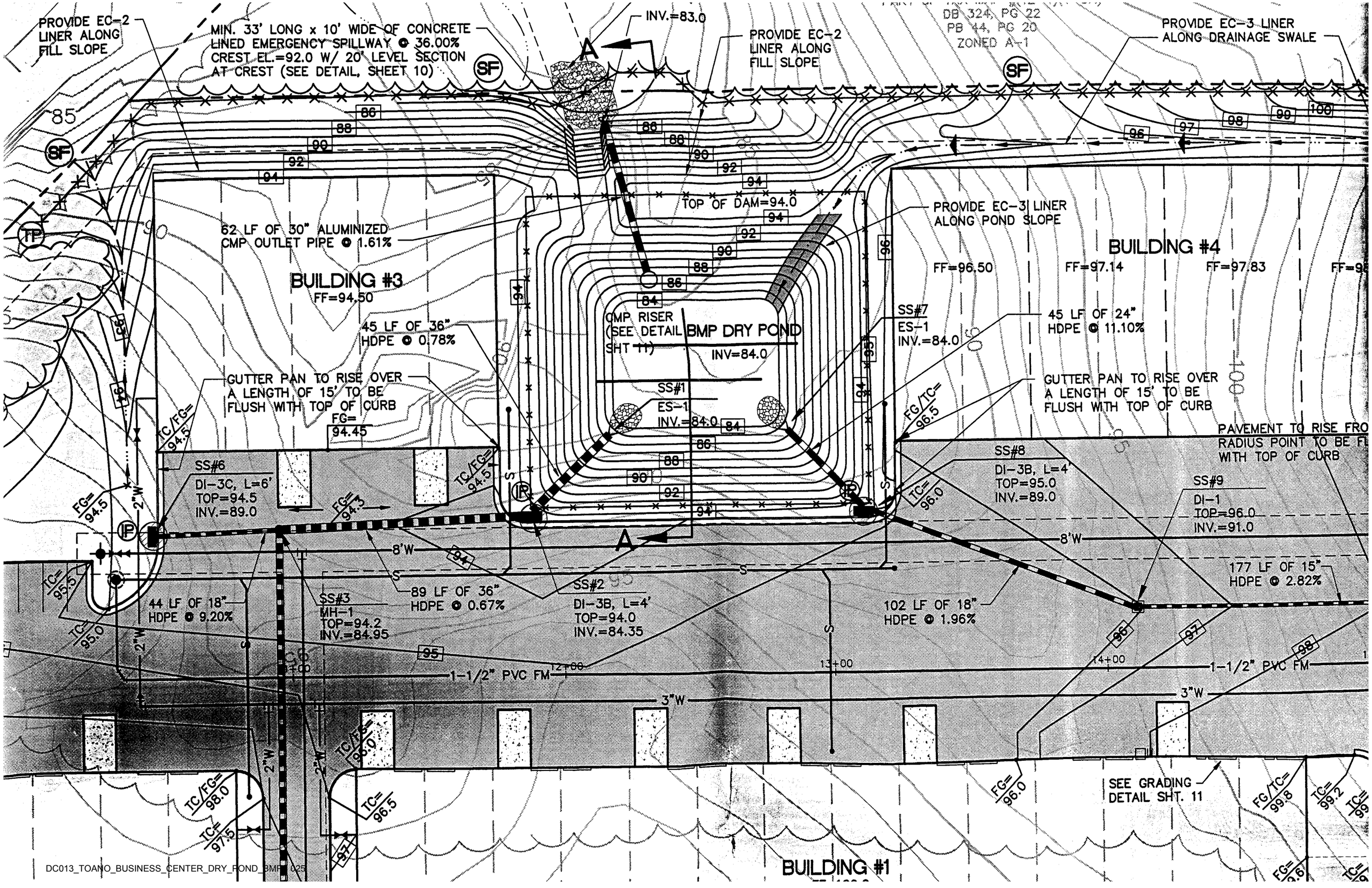
TYPE:	PROVIDED	REQUIRED
HANDICAP	4	4
LOADING SPACES 50'x12'	37***	4
REGULAR 9'x18'	84	81

* AT 1 SPACE/250 S.F. OF OFFICE/RETAIL SPACE
** 74 WAREHOUSE EMPLOYEES AT 1 SPACE/2 EMPLOYEES
*** PERPENDICULAR LOADING IS AVAILABLE AT EACH OVERHEAD DOOR, THEREFORE 37 LOADING SPACES ARE PROVIDED.

DRY POND BMP

oad, Suite 1
nia 23188
040
-8994


BUILDING #4
15' DRAINAGE EASEMENT
N/F
WILLIAM W. & PATRICIA A. STEWART
PART OF TAX MAP #(12-4)(1-9A)
DB 324, PG 22
PB 44, PG 20
ZONED A-1
S15°40'02"W 529.71'
146.32'±
20' BUILDING SETBACK
30'
140.64'
50.0'
100' R/W
ZONED A-1
CSX RAILROAD
20' BUILDING SETBACK
331.86'
482.46'
N29°50'57"W
14.50'
20.0'
PROPOSED OFFICE/ WAREHOUSE BUILDING #3
12,500 S.F.
F.F.=94.5
HEIGHT 25 FT.±
100.0'
125.0'
18'
BMP DRY POND
(SEE DETAIL, SHEET 11)
PROPOSED OFFICE/WAREHOUSE BUILDING #4
20,000 S.F.
F.F.=96.5
F.F.=97.14
F.F.=97.83
F.F.=98.5
HEIGHT 25 FT.±
200.0'
100.0'
50.0'
CG-2
428.05'
5'R
2 SP. @ 9' EA. = 18'
CG-6
CG-6
CG-2
11 SPACES @ 9' EA. = 99'
5'R
5'R
25'R
10'R
10'R
REVERSE CG-6
118'±
118'±
90.0'
FC/BLDG
60.0'
21"x12' CONC. DUMPSTER PAD (SEE DETAIL, SHEET 8)
TYPE I -TYPE II PAVEMENT BREAK
10'R
10'R
20.93'
250.0'
CG-2
CG-2
10'±
24'
10'±
PROPOSED OFFICE/WAREHOUSE BUILDING #2
20,000 S.F.
F.F.=98.0
HEIGHT 25 FT.±
80.0'
"HANDICAP SPACE" PARKING SIGN (TYP.)
CG-12
CONC. SIDEWALK
PROPOSED OFFICE/WAREHOUSE BUILDING #1
28,000 S.F.
F.F.=100.0
HEIGHT 25 FT.±
"HANDICAP SPACE" PARKING SIGN (TYP.)
CG-2
CG-12
80.0'
CG-6
28'
CG-2
100.0'
13 SPACES @ 9' EA. = 117'
N74°19'58"W
287.41'
CG-6
CG-2
25'R
25'R
10'R
REVERSE CG-6
FC
30'
25'
5'R
18'
24'


PROVIDE EC-2 LINER ALONG FILL SLOPE
MIN. 33' LONG x 10' WIDE OF CONCRETE LINED EMERGENCY SPILLWAY @ 36.00% CREST EL.=92.0 W/ 20' LEVEL SECTION AT CREST (SEE DETAIL, SHEET 10)
INV.=83.0
PROVIDE EC-2 LINER ALONG FILL SLOPE
DB 324, PG 22
PB 44, PG 20
ZONED A-1
PROVIDE EC-3 LINER ALONG DRAINAGE SWALE
TOP OF DAM=94.0
PROVIDE EC-3 LINER ALONG POND SLOPE
62 LF OF 30" ALUMINIZED CMP OUTLET PIPE @ 1.61%
BUILDING #3
FF=94.50
BUILDING #4
FF=96.50
FF=97.14
FF=97.83
45 LF OF 36" HDPE @ 0.78%
CMP RISER (SEE DETAIL SHT 11)
BMP DRY POND
INV=84.0
SS#7
ES-1
INV.=84.0
45 LF OF 24" HDPE @ 11.10%
GUTTER PAN TO RISE OVER A LENGTH OF 15' TO BE FLUSH WITH TOP OF CURB
SS#1
ES-1
INV.=84.0
FG=
94.45
TC/FG=
94.5
FG/TC=
96.5
PAVEMENT TO RISE FRO
RADIUS POINT TO BE FL
WITH TOP OF CURB
SS#8
DI-3B, L=4'
TOP=95.0
INV.=89.0
SS#6
DI-3C, L=6'
TOP=94.5
INV.=89.0
SS#9
DI-1
TOP=96.0
INV.=91.0
TC=
96.0
FG=
94.5
8"W
177 LF OF 15" HDPE @ 2.82%
44 LF OF 18" HDPE @ 9.20%
SS#3
MH-1
TOP=94.2
INV.=84.95
89 LF OF 36" HDPE @ 0.67%
SS#2
DI-3B, L=4'
TOP=94.0
INV.=84.35
102 LF OF 18" HDPE @ 1.96%
TC=
95.5
TC=
95.0
2"W
1-1/2" PVC FM
12+00
13+00
14+00
3"W
TC/FG=
96.0
TC/FG=
98.0
TC=
97.5
TC=
96.5
FG=
96.0
SEE GRADING DETAIL SHT. 11
FG/TC=
99.8
TC=
99.2
BUILDING #1

STANDARD
EROSION AND SEDIMENT CONTROL NOTES
FOR JAMES CITY COUNTY, VIRGINIA
REVISED 4/7/97

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 RIGHTS-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 THE ENVIRONMENTAL DIVISION 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 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 ADJUSTMENTS AT TIME OF CONSTRUCTION TO INSURE THEIR INTENDED PURPOSE IS ACCOMPLISHED. ENVIRONMENTAL DIVISION 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 ENVIRONMENTAL DIVISION 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 SITE 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 SLOPES SHALL BE CREATED STEEPER THAN 2:1.

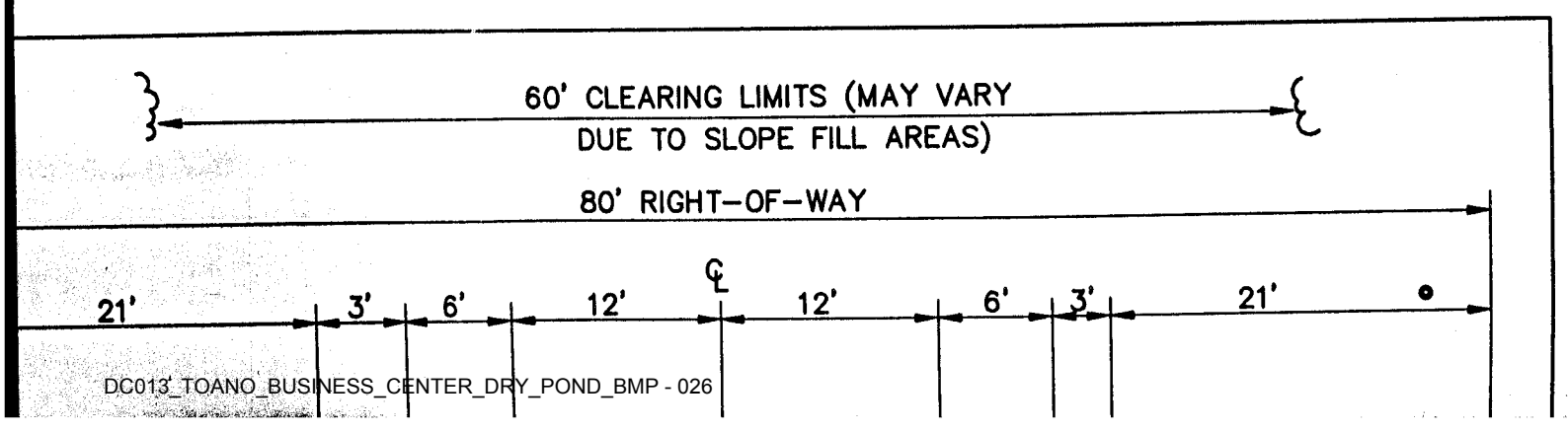
14. INLET PROTECTION IN ACCORDANCE WITH SPECIFICATION 3.07 SHALL BE PROVIDED FOR ALL STORM DRAIN INLETS AS SOON AS PRACTICAL FOLLOWING CONSTRUCTION OF SAME.

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.

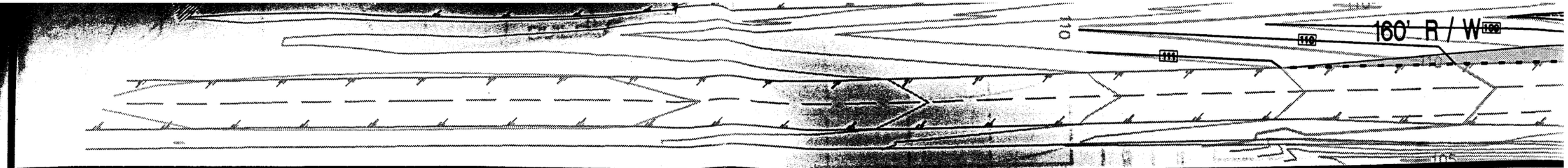


No.	DATE	REVISION / COMMENT / NOTE	BY
2	6/98	REVISED PER JCC COMMENTS 6/10/98	RMI
1	5/98	REVISED PER JCC COMMENTS 3/10/98	RMI

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
1/21/98
PROFESSIONAL ENGINEER

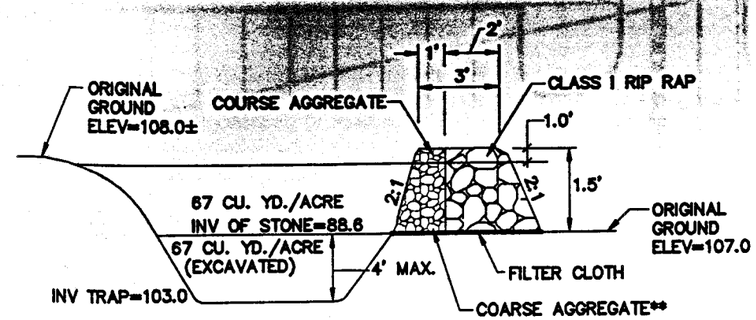
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994
CONSULTING ENGINEERS

VIRGINIA
NTER
WN, LLC.

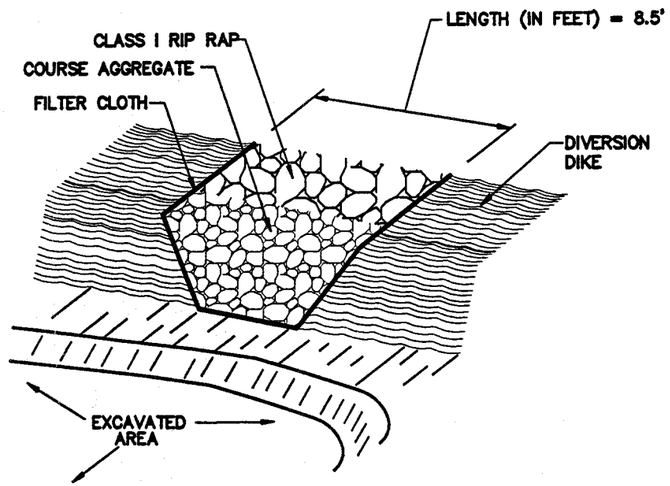


CONSTRUCTION SEQUENCING

1. ENSURE THAT THE CONSTRUCTION ENTRANCE HAS BEEN INSTALLED FOR THE ENTIRE DEVELOPMENT.
2. CLEAR AS NECESSARY TO ACCESS SITE AND BASIN #1 LOCATION.
3. INSTALL THE SILT FENCE AROUND PROPOSED BASIN AND THE REMAINDER OF THE SITE AS SPECIFIED ON THE PLANS. INSTALL SEDIMENT BASIN #1.
4. CLEAR AS NECESSARY TO ACCESS OFFSET STOCKPILE AREA AND TEMPORARY TRAP LOCATION.
5. INSTALL THE SILT FENCE AROUND PROPOSED TRAP AND THE REMAINDER OF THE OFFSET AREA AS SPECIFIED ON THE PLANS. INSTALL OFFSET SEDIMENT TRAP #1.
6. CLEAR THE OFFSET STOCKPILE AREA.
7. INSTALL DIVERSION DIKE SYSTEM, DRAINAGE SWALES, AND CHECK DAMS AS SPECIFIED ON PLANS. CLEAR THE BUSINESS CENTER SITE AND REMOVE THE TOPSOIL. STOCKPILE TOPSOIL ON OFF SITE AREA.
8. CUT TEMPORARY VDOT DRAINAGE SWALE FROM VDOT OUTFALL SOUTH OF INDUSTRIAL BOULEVARD WEST ACROSS PROPERTY TO BASIN #1. THIS SWALE TO REMAIN IN PLACE DURING CONSTRUCTION AND UNTIL GRADING FOR BUILDING #1 OCCURS AND STORM SEWER SS#14 AND SS#15 HAVE BEEN INSTALLED. SWALE SHALL THEN BE REDIRECTED TO FLOW INTO SS#15 THROUGH DI-7 TOP.
9. PREPARE THE BUILDING PAD AND ROUGH GRADE THE AREA TO BE PAVED.
10. INSTALL ALL UNDERGROUND UTILITIES.
11. INSTALL THE PROPOSED STORM DRAINAGE SYSTEM. INSTALL INLET PROTECTION OF AN APPROVED TYPE FOR THE NEW DRAINAGE STRUCTURES.
12. INSTALL CURB AND THEN BACKFILL BEHIND THE CURB, THEN GRADE BEHIND THE CURB.
13. ESTABLISH VEGETATIVE COVER BEHIND CURB.
14. PLACE BASE STONE AND ASPHALT.
15. REPAIR ANY INADVERTENT EROSION AND REMOVE ANY INADVERTENT SEDIMENTATION.
16. DRESS AND SEED ALL DISTURBED AREAS AS NECESSARY TO EFFECT PERMANENT VEGETATIVE COVER.
17. FOLLOWING COMPLETION OF ALL LAND DISTURBANCE ACTIVITY AND STABILIZATION OF SITE, VDOT INFILTRATION TRENCH SHALL BE INSTALLED AND CONNECTED TO SS#15. SS#14 SHALL THEN BE INSTALLED AND THE 15" CULVERT BENEATH INDUSTRIAL BOULEVARD WEST AND THE 24" VDOT CULVERT SHALL THEN BE EXTENDED AND CONNECTED TO SS#14. SS#14 SHALL BE CONNECTED TO THE VDOT INFILTRATION TRENCH BY A 24" HDPE PIPE AS SPECIFIED ON THE PLANS. A PERMANENT DRAINAGE SWALE SHALL BE RE-CONSTRUCTED TO EXTEND FROM THE ROADSIDE DITCH AT INDUSTRIAL BOULEVARD WEST TO SS#15 IN ORDER TO DRAIN RUNOFF FROM INDUSTRIAL BOULEVARD WEST INTO SS#15 THROUGH DI-7.
18. REMOVE ANY REMAINING TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES WITHIN THIRTY DAYS AFTER THE FINAL SITE STABILIZATION.

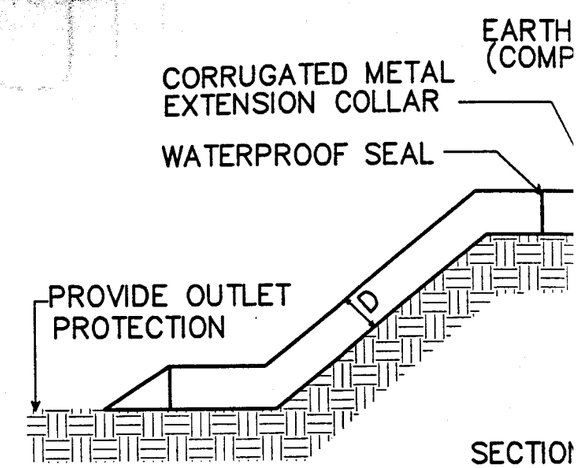


CROSS SECTION OF OUTLET

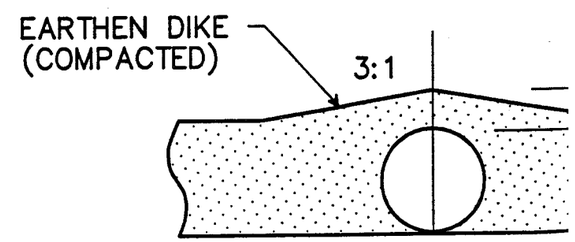


** COARSE AGGREGATE SHALL BE VDOT #3, #357 OR #5

OUTLET (PERSPECTIVE VIEW)



NOTE: SEDIMENT MAY BE CON
UPLAND PONDING WILL



SECTION

TSD TEMPORARY

SOURCE: VA. DSWC

TOANO BUSINESS CENTER
TEMPORARY SEDIMENT TRAP
N.T.S

D-ST

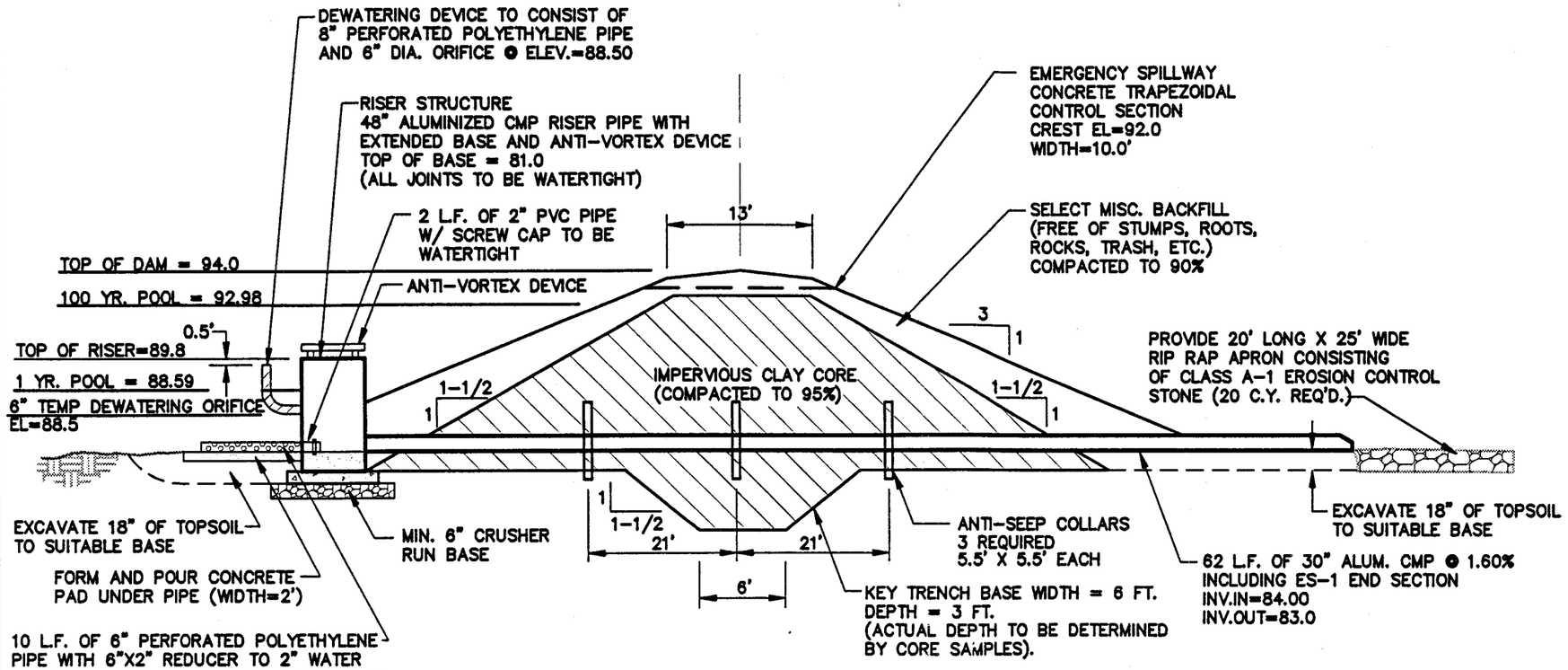
07.06.98-14:20 03ES02.dwg

DMO

DR13_TOANO_BUSINESS_CENTER_DRY_POND_BMP - 027

NOTE:
AFTER ALL DISTURBED AREAS WITHIN THE BASIN'S DRAINAGE AREA ARE STABILIZED AND OPERATION AS TEMPORARY SEDIMENT BASIN CEASES, THE SCREW CAP ON THE 2" PVC PIPE ATTACHED TO THE WATER QUALITY ORIFICE IS TO BE OPENED, THE DEWATERING DEVICE REMOVED, AND THE DEWATERING ORIFICE SEALED TO BE WATERTIGHT.

NOTE:
SEDIMENT CLEANOUT POINT DURING OPERATION AS TEMPORARY SEDIMENT BASIN AS AT 12,256 C.F. OF STORAGE OR ELEV.=86.6



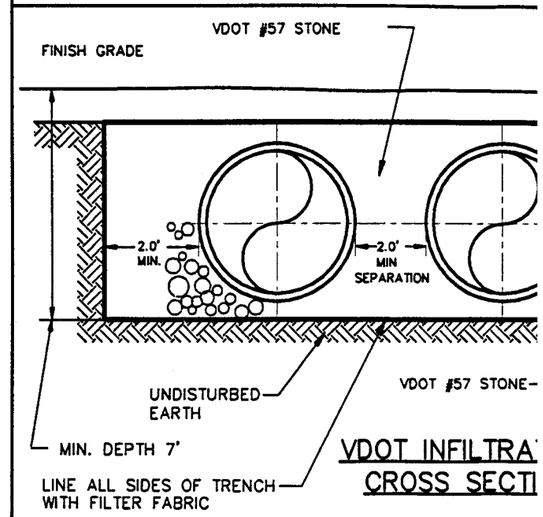
DAM - CROSS SECTION BASIN #1

NOT TO SCALE

D-8003

NOTES:

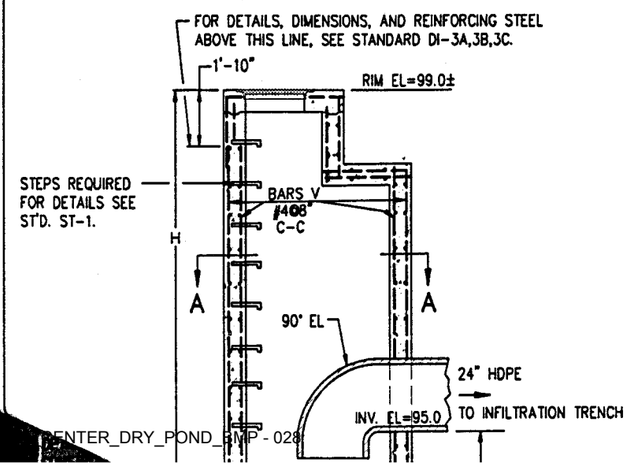
1. PROPOSED SWM/BMP "DRY" POND #1 S BASIN DURING CONSTRUCTION. SEE TEM SHEET.
2. SEDIMENT CLEAN OUT POINT DURING O BASIN IS @ EL.=86.6'
3. AFTER ALL DISTURBED AREAS ARE STA SEDIMENT BASIN CEASES, THE BASIN S PERFORATED POLYETHYLENE DEWATERIN SHALL THEN BE LOWERED TO ATTAIN A
4. UPON COMPLETION, THE CONSTRUCTION GEOTECHNICALL ENGINEER WHO HAS IN
5. CONTRACTOR SHALL PROVIDE AS-BUIL OF BMP FACILITY.



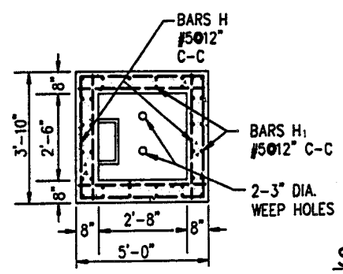
VDOT INFILTRA
CROSS SECTI

N.T.S

DI-3AA, MODIFIED



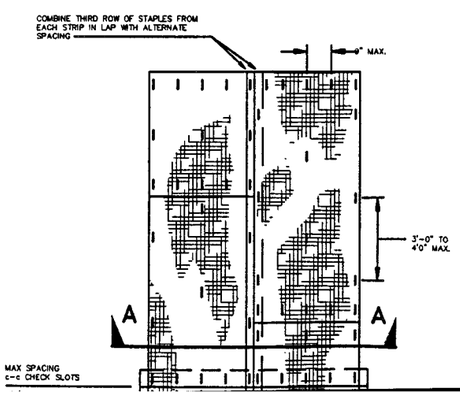
⊗ 3" DIA. WEEP HOLE TO BE LOCATED TO DRAIN SUBBASE MATERIAL. WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIA. 0.03 INCH, NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY OUTSIDE OF STRUCTURE.

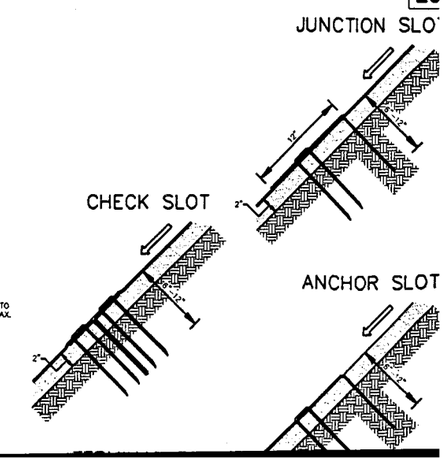


SECTION A-A

#4X8" SMOOTH DOWELS @ APPROX. 12" C-C- TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT.

EC





DAM CONSTRUCTION NOTES

1. A GEOTECHNICAL SUBSURFACE EXPLORATION AT THE PROPOSED DAM SITE SHALL BE PERFORMED BY THE OWNERS TESTING AGENCY. THE GEOTECHNICAL ENGINEER SHALL SUBMIT TO THE JAMES CITY COUNTY ENVIRONMENTAL DIVISION FOR APPROVAL, THEIR RECOMMENDATIONS FOR DAM DESIGN, CORE TRENCH WIDTH AND DEPTH, ANTI-SEEPAGE CONTROL , ETC. THE GEOTECHNICAL ENGINEER WILL INSPECT THE DAM DURING CONSTRUCTION. AFTER COMPLETION THE GEOTECHNICAL ENGINEER SHALL SUBMIT TO THE COUNTY A LETTER CERTIFYING THAT THE DAM WAS BUILT IN ACCORDANCE WITH THE PLANS, SPECIFICATIONS AND RECOMMENDATIONS FOR THE PROJECT.

2. SITE PREPARATION: THE CONTRACTOR SHALL STRIP ALL AREAS OF THE PERMANENT CONSTRUCTION TO REMOVE ALL UNSUITABLE MATERIALS. THE UNSUITABLE MATERIALS TO BE REMOVED BY STRIPPING SHALL INCLUDE ALL TOPSOIL, DEBRIS AND VEGETABLE MATTER, INCLUDING STUMPS AND ROOTS, AND ALL OTHER MATERIALS WHICH MAY BE UNSUITABLE FOR USE IN THE PERMANENT CONSTRUCTION.

3. EMBANKMENT: THE EXPOSED SUBGRADE SOILS SHALL BE CAREFULLY INSPECTED BY THE GEOTECHNICAL ENGINEER. ANY UNSUITABLE SUBGRADE MATERIALS THUS EXPOSED SHALL BE REMOVED AND REPLACED WITH A WELL COMPACTED, SUITABLE MATERIAL. DENSITY TESTING AT THE DISCRETION OF THE GEOTECHNICAL ENGINEER SHALL BE PERFORMED AT THIS TIME.

   THE EMBANKMENT SHALL BE KEYED INTO THE UNDISTURBED (EXISTING) SOIL STRATUM.. EMBANKMENT SHALL BE KEYED INTO THE STRATUM AS SPECIFIED BY THE GEOTECHNICAL ENGINEER. THE EMBANKMENT FOUNDATION AND ABUTMENTS SHALL BEAR ON FIRM AND STABLE EXISTING SUBGRADE WHICH HAS BEEN PREPARED SO AS TO REMOVE ALL ORGANIC, LOOSE, AND GENERALLY UNSUITABLE MATERIAL.

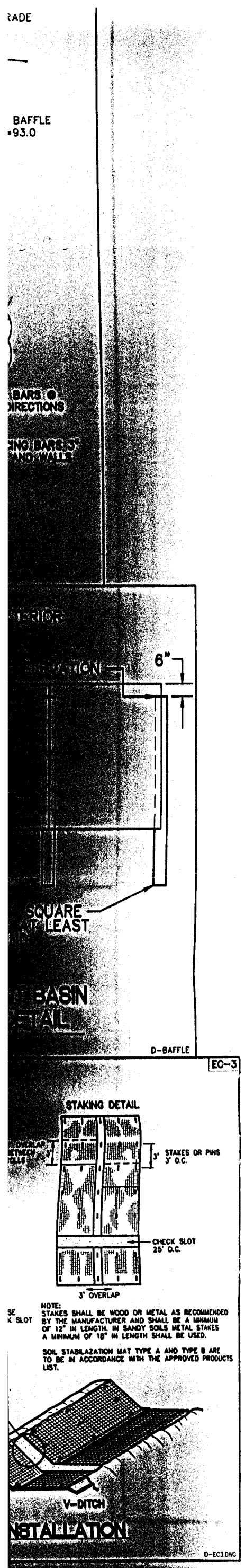
   ALL MATERIALS TO BE USED FOR BACK FILL OR COMPACTED FILL SHALL BE INSPECTED AND TESTED BY THE SOILS ENGINEER IN ACCORDANCE WITH ASTM D2487 PRIOR TO PLACEMENT TO DETERMINE IF THEY ARE SUITABLE FOR THE INTENDED USE.

   THE FILL MATERIAL SHALL BE TAKEN FROM APPROVED BORROW AREAS. IT SHALL BE CLEAN MINERAL SOIL, FREE OF ROOTS, WOOD VEGETATION, OVERSIZED STONES, ROCKS, OR OTHER OBJECTIONABLE MATERIAL. SOILS WHICH ARE APPROVABLE FOR THE CONSTRUCTION OF THE IMPERVIOUS CLAY CORE, AS DEFINED BY THE UNIFIED SOIL CLASSIFICATION SYSTEM, ARE CH, INORGANIC CLAYS OF HIGH PLASTICITY; CL, INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELY CLAYS, SANDY CLAYS, SILTY CLAYS; SC, (WITH ENGINEERS APPROVAL) CLAYEY SANDS, POORLY GRADED SAND CLAY MIXTURES. MATERIALS TO BE USED FOR THE CONSTRUCTION OF THE SHELL SHALL BE SELECT BACK FILL FREE OF STUMPS, ROOTS, ROCKS, TRASH, ETC. AND SHALL BE MORE PERVIOUS THAN THE IMPERVIOUS CLAY CORE. THE FILL MATERIAL'S MOISTURE CONTENT SHALL BE +3 TO -2 PERCENTAGE POINTS OF OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D2216 (I.E. IN GENERAL THE FILL MATERIAL SHOULD CONTAIN SUFFICIENT MOISTURE SO THAT IT CAN BE FORMED INTO A BALL WITHOUT CRUMBLING. IF WATER CAN BE SQUEEZED OUT OF THE BALL, IT IS TOO WET FOR PROPER COMPACTION). FILL MATERIAL SHALL BE PLACED IN 6 TO 8-INCH CONTINUOUS LAYERS OVER THE ENTIRE LENGTH OF THE FILL. FIRST LIFT ON SUB GRADE MAY BE PLACED AT A DEPTH UP TO 30 INCHES TO BRIDGE SUBGRADE SOILS WITH OVER OPTIMUM MOISTURE CONTENT. COMPACTION, AS NOTED ON PLAN, SHALL BE OBTAINED GENERALLY BY USING A SHEEPSFOOT COMPACTOR. FINISHED GRADES SHALL BE MERGED NATURALLY INTO THE EXISTING GRADES.
   THE OWNER'S TESTING AGENCY SHALL PROVIDE A TESTING PROGRAM TO ENSURE THE DAM WAS CONSTRUCTED IN ACCORDANCE WITH THE GEOTECHNICAL REPORT'S RECOMMENDATIONS. THE LAB SHALL, AT A MINIMUM, TEST EVERY LIFT OF FILL. IF THE LIFT EXCEEDS 15,000 SQUARE FEET THEN A TEST SHALL BE PROVIDED, AT A MINIMUM, FOR EACH 15,000 SQUARE FEET OF FILL IN THE LIFT. THESE TEST RESULTS SHALL BE PROVIDED TO THE OWNER AT AN ONGOING BASIS. AT THE COMPLETION OF THE EMBANKMENT THE TESTING AGENCY SHALL PROVIDE THE OWNER WITH A LETTER TO CERTIFY THAT SUFFICIENT TESTS HAVE BEEN TAKEN TO ENSURE THE CONSTRUCTION IS IN ACCORDANCE WITH GEOTECHNICAL REPORT'S RECOMMENDATIONS. SHELL MATERIAL TO BE SELECT FILL (COMPACTION TO A DRY DENSITY OF 90%). CORE SHALL BE IMPERVIOUS CLAY WITH A COMPACTION TO DRY DENSITY OF 95%.

4. CUTOFF TRENCH/KEY TRENCH: THE TRENCH SHALL BE EXCAVATED ALONG THE CENTERLINE OF THE DAM. THE MINIMUM DEPTH AND WIDTH SHALL BE AS DETERMINED BY THE GEOTECHNICAL ENGINEER.
   THE MINIMUM BOTTOM WIDTH SHALL BE WIDE ENOUGH TO PERMIT OPERATION OF COMPACTION EQUIPMENT. THE SIDE SLOPES SHALL BE NO STEEPER THAN 1:1. COMPACTION REQUIREMENTS SHALL BE THE SAME AS THOSE FOR THE EMBANKMENT. THE TRENCH SHALL BE KEPT DRAINED DURING THE BACKFILLING-COMPACTING OPERATIONS.

5. PRINCIPAL SPILLWAY: THE BOTTOM OF THE SPILLWAY RISER FOUNDATION BASE EXCAVATION SHALL BE OBSERVED BY THE GEOTECHNICAL ENGINEER TO ENSURE THAT ALL UNSUITABLE AND LOOSE MATERIALS ARE REMOVED AND THAT ACCEPTABLE BEARING CONDITIONS EXIST IN THE EXCAVATION'S BASE.

   ALL JOINTS IN THE PRINCIPAL SPILLWAY RISER STRUCTURE AND BARREL SHALL BE OF WATERTIGHT CONSTRUCTION. THE RISER OF THE PRINCIPAL SPILLWAY SHALL BE SECURELY ATTACHED TO THE BARREL BY A WATERTIGHT CONNECTION. THE BARREL AND RISER SHALL BE PLACED ON A FIRM COMPACTED SOIL FOUNDATION, THE BASE OF THE RISER SHALL BE FIRMLY ANCHORED ACCORDING TO THE

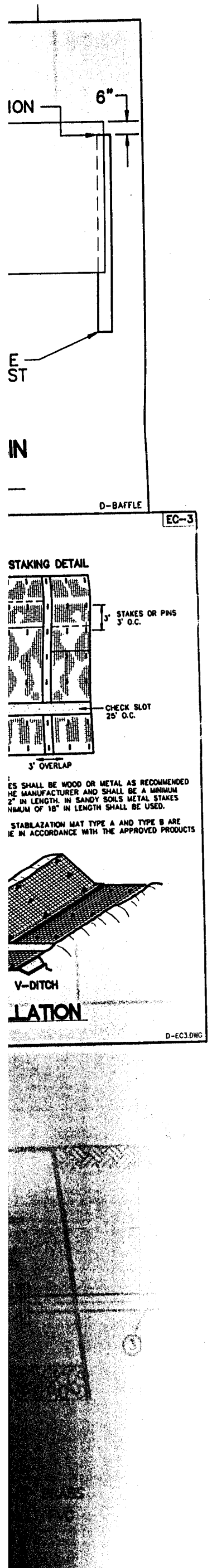


No.	DATE	REVISION / COMMENT / NOTE
2	6/98	REVISED PER JCC COMMENTS 6/10/98
1	5/98	REVISED PER JCC COMMENTS 3/10/98

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
1/21/98
PROFESSIONAL ENGINEER

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(804) 253-0040
Fax (804) 220-8994
CONSULTING ENGINEERS

CENTER
BROWN, L.L.C.
VIRGINIA



BEEN PREPARED SO AS TO REMOVE ALL ORGANIC, LOOSE, AND GENERALLY UNSUITABLE MATERIAL.

ALL MATERIALS TO BE USED FOR BACK FILL OR COMPACTED FILL SHALL BE INSPECTED AND TESTED BY THE SOILS ENGINEER IN ACCORDANCE WITH ASTM D2487 PRIOR TO PLACEMENT TO DETERMINE IF THEY ARE SUITABLE FOR THE INTENDED USE.

THE FILL MATERIAL SHALL BE TAKEN FROM APPROVED BORROW AREAS. IT SHALL BE CLEAN MINERAL SOIL, FREE OF ROOTS, WOOD VEGETATION, OVERSIZED STONES, ROCKS, OR OTHER OBJECTIONABLE MATERIAL. SOILS WHICH ARE APPROVABLE FOR THE CONSTRUCTION OF THE IMPERVIOUS CLAY CORE, AS DEFINED BY THE UNIFIED SOIL CLASSIFICATION SYSTEM, ARE CH, INORGANIC CLAYS OF HIGH PLASTICITY; CL, INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELY CLAYS, SANDY CLAYS, SILTY CLAYS; SC, (WITH ENGINEERS APPROVAL) CLAYEY SANDS, POORLY GRADED SAND CLAY MIXTURES. MATERIALS TO BE USED FOR THE CONSTRUCTION OF THE SHELL SHALL BE SELECT BACK FILL FREE OF STUMPS, ROOTS, ROCKS, TRASH, ETC. AND SHALL BE MORE PERVIOUS THAN THE IMPERVIOUS CLAY CORE. THE FILL MATERIAL'S MOISTURE CONTENT SHALL BE +3 TO −2 PERCENTAGE POINTS OF OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D2216 (I.E. IN GENERAL THE FILL MATERIAL SHOULD CONTAIN SUFFICIENT MOISTURE SO THAT IT CAN BE FORMED INTO A BALL WITHOUT CRUMBLING. IF WATER CAN BE SQUEEZED OUT OF THE BALL, IT IS TOO WET FOR PROPER COMPACTION). FILL MATERIAL SHALL BE PLACED IN 6 TO 8-INCH CONTINUOUS LAYERS OVER THE ENTIRE LENGTH OF THE FILL. FIRST LIFT ON SUB GRADE MAY BE PLACED AT A DEPTH UP TO 30 INCHES TO BRIDGE SUBGRADE SOILS WITH OVER OPTIMUM MOISTURE CONTENT. COMPACTION, AS NOTED ON PLAN, SHALL BE OBTAINED GENERALLY BY USING A SHEEPSFOOT COMPACTOR. FINISHED GRADES SHALL BE MERGED NATURALLY INTO THE EXISTING GRADES.
THE OWNER'S TESTING AGENCY SHALL PROVIDE A TESTING PROGRAM TO ENSURE THE DAM WAS CONSTRUCTED IN ACCORDANCE WITH THE GEOTECHNICAL REPORT'S RECOMMENDATIONS. THE LAB SHALL, AT A MINIMUM, TEST EVERY LIFT OF FILL. IF THE LIFT EXCEEDS 15,000 SQUARE FEET THEN A TEST SHALL BE PROVIDED, AT A MINIMUM, FOR EACH 15,000 SQUARE FEET OF FILL IN THE LIFT. THESE TEST RESULTS SHALL BE PROVIDED TO THE OWNER AT AN ONGOING BASIS. AT THE COMPLETION OF THE EMBANKMENT THE TESTING AGENCY SHALL PROVIDE THE OWNER WITH A LETTER TO CERTIFY THAT SUFFICIENT TESTS HAVE BEEN TAKEN TO ENSURE THE CONSTRUCTION IS IN ACCORDANCE WITH GEOTECHNICAL REPORT'S RECOMMENDATIONS. SHELL MATERIAL TO BE SELECT FILL (COMPACTION TO A DRY DENSITY OF 90%). CORE SHALL BE IMPERVIOUS CLAY WITH A COMPACTION TO DRY DENSITY OF 95%.

4. CUTOFF TRENCH/KEY TRENCH: THE TRENCH SHALL BE EXCAVATED ALONG THE CENTERLINE OF THE DAM. THE MINIMUM DEPTH AND WIDTH SHALL BE AS DETERMINED BY THE GEOTECHNICAL ENGINEER. THE MINIMUM BOTTOM WIDTH SHALL BE WIDE ENOUGH TO PERMIT OPERATION OF COMPACTION EQUIPMENT. THE SIDE SLOPES SHALL BE NO STEEPER THAN 1:1. COMPACTION REQUIREMENTS SHALL BE THE SAME AS THOSE FOR THE EMBANKMENT. THE TRENCH SHALL BE KEPT DRAINED DURING THE BACKFILLING-COMPACTING OPERATIONS.

5. PRINCIPAL SPILLWAY: THE BOTTOM OF THE SPILLWAY RISER FOUNDATION BASE EXCAVATION SHALL BE OBSERVED BY THE GEOTECHNICAL ENGINEER TO ENSURE THAT ALL UNSUITABLE AND LOOSE MATERIALS ARE REMOVED AND THAT ACCEPTABLE BEARING CONDITIONS EXIST IN THE EXCAVATION'S BASE.

   ALL JOINTS IN THE PRINCIPAL SPILLWAY RISER STRUCTURE AND BARREL SHALL BE OF WATERTIGHT CONSTRUCTION. THE RISER OF THE PRINCIPAL SPILLWAY SHALL BE SECURELY ATTACHED TO THE BARREL BY A WATERTIGHT CONNECTION. THE BARREL AND RISER SHALL BE PLACED ON A FIRM COMPACTED SOIL FOUNDATION, THE BASE OF THE RISER SHALL BE FIRMLY ANCHORED ACCORDING TO THE DESIGN CRITERIA TO PREVENT ITS FLOATING. PERVIOUS MATERIALS SUCH AS SAND, GRAVEL OR CRUSHED STONE SHALL NOT BE USED AS BACK FILL AROUND THE BARREL. FILL MATERIAL SHALL BE PLACED AROUND THE PIPE IN 4-INCH LAYERS AND COMPACTED BY HAND AT LEAST TO THE SAME DENSITY AS THE EMBANKMENT. A MINIMUM OF TWO FEET OF FILL SHALL BE HAND-COMPACTED OVER THE BARREL BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.

6. EMERGENCY SPILLWAY: EMERGENCY SPILLWAY CONSTRUCTED OVER FILL MATERIAL SHALL BE CONCRETE LINED.

7. VEGETATIVE STABILIZATION: FINAL VEGETATIVE COVER (STABILIZATION) SHALL CONSIST OF TOP SOILING, LIMING, FERTILIZING, SEEDING, AND MULCHING TO ASSURE A FIRM STAND OF GRASS AS SOON AS PRACTICAL. SEDIMENT BASINS AND OTHER TEMPORARY EROSION CONTROL MEASURES ARE TO BE REMOVED ONLY WHEN STABILIZATION IS COMPLETE. FINAL VEGETAL COVER SHALL BE PROVIDED IN ACCORDANCE WITH THE FOLLOWING:

TOPSOIL:	AT LEAST 2" THICKNESS OBTAINED FROM STOCKPILES ON SITE, FREE OF LARGE DEBRIS.
LIME:	4,000#/ACRE (90#/1,000 S.F.)
SEED:	KENTUCKY 31 TALL FESCUE 250#/ACRE (6#/1,000 S.F.)
FERTILIZER:	10/20/10 MIX, 1,000#/ACRE (25#/1,000 S.F.)
MULCH:	STRAW OR HAY (LOCALLY OBTAINED) 4,000#/ACRE (90#/1,000 S.F.)

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
1/21/98
PROFESSIONAL ENGINEER

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(804) 253-0040
Fax (804) 220-8994
CONSULTING ENGINEERS

NOTES AND DETAILS
TOANO BUSINESS CENTER
OWNER/DEVELOPER: MICHAEL C. BROWN, L.L.C.
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
RMO/GAM	EAW
Scale	Date
1"=30'	1/5/98

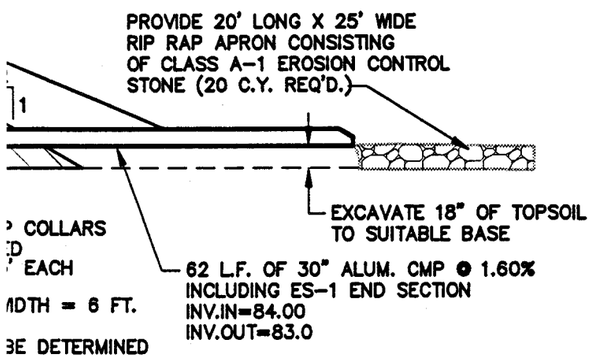
Project No. 8003

Drawing No. 11 OF 14

UT POINT DURING OPERATION AS TEMPORARY
AS AT 12,256 C.F. OF STORAGE OR ELEV.=86.6

MERGENCY SPILLWAY
ONCRETE TRAPEZOIDAL
ONTROL SECTION
REST EL=92.0
IDTH=10.0'

ELECT MISC. BACKFILL
FREE OF STUMPS, ROOTS,
OCKS, TRASH, ETC.)
OMPACTED TO 90%

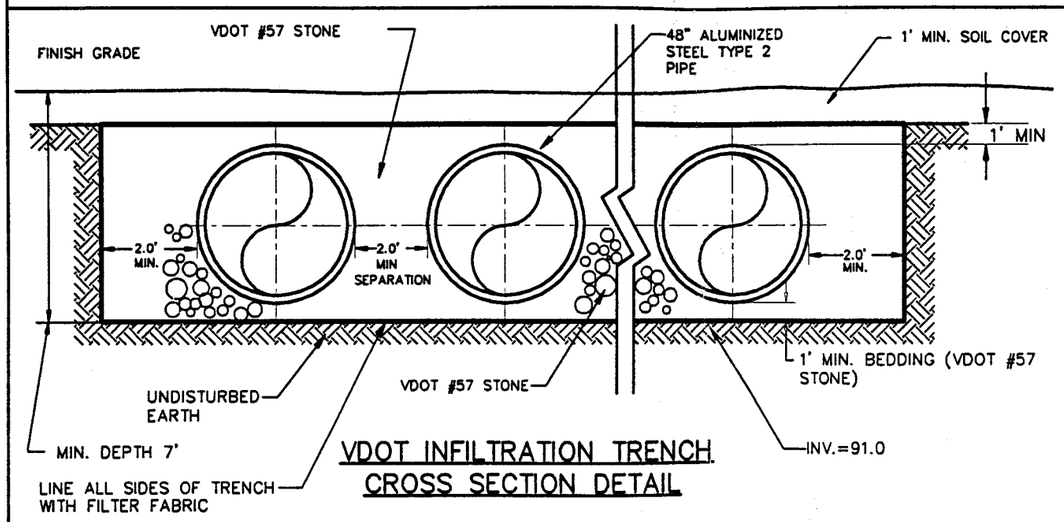


COLLARS
ED
EACH
IDTH = 6 FT.
BE DETERMINED

D-8003

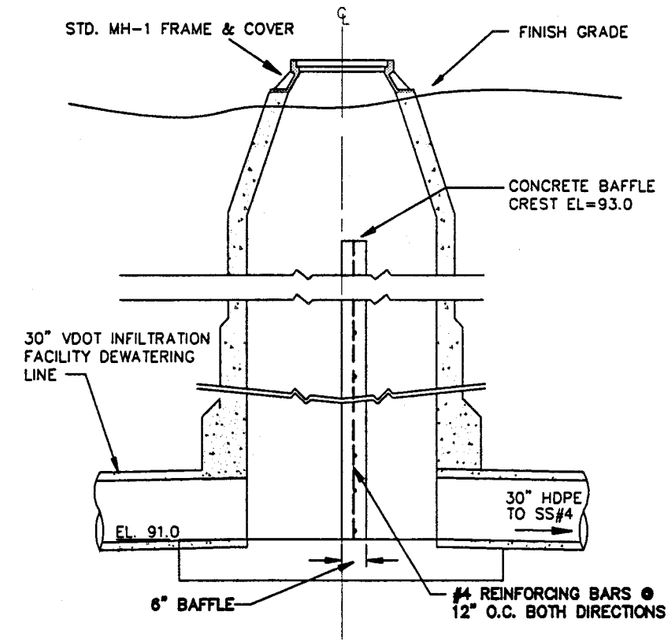
NOTES:

1. PROPOSED SWM/BMP "DRY" POND #1 SHALL ACT AS A TEMPORARY SEDIMENT BASIN DURING CONSTRUCTION. SEE TEMPORARY RISER STRUCTURE THIS SHEET.
2. SEDIMENT CLEAN OUT POINT DURING OPERATION AS TEMPORARY SEDIMENT BASIN IS @ EL.=86.6'
3. AFTER ALL DISTURBED AREAS ARE STABILIZED AND OPERATION AS TEMPORARY SEDIMENT BASIN CEASES, THE BASIN SHALL BE CLEANED OF SEDIMENT AND THE PERFORATED POLYETHYLENE DEWATERING DEVICE SHALL BE REMOVED. RISER PIPE SHALL THEN BE LOWERED TO ATTAIN A PERMANENT CREST ELEVATION OF 88.3.
4. UPON COMPLETION, THE CONSTRUCTION OF THE DAM SHALL BE CERTIFIED BY A GEOTECHNICALL ENGINEER WHO HAS INSPECTED THE STRUCTURE DURING CONSTRUCTION.
5. CONTRACTOR SHALL PROVIDE AS-BUILT DRAWINGS TO ENGINEER UPON COMPLETION OF BMP FACILITY.



VDOT INFILTRATION TRENCH
CROSS SECTION DETAIL

N.T.S.

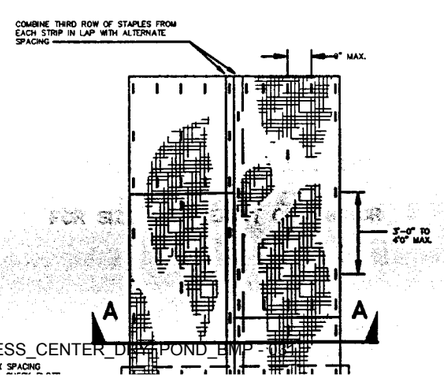


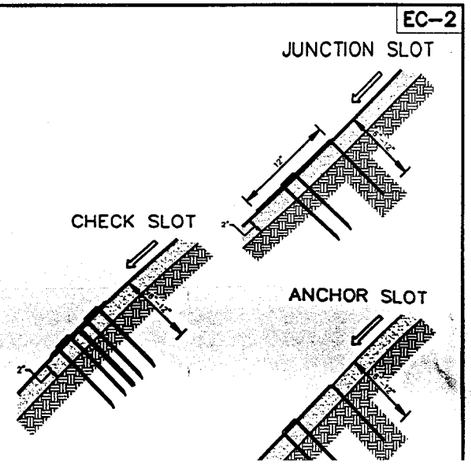
NOTE
EPOXY REINFORCING BARS 3"
INTO MH FLOOR AND WALLS

MODIFIED MH-1 MANHOLE
SS#15

NOT TO SCALE

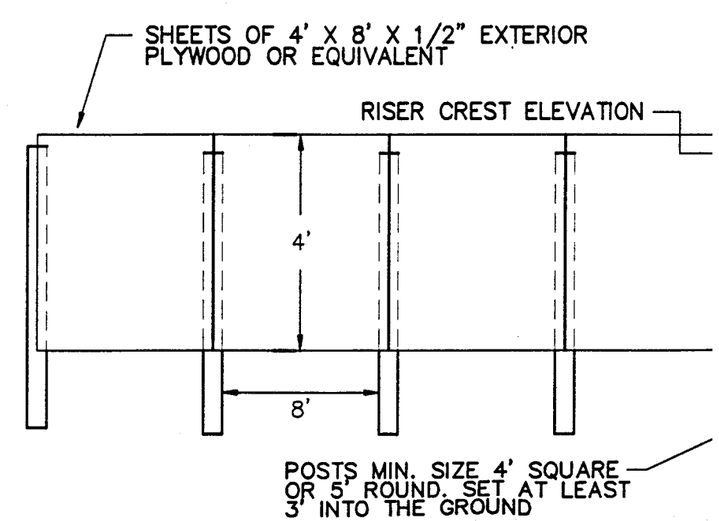
DI-3AA, MODIFIED





EC-2

-A
ROX. 12" C-C-
ADJACENT TO
ENT SETTLEMENT.



TEMPORARY SEDIMENT BASIN

C013_TOANO_BUSINESS_CENTER_DEV_POND_BMP

TOANO BUSINESS CENTER
CURVE NUMBER ANALYSIS
AES PROJ # 8003

Date: 8/14/97
Revised: 4/20/98

PRE-DEVELOPMENT CONDITION: (ALL CATEGORY 'C' SOILS)

TOTAL DRAINAGE AREA (DA)	Site		7.27 AC.
	Offsite		5.17
	VDOT		7.75
	Total		20.19

WOODED	CN=	72	8.50 AC.
PAVEMENT	CN=	92	2.57 AC.
SHOULDERS	CN=	92	5.18 AC.
OPEN	CN=	72	2.91 AC.

WEIGHTED AVERAGE: CN= 76.00

Say CN= 76

POST-DEVELOPMENT

TOTAL DRAINAGE AREA 8.08 AC.

INDUSTRIAL	CN=	94	1.85 AC.
SITE PAVEMENT AND SIDEWALKS	CN=	94	2.51 AC.
RIGHT OF WAY	CN=	92	0.35 AC.
WOODED	CN=	72	0.75 AC.
GRASSED OPEN SPACE	CN=	79	2.62 AC.
			8.08

WEIGHTED AVERAGE: CN= 87.01

Say CN= 87

USE POST DEVELOPMENT COMPOSITE CN=87

EXTENDED DETENTION POND SIZING CALCULATION
TOANO BUSINESS CENTER
DESIGN 3 - 6 PT DRY POND

Date:	08/27/97
Revised:	05/14/98

Total Site Area =	7.27 Ac.
Total Area Served by Pond for E&S =	13.55 Ac.
Total Area Served by Pond for BMP & SWM =	8.08 Ac.

EROSION AND SEDIMENT CONTROL:

Total drainage area to basin #1 =		13.55 Ac.	
Total Storage Volume Required (CY) = (134 CY / AC) * DA		1,816 CY occurs @	EL=89.8
		49,024 C.F. Minimum Volume Required	
Minimum wet storage required =	908 C.Y.	24,512 C.F.	
Minimum dry storage required =	908 C.Y.	24,512 C.F.	

Wet storage volume of	24,512 CF is achieved at Elev. =	88.50	
Dry storage volume of	24,512 CF is achieved at Elev. =	91.10	
Cleanout required when wet storage is reduced by 50% to		12,256 CF at Elev. =	86.60
Separation b/w wet storage and orifice		1.90	OK

Elevation	Depth	Area (sq. ft.)	Volume (cu. ft.)	Volume (cu. yd.)	Cum Volume (cu. ft.)	Cum Volume (cu. yd.)
84.0	0.0	3624	0	0	0	0
89.0	5.0	8165	29473	1092	29,473	1092
94.0	5.0	13048	53033	1964	82,505	3056
95.0	0.0		0	0	0	3056
96.0	0.0		0	0	0	3056
97.0	0.0		0	0	0	3056
98.0	0.0		0	0	0	3056
99.0	0.0		0	0	0	3056
100.0	0.0		0	0	0	3056
101.0	0.0		0	0	0	3056
102.0	0.0		0	0	0	3056
103.0	0.0		0	0	0	3056

SEDIMENT TRAP SIZING CALCULATION
TOANO BUSINESS CENTER

Date:	04/17/98
Revised:	05/14/98

Total Site Area =	2.25 Ac.
Total Area Served by Trap for E&S =	1.39 Ac.

EROSION AND SEDIMENT CONTROL:

Total drainage area to basin #1 =		1.39 Ac.
Total Storage Volume Required (CY) = (134 CY / AC) * DA		186 CY occurs EL=106.0
		5,029 C.F. Minimum Volume Required
Minimum wet storage required =	93 C.Y.	2,515 C.F.
Minimum dry storage required =	93 C.Y.	2,515 C.F.

Wet storage volume of	2,515 CF is achieved at Elev. =	104.60
Dry storage volume of	2,515 CF is achieved at Elev. =	106.00
Cleanout required when wet storage is reduced by 50% to		1,257 CF at Elev. 103.85

Elevation	Depth	Area (sq. ft.)	Volume (cu. ft.)	Volume (cu. yd.)	Cum Volume (cu. ft.)	Cum Volume (cu. yd.)
103.0	0.0	1402	0	0	0	0
104.0	1.0	1587	1495	55	1,495	55
105.0	1.0	1779	1683	62	3,178	118
106.0	1.0	1977	1878	70	5,056	187
107.0	1.0	2182	2080	77	7,135	264
108.0	0.0		0	0	0	264
109.0	0.0		0	0	0	264
110.0	0.0		0	0	0	264
111.0	0.0		0	0	0	264
112.0	0.0		0	0	0	264
113.0	0.0		0	0	0	264
114.0	0.0		0	0	0	264

TRAP DIMENSIONS (See detail, E&S Plan):

Top of embankment Elev =	107.0
Invert Elev.=	103.0
Embankment Length (6x DA)	8.5 ft.
Width (W)	3.0 ft.
Height (H)	1.5 ft.
Ho	0.5 ft.
Excavated depth	4.0 ft.

TOANO BUSINESS CENTER
BMP DESIGN CALCULATIONS
ONSITE EXTENDED DRY DETENTION BASIN
AND
OFFSITE TREATMENT INFILTRATION FACILITY
AES PROJ # 6003

Date: 4/1/98
Revised: 5/14/98

TOTAL PROJECT DRAINAGE AREA	20.20 AC.
TOTAL PROJECT SITE AREA	7.27 AC.
AREA - Offsite NW	1.15 AC.
AREA - Offsite NE	4.00 AC.
AREA - VDOT North	2.79 AC.
AREA - VDOT South	5.13 AC.
ONSITE -Open Space Area	2.57 AC.

PROPOSED ONSITE BMP: DESIGN 3	6 PTS
PROPOSED OFFSITE BMP: DESIGN 8	9 PTS

SITE BMP CALCULATIONS:		Acres	C Factor	Equiv Acres
IMPERVIOUS AREAS	Buildings	1.85	0.90	1.67
	Pavement / Sidewalks	2.51	0.90	2.26
	Roads	1.11	0.90	1.00
	Open Space	1.46	0.35	0.51
	Total Acres	6.93		5.43

TOTAL IMPERVIOUS AREA FOR BMP CALCULATION	5.43	AC.
DRAINAGE AREA FOR BMP CALCULATION:	6.93	AC.
% IMPERVIOUS POST DEVELOPMENT AREA	78.41%	

OFF-SITE BMP CALCULATIONS:		Acres	C Factor	Equiv Acres
IMPERVIOUS AREAS	Wooded	0.90	0.10	0.09
	Roads	0.61	0.90	0.55
		1.51		0.64

TOTAL IMPERVIOUS AREA FOR BMP CALCULATION	0.64	AC.
DRAINAGE AREA FOR BMP CALCULATION:	1.51	AC.
% IMPERVIOUS POST DEVELOPMENT AREA	42.32%	

VDOT BMP CALCULATIONS:		Acres	C Factor	Acres
IMPERVIOUS AREAS	Pavement	2.57	0.90	2.31
	Shoulders	5.18	0.55	2.85
	Grass/Residential	4.0	0.45	1.80
		11.75		6.96

TOTAL IMPERVIOUS AREA FOR BMP CALCULATION	6.96	AC.
DRAINAGE AREA FOR BMP CALCULATION:	11.75	AC.
% IMPERVIOUS POST DEVELOPMENT AREA	59.25%	

COMPOSITE BMP POINT CALCULATION

Area	BMP Type	Points	Percent Impervious	Equivalent Points		
SITE	Design 3	6	78.41%	4.70		
OFFSITE	Design 3	6	42.32%	2.54		
VDOT	Design 8	9	59.25%	5.33		
				12.58	>10	OK

TOANO BUSINESS CENTER
CURVE NUMBER ANALYSIS
AES PROJ # 8003

Date: 8/14/97
Revised: 5/14/98

PRE-DEVELOPMENT CONDITION: (ALL CATEGORY 'C' SOILS)

TOTAL DRAINAGE AREA (DA)		
Site	7.27	AC.
Offsite	5.17	
VDOT	7.75	
Total	20.19	

WOODED	CN=	72	8.50 AC.
PAVEMENT	CN=	92	2.57 AC.
SHOULDERS	CN=	92	5.18 AC.
OPEN	CN=	72	2.91 AC.

WEIGHTED AVERAGE: CN= 76.00

Say CN= 76

POST-DEVELOPMENT

TOTAL DRAINAGE AREA 8.08 AC.

INDUSTRIAL	CN=	94	1.85 AC.
SITE PAVEMENT AND SIDEWALKS	CN=	94	2.51 AC.
RIGHT OF WAY	CN=	92	0.35 AC.
WOODED	CN=	72	0.75 AC.
GRASSED OPEN SPACE	CN=	79	2.62 AC.
			8.08

WEIGHTED AVERAGE: CN= 87.01

Say CN= 87

USE POST DEVELOPMENT COMPOSITE C87

EXTENDED DETENTION POND SIZING CALCULATION
TOANO BUSINESS CENTER
DESIGN 3 - 6 PT DRY POND

Date:	08/27/97
Revised:	05/14/98

Total Site Area =	7.27 Ac.
Total Area Served by Pond for E&S =	13.55 Ac.
Total Area Served by Pond for BMP & SWM =	8.08 Ac.

EROSION AND SEDIMENT CONTROL:

Total drainage area to basin #1 = 13.55 Ac.

Total Storage Volume Required (CY) = (134 CY / AC) * DA 1,816 CY occurs @ EL=89.8

49,024 C.F. Minimum Volume Required

Minimum wet storage required =	908 C.Y.	24,512 C.F.
Minimum dry storage required =	908 C.Y.	24,512 C.F.

Wet storage volume of	24,512 CF is achieved at Elev. =	88.50	
Dry storage volume of	24,512 CF is achieved at Elev. =	91.10	
Cleanout required when wet storage is reduced by 50% to		12,256 CF at Elev. =	86.60

Separation b/w wet storage and orifice 1.90 OK

Elevation	Depth	Area (sq. ft.)	Volume (cu. ft.)	Volume (cu. yd.)	Cum Volume (cu. ft.)	Cum Volume (cu. yd.)
84.0	0.0	3624	0	0	0	0
89.0	5.0	8165	29473	1092	29,473	1092
94.0	5.0	13048	53033	1964	82,505	3056
95.0	0.0		0	0	0	3056
96.0	0.0		0	0	0	3056
97.0	0.0		0	0	0	3056
98.0	0.0		0	0	0	3056
99.0	0.0		0	0	0	3056
100.0	0.0		0	0	0	3056
101.0	0.0		0	0	0	3056
102.0	0.0		0	0	0	3056
103.0	0.0		0	0	0	3056

Size Sediment Basin Temporary Dewatering Orifice

DA =	13.55	Ac.
Riser Elev	89.8	
Orifice Elev.	88.75	

Dry Storage (S) required = 24511.95 For minimum 6 hour drawdown 21600 sec.

Q=S/sec = 1.13 cfs

h = Riser El - Orifice El. = 1.05 ft

$$A0 = \frac{Q}{\sqrt{64.32 \times h/2} \times 0.6} = \frac{1.13}{\sqrt{64.32 \times .525} \times 0.6}$$

A0 = 0.325

Diameter = $2 \times \sqrt{A/3.14} = 2 \times \sqrt{.325/3.14}$ 0.64 ft.

7.73 inches

Use 6 inch Orifice

TOANO BUSINESS CENTER
AES Project No 8003

Paved Ditch Design for VDOT Runoff

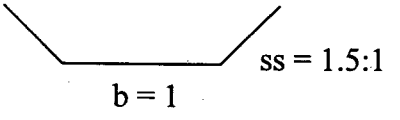
Drainage Area = 15,897 s.f. = 0.36 Ac.
C = 0.85
t_c = 5 min.
i_{10} = 7 in./hr. i_2 = 5.75

Q_{10} = CiA
= (.85)(7)(.36) = 2.14 c.f.s.

Q_2 = 1.76 c.f.s.

Proposed Ditch Section:

Trapezoidal Section

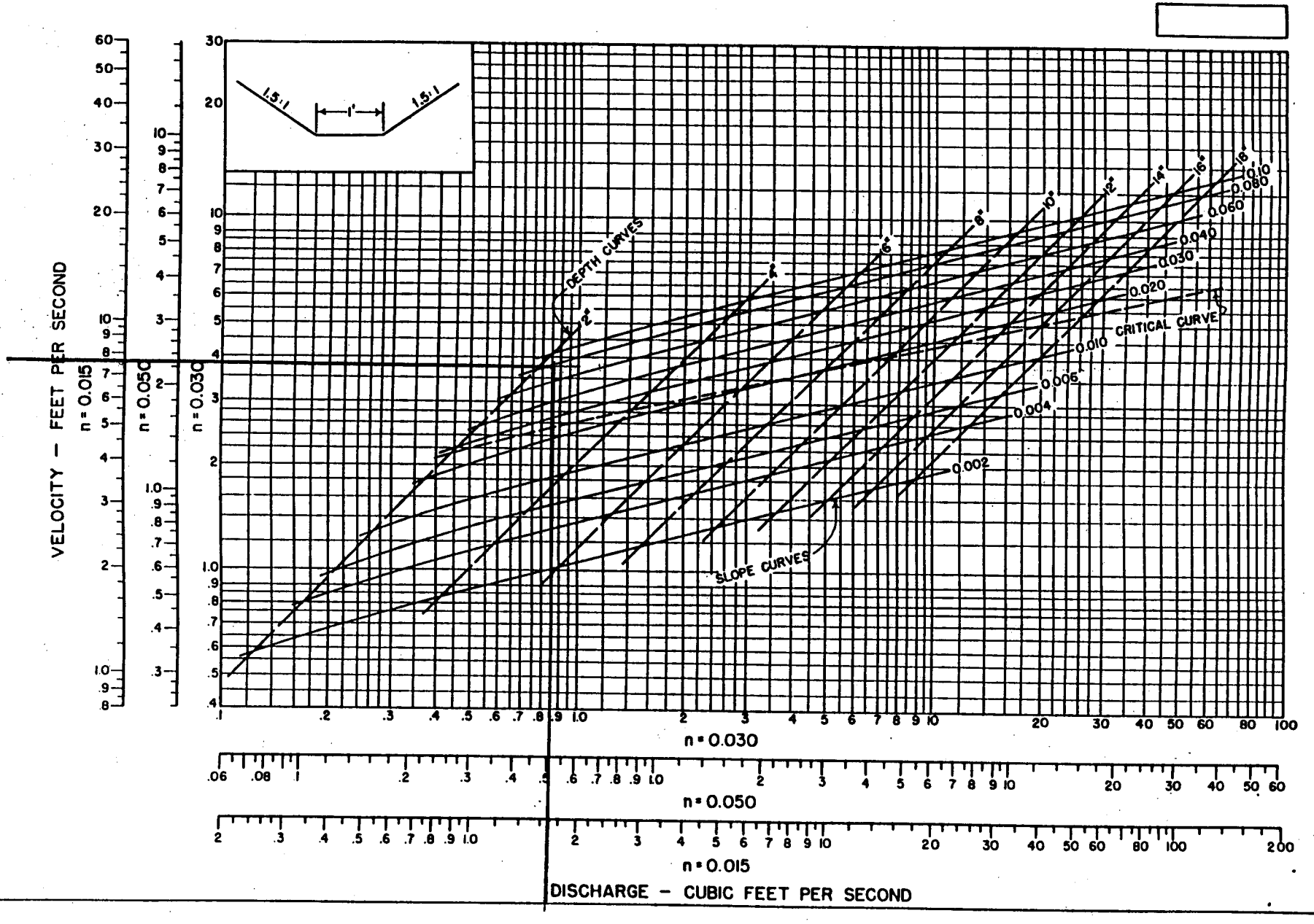


Slope = .073 ft./ft.

From Fig. 2.8.5 VDOT Drainage Manual

V = 7.5 fps

Depth = 2.2"



TRAPEZOIDAL DITCH FLOW CHART

FIG. 2.8.50

TOANO BUSINESS CENTER
AES Project No 8003

Dry Pond Outfall Channel Adequacy Analysis
(Assume Trapazoid Channel)

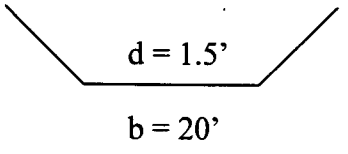
Assume b = 20' Assume Depth = $\pm$1.5'

SS = 5:1

Slope = 0.0167 ft./ft.

n = 0.075 (from VDOT Manual – Light Brush/Trees)

Assume Fescue Lining: Therefore max. velocity = 5 fps



e = 7.5'
z = 5'

Area = $bd + zd^2$ = 41.25 $ft/^2$

$R = bd + zd^2/b + 2d\sqrt{Z^2} + 1 = 1.16$

$V = 1.49/n * R^{2/3} * S^{1/2} = 1.49/0.075 * 1.16^{2/3} * .0167^{1/2}$

V = 2.84 fps < 5 fps OK

$Q_1 = 6.88$

$Q_{10} = 55.13$

$A_{10} = Q/V = 55.13/2.84$

$= 19.41\ ft.^2 < 41.25\ ft.^2$ OK

8003\00\WORDPROC\Document\80030N04.RMO.doc

RIPRAP - BASIN #1 - OUTFALL

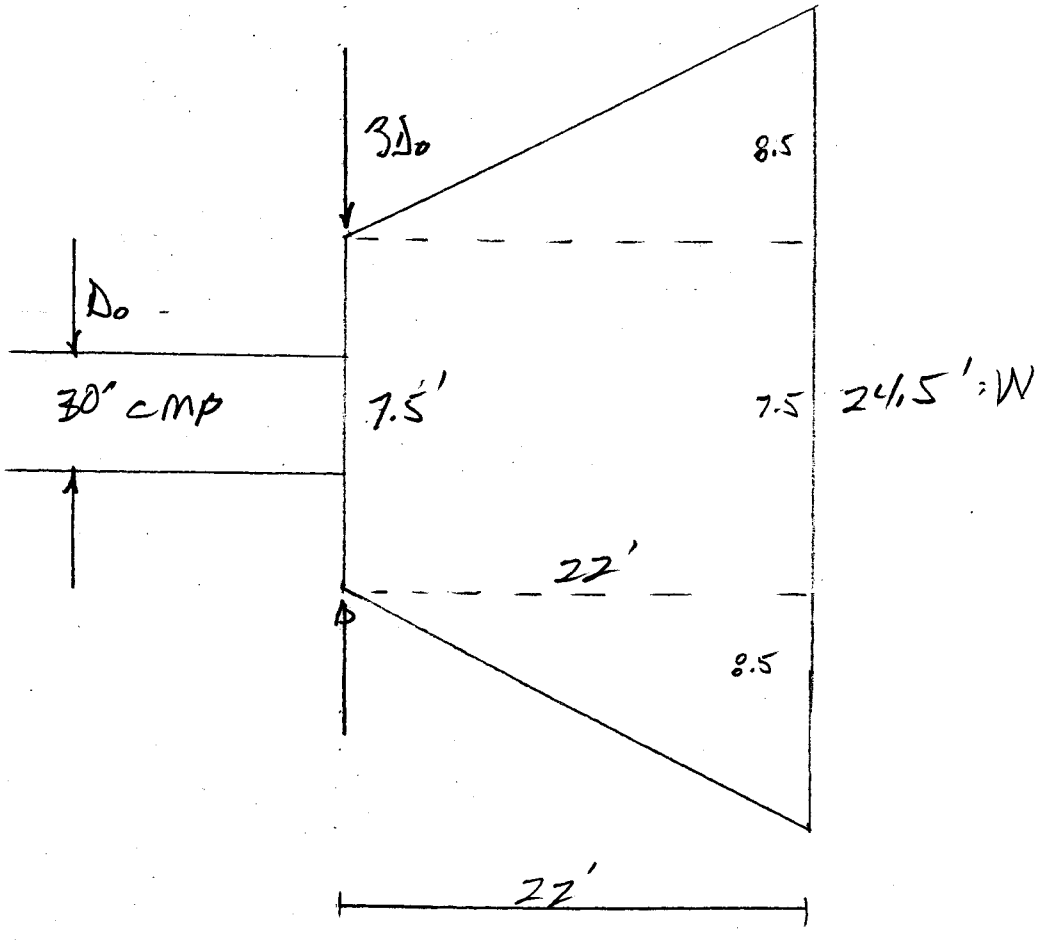
$Q_{10} = 51.96$ cfs $\quad D_o = 30''$

NATURAL CHANNEL - ASSUME MINIMUM TAILWATER

$L_a = 22$ FT

$3D_o = 90'' = 7.5$

$W = D_o + L_a = 2.5 + 22$



18" DEEP

$(22 \times 7.5) + (22 \times 8.5) = 352$ SF

$352 \times 1.5 = \quad = 528$ CF $= 19.5$ CY $\qquad$ Use 20 CY

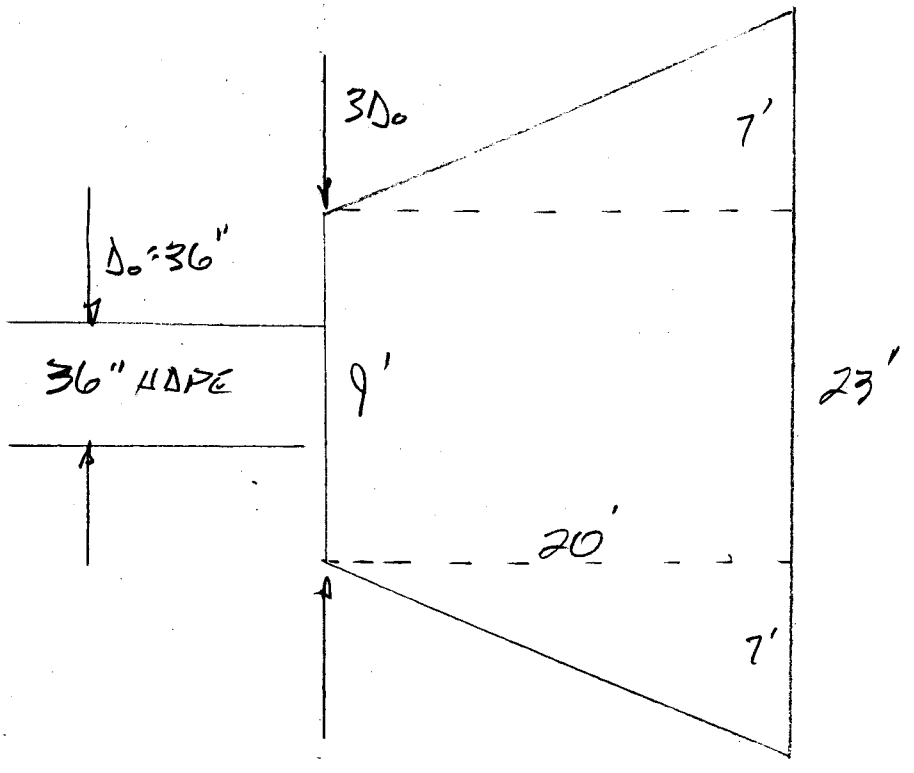
RIPRAP - BASIN #1 - STORM SYSTEM #1 - SS #1

$Q_{10} = 58.02$ cfs $D_o = 36''$ ASSUME MINIMUM TAILWATER

$3D_o = 108'' = 9'$

$L_a = 20'$

$W = D_o + L_a = 3' + 20' = 23'$



18" DEEP

$(20 \times 9) + (20 \times 7) = 320$ sf

$320 \times 1.5' = 480$ cf $= 17.7$ cy USE 18cy

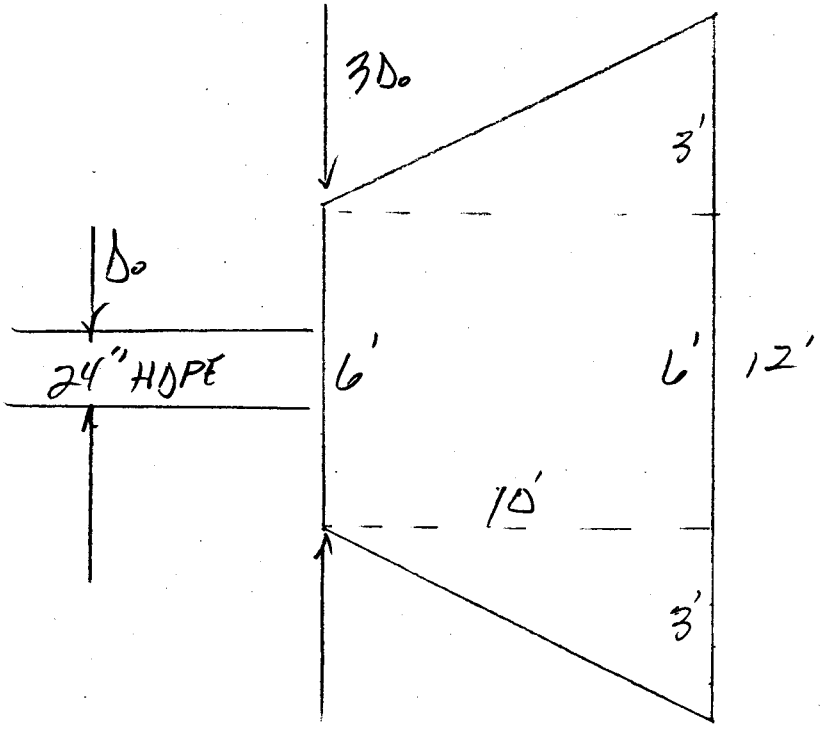
Rip Rap Design - Basin #1 - SS #7

$Q_{10} = 10.51$ cfs $\quad D_o = 24''$

$3D_o = 72'' = 6'$

$L_a = 10'$

$W = D_o + L_a = 2' + 10 = 12'$



18" deep

$(10 \times 6) + (10 \times 3) = 90$ sf

$90 \times 1.5 = 135$ cf $= \underline{\underline{5 \text{ cy}}}$

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

REVISED 4/28/98

Project TOANO BUSINESS CENTER

Basin # 1 Location WESTERN BOUNDARY

Total area draining to basin: 13.55 acres.

Basin Volume Design

Wet Storage:

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

   67 cu. yds. x 13.55 acres = 908 cu. yds.

2. Available basin volume = 908 cu. yds. at elevation 88.5. (From storage - elevation curve)

3. Excavate 50 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 13.55 acres = 447 cu. yds.

5. Elevation corresponding to cleanout level = 86.6.

   (From Storage - Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 1.9 ft. (Min. = 1.0 ft.)

Dry Storage:

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

   67 cu. yds. x 13.55 acres = 908 cu. yds.

8. Total available basin volume at crest of riser* = 1,816 cu. yds. at elevation 89.8. (From Storage - Elevation Curve)

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

9. Diameter of dewatering orifice = 6 in.

10. Diameter of flexible tubing = 8 in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of Riser = 89.8

Top of Dam = 94.0

Design High Water = 92.23

Upstream Toe of Dam = 84

Basin Shape

12. Length of Flow / Effective Width $\frac{L}{We}$ = 75/93 = 0.8

A = 7000 We = 93
L = 75

If > 2, baffles are not required _____

If < 2, baffles are required yes

Runoff

13. Q_2 = 16 cfs (From Chapter 5)

14. Q_{25} = 50.4 cfs (From Chapter 5)

Principal Spillway Design

15. With emergency spillway, required spillway capacity $Q_p = Q_2$ = 16 cfs. (riser and barrel)

Without emergency spillway, required spillway capacity $Q_p = Q_{25}$ = 50.4 cfs. (riser and barrel)

16. With emergency spillway:

Assumed available head (h) = -0- ft. (Using Q_2)

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

Without emergency spillway:

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) = 0.5 ft.

(From Plate 3.14-8.)

Note: Avoid orifice flow conditions.

18. Barrel length (l) = 62 ft.

Head (H) on barrel through embankment = 8.1 ft.

(From Plate 3.14-7).

19. Barrel diameter = 30 in.

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

20. Trash rack and anti-vortex device

Diameter = 72 inches.

Height = 21 inches.

(From Table 3.14-D).

Emergency Spillway Design

21. Required spillway capacity $Q_e = Q_{25} - Q_p$ = 34.4 cfs.

22. Bottom width (b) = 20 ft.; the slope of the exit channel (s) = 3.2 ft./foot; and the minimum length of the exit channel (x) = 45 ft.
(From Table 3.14-C).

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = 7.1 ft.

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

Slope of principal spillway barrel (S_b) = 1.6 %

Length of barrel in saturated zone (L_s) = 60 ft.

24. Number of collars required = 3 dimensions = 5.5' x 5.5'

(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 94.0

Design High Water = 92.23

Emergency Spillway Crest = 92

Principal Spillway Crest = 89.8

Dewatering Orifice Invert = 88.5

Cleanout Elevation = 86.6

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = 84

TOANO BUSINESS CENTER 4/2/98

SIZE WATER QUALITY ORIFICE - BASIN #1

1 INCH STORM DETAINED 24 HOURS - DESIGN TYPE 3 - 6 POINTS

$\Delta A = 8.08$ Ac

$C = 0.8$

$(1''/12)(8.08)(43{,}560)(0.8) = 23{,}464$ CF MIN STORAGE VOLUME

STORAGE VOLUME OCCURS AT EL = 88.3

ORIFICE AT INV EL = 84.0

SIZE ORIFICE

$Q = V/T = 23{,}464/86{,}400 = 0.27$ cfs

$h_2 - h_1 = 88.3 - 84.0 = 4.3$ FT

$K = 0.73$

$A_o = Q/K * \sqrt{2g\Delta h}$

$= .27/.73 * \sqrt{64.4(4.3)} = 0.022$ FT^2

$A = \frac{\pi D^2}{4}$

$D = \sqrt{4\left(\frac{A}{\pi}\right)} = \sqrt{4\left(\frac{.022}{\pi}\right)} = 0.164$ FT

$= 2.01$ INCH

USE 2 INCH

BAFFLE DESIGN #1

NP = 88.7 SURFACE AREA @ NP = 7,850 sf = A

L = 65 A/L = We = 120

$$\frac{L}{W_e} = \frac{65}{120} = 0.54 < 2$$ BAFFLE REQ'D

PROVIDE: 2 - 7.0' x 4' HIGH BAFFLES

TOANO BUSINESS CENTER
AES Project No. 8003

HYDROGRAPH ROUTING SUMMARY

PRE-DEVELOPMENT 20.19 Total Acres — Revised: 05/05/98

Reservoir # N/A — Hydrogrpah #1,3,5, 7, & 9

Slope = 2.25%

Flow Length = 1505

Drainage Area	Area	CN
Site	7.27	72
VDOT-No	2.62	85
VDOT-So	5.13	85
Offsite-NW	1.15	72
Offsite-Ne	4.00	72
Total	20.17	
Composite CN		77

Storm Event	Flow
1	16.17
2	25.59
10	57.46
25	71.96
100	98.22

POST-DEVELOPMENT (For construction erosion and sediment control- to Basin #1)

Reservoir #2 — Hydrogrpah #15 - 20

Slope = 2.55%

Flow Length = 1505

Drainage Area	Area	CN
Site	7.27	88
Offsite NW	1.15	72
Offsite NE	1.75	72
VDOT	7.79	85
Total	17.96	
Composite CN		84

Storm Event	Flow (cfs)	Routed Flow (cfs)	Max Elev.
1	33.84	32.13	90.67
25	80.57	64.21	92.23
100	105.75	96.15	92.96

VDOT Infiltration Trench - VDOT and Offsite Combined - Pre & Post

Reservoir #1 — Hydrogrpah #1-6

Slope = 2.07%

Flow Length = 1522

Drainage Area	Area	CN
VDOT	7.79	85
Offsite	4	74
Total	11.79	
Composite CN		81

	Storm Event	Flow (cfs)	Routed (cfs)	Max Elev.
(SWM)	.5"	12.28	11.36	95.14
(SWM)	10	38.12	37.82	96.19
(SWM)	100	62.53	62.09	96.95

POST-DEVELOPMENT -On-site for SWM to Dry Pond

Reservoir # N/A Hydrogrpah #1,3, &5

Slope = 2.55%

Flow Length = 935

Drainage Area	Area	CN
Site	8.08	88
Total	8.08	
Composite CN		88

Storm Event	Flow (cfs)	Routed Flow (cfs)	Max Elev.
1	19.11	-	-
25	47.76	-	-
100	73.21	-	-

ONSITE - Combined VDOT, Offsite and Site for Permanent SWM

Reservoir #2 Hydrogrpah #15-20

Slope = 3.4%

Flow Length = 935

Drainage Area	Area	CN
Site	8.08	88
Offsite	4	74
VDOT	7.79	85
Total	19.87	
Composite CN		84

Storm Event	Flow (cfs)	Offsite Inflow (cfs)	Combined (cfs)	Routed (cfs)	Max Elev.
1	19.11	11.36	20.08	6.88	88.59
10	47.76	37.82	73.50	55.00	90.62
100	73.21	62.09	117.28	94.96	92.97

HYDROLOGIC REPORT

1 YR, 24 HR STORM.....
PRE-DEVELOPMENT.....
.....

Hyd. No. 1

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 16.17 cfs
Storm frequency	= 1 yr	Time interval	= 2 min
Basin area	= 20.2 ac	Basin curve No.	= 77
Ave basin slope	= 2.55 %	Hydraulic len	= 1505 ft
Basin lag	= 18.1 min	Time of concen	= 30.29 min
Total precip.	= 2.80 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
11.63	0.58	11.67	0.72	11.70	0.90	11.73	1.16
11.77	1.51	11.80	1.99	11.83	2.66	11.87	3.56
11.90	4.78	11.93	6.29	11.97	7.97	12.00	9.68
12.03	11.31	12.07	12.84	12.10	14.20	12.13	15.28
12.17	15.98	12.20	16.17	12.23	15.85	12.27	15.18
12.30	14.37	12.33	13.51	12.37	12.62	12.40	11.69
12.43	10.74	12.47	9.78	12.50	8.80	12.53	7.83
12.57	6.88	12.60	5.98	12.63	5.16	12.67	4.47
12.70	3.96	12.73	3.64	12.77	3.43	12.80	3.28
12.83	3.14	12.87	3.01	12.90	2.90	12.93	2.79
12.97	2.69	13.00	2.61	13.03	2.53	13.07	2.45
13.10	2.39	13.13	2.33	13.17	2.27	13.20	2.22
13.23	2.17	13.27	2.13	13.30	2.09	13.33	2.05
13.37	2.01	13.40	1.97	13.43	1.94	13.47	1.90
13.50	1.87	13.53	1.84	13.57	1.81	13.60	1.78
13.63	1.75	13.67	1.72	13.70	1.69	13.73	1.67
13.77	1.64	13.80	1.62	13.83	1.59	13.87	1.57
13.90	1.54	13.93	1.52	13.97	1.50	14.00	1.48
14.03	1.45	14.07	1.43	14.10	1.41	14.13	1.39
14.17	1.37	14.20	1.35	14.23	1.34	14.27	1.32
14.30	1.30	14.33	1.29	14.37	1.28	14.40	1.26
14.43	1.25	14.47	1.24	14.50	1.23	14.53	1.22
14.57	1.21	14.60	1.20	14.63	1.20	14.67	1.19
14.70	1.18	14.73	1.17	14.77	1.17	14.80	1.16
14.83	1.15	14.87	1.15	14.90	1.14	14.93	1.13
14.97	1.13	15.00	1.12	15.03	1.11	15.07	1.10
15.10	1.10	15.13	1.09	15.17	1.08	15.20	1.08
15.23	1.07	15.27	1.06	15.30	1.05	15.33	1.05
15.37	1.04	15.40	1.03	15.43	1.02	15.47	1.02

HYDROLOGIC REPORT

2 YR, 24 HR STORM.....
PRE-DEVELOPMENT.....
.....

Hyd. No. 3

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 25.59 cfs
Storm frequency	= 2 yr	Time interval	= 2 min
Basin area	= 20.2 ac	Basin curve No.	= 77
Ave basin slope	= 2.55 %	Hydraulic len	= 1505 ft
Basin lag	= 18.1 min	Time of concen	= 30.29 min
Total precip.	= 3.50 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
11.50	0.99	11.53	1.07	11.57	1.17	11.60	1.31
11.63	1.50	11.67	1.76	11.70	2.12	11.73	2.59
11.77	3.22	11.80	4.07	11.83	5.21	11.87	6.71
11.90	8.68	11.93	11.07	11.97	13.69	12.00	16.30
12.03	18.78	12.07	21.06	12.10	23.03	12.13	24.55
12.17	25.46	12.20	25.59	12.23	24.94	12.27	23.77
12.30	22.40	12.33	20.96	12.37	19.48	12.40	17.95
12.43	16.41	12.47	14.84	12.50	13.29	12.53	11.75
12.57	10.26	12.60	8.86	12.63	7.60	12.67	6.56
12.70	5.79	12.73	5.31	12.77	5.00	12.80	4.78
12.83	4.57	12.87	4.38	12.90	4.21	12.93	4.05
12.97	3.91	13.00	3.78	13.03	3.66	13.07	3.55
13.10	3.45	13.13	3.36	13.17	3.28	13.20	3.21
13.23	3.14	13.27	3.07	13.30	3.01	13.33	2.95
13.37	2.90	13.40	2.84	13.43	2.79	13.47	2.74
13.50	2.69	13.53	2.64	13.57	2.60	13.60	2.55
13.63	2.51	13.67	2.47	13.70	2.43	13.73	2.39
13.77	2.35	13.80	2.32	13.83	2.28	13.87	2.25
13.90	2.21	13.93	2.18	13.97	2.14	14.00	2.11
14.03	2.08	14.07	2.05	14.10	2.02	14.13	1.99
14.17	1.96	14.20	1.93	14.23	1.91	14.27	1.88
14.30	1.86	14.33	1.84	14.37	1.82	14.40	1.80
14.43	1.78	14.47	1.77	14.50	1.75	14.53	1.74
14.57	1.73	14.60	1.71	14.63	1.70	14.67	1.69
14.70	1.68	14.73	1.67	14.77	1.66	14.80	1.65
14.83	1.64	14.87	1.63	14.90	1.62	14.93	1.61
14.97	1.60	15.00	1.59	15.03	1.58	15.07	1.57
15.10	1.56	15.13	1.55	15.17	1.54	15.20	1.53
15.23	1.52	15.27	1.50	15.30	1.49	15.33	1.48

HYDROLOGIC REPORT

10 YR PRE-DEVELOPMENT.

.....

.....

Hyd. No. 5

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 57.46 cfs
Storm frequency	= 10 yr	Time interval	= 2 min
Basin area	= 20.2 ac	Basin curve No.	= 77
Ave basin slope	= 2.55 %	Hydraulic len	= 1505 ft
Basin lag	= 18.1 min	Time of concen	= 30.29 min
Total precip.	= 5.60 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
10.30	1.02	10.33	1.05	10.37	1.09	10.40	1.12
10.43	1.16	10.47	1.20	10.50	1.23	10.53	1.27
10.57	1.31	10.60	1.36	10.63	1.40	10.67	1.45
10.70	1.49	10.73	1.54	10.77	1.60	10.80	1.65
10.83	1.71	10.87	1.77	10.90	1.83	10.93	1.90
10.97	1.96	11.00	2.03	11.03	2.10	11.07	2.16
11.10	2.23	11.13	2.30	11.17	2.38	11.20	2.46
11.23	2.56	11.27	2.66	11.30	2.76	11.33	2.90
11.37	3.04	11.40	3.19	11.43	3.35	11.47	3.52
11.50	3.70	11.53	3.92	11.57	4.20	11.60	4.58
11.63	5.11	11.67	5.83	11.70	6.80	11.73	8.06
11.77	9.70	11.80	11.85	11.83	14.64	11.87	18.23
11.90	22.75	11.93	28.09	11.97	33.79	12.00	39.38
12.03	44.57	12.07	49.24	12.10	53.14	12.13	55.98
12.17	57.46	12.20	57.21	12.23	55.35	12.27	52.43
12.30	49.08	12.33	45.64	12.37	42.11	12.40	38.54
12.43	34.95	12.47	31.37	12.50	27.85	12.53	24.41
12.57	21.12	12.60	18.08	12.63	15.39	12.67	13.18
12.70	11.59	12.73	10.59	12.77	9.96	12.80	9.50
12.83	9.07	12.87	8.69	12.90	8.34	12.93	8.01
12.97	7.72	13.00	7.46	13.03	7.22	13.07	7.00
13.10	6.80	13.13	6.62	13.17	6.45	13.20	6.30
13.23	6.16	13.27	6.03	13.30	5.90	13.33	5.78
13.37	5.67	13.40	5.56	13.43	5.45	13.47	5.35
13.50	5.25	13.53	5.16	13.57	5.07	13.60	4.98
13.63	4.89	13.67	4.81	13.70	4.73	13.73	4.65
13.77	4.58	13.80	4.50	13.83	4.43	13.87	4.36
13.90	4.29	13.93	4.22	13.97	4.16	14.00	4.09
14.03	4.03	14.07	3.97	14.10	3.90	14.13	3.85

HYDROLOGIC REPORT

25 YR PRE DEVELOPMENT.

.....

.....

Hyd. No. 7

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 71.96 cfs
Storm frequency	= 25 yr	Time interval	= 2 min
Basin area	= 20.2 ac	Basin curve No.	= 77
Ave basin slope	= 2.55 %	Hydraulic len	= 1505 ft
Basin lag	= 18.1 min	Time of concen	= 30.29 min
Total precip.	= 6.50 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
9.63	0.98	9.67	0.99	9.70	1.01	9.73	1.03
9.77	1.04	9.80	1.06	9.83	1.09	9.87	1.11
9.90	1.13	9.93	1.16	9.97	1.19	10.00	1.22
10.03	1.25	10.07	1.28	10.10	1.31	10.13	1.35
10.17	1.38	10.20	1.42	10.23	1.46	10.27	1.50
10.30	1.54	10.33	1.59	10.37	1.63	10.40	1.68
10.43	1.73	10.47	1.78	10.50	1.83	10.53	1.88
10.57	1.94	10.60	2.00	10.63	2.05	10.67	2.12
10.70	2.18	10.73	2.25	10.77	2.31	10.80	2.39
10.83	2.46	10.87	2.54	10.90	2.63	10.93	2.71
10.97	2.80	11.00	2.89	11.03	2.97	11.07	3.06
11.10	3.15	11.13	3.24	11.17	3.34	11.20	3.45
11.23	3.57	11.27	3.70	11.30	3.84	11.33	4.02
11.37	4.20	11.40	4.40	11.43	4.61	11.47	4.83
11.50	5.07	11.53	5.35	11.57	5.72	11.60	6.22
11.63	6.91	11.67	7.85	11.70	9.10	11.73	10.74
11.77	12.85	11.80	15.62	11.83	19.17	11.87	23.71
11.90	29.40	11.93	36.06	11.97	43.14	12.00	50.05
12.03	56.45	12.07	62.16	12.10	66.89	12.13	70.28
12.17	71.96	12.20	71.51	12.23	69.07	12.27	65.33
12.30	61.07	12.33	56.70	12.37	52.24	12.40	47.73
12.43	43.20	12.47	38.71	12.50	34.30	12.53	30.01
12.57	25.91	12.60	22.13	12.63	18.80	12.67	16.07
12.70	14.12	12.73	12.89	12.77	12.13	12.80	11.56
12.83	11.04	12.87	10.56	12.90	10.13	12.93	9.74
12.97	9.38	13.00	9.06	13.03	8.76	13.07	8.50
13.10	8.25	13.13	8.03	13.17	7.83	13.20	7.64
13.23	7.47	13.27	7.31	13.30	7.16	13.33	7.01
13.37	6.87	13.40	6.74	13.43	6.61	13.47	6.48

HYDROLOGIC REPORT

100-YR PRE DEVELOPMENT

.....

.....

Hyd. No. 9

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 98.22 cfs
Storm frequency	= 100 yr	Time interval	= 2 min
Basin area	= 20.2 ac	Basin curve No.	= 77
Ave basin slope	= 2.55 %	Hydraulic len	= 1505 ft
Basin lag	= 18.1 min	Time of concen	= 30.29 min
Total precip.	= 8.10 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
8.70	1.02	8.73	1.05	8.77	1.07	8.80	1.10
8.83	1.13	8.87	1.16	8.90	1.18	8.93	1.21
8.97	1.24	9.00	1.27	9.03	1.30	9.07	1.33
9.10	1.36	9.13	1.39	9.17	1.42	9.20	1.45
9.23	1.48	9.27	1.51	9.30	1.54	9.33	1.56
9.37	1.59	9.40	1.61	9.43	1.63	9.47	1.65
9.50	1.67	9.53	1.69	9.57	1.71	9.60	1.73
9.63	1.75	9.67	1.77	9.70	1.80	9.73	1.82
9.77	1.85	9.80	1.87	9.83	1.91	9.87	1.94
9.90	1.98	9.93	2.02	9.97	2.06	10.00	2.10
10.03	2.15	10.07	2.19	10.10	2.24	10.13	2.29
10.17	2.35	10.20	2.40	10.23	2.46	10.27	2.52
10.30	2.59	10.33	2.65	10.37	2.72	10.40	2.79
10.43	2.86	10.47	2.94	10.50	3.01	10.53	3.09
10.57	3.17	10.60	3.25	10.63	3.34	10.67	3.43
10.70	3.52	10.73	3.62	10.77	3.72	10.80	3.83
10.83	3.94	10.87	4.05	10.90	4.17	10.93	4.30
10.97	4.43	11.00	4.56	11.03	4.67	11.07	4.79
11.10	4.92	11.13	5.06	11.17	5.20	11.20	5.36
11.23	5.53	11.27	5.71	11.30	5.91	11.33	6.16
11.37	6.44	11.40	6.72	11.43	7.02	11.47	7.34
11.50	7.67	11.53	8.08	11.57	8.60	11.60	9.32
11.63	10.31	11.67	11.66	11.70	13.45	11.73	15.78
11.77	18.76	11.80	22.64	11.83	27.60	11.87	33.88
11.90	41.66	11.93	50.72	11.97	60.28	12.00	69.56
12.03	78.09	12.07	85.66	12.10	91.85	12.13	96.21
12.17	98.22	12.20	97.37	12.23	93.84	12.27	88.61
12.30	82.69	12.33	76.62	12.37	70.45	12.40	64.23
12.43	58.02	12.47	51.87	12.50	45.84	12.53	40.01

HYDROLOGIC REPORT FOR

TOANO BUSINESS CENTER

SWM BASIN ANALYSIS

AES PROJECT 8003

BASIN #1 E&S ANALYSIS

prepared by:

AES CONSULTING ENGINEERS

5248 OLDE TOWNE ROAD

WILLIAMSBURG, VA 23185

Revised: April 17,1998

Reservoir No. 2

OUTLET STRUCTURES

CULVERT STRUC A. Q=CoA[2gh/k]^.5

1. WIDTH (in) = 30.
2. HEIGHT (in) = 30.
3. No. BARRELS = 1..
4. INVERT ELEV. = 84.....
5. Co = 0.60
6. CULVERT LENGTH (ft) = 62..
7. CULVERT SLOPE (%) = 1.61
8. MANNING'S N-VALUE = .013

CULVERT STRUC B. Q=CoA[2gh/k]^.5

9. WIDTH (in) = 6..
10. HEIGHT (in) = 6..
11. No. BARRELS = 1..
12. INVERT ELEV. = 88.5.....
13. Co = 0.60
14. CULVERT LENGTH (ft) = 0...
15. CULVERT SLOPE (%) = 0...
16. MANNING'S N-VALUE = .013
17. MULTI-STAGE OPTION ? (Y/N) N

WEIR STRUCTURE A. Q=CwLH^EXP

18. CREST LENGTH (ft) = 12.56..
19. CREST ELEVATION = 89.8...
20. Cw = 3.00
21. EXP = 1.50
22. MULTI-STAGE OPTION ? (Y/N) Y

WEIR STRUCTURE B. Q=CwLH^EXP

23. CREST LENGTH (ft) = 10.....
24. CREST ELEVATION = 92.....
25. Cw = 3.00
26. EXP = 1.50
27. MULTI-STAGE OPTION ? (Y/N) Y

Change item number: 0

↵ to cont

Option 1

STAGE / STORAGE / DISCHARGE SUMMARY

RESERVOIR No = 2

RESERVOIR NAME = E&S BASIN #1

S = Ks * Z^b

Ks = 0

b = 0

START ELEV = 0

INCREMENT = 0

STAGE ft	ELEVATION ft	STORAGE cu ft	DISCHARGE cfs	
0.00	88.50	0	0.00	1.
0.50	89.00	3927	0.47	2.
4.50	93.00	46353	67.74	3.
0.00	0.00	0	0.00	4.
0.00	0.00	0	0.00	5.
0.00	0.00	0	0.00	6.
0.00	0.00	0	0.00	7.
0.00	0.00	0	0.00	8.
0.00	0.00	0	0.00	9.
0.00	0.00	0	0.00	10.
0.00	0.00	0	0.00	11.

[↵] cont [E] edit [R] reset [G] graph [S] screen [P] print

E+S
Pre

HYDROLOGIC REPORT

2 YR STORM RUNOFF FOR
E&S CONTROL.....
.....

Hyd. No. 15

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 33.84 cfs
Storm frequency	= 2 yr	Time interval	= 2 min
Basin area	= 17.95 ac	Basin curve No.	= 84
Ave basin slope	= 2.25 %	Hydraulic len	= 1505 ft
Basin lag	= 15.5 min	Time of concen	= 25.84 min
Total precip.	= 3.50 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
10.83	0.94	10.87	0.98	10.90	1.01	10.93	1.05
10.97	1.09	11.00	1.13	11.03	1.16	11.07	1.20
11.10	1.23	11.13	1.27	11.17	1.32	11.20	1.36
11.23	1.41	11.27	1.47	11.30	1.54	11.33	1.62
11.37	1.71	11.40	1.80	11.43	1.89	11.47	1.99
11.50	2.09	11.53	2.22	11.57	2.40	11.60	2.64
11.63	2.98	11.67	3.45	11.70	4.09	11.73	4.93
11.77	6.02	11.80	7.44	11.83	9.28	11.87	11.63
11.90	14.58	11.93	18.05	11.97	21.71	12.00	25.23
12.03	28.39	12.07	31.01	12.10	32.91	12.13	33.84
12.17	33.58	12.20	32.18	12.23	30.05	12.27	27.66
12.30	25.22	12.33	22.78	12.37	20.34	12.40	17.94
12.43	15.60	12.47	13.37	12.50	11.29	12.53	9.46
12.57	7.96	12.60	6.89	12.63	6.23	12.67	5.83
12.70	5.54	12.73	5.26	12.77	5.01	12.80	4.78
12.83	4.58	12.87	4.40	12.90	4.24	12.93	4.09
12.97	3.96	13.00	3.84	13.03	3.73	13.07	3.64
13.10	3.55	13.13	3.46	13.17	3.39	13.20	3.31
13.23	3.24	13.27	3.17	13.30	3.11	13.33	3.05
13.37	2.99	13.40	2.93	13.43	2.88	13.47	2.83
13.50	2.78	13.53	2.73	13.57	2.69	13.60	2.64
13.63	2.60	13.67	2.55	13.70	2.51	13.73	2.47
13.77	2.43	13.80	2.39	13.83	2.35	13.87	2.32
13.90	2.28	13.93	2.24	13.97	2.21	14.00	2.18
14.03	2.14	14.07	2.11	14.10	2.08	14.13	2.05
14.17	2.02	14.20	1.99	14.23	1.96	14.27	1.94
14.30	1.92	14.33	1.90	14.37	1.88	14.40	1.86
14.43	1.84	14.47	1.83	14.50	1.81	14.53	1.80
14.57	1.79	14.60	1.78	14.63	1.76	14.67	1.75

HYDROLOGIC REPORT

2 YR STORM ROUTED.....
FOR E&S THROUGH.....
BASIN #1.....

Hyd. No. 16

Hydrograph type = RESERVOIR ROUTE Peak discharge = 32.13 cfs
Storm frequency = 2 yr Time interval = 2 min
Inflow hyd. no. = 15 Reservoir no. = 2

HYDROGRAPH DISCHARGE TABLE

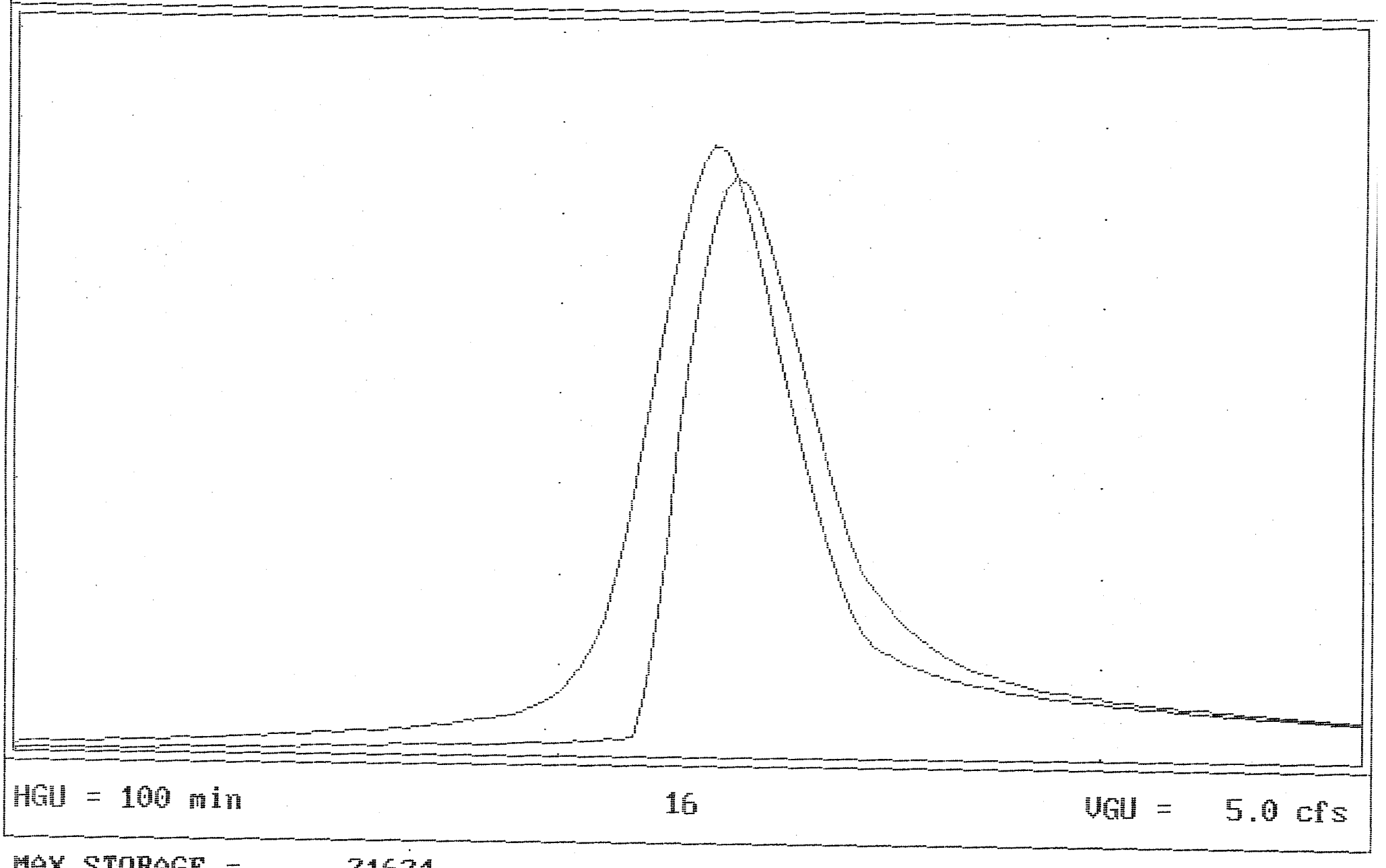
TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
10.90	1.01	1.05	46.29	46.92	0.32
10.93	1.05	1.09	47.68	48.35	0.33
10.97	1.09	1.13	49.12	49.82	0.35
11.00	1.13	1.16	50.59	51.33	0.37
11.03	1.16	1.20	52.11	52.88	0.39
11.07	1.20	1.23	53.68	54.47	0.40
11.10	1.23	1.27	55.29	56.10	0.41
11.13	1.27	1.32	56.96	57.80	0.42
11.17	1.32	1.36	58.69	59.55	0.43
11.20	1.36	1.41	60.49	61.37	0.44
11.23	1.41	1.47	62.36	63.27	0.45
11.27	1.47	1.54	64.31	65.24	0.47
11.30	1.54	1.62	66.37	67.32	0.48
11.33	1.62	1.71	68.56	69.54	0.49
11.37	1.71	1.80	70.90	71.89	0.50
11.40	1.80	1.89	73.39	74.40	0.51
11.43	1.89	1.99	76.04	77.08	0.52
11.47	1.99	2.09	78.87	79.93	0.53
11.50	2.09	2.22	81.87	82.95	0.54
11.53	2.22	2.40	85.08	86.19	0.56
11.57	2.40	2.64	88.56	89.70	0.57
11.60	2.64	2.98	92.42	93.59	0.59
11.63	2.98	3.45	96.83	98.03	0.60
11.67	3.45	4.09	102.00	103.25	0.62
11.70	4.09	4.93	108.23	109.53	0.65

HYDROGRAPH DISCHARGE TABLE Cont'd

TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
17.33	1.06	1.06	206.59	208.75	1.08
17.37	1.06	1.05	206.56	208.71	1.07
17.40	1.05	1.05	206.54	208.68	1.07
17.43	1.05	1.05	206.51	208.64	1.07
17.47	1.05	1.04	206.49	208.61	1.06
17.50	1.04	1.04	206.46	208.58	1.06
17.53	1.04	1.03	206.43	208.54	1.05
17.57	1.03	1.03	206.41	208.51	1.05
17.60	1.03	1.03	206.38	208.47	1.05
17.63	1.03	1.02	206.36	208.44	1.04
17.67	1.02	1.02	206.33	208.40	1.04
17.70	1.02	1.01	206.30	208.37	1.03
17.73	1.01	1.01	206.28	208.34	1.03
17.77	1.01	1.01	206.25	208.30	1.02
17.80	1.01	1.00	206.23	208.27	1.02
17.83	1.00	1.00	206.20	208.23	1.02
17.87	1.00	0.99	206.17	208.20	1.01
17.90	0.99	0.99	206.15	208.16	1.01
17.93	0.99	0.98	206.12	208.13	1.00

Maximum outflow (cfs) = 32.13
Maximum storage (cu ft) = 21624
Maximum elevation (ft) = 90.67

Qp = 32.1 RESERVOIR ROUTE 2 Yr



MAX STORAGE = 21624

MAX ELEVATION = 90.67

HYDROLOGIC REPORT

25 YR STORM RUNOFF FOR
E&S CONTROL.....
.....

Hyd. No. 17

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 80.57 cfs
Storm frequency	= 25 yr	Time interval	= 2 min
Basin area	= 17.95 ac	Basin curve No.	= 84
Ave basin slope	= 2.25 %	Hydraulic len	= 1505 ft
Basin lag	= 15.5 min	Time of concen	= 25.84 min
Total precip.	= 6.50 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
8.57	0.97	8.60	0.99	8.63	1.01	8.67	1.04
8.70	1.06	8.73	1.08	8.77	1.11	8.80	1.13
8.83	1.15	8.87	1.18	8.90	1.20	8.93	1.23
8.97	1.25	9.00	1.28	9.03	1.30	9.07	1.33
9.10	1.35	9.13	1.38	9.17	1.40	9.20	1.42
9.23	1.45	9.27	1.47	9.30	1.49	9.33	1.51
9.37	1.52	9.40	1.54	9.43	1.56	9.47	1.57
9.50	1.58	9.53	1.60	9.57	1.61	9.60	1.62
9.63	1.64	9.67	1.65	9.70	1.67	9.73	1.69
9.77	1.71	9.80	1.74	9.83	1.77	9.87	1.80
9.90	1.83	9.93	1.86	9.97	1.90	10.00	1.94
10.03	1.98	10.07	2.02	10.10	2.06	10.13	2.10
10.17	2.15	10.20	2.20	10.23	2.25	10.27	2.30
10.30	2.35	10.33	2.41	10.37	2.46	10.40	2.52
10.43	2.58	10.47	2.64	10.50	2.71	10.53	2.77
10.57	2.84	10.60	2.91	10.63	2.98	10.67	3.05
10.70	3.13	10.73	3.21	10.77	3.30	10.80	3.39
10.83	3.48	10.87	3.58	10.90	3.68	10.93	3.78
10.97	3.89	11.00	4.00	11.03	4.09	11.07	4.18
11.10	4.28	11.13	4.38	11.17	4.50	11.20	4.62
11.23	4.76	11.27	4.91	11.30	5.12	11.33	5.34
11.37	5.57	11.40	5.82	11.43	6.08	11.47	6.35
11.50	6.63	11.53	6.98	11.57	7.45	11.60	8.11
11.63	9.05	11.67	10.33	11.70	12.06	11.73	14.30
11.77	17.18	11.80	20.84	11.83	25.47	11.87	31.23
11.90	38.29	11.93	46.38	11.97	54.77	12.00	62.68
12.03	69.65	12.07	75.25	12.10	79.05	12.13	80.57
12.17	79.33	12.20	75.53	12.23	70.15	12.27	64.20
12.30	58.20	12.33	52.23	12.37	46.34	12.40	40.59

HYDROLOGIC REPORT

25 YR STORM ROUTED....
FOR E&S THROUGH.....
BASIN #1.....

Hyd. No. 18

Hydrograph type = RESERVOIR ROUTE Peak discharge = 64.21 cfs
Storm frequency = 25 yr Time interval = 2 min
Inflow hyd. no. = 17 Reservoir no. = 2

HYDROGRAPH DISCHARGE TABLE

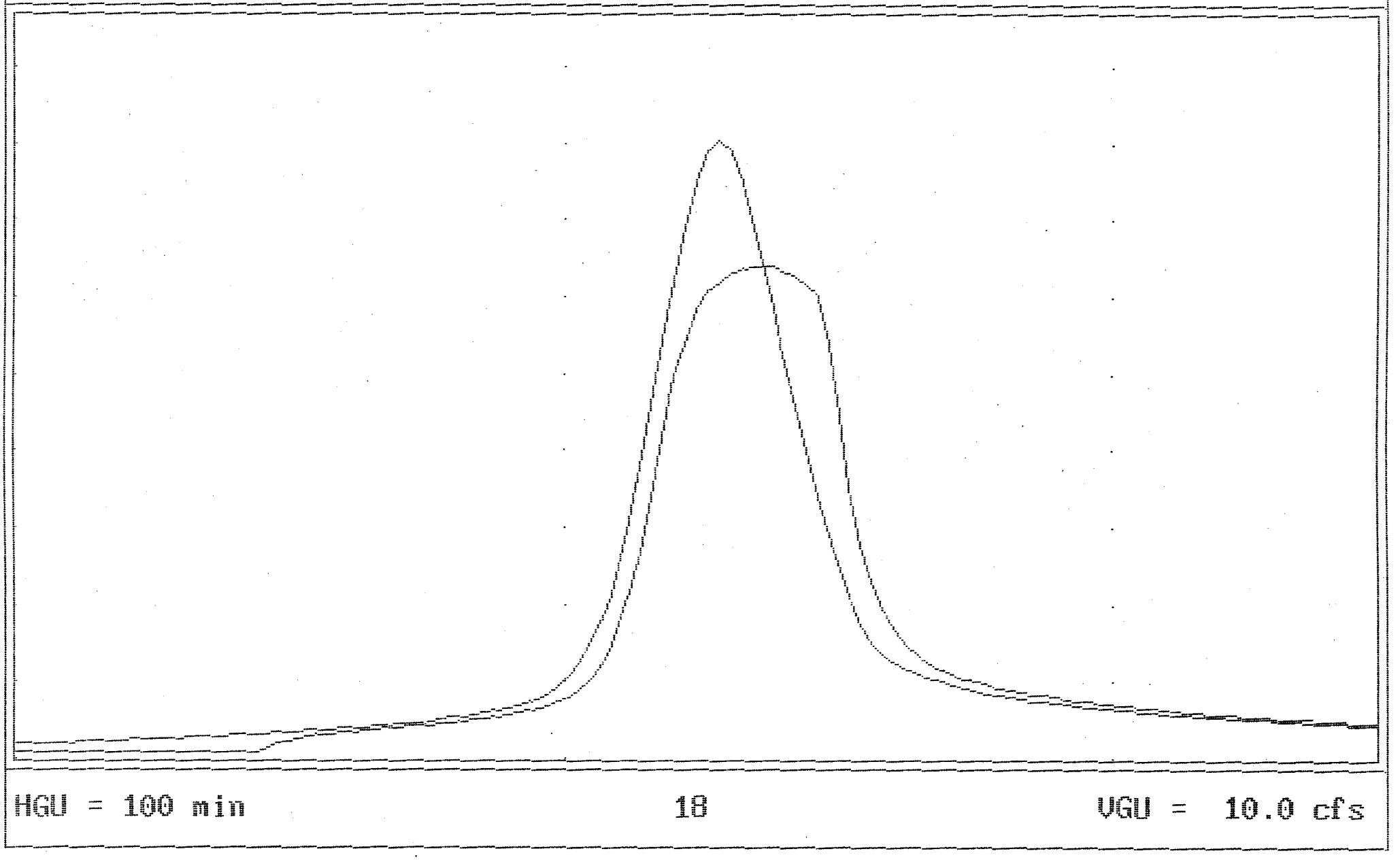
TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
8.63	1.01	1.04	62.33	63.23	0.45
8.67	1.04	1.06	63.45	64.38	0.46
8.70	1.06	1.08	64.61	65.55	0.47
8.73	1.08	1.11	65.80	66.75	0.48
8.77	1.11	1.13	67.02	67.98	0.48
8.80	1.13	1.15	68.28	69.25	0.49
8.83	1.15	1.18	69.58	70.56	0.49
8.87	1.18	1.20	70.91	71.91	0.50
8.90	1.20	1.23	72.29	73.29	0.50
8.93	1.23	1.25	73.70	74.71	0.51
8.97	1.25	1.28	75.14	76.17	0.51
9.00	1.28	1.30	76.63	77.67	0.52
9.03	1.30	1.33	78.15	79.21	0.53
9.07	1.33	1.35	79.72	80.78	0.53
9.10	1.35	1.38	81.32	82.39	0.54
9.13	1.38	1.40	82.95	84.04	0.55
9.17	1.40	1.42	84.62	85.73	0.55
9.20	1.42	1.45	86.33	87.45	0.56
9.23	1.45	1.47	88.07	89.20	0.57
9.27	1.47	1.49	89.83	90.98	0.57
9.30	1.49	1.51	91.62	92.79	0.58
9.33	1.51	1.52	93.44	94.62	0.59
9.37	1.52	1.54	95.28	96.47	0.60
9.40	1.54	1.56	97.13	98.34	0.60
9.43	1.56	1.57	99.00	100.23	0.61

HYDROGRAPH DISCHARGE TABLE Cont'd

TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
23.47	1.25	1.25	207.69	210.20	1.25
23.50	1.25	1.24	207.68	210.18	1.25
23.53	1.24	1.24	207.67	210.17	1.25
23.57	1.24	1.24	207.66	210.15	1.25
23.60	1.24	1.24	207.65	210.14	1.25
23.63	1.24	1.24	207.64	210.12	1.24
23.67	1.24	1.23	207.62	210.11	1.24
23.70	1.23	1.23	207.61	210.09	1.24
23.73	1.23	1.23	207.60	210.08	1.24
23.77	1.23	1.23	207.59	210.07	1.24
23.80	1.23	1.23	207.58	210.05	1.24
23.83	1.23	1.23	207.57	210.04	1.23
23.87	1.23	1.22	207.56	210.02	1.23
23.90	1.22	1.22	207.55	210.01	1.23
23.93	1.22	1.22	207.53	209.99	1.23
23.97	1.22	0.00	207.52	209.98	1.23
24.00	0.00	0.00	206.59	208.74	1.08

Maximum outflow (cfs) = 64.21
Maximum storage (cu ft) = 38212
Maximum elevation (ft) = 92.23

Qp = 64.2 RESERVOIR ROUTE 25 Yr



MAX STORAGE = 38212

MAX ELEVATION = 92.23

HYDROLOGIC REPORT

100YR POST DEVELOPMENT
FOR E&S CONTROL.....
.....

Hyd. No. 19

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 105.75 cfs
Storm frequency	= 100 yr	Time interval	= 2 min
Basin area	= 17.95 ac	Basin curve No.	= 84
Ave basin slope	= 2.25 %	Hydraulic len	= 1505 ft
Basin lag	= 15.5 min	Time of concen	= 25.84 min
Total precip.	= 8.10 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
7.37	0.97	7.40	0.99	7.43	1.00	7.47	1.01
7.50	1.02	7.53	1.03	7.57	1.05	7.60	1.06
7.63	1.07	7.67	1.08	7.70	1.10	7.73	1.11
7.77	1.12	7.80	1.13	7.83	1.15	7.87	1.16
7.90	1.17	7.93	1.18	7.97	1.20	8.00	1.21
8.03	1.22	8.07	1.23	8.10	1.25	8.13	1.26
8.17	1.28	8.20	1.29	8.23	1.31	8.27	1.33
8.30	1.35	8.33	1.37	8.37	1.40	8.40	1.42
8.43	1.45	8.47	1.48	8.50	1.51	8.53	1.54
8.57	1.57	8.60	1.60	8.63	1.63	8.67	1.66
8.70	1.69	8.73	1.73	8.77	1.76	8.80	1.79
8.83	1.83	8.87	1.86	8.90	1.90	8.93	1.93
8.97	1.97	9.00	2.00	9.03	2.04	9.07	2.08
9.10	2.11	9.13	2.15	9.17	2.18	9.20	2.21
9.23	2.24	9.27	2.27	9.30	2.30	9.33	2.32
9.37	2.34	9.40	2.37	9.43	2.39	9.47	2.40
9.50	2.42	9.53	2.44	9.57	2.45	9.60	2.47
9.63	2.49	9.67	2.51	9.70	2.53	9.73	2.55
9.77	2.58	9.80	2.62	9.83	2.66	9.87	2.70
9.90	2.74	9.93	2.79	9.97	2.84	10.00	2.89
10.03	2.94	10.07	3.00	10.10	3.06	10.13	3.12
10.17	3.19	10.20	3.25	10.23	3.32	10.27	3.39
10.30	3.46	10.33	3.54	10.37	3.62	10.40	3.70
10.43	3.78	10.47	3.87	10.50	3.96	10.53	4.04
10.57	4.14	10.60	4.23	10.63	4.33	10.67	4.43
10.70	4.53	10.73	4.65	10.77	4.76	10.80	4.88
10.83	5.01	10.87	5.14	10.90	5.28	10.93	5.42
10.97	5.56	11.00	5.71	11.03	5.83	11.07	5.95
11.10	6.09	11.13	6.23	11.17	6.38	11.20	6.55

HYDROLOGIC REPORT

100 YR STORM ROUTED...
FOR E&S THROUGH.....
BASIN #1.....

Hyd. No. 20

Hydrograph type = RESERVOIR ROUTE
Storm frequency = 100 yr
Inflow hyd. no. = 19

Peak discharge = 96.15 cfs
Time interval = 2 min
Reservoir no. = 2

HYDROGRAPH DISCHARGE TABLE

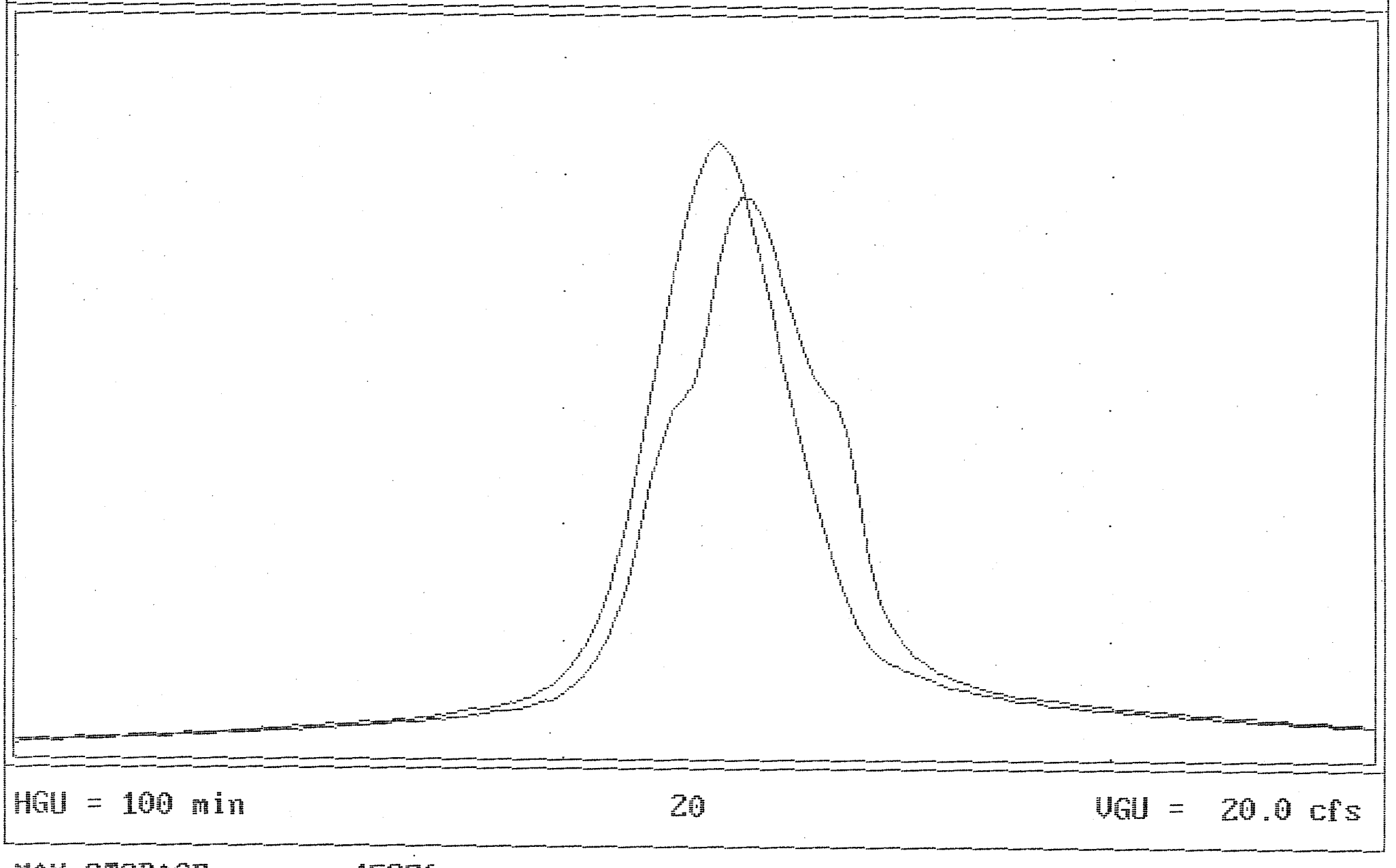
TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
7.47	1.01	1.02	63.53	64.46	0.46
7.50	1.02	1.03	64.62	65.56	0.47
7.53	1.03	1.05	65.73	66.68	0.48
7.57	1.05	1.06	66.85	67.81	0.48
7.60	1.06	1.07	67.98	68.95	0.49
7.63	1.07	1.08	69.13	70.11	0.49
7.67	1.08	1.10	70.30	71.29	0.49
7.70	1.10	1.11	71.48	72.48	0.50
7.73	1.11	1.12	72.68	73.69	0.50
7.77	1.12	1.13	73.89	74.91	0.51
7.80	1.13	1.15	75.12	76.14	0.51
7.83	1.15	1.16	76.36	77.40	0.52
7.87	1.16	1.17	77.61	78.66	0.52
7.90	1.17	1.18	78.88	79.94	0.53
7.93	1.18	1.20	80.17	81.24	0.54
7.97	1.20	1.21	81.47	82.55	0.54
8.00	1.21	1.22	82.78	83.87	0.55
8.03	1.22	1.23	84.11	85.21	0.55
8.07	1.23	1.25	85.45	86.57	0.56
8.10	1.25	1.26	86.81	87.94	0.56
8.13	1.26	1.28	88.19	89.32	0.57
8.17	1.28	1.29	89.58	90.73	0.57
8.20	1.29	1.31	90.99	92.15	0.58
8.23	1.31	1.33	92.43	93.60	0.59
8.27	1.33	1.35	93.89	95.07	0.59

HYDROGRAPH DISCHARGE TABLE Cont'd

TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
23.70	1.57	1.56	209.71	212.86	1.57
23.73	1.56	1.56	209.70	212.84	1.57
23.77	1.56	1.56	209.68	212.82	1.57
23.80	1.56	1.56	209.67	212.81	1.57
23.83	1.56	1.56	209.66	212.79	1.57
23.87	1.56	1.55	209.64	212.77	1.56
23.90	1.55	1.55	209.63	212.75	1.56
23.93	1.55	1.55	209.61	212.73	1.56
23.97	1.55	0.00	209.60	212.71	1.56
24.00	0.00	0.00	208.41	211.15	1.37

Maximum outflow (cfs) = 96.15
Maximum storage (cu ft) = 45976
Maximum elevation (ft) = 92.96

Qp = 96.2 RESERVOIR ROUTE 100 Yr



MAX STORAGE = 45976

MAX ELEVATION = 92.96

VDOT INFILTRATION STRUCTURE

AND OFFSITE RUNOFF ROUTED

TOANO BUSINESS CENTER

SIZE INFILTRATION BASIN FOR 1ST FLUSH 1/2" RUNOFF

VDOT - RUNOFF

TOTAL VDOT DA = 7.75 AC C = 0.65

(.5"/12)(7.75)(43,560)(.65) = 9,143 CF TOTAL STORAGE FOR INFILTRATION

VDOT TRENCH DESIGN

PROPOSE 3 ROWS OF 48" PERFORATED ALUMINIZED CMP

TRENCH DIMENSIONS:

20' x 257' x 7' DEEP = 35,980 CF

40% VOIDS = 14,392 CF AVAILABLE STONE STORAGE

PIPE STORAGE:

277 TOTAL LF PIPE (INCL MEADERS) = [illegible] x 12.5 = 3,462 CF

(ASSUMES 3' SPACING & SIDE CLEARANCE FROM PIT)

PIT VOLUME	35,980 CF
PIPE VOLUME	− 3462
TOTAL STONE	32,517
LESS 60%	− 19,510
AVAIL STONE VOLUME	13,007
PIPE STORAGE	3,462
	16,469 CF

1

HYDROLOGIC REPORT FOR

0

TOANO BUSINESS CENTER

SWM POND ANALYSIS

AES PROJECT 8003

VDOT INFILTRATION TRENCH

prepared by:

AES CONSULTING ENGINEERS

5248 OLDE TOWNE ROAD

WILLIAMSBURG, VA 23185

Revised: April 20, 1998

VDOT INFILTRATION TRENCH

RESERVOIR No = 1 RESERVOIR NAME = VDOT PIT....
S = Ks * Z^b
Ks = 0 b = 0
START ELEV = 0 INCREMENT = 0

STAGE ft	ELEVATION ft	STORAGE cu ft	DISCHARGE cfs	
0.00	91.00	0	0.00	1.
6.00	97.00	16500	63.89	2.
0.00	0.00	0	0.00	3.
0.00	0.00	0	0.00	4.
0.00	0.00	0	0.00	5.
0.00	0.00	0	0.00	6.
0.00	0.00	0	0.00	7.
0.00	0.00	0	0.00	8.
0.00	0.00	0	0.00	9.
0.00	0.00	0	0.00	10.
0.00	0.00	0	0.00	11.

CULVERT STRUC A. Q=CoA[2gh/k]^.5

1. WIDTH (in) = 30.
2. HEIGHT (in) = 30.
3. No. BARRELS = 1..
4. INVERT ELEV. = 91.....
5. Co = 0.80
6. CULVERT LENGTH (ft) = 30..
7. CULVERT SLOPE (%) = 6.67
8. MANNING'S N-VALUE = .013

CULVERT STRUC B. Q=CoA[2gh/k]^.5

9. WIDTH (in) = 0..
10. HEIGHT (in) = 0..
11. No. BARRELS = 0..
12. INVERT ELEV. = 0.....
13. Co = 0.60
14. CULVERT LENGTH (ft) = 0...
15. CULVERT SLOPE (%) = 0...
16. MANNING'S N-VALUE = .013
17. MULTI-STAGE OPTION ? (Y/N) N

WEIR STRUCTURE A. Q=CwLH^EXP
WEIR STRUCTURE B. Q=CwLH^EXP

18. CREST LENGTH (ft) = 5
19. CREST ELEVATION = 94.3
20. Cw = 2.88
21. EXP = 1.50
22. MULTI-STAGE OPTION ? (Y/N) Y

23. CREST LENGTH (ft) = 0.....
24. CREST ELEVATION = 0.....
25. Cw = 3.00
26. EXP = 1.50
27. MULTI-STAGE OPTION ? (Y/N) N

1
0

HYDROLOGIC REPORT

.5 INCH FIRST FLUSH...
EXFILTRATED THROUGH...
TRENCH.....

Hyd. No. 1

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 12.28 cfs
Storm frequency	= 1 yr	Time interval	= 2 min
Basin area	= 11.92 ac	Basin curve No.	= 81
Ave basin slope	= 2.07 %	Hydraulic len	= 1522 ft
Basin lag	= 18.0 min	Time of concen	= 30.01 min
Total precip.	= 2.80 in	Distribution	= S.C.S. II

1
0

HYDROLOGIC REPORT

10 YR EXCESS PASSING..
THROUGH INFILTRATION..
TRENCH.....

Hyd. No. 3

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 38.12 cfs
Storm frequency	= 10 yr	Time interval	= 2 min
Basin area	= 11.92 ac	Basin curve No.	= 81
Ave basin slope	= 2.07 %	Hydraulic len	= 1522 ft
Basin lag	= 18.0 min	Time of concen	= 30.01 min
Total precip.	= 5.60 in	Distribution	= S.C.S. II

1
0

HYDROLOGIC REPORT

100 YR EXCESS PASSING.
THROUGH INFILTRATION..
TRENCH.....

Hyd. No. 5

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 62.53 cfs
Storm frequency	= 100 yr	Time interval	= 2 min
Basin area	= 11.92 ac	Basin curve No.	= 81
Ave basin slope	= 2.07 %	Hydraulic len	= 1522 ft
Basin lag	= 18.0 min	Time of concen	= 30.01 min
Total precip.	= 8.10 in	Distribution	= S.C.S. II

HYDROLOGIC REPORT

.5 INCH FIRST FLUSH...
DETAINED 12 HOURS AND.
EXFILTRATED.....

Hyd. No. 2

Hydrograph type = RESERVOIR ROUTE
Storm frequency = 1 yr
Inflow hyd. no. = 1

Peak discharge = 11.36 cfs
Time interval = 2 min
Reservoir no. = 1

HYDROGRAPH DISCHARGE TABLE

TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
11.70	1.04	1.27	22.62	22.62	0.00
11.73	1.27	1.57	24.93	24.93	0.00
11.77	1.57	1.98	27.77	27.77	0.00
11.80	1.98	2.53	31.33	31.33	0.00
11.83	2.53	3.26	35.85	35.85	0.00
11.87	3.26	4.21	41.64	41.64	0.00
11.90	4.21	5.35	49.11	49.11	0.00
11.93	5.35	6.61	58.67	58.67	0.00
11.97	6.61	7.86	70.63	70.63	0.00
12.00	7.86	9.04	85.10	85.10	0.00
12.03	9.04	10.13	102.00	102.00	0.00
12.07	10.13	11.07	121.18	121.18	0.00
12.10	11.07	11.80	141.61	142.39	0.39
12.13	11.80	12.23	160.21	164.49	2.14
12.17	12.23	12.28	170.56	184.24	6.84
12.20	12.28	11.97	175.64	195.07	9.72
12.23	11.97	11.41	177.90	199.89	10.99
12.27	11.41	10.74	178.55	201.28	11.36
12.30	10.74	10.05	178.28	200.70	11.21
12.33	10.05	9.33	177.52	199.07	10.78
12.37	9.33	8.60	176.50	196.90	10.20
12.40	8.60	7.86	175.34	194.44	9.55
12.43	7.86	7.11	174.11	191.80	8.85
12.47	7.11	6.36	172.82	189.07	8.12
12.50	6.36	5.62	171.52	186.29	7.39

HYDROGRAPH DISCHARGE TABLE Cont'd

TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
12.53	5.62	4.90	170.21	183.49	6.64
12.57	4.90	4.23	168.91	180.73	5.91
12.60	4.23	3.63	167.65	178.04	5.20
12.63	3.63	3.13	166.46	175.51	4.53
12.67	3.13	2.77	165.38	173.22	3.92
12.70	2.77	2.53	164.47	171.28	3.40
12.73	2.53	2.39	163.76	169.77	3.00
12.77	2.39	2.28	163.25	168.68	2.72
12.80	2.28	2.18	162.89	167.92	2.51
12.83	2.18	2.09	162.62	167.36	2.37
12.87	2.09	2.01	162.24	166.90	2.33
12.90	2.01	1.93	161.77	166.34	2.28
12.93	1.93	1.86	161.24	165.71	2.23
12.97	1.86	1.80	160.67	165.04	2.18
13.00	1.80	1.75	160.09	164.34	2.13
13.03	1.75	1.69	159.50	163.64	2.07
13.07	1.69	1.65	158.91	162.94	2.02
13.10	1.65	1.61	158.33	162.25	1.96
13.13	1.61	1.57	157.76	161.58	1.91
13.17	1.57	1.53	157.22	160.94	1.86
13.20	1.53	1.50	156.70	160.32	1.81
13.23	1.50	1.47	156.21	159.73	1.76
13.27	1.47	1.44	155.74	159.17	1.72
13.30	1.44	1.41	155.29	158.64	1.67
13.33	1.41	1.38	154.87	158.14	1.63
13.37	1.38	1.36	154.46	157.66	1.60
13.40	1.36	1.33	154.08	157.20	1.56
13.43	1.33	1.31	153.71	156.76	1.53
13.47	1.31	1.28	153.36	156.35	1.49
13.50	1.28	1.26	153.03	155.95	1.46
13.53	1.26	1.24	152.71	155.57	1.43
13.57	1.24	1.22	152.40	155.21	1.40
13.60	1.22	1.20	152.11	154.86	1.38
13.63	1.20	1.18	151.83	154.53	1.35
13.67	1.18	1.16	151.56	154.20	1.32
13.70	1.16	1.14	151.30	153.90	1.30
13.73	1.14	1.12	151.05	153.60	1.28
13.77	1.12	1.10	150.80	153.31	1.25
13.80	1.10	1.09	150.57	153.03	1.23
13.83	1.09	1.07	150.34	152.76	1.21
13.87	1.07	1.05	150.13	152.50	1.19
13.90	1.05	1.04	149.91	152.25	1.17

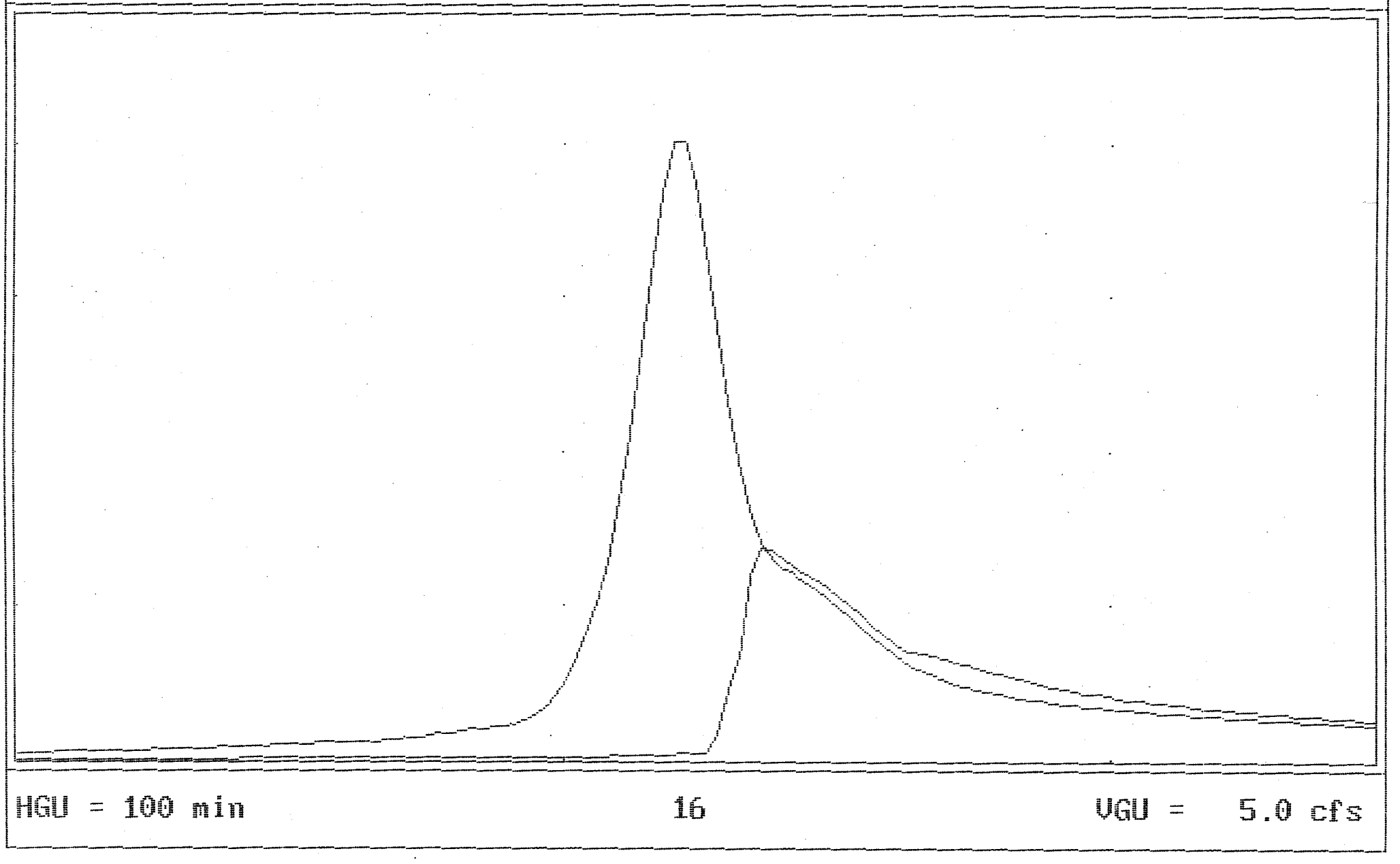
HYDROGRAPH DISCHARGE TABLE Cont'd

TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
13.93	1.04	1.02	149.71	152.01	1.15
13.97	1.02	1.01	149.51	151.77	1.13
14.00	1.01	0.99	149.31	151.54	1.11
14.03	0.99	0.98	149.12	151.31	1.09
14.07	0.98	0.96	148.94	151.09	1.08
14.10	0.96	0.95	148.76	150.87	1.06
14.13	0.95	0.93	148.58	150.66	1.04
14.17	0.93	0.92	148.41	150.46	1.03
14.20	0.92	0.91	148.24	150.26	1.01

Maximum outflow (cfs) = 11.36
Maximum storage (cu ft) = 11395
Maximum elevation (ft) = 95.14

1-YR, NOT 2-YR.

Qp = 6.9 RESERVOIR ROUTE 1 Yr



MAX STORAGE = 27043

MAX ELEVATION = 88.59

HYDROLOGIC REPORT

10 YR STORM EXCESS....
ROUTED THROUGH VDOT...
INFILTRATION TRENCH...

Hyd. No. 4

Hydrograph type = RESERVOIR ROUTE Peak discharge = 37.82 cfs
Storm frequency = 10 yr Time interval = 2 min
Inflow hyd. no. = 3 Reservoir no. = 1

HYDROGRAPH DISCHARGE TABLE

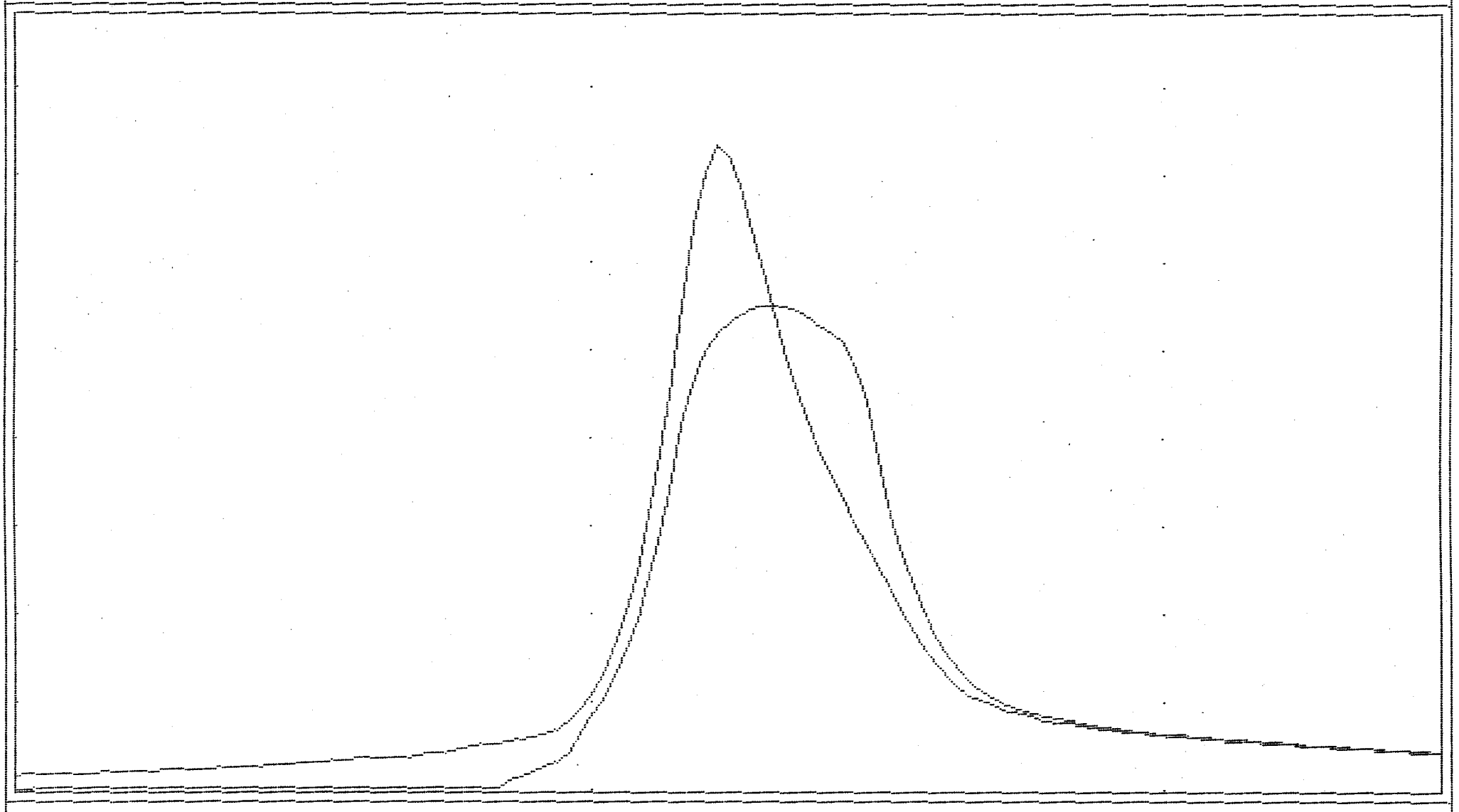
TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
10.43	1.00	1.03	79.41	79.41	0.00
10.47	1.03	1.06	81.44	81.44	0.00
10.50	1.06	1.09	83.52	83.52	0.00
10.53	1.09	1.12	85.67	85.67	0.00
10.57	1.12	1.15	87.87	87.87	0.00
10.60	1.15	1.18	90.13	90.13	0.00
10.63	1.18	1.21	92.46	92.46	0.00
10.67	1.21	1.25	94.85	94.85	0.00
10.70	1.25	1.28	97.31	97.31	0.00
10.73	1.28	1.32	99.84	99.84	0.00
10.77	1.32	1.36	102.44	102.44	0.00
10.80	1.36	1.40	105.13	105.13	0.00
10.83	1.40	1.45	107.89	107.89	0.00
10.87	1.45	1.49	110.74	110.74	0.00
10.90	1.49	1.54	113.68	113.68	0.00
10.93	1.54	1.59	116.71	116.71	0.00
10.97	1.59	1.64	119.83	119.83	0.00
11.00	1.64	1.68	123.06	123.06	0.00
11.03	1.68	1.73	126.37	126.37	0.00
11.07	1.73	1.77	129.78	129.78	0.00
11.10	1.77	1.82	133.28	133.28	0.00
11.13	1.82	1.88	136.87	136.87	0.00
11.17	1.88	1.94	140.09	140.58	0.24
11.20	1.94	2.00	142.89	143.91	0.51
11.23	2.00	2.07	145.35	146.83	0.74

HYDROGRAPH DISCHARGE TABLE Cont'd

TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
18.27	1.09	1.08	149.37	151.60	1.12
18.30	1.08	1.08	149.32	151.54	1.11
18.33	1.08	1.07	149.26	151.48	1.11
18.37	1.07	1.07	149.21	151.42	1.10
18.40	1.07	1.06	149.16	151.36	1.10
18.43	1.06	1.06	149.11	151.29	1.09
18.47	1.06	1.05	149.06	151.23	1.09
18.50	1.05	1.05	149.01	151.17	1.08
18.53	1.05	1.05	148.95	151.11	1.08
18.57	1.05	1.04	148.90	151.05	1.07
18.60	1.04	1.04	148.85	150.99	1.07
18.63	1.04	1.03	148.80	150.93	1.06
18.67	1.03	1.03	148.75	150.87	1.06
18.70	1.03	1.02	148.70	150.80	1.05
18.73	1.02	1.02	148.64	150.74	1.05
18.77	1.02	1.01	148.59	150.68	1.04
18.80	1.01	1.01	148.54	150.62	1.04
18.83	1.01	1.00	148.49	150.56	1.03
18.87	1.00	1.00	148.44	150.50	1.03
18.90	1.00	0.99	148.39	150.44	1.02
18.93	0.99	0.99	148.33	150.37	1.02
18.97	0.99	0.98	148.28	150.31	1.01
19.00	0.98	0.98	148.23	150.25	1.01
19.03	0.98	0.97	148.18	150.19	1.01
19.07	0.97	0.97	148.13	150.13	1.00

Maximum outflow (cfs) = 37.82
Maximum storage (cu ft) = 14280
Maximum elevation (ft) = 96.19

Qp = 55.1 RESERVOIR ROUTE 10 Yr



HGU = 100 min 18 VGU = 10.0 cfs

MAX STORAGE = 46862

MAX ELEVATION = 90.64

HYDROLOGIC REPORT

100 YR STORM EXCESS...
ROUTED THROUGH VDOT
INFILTRATION TRENCH...

Hyd. No. 6

Hydrograph type = RESERVOIR ROUTE Peak discharge = 62.09 cfs
Storm frequency = 100 yr Time interval = 2 min
Inflow hyd. no. = 5 Reservoir no. = 1

HYDROGRAPH DISCHARGE TABLE

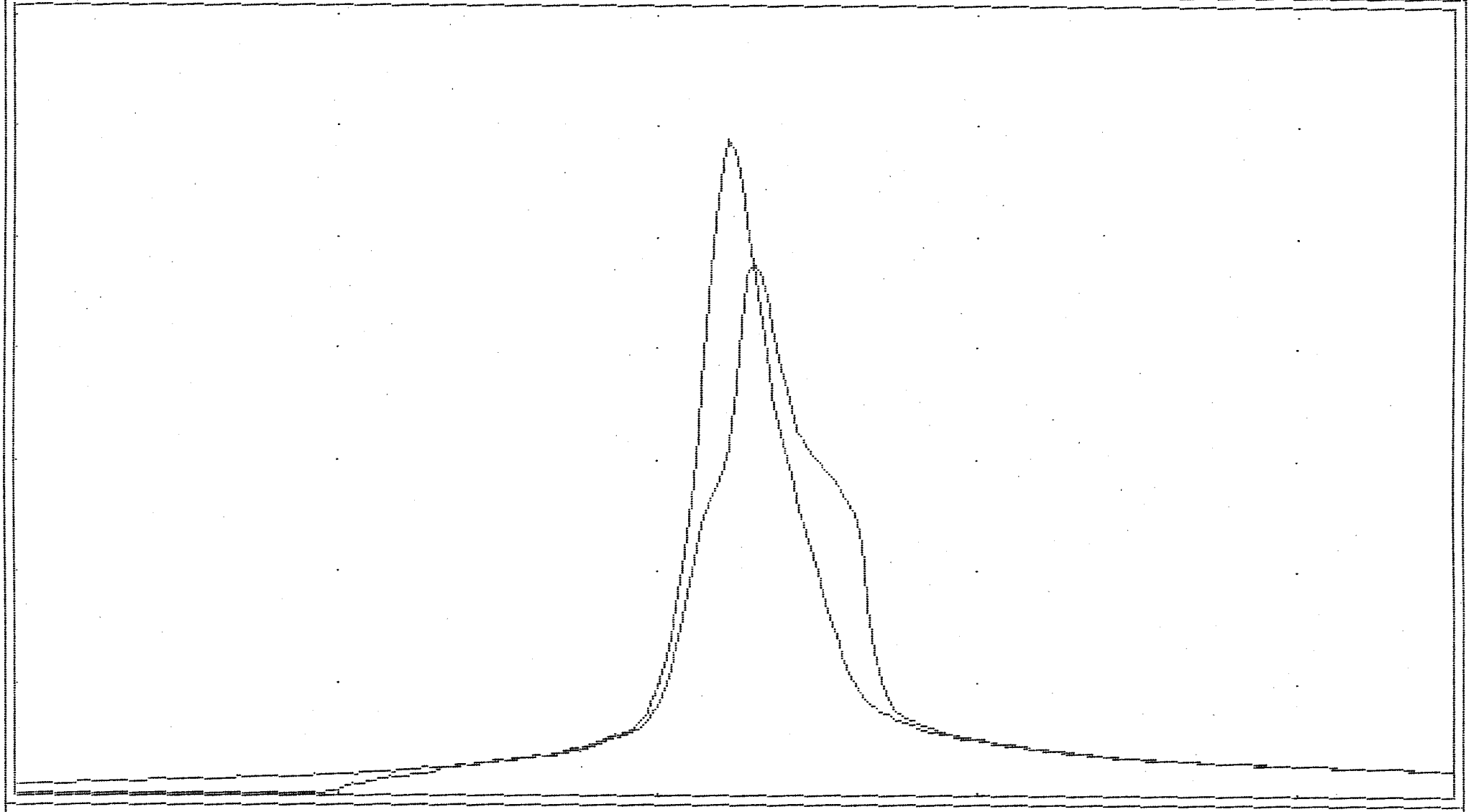
TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
8.93	1.02	1.04	94.14	94.14	0.00
8.97	1.04	1.06	96.20	96.20	0.00
9.00	1.06	1.08	98.30	98.30	0.00
9.03	1.08	1.10	100.44	100.44	0.00
9.07	1.10	1.12	102.62	102.62	0.00
9.10	1.12	1.15	104.85	104.85	0.00
9.13	1.15	1.17	107.12	107.12	0.00
9.17	1.17	1.19	109.43	109.43	0.00
9.20	1.19	1.21	111.78	111.78	0.00
9.23	1.21	1.22	114.17	114.17	0.00
9.27	1.22	1.24	116.60	116.60	0.00
9.30	1.24	1.26	119.07	119.07	0.00
9.33	1.26	1.27	121.57	121.57	0.00
9.37	1.27	1.29	124.11	124.11	0.00
9.40	1.29	1.30	126.67	126.67	0.00
9.43	1.30	1.32	129.27	129.27	0.00
9.47	1.32	1.33	131.89	131.89	0.00
9.50	1.33	1.34	134.54	134.54	0.00
9.53	1.34	1.35	137.21	137.21	0.00
9.57	1.35	1.37	139.52	139.91	0.19
9.60	1.37	1.38	141.49	142.25	0.38
9.63	1.38	1.39	143.17	144.24	0.53
9.67	1.39	1.41	144.60	145.94	0.67
9.70	1.41	1.42	145.83	147.40	0.78
9.73	1.42	1.44	146.89	148.66	0.88

HYDROGRAPH DISCHARGE TABLE Cont'd

TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
23.77	1.04	1.04	148.62	150.71	1.05
23.80	1.04	1.03	148.60	150.69	1.05
23.83	1.03	1.03	148.59	150.67	1.04
23.87	1.03	1.03	148.57	150.65	1.04
23.90	1.03	1.03	148.55	150.64	1.04
23.93	1.03	1.03	148.54	150.62	1.04
23.97	1.03	0.00	148.52	150.60	1.04

Maximum outflow (cfs) = 62.09
Maximum storage (cu ft) = 16353
Maximum elevation (ft) = 96.95

Qp = 95.3 RESERVOIR ROUTE 100 Yr



HGU = 100 min 20 VGU = 20.0 cfs

MAX STORAGE = 71708

MAX ELEVATION = 92.98

BASIN #1

ON-SITE RUNOFF

PRE-ROUTED

POST-DEVELOPMENT

HYDROLOGIC REPORT

1 YR, 24 HR STORM.....
ONSITE RUNOFF.....
.....

Hyd. No. 2

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 19.11 cfs
Storm frequency	= 1 yr	Time interval	= 2 min
Basin area	= 8.08 ac	Basin curve No.	= 88
Ave basin slope	= 3.4 %	Hydraulic len	= 935 ft
Basin lag	= 7.4 min	Time of concen	= 12.43 min
Total precip.	= 2.80 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
11.37	0.93	11.40	0.97	11.43	1.02	11.47	1.06
11.50	1.11	11.53	1.20	11.57	1.34	11.60	1.59
11.63	1.99	11.67	2.54	11.70	3.26	11.73	4.13
11.77	5.15	11.80	6.41	11.83	7.99	11.87	10.01
11.90	12.57	11.93	15.38	11.97	17.80	12.00	19.11
12.03	18.81	12.07	17.03	12.10	14.39	12.13	11.57
12.17	8.99	12.20	6.76	12.23	5.01	12.27	3.84
12.30	3.24	12.33	2.99	12.37	2.85	12.40	2.72
12.43	2.58	12.47	2.44	12.50	2.30	12.53	2.16
12.57	2.03	12.60	1.91	12.63	1.81	12.67	1.73
12.70	1.66	12.73	1.60	12.77	1.56	12.80	1.52
12.83	1.49	12.87	1.46	12.90	1.43	12.93	1.39
12.97	1.36	13.00	1.33	13.03	1.30	13.07	1.27
13.10	1.24	13.13	1.21	13.17	1.19	13.20	1.16
13.23	1.14	13.27	1.12	13.30	1.11	13.33	1.09
13.37	1.07	13.40	1.05	13.43	1.03	13.47	1.02

HYDROLOGIC REPORT

10 YR POST DEVELOPMENT

.....

.....

Hyd. No. 4

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 47.76 cfs
Storm frequency	= 10 yr	Time interval	= 2 min
Basin area	= 8.08 ac	Basin curve No.	= 88
Ave basin slope	= 3.4 %	Hydraulic len	= 935 ft
Basin lag	= 7.4 min	Time of concen	= 12.43 min
Total precip.	= 5.60 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
9.90	0.95	9.93	0.96	9.97	0.98	10.00	1.00
10.03	1.02	10.07	1.04	10.10	1.06	10.13	1.09
10.17	1.11	10.20	1.14	10.23	1.16	10.27	1.19
10.30	1.22	10.33	1.25	10.37	1.28	10.40	1.31
10.43	1.34	10.47	1.37	10.50	1.40	10.53	1.43
10.57	1.46	10.60	1.49	10.63	1.53	10.67	1.57
10.70	1.61	10.73	1.66	10.77	1.71	10.80	1.75
10.83	1.80	10.87	1.85	10.90	1.90	10.93	1.96
10.97	2.01	11.00	2.06	11.03	2.07	11.07	2.09
11.10	2.11	11.13	2.14	11.17	2.25	11.20	2.37
11.23	2.50	11.27	2.64	11.30	2.78	11.33	2.92
11.37	3.07	11.40	3.20	11.43	3.32	11.47	3.45
11.50	3.58	11.53	3.82	11.57	4.24	11.60	4.98
11.63	6.15	11.67	7.74	11.70	9.76	11.73	12.16
11.77	14.91	11.80	18.19	11.83	22.19	11.87	27.14
11.90	33.28	11.93	39.81	11.97	45.17	12.00	47.76
12.03	46.45	12.07	41.64	12.10	34.90	12.13	27.84
12.17	21.45	12.20	15.99	12.23	11.74	12.27	8.96
12.30	7.53	12.33	6.93	12.37	6.60	12.40	6.28
12.43	5.95	12.47	5.62	12.50	5.30	12.53	4.97
12.57	4.67	12.60	4.39	12.63	4.15	12.67	3.96
12.70	3.80	12.73	3.67	12.77	3.57	12.80	3.48
12.83	3.40	12.87	3.33	12.90	3.25	12.93	3.18
12.97	3.10	13.00	3.03	13.03	2.95	13.07	2.88
13.10	2.81	13.13	2.75	13.17	2.69	13.20	2.64
13.23	2.59	13.27	2.55	13.30	2.51	13.33	2.47
13.37	2.42	13.40	2.38	13.43	2.34	13.47	2.30
13.50	2.26	13.53	2.22	13.57	2.18	13.60	2.14
13.63	2.11	13.67	2.07	13.70	2.04	13.73	2.01

HYDROLOGIC REPORT

100YR POST DEVELOPMENT

.....

.....

Hyd. No. 6

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 73.21 cfs
Storm frequency	= 100 yr	Time interval	= 2 min
Basin area	= 8.08 ac	Basin curve No.	= 88
Ave basin slope	= 3.4 %	Hydraulic len	= 935 ft
Basin lag	= 7.4 min	Time of concen	= 12.43 min
Total precip.	= 8.10 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
8.43	0.99	8.47	1.01	8.50	1.02	8.53	1.04
8.57	1.06	8.60	1.08	8.63	1.10	8.67	1.12
8.70	1.13	8.73	1.15	8.77	1.17	8.80	1.19
8.83	1.21	8.87	1.23	8.90	1.25	8.93	1.27
8.97	1.29	9.00	1.31	9.03	1.33	9.07	1.35
9.10	1.36	9.13	1.38	9.17	1.39	9.20	1.40
9.23	1.41	9.27	1.42	9.30	1.43	9.33	1.43
9.37	1.44	9.40	1.44	9.43	1.45	9.47	1.45
9.50	1.46	9.53	1.46	9.57	1.47	9.60	1.48
9.63	1.50	9.67	1.51	9.70	1.54	9.73	1.56
9.77	1.59	9.80	1.62	9.83	1.65	9.87	1.68
9.90	1.71	9.93	1.74	9.97	1.77	10.00	1.80
10.03	1.84	10.07	1.87	10.10	1.90	10.13	1.94
10.17	1.98	10.20	2.02	10.23	2.07	10.27	2.11
10.30	2.16	10.33	2.20	10.37	2.25	10.40	2.30
10.43	2.35	10.47	2.39	10.50	2.44	10.53	2.49
10.57	2.54	10.60	2.60	10.63	2.66	10.67	2.72
10.70	2.79	10.73	2.87	10.77	2.94	10.80	3.02
10.83	3.10	10.87	3.18	10.90	3.26	10.93	3.34
10.97	3.42	11.00	3.51	11.03	3.52	11.07	3.54
11.10	3.57	11.13	3.62	11.17	3.80	11.20	3.99
11.23	4.20	11.27	4.42	11.30	4.65	11.33	4.88
11.37	5.12	11.40	5.32	11.43	5.52	11.47	5.71
11.50	5.92	11.53	6.30	11.57	6.97	11.60	8.16
11.63	10.05	11.67	12.58	11.70	15.79	11.73	19.58
11.77	23.88	11.80	28.95	11.83	35.10	11.87	42.63
11.90	51.89	11.93	61.65	11.97	69.55	12.00	73.21
12.03	70.93	12.07	63.40	12.10	53.01	12.13	42.19
12.17	32.42	12.20	24.12	12.23	17.66	12.27	13.45

DRY POND #1

POST-DEVELOPMENT

FINAL ROUTINGS

ALL SITE AND OFF-SITE RUNOFF

BASIN #1

RESERVOIR No = 2 RESERVOIR NAME = DRY POND....
S = Ks * Z^b
Ks = 0 b = 0
START ELEV = 0 INCREMENT = 0

STAGE ft	ELEVATION ft	STORAGE cu ft	DISCHARGE cfs	
0.00	84.00	0	0.00	1.
5.00	89.00	29472	22.30	2.
9.00	93.00	71898	66.10	3.
0.00	0.00	0	0.00	4.
0.00	0.00	0	0.00	5.
0.00	0.00	0	0.00	6.
0.00	0.00	0	0.00	7.
0.00	0.00	0	0.00	8.
0.00	0.00	0	0.00	9.
0.00	0.00	0	0.00	10.
0.00	0.00	0	0.00	11.

CULVERT STRUC A. Q=CoA [2gh/k]^.5

1. WIDTH (in) = 30.
2. HEIGHT (in) = 30.
3. No. BARRELS = 1..
4. INVERT ELEV. = 84.....
5. Co = 0.60
6. CULVERT LENGTH (ft) = 62..
7. CULVERT SLOPE (%) = 1.61
8. MANNING'S N-VALUE = .013

CULVERT STRUC B. Q=CoA[2gh/k]^.5

9. WIDTH (in) = 2..
10. HEIGHT (in) = 2..
11. No. BARRELS = 1..
12. INVERT ELEV. = 84.....
13. Co = 0.60
14. CULVERT LENGTH (ft) = 0...
15. CULVERT SLOPE (%) = 0...
16. MANNING'S N-VALUE = .013
17. MULTI-STAGE OPTION ? (Y/N) N

WEIR STRUCTURE A. Q=CwLH^EXP
WEIR STRUCTURE B. Q=CwLH^EXP

18. CREST LENGTH (ft) = 12.56..
19. CREST ELEVATION = 88.3...
20. Cw = 3.00
21. EXP = 1.50
22. MULTI-STAGE OPTION ? (Y/N) Y

23. CREST LENGTH (ft) = 10.....
24. CREST ELEVATION = 92.....
25. Cw = 3.00
26. EXP = 1.50
27. MULTI-STAGE OPTION ? (Y/N) Y

1

HYDROLOGIC REPORT FOR

0

TOANO BUSINESS CENTER

SWM POND ANALYSIS

AES PROJECT 8003

DESIGN 3, 6 PT. DRY POND

prepared by:

AES CONSULTING ENGINEERS

5248 OLDE TOWNE ROAD

WILLIAMSBURG, VA 23185

Revised: April 30, 1998

HYDROLOGIC REPORT

1 YR STORM: SITE, OFF-
SITE,& VDOT RUNOFF ...
ROUTED THRU DRY POND..

Hyd. No. 16

Hydrograph type = RESERVOIR ROUTE Peak discharge = 6.88 cfs
Storm frequency = 1 yr Time interval = 2 min
Inflow hyd. no. = 15 Reservoir no. = 2

HYDROGRAPH DISCHARGE TABLE

TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
11.43	1.02	1.06	52.13	52.27	0.07
11.47	1.06	1.11	54.07	54.22	0.07
11.50	1.11	1.20	56.11	56.25	0.07
11.53	1.20	1.34	58.27	58.42	0.07
11.57	1.34	1.59	60.66	60.81	0.08
11.60	1.59	2.00	63.44	63.59	0.08
11.63	2.00	2.55	66.87	67.02	0.08
11.67	2.55	3.27	71.25	71.41	0.08
11.70	3.27	4.15	76.89	77.06	0.09
11.73	4.15	5.19	84.13	84.31	0.09
11.77	5.19	6.48	93.27	93.47	0.10
11.80	6.48	8.11	104.73	104.94	0.10
11.83	8.11	10.20	119.10	119.32	0.11
11.87	10.20	12.88	137.17	137.41	0.12
11.90	12.88	15.86	159.99	160.25	0.13
11.93	15.86	18.49	188.43	188.72	0.14
11.97	18.49	20.07	222.47	222.78	0.15
12.00	20.07	20.08	260.69	261.03	0.17
12.03	20.08	18.63	300.48	300.84	0.18
12.07	18.63	16.33	338.80	339.19	0.19
12.10	16.33	13.85	373.36	373.76	0.20
12.13	13.85	11.59	401.78	403.54	0.88
12.17	11.59	9.64	422.42	427.23	2.40
12.20	9.64	8.09	436.74	443.66	3.46
12.23	8.09	7.06	442.43	454.47	6.02

HYDROGRAPH DISCHARGE TABLE Cont'd

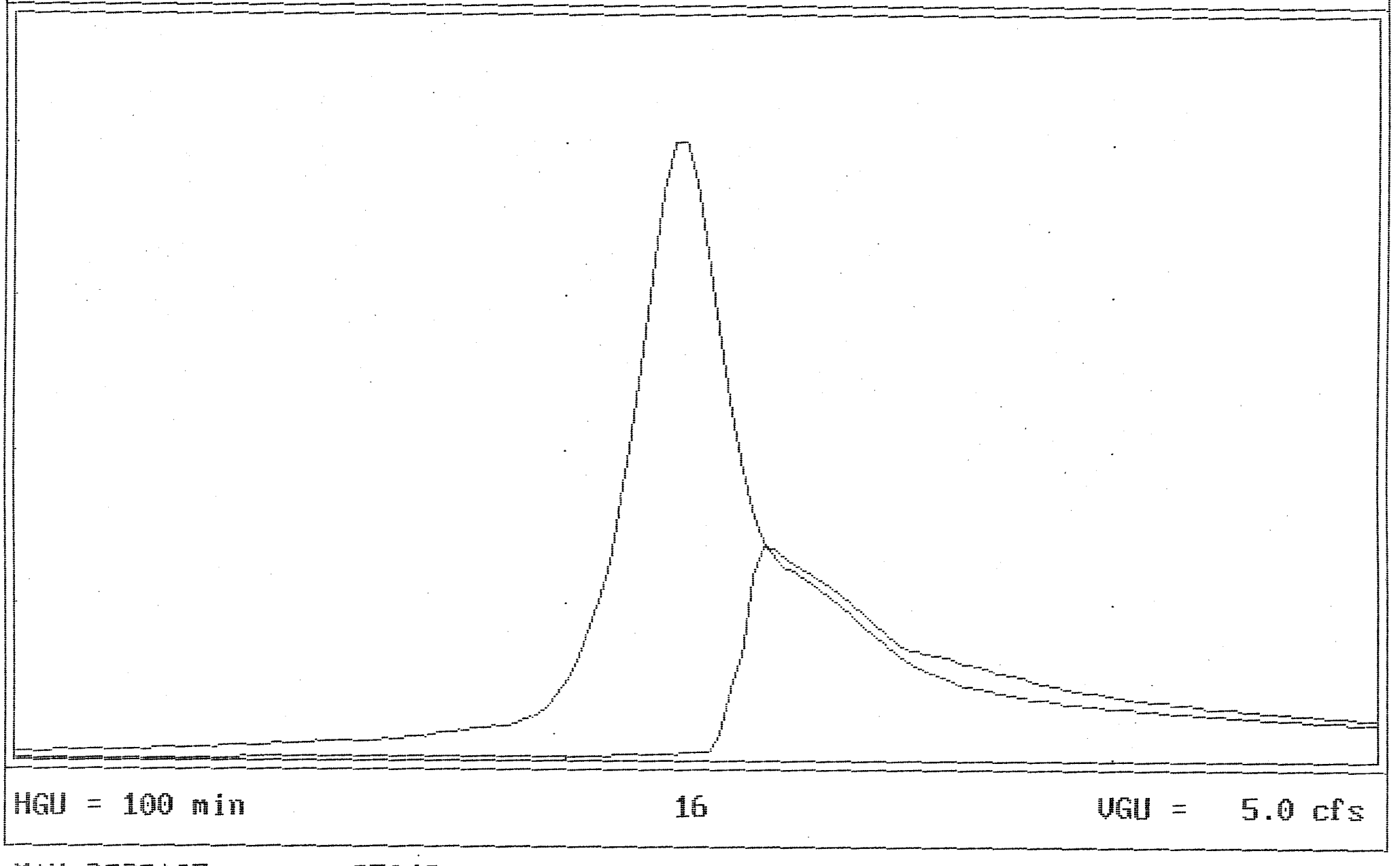
TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
12.27	7.06	6.52	443.83	457.59	6.88
12.30	6.52	6.27	443.75	457.41	6.83
12.33	6.27	6.08	443.36	456.54	6.59
12.37	6.08	5.86	442.99	455.71	6.36
12.40	5.86	5.60	442.64	454.93	6.14
12.43	5.60	5.33	442.27	454.10	5.92
12.47	5.33	5.03	441.86	453.20	5.67
12.50	5.03	4.71	441.42	452.22	5.40
12.53	4.71	4.39	440.95	451.16	5.11
12.57	4.39	4.08	440.46	450.06	4.80
12.60	4.08	3.78	439.95	448.93	4.49
12.63	3.78	3.50	439.45	447.81	4.18
12.67	3.50	3.25	438.96	446.73	3.88
12.70	3.25	3.04	438.51	445.72	3.60
12.73	3.04	2.86	437.73	444.80	3.53
12.77	2.86	2.71	436.71	443.63	3.46
12.80	2.71	2.59	435.53	442.28	3.37
12.83	2.59	2.48	434.27	440.83	3.28
12.87	2.48	2.38	432.97	439.34	3.18
12.90	2.38	2.30	431.66	437.83	3.09
12.93	2.30	2.22	430.37	436.35	2.99
12.97	2.22	2.15	429.09	434.88	2.90
13.00	2.15	2.08	427.85	433.46	2.80
13.03	2.08	2.02	426.65	432.08	2.72
13.07	2.02	1.96	425.49	430.75	2.63
13.10	1.96	1.91	424.38	429.47	2.55
13.13	1.91	1.87	423.32	428.25	2.47
13.17	1.87	1.82	422.31	427.09	2.39
13.20	1.82	1.79	421.35	425.99	2.32
13.23	1.79	1.75	420.44	424.96	2.26
13.27	1.75	1.72	419.59	423.98	2.19
13.30	1.72	1.69	418.79	423.06	2.13
13.33	1.69	1.66	418.04	422.19	2.08
13.37	1.66	1.63	417.33	421.38	2.03
13.40	1.63	1.60	416.66	420.61	1.98
13.43	1.60	1.57	416.02	419.88	1.93
13.47	1.57	1.54	415.42	419.19	1.88
13.50	1.54	1.51	414.85	418.53	1.84
13.53	1.51	1.49	414.30	417.90	1.80
13.57	1.49	1.46	413.78	417.30	1.76
13.60	1.46	1.44	413.27	416.73	1.73
13.63	1.44	1.41	412.79	416.18	1.69

HYDROGRAPH DISCHARGE TABLE Cont'd

TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
13.67	1.41	1.39	412.33	415.65	1.66
13.70	1.39	1.37	411.89	415.14	1.62
13.73	1.37	1.35	411.47	414.66	1.59
13.77	1.35	1.33	411.07	414.19	1.56
13.80	1.33	1.31	410.68	413.75	1.53
13.83	1.31	1.29	410.31	413.32	1.51
13.87	1.29	1.27	409.95	412.91	1.48
13.90	1.27	1.25	409.60	412.51	1.45
13.93	1.25	1.23	409.26	412.12	1.43
13.97	1.23	1.21	408.94	411.75	1.41
14.00	1.21	1.19	408.62	411.38	1.38
14.03	1.19	1.18	408.31	411.03	1.36
14.07	1.18	1.16	408.01	410.68	1.34
14.10	1.16	1.14	407.72	410.34	1.31
14.13	1.14	1.13	407.43	410.02	1.29
14.17	1.13	1.12	407.16	409.70	1.27
14.20	1.12	1.11	406.90	409.40	1.25
14.23	1.11	1.10	406.65	409.12	1.24
14.27	1.10	1.09	406.41	408.85	1.22
14.30	1.09	1.08	406.19	408.59	1.20
14.33	1.08	1.07	405.98	408.35	1.19
14.37	1.07	1.06	405.78	408.12	1.17
14.40	1.06	1.05	405.59	407.91	1.16
14.43	1.05	1.04	405.41	407.70	1.14
14.47	1.04	1.04	405.24	407.51	1.13
14.50	1.04	1.03	405.08	407.32	1.12
14.53	1.03	1.02	404.93	407.14	1.11
14.57	1.02	1.01	404.78	406.97	1.10
14.60	1.01	1.01	404.64	406.81	1.09
14.63	1.01	1.00	404.50	406.66	1.08
14.67	1.00	0.99	404.37	406.51	1.07
14.70	0.99	0.99	404.25	406.37	1.06
14.73	0.99	0.98	404.13	406.23	1.05
14.77	0.98	0.97	404.01	406.09	1.04
14.80	0.97	0.97	403.90	405.97	1.03
14.83	0.97	0.96	403.79	405.84	1.02
14.87	0.96	0.95	403.69	405.72	1.02
14.90	0.95	0.95	403.58	405.60	1.01
14.93	0.95	0.94	403.48	405.48	1.00

Maximum outflow (cfs) = 6.88
Maximum storage (cu ft) = 27043
Maximum elevation (ft) = 88.59

Qp = 6.9 RESERVOIR ROUTE 1 Yr



MAX STORAGE = 27043

MAX ELEVATION = 88.59

HYDROLOGIC REPORT

10 YR STORM: SITE,OFF-
SITE,& VDOT RUNOFF....
ROUTED THRU DRY POND..

Hyd. No. 18

Hydrograph type = RESERVOIR ROUTE Peak discharge = 55.00 cfs
Storm frequency = 10 yr Time interval = 2 min
Inflow hyd. no. = 17 Reservoir no. = 2

HYDROGRAPH DISCHARGE TABLE

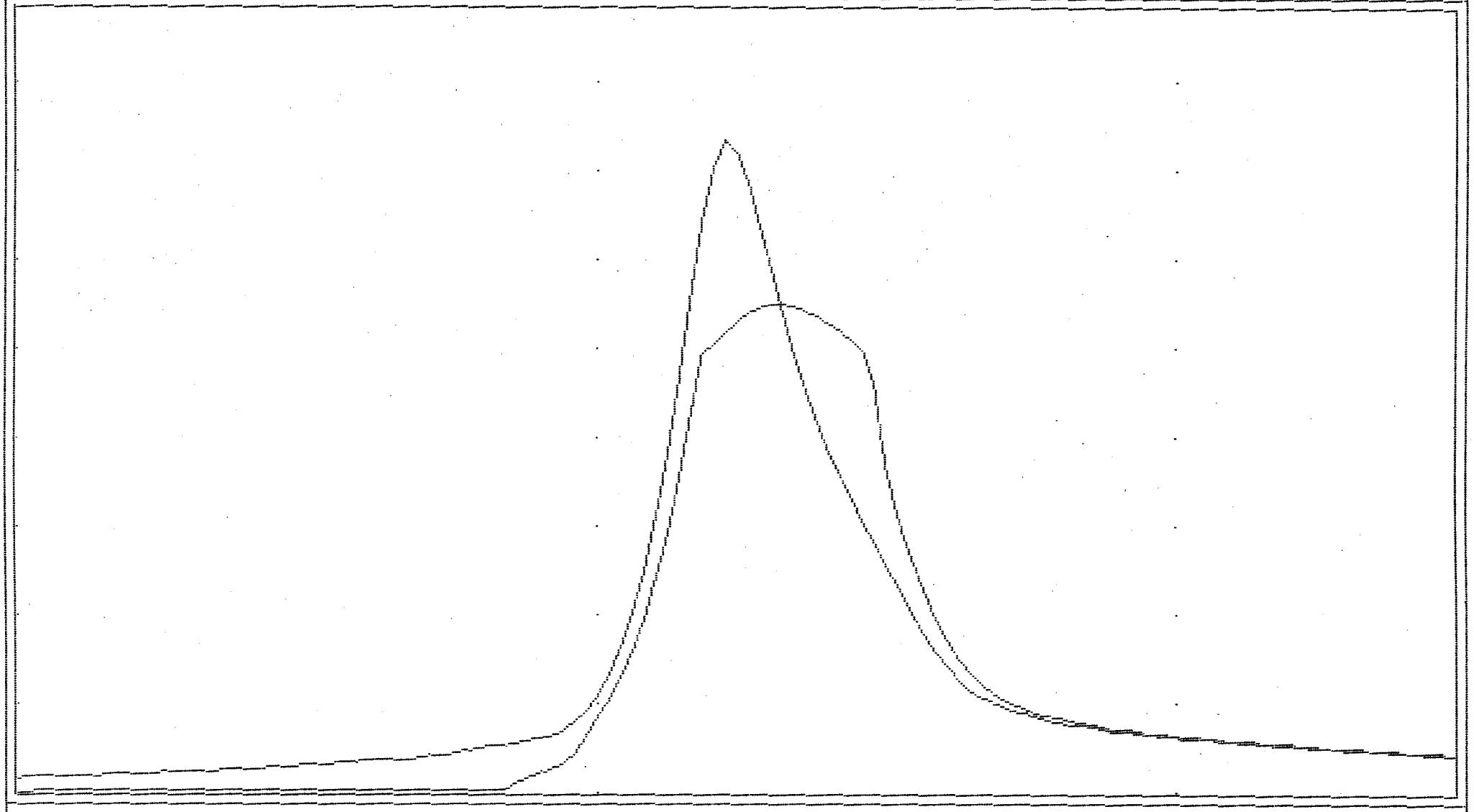
TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
8.93	1.02	1.04	82.50	82.68	0.09
8.97	1.04	1.06	84.37	84.56	0.09
9.00	1.06	1.08	86.29	86.47	0.09
9.03	1.08	1.11	88.25	88.43	0.09
9.07	1.11	1.13	90.25	90.44	0.10
9.10	1.13	1.15	92.29	92.48	0.10
9.13	1.15	1.17	94.36	94.56	0.10
9.17	1.17	1.18	96.48	96.68	0.10
9.20	1.18	1.20	98.63	98.83	0.10
9.23	1.20	1.22	100.81	101.01	0.10
9.27	1.22	1.23	103.02	103.23	0.10
9.30	1.23	1.25	105.27	105.47	0.10
9.33	1.25	1.26	107.54	107.75	0.11
9.37	1.26	1.28	109.84	110.05	0.11
9.40	1.28	1.29	112.16	112.38	0.11
9.43	1.29	1.30	114.51	114.73	0.11
9.47	1.30	1.32	116.89	117.11	0.11
9.50	1.32	1.33	119.29	119.51	0.11
9.53	1.33	1.35	121.71	121.94	0.11
9.57	1.35	1.36	124.16	124.39	0.11
9.60	1.36	1.38	126.64	126.87	0.11
9.63	1.38	1.40	129.15	129.38	0.12
9.67	1.40	1.42	131.69	131.92	0.12
9.70	1.42	1.44	134.27	134.51	0.12
9.73	1.44	1.47	136.89	137.13	0.12

HYDROGRAPH DISCHARGE TABLE Cont'd

TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
23.77	1.19	1.19	406.22	408.63	1.20
23.80	1.19	1.19	406.20	408.61	1.20
23.83	1.19	1.19	406.18	408.58	1.20
23.87	1.19	1.19	406.16	408.55	1.20
23.90	1.19	1.18	406.13	408.53	1.20
23.93	1.18	1.18	406.11	408.50	1.20
23.97	1.18	0.59	406.09	408.47	1.19
24.00	0.59	0.00	405.55	407.85	1.15

Maximum outflow (cfs) = 55.00
Maximum storage (cu ft) = 46602
Maximum elevation (ft) = 90.62

Qp = 55.0 RESERVOIR ROUTE 10 Yr



HGU = 100 min 18 VGU = 10.0 cfs

MAX STORAGE = 46602

MAX ELEVATION = 90.62

HYDROLOGIC REPORT

100YR STORM: SITE,OFF-
SITE, & VDOT RUNOFF...
ROUTED THRU DRY POND..

Hyd. No. 20

Hydrograph type = RESERVOIR ROUTE Peak discharge = 94.96 cfs
Storm frequency = 100 yr Time interval = 2 min
Inflow hyd. no. = 19 Reservoir no. = 2

HYDROGRAPH DISCHARGE TABLE

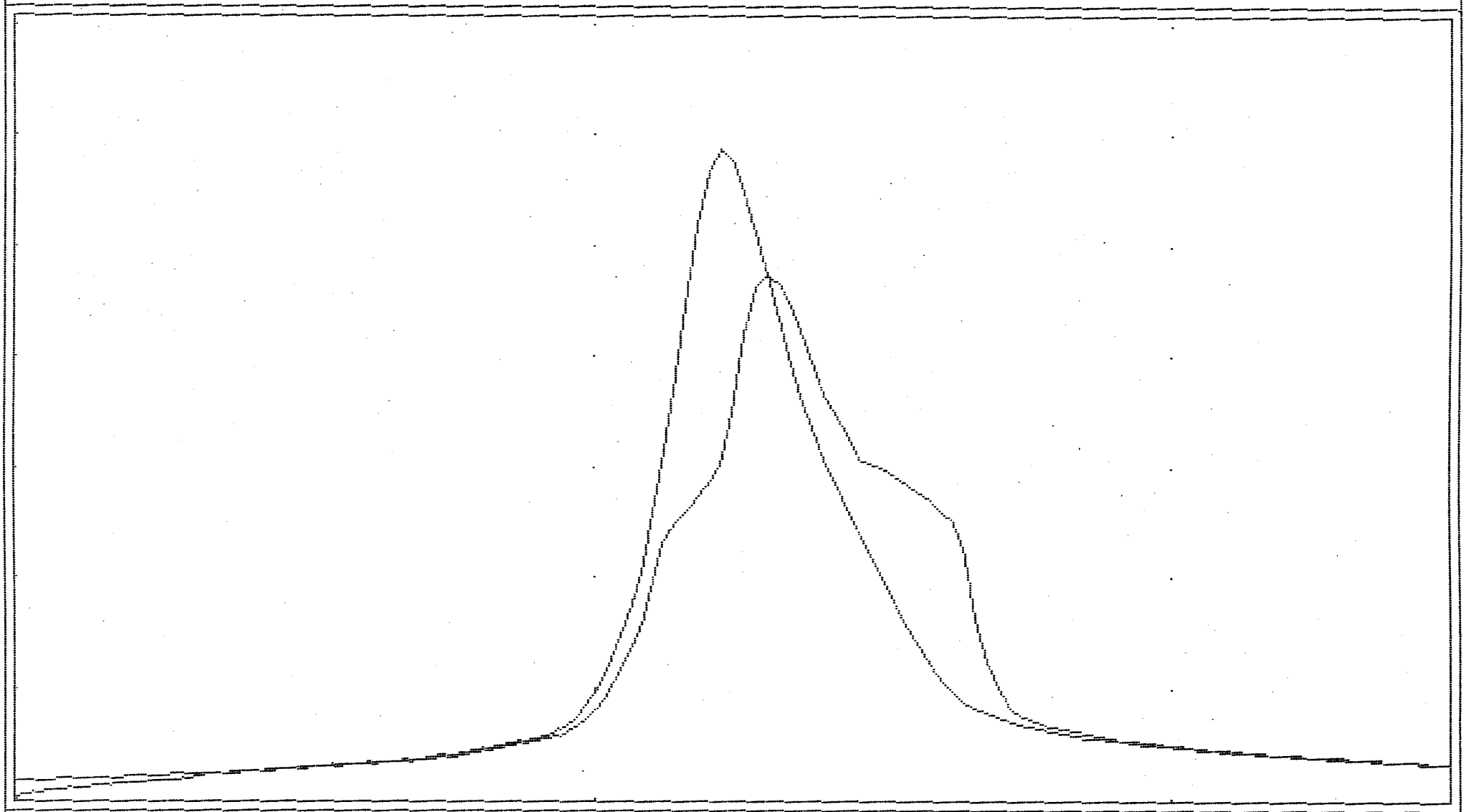
TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
7.07	1.01	1.02	84.33	84.51	0.09
7.10	1.02	1.03	86.17	86.35	0.09
7.13	1.03	1.05	88.04	88.23	0.09
7.17	1.05	1.06	89.93	90.12	0.10
7.20	1.06	1.08	91.85	92.04	0.10
7.23	1.08	1.09	93.79	93.99	0.10
7.27	1.09	1.10	95.76	95.95	0.10
7.30	1.10	1.12	97.75	97.95	0.10
7.33	1.12	1.13	99.76	99.97	0.10
7.37	1.13	1.14	101.80	102.01	0.10
7.40	1.14	1.16	103.87	104.08	0.10
7.43	1.16	1.17	105.96	106.17	0.10
7.47	1.17	1.19	108.08	108.29	0.11
7.50	1.19	1.20	110.22	110.44	0.11
7.53	1.20	1.21	112.39	112.61	0.11
7.57	1.21	1.23	114.59	114.81	0.11
7.60	1.23	1.24	116.81	117.03	0.11
7.63	1.24	1.25	119.05	119.27	0.11
7.67	1.25	1.27	121.32	121.55	0.11
7.70	1.27	1.28	123.62	123.85	0.11
7.73	1.28	1.30	125.94	126.17	0.11
7.77	1.30	1.31	128.29	128.52	0.12
7.80	1.31	1.32	130.66	130.90	0.12
7.83	1.32	1.34	133.06	133.30	0.12
7.87	1.34	1.35	135.49	135.73	0.12

HYDROGRAPH DISCHARGE TABLE Cont'd

TIME hrs	INFLOW (i) cfs	INFLOW (j) cfs	2S/dt-O (i) cfs	2S/dt+O (j) cfs	OUTFLOW cfs
23.30	1.82	1.82	414.85	418.53	1.84
23.33	1.82	1.82	414.81	418.49	1.84
23.37	1.82	1.82	414.78	418.45	1.84
23.40	1.82	1.81	414.74	418.41	1.83
23.43	1.81	1.81	414.71	418.37	1.83
23.47	1.81	1.81	414.67	418.33	1.83
23.50	1.81	1.81	414.64	418.29	1.83
23.53	1.81	1.80	414.60	418.25	1.82
23.57	1.80	1.80	414.57	418.21	1.82
23.60	1.80	1.80	414.53	418.17	1.82
23.63	1.80	1.80	414.50	418.13	1.82
23.67	1.80	1.79	414.46	418.09	1.81
23.70	1.79	1.79	414.43	418.05	1.81
23.73	1.79	1.79	414.39	418.01	1.81
23.77	1.79	1.78	414.36	417.97	1.81
23.80	1.78	1.78	414.32	417.93	1.80
23.83	1.78	1.78	414.29	417.89	1.80
23.87	1.78	1.78	414.25	417.85	1.80
23.90	1.78	1.77	414.22	417.81	1.80
23.93	1.77	1.77	414.18	417.77	1.79
23.97	1.77	0.89	414.15	417.73	1.79
24.00	0.89	0.00	413.35	416.81	1.73

Maximum outflow (cfs) = 94.96
Maximum storage (cu ft) = 71616
Maximum elevation (ft) = 92.97

Qp = 95.0 RESERVOIR ROUTE 100 Yr



HGU = 100 min 20 VGU = 20.0 cfs

MAX STORAGE = 71616

MAX ELEVATION = 92.97

1

HYDRAULIC REPORT FOR

0

TOANO BUSINESS CENTER

STORMWATER DRAINAGE SYSTEM

AES PROJECT 8003

SYSTEM #1

prepared by:

AES CONSULTING ENGINEERS

5248 OLDE TOWNE RD. STE 1

WILLIAMSBURG, VA 23188

DATE: April 15, 1998

Return Period = 10 Yrs
Rainfall file: JCC

Run Date: 05-14-1998
File: 8003VDOT.ST3

LINE 1 / Q = 58.02 / HT = 36 / WID = 36 / N = .013 / L = 45 / JLC = 0

SS#1 / Outfall

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	90.70	36.00	84.00	8.21	91.75	0.00	-3	7.07
UPSTRM	91.04	36.00	84.35	8.21	92.09	0.00	5.65	7.07

Drainage area (ac)	= 0.91	Slope of invert (%)	= 0.7778
Runoff coefficient	= 0.90	Slope energy grade line (%)	= 0.7569
Time of conc (min)	= 6.63	Critical depth (in)	= 29.13
Inlet time (min)	= 4.00	Natural ground elev. (ft)	= 93.00
Intensity (in/hr)	= 6.55	Upstream surcharge (ft)	= 3.69
Cumulative C*A	= 4.23	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 27.69	Line capacity (cfs)	= 58.82
Q catchment (cfs)	= 5.99	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 23.85	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 29.84	Ponding width (ft)	= N/A

LINE 2 / Q = 52.83 / HT = 36 / WID = 36 / N = .013 / L = 89 / JLC = .9

SS#2-SS#3 / DNLN = 1

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	91.04	36.00	84.35	7.48	91.91	0.00	5.65	7.07
UPSTRM	91.60	36.00	84.95	7.47	92.47	0.00	5.25	7.07

Drainage area (ac)	= 0.00	Slope of invert (%)	= 0.6742
Runoff coefficient	= 0.00	Slope energy grade line (%)	= 0.6275
Time of conc (min)	= 6.44	Critical depth (in)	= 27.79
Inlet time (min)	= 0.00	Natural ground elev. (ft)	= 93.20
Intensity (in/hr)	= 6.60	Upstream surcharge (ft)	= 3.65
Cumulative C*A	= 3.41	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 22.50	Line capacity (cfs)	= 54.76
Q catchment (cfs)	= 0.00	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 23.85	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 23.85	Ponding width (ft)	= N/A

LINE 3 / Q = 45.83 / HT = 30 / WID = 30 / N = .013 / L = 220 / JLC = .9

SS#3-SS#4 / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	92.38	30.00	84.95	9.34	93.73	0.00	5.75	4.91
UPSTRM	95.13	30.00	88.00	9.34	96.48	0.00	4.5	4.91

Drainage area (ac)	= 0.65	Slope of invert (%)	= 1.3864
Runoff coefficient	= 0.80	Slope energy grade line (%)	= 1.2490
Time of conc (min)	= 6.04	Critical depth (in)	= 27.45
Inlet time (min)	= 5.00	Natural ground elev. (ft)	= 95.00
Intensity (in/hr)	= 6.70	Upstream surcharge (ft)	= 4.63
Cumulative C*A	= 2.31	Additional Q (cfs)	= 30.33
Q = CA * I (cfs)	= 15.50	Line capacity (cfs)	= 48.29
Q catchment (cfs)	= 3.64	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 12.54	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 16.18	Ponding width (ft)	= N/A

LINE 4 / Q = 7.00 / HT = 18 / WID = 18 / N = .013 / L = 248 / JLC = .9

SS#4-SS#5 / DNLN = 3

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	96.35	18.00	88.00	3.96	96.59	0.00	5.5	1.77
UPSTRM	97.67	18.00	93.00	3.96	97.91	0.00	1.5	1.77

Drainage area (ac)	= 1.25	Slope of invert (%)	= 2.0161
Runoff coefficient	= 0.80	Slope energy grade line (%)	= 0.5325
Time of conc (min)	= 5.00	Critical depth (in)	= 12.11
Inlet time (min)	= 5.00	Natural ground elev. (ft)	= 96.00
Intensity (in/hr)	= 7.00	Upstream surcharge (ft)	= 3.17
Cumulative C*A	= 1.00	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 7.00	Line capacity (cfs)	= 14.91
Q catchment (cfs)	= 7.00	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 7.00	Ponding width (ft)	= N/A

LINE 5 / Q = 5.54 / HT = 18 / WID = 18 / N = .013 / L = 175 / JLC = .9

SS#4-SS#6 / DNLN = 3

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	96.35	18.00	88.00	3.14	96.50	0.00	5.5	1.77
UPSTRM	96.97	18.00	91.30	3.14	97.12	0.00	1.5	1.77

Drainage area (ac)	= 0.99	Slope of invert (%)	= 1.8857
Runoff coefficient	= 0.80	Slope energy grade line (%)	= 0.3571
Time of conc (min)	= 5.00	Critical depth (in)	= 10.78
Inlet time (min)	= 5.00	Natural ground elev. (ft)	= 94.30
Intensity (in/hr)	= 7.00	Upstream surcharge (ft)	= 4.17
Cumulative C*A	= 0.79	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 5.54	Line capacity (cfs)	= 14.42
Q catchment (cfs)	= 5.54	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 5.54	Ponding width (ft)	= N/A

LINE 6 / Q = 7.67 / HT = 18 / WID = 18 / N = .013 / L = 44 / JLC = .9

SS#3-SS#13 / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	92.38	18.00	84.95	4.34	92.67	0.00	6.75	1.77
UPSTRM	92.88	18.00	89.00	4.34	93.17	0.00	2.5	1.77

Drainage area (ac)	= 1.29	Slope of invert (%)	= 9.2046
Runoff coefficient	= 0.85	Slope energy grade line (%)	= 0.5340
Time of conc (min)	= 5.00	Critical depth (in)	= 12.68
Inlet time (min)	= 5.00	Natural ground elev. (ft)	= 93.00
Intensity (in/hr)	= 7.00	Upstream surcharge (ft)	= 2.38
Cumulative C*A	= 1.10	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 7.67	Line capacity (cfs)	= 31.86
Q catchment (cfs)	= 7.67	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 7.67	Ponding width (ft)	= N/A

1

0

HYDRAULIC REPORT FOR

TOANO BUSINESS CENTER

STORMWATER DRAINAGE SYSTEM

AES PROJECT 8003

SYSTEM #2

prepared by:

AES CONSULTING ENGINEERS

5248 OLDE TOWNE RD. STE 1

WILLIAMSBURG, VA 23188

DATE: April 15, 1998

Return Period = 10 Yrs
Rainfall file: JCC

Run Date: 05-14-1998
File: 80030E03.ST3

LINE 1 / Q = 10.53 / HT = 24 / WID = 24 / N = .013 / L = 45 / JLC = .9

OUTFALL-SS#8 / Outfall

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	90.70	24.00	84.00	3.35	90.87	0.00	7	3.14
UPSTRM	90.77	21.24	89.00	3.58	90.97	15.30	3	2.94

Drainage area (ac) =	0.51	Slope of invert (%)	=11.1111
Runoff coefficient =	0.90	Slope energy grade line (%)	= 0.2106
Time of conc (min) =	9.18	Critical depth (in)	= 13.79
Inlet time (min) =	4.00	Natural ground elev. (ft)	= 94.00
Intensity (in/hr) =	5.97	Upstream surcharge (ft)	= 0.00
Cumulative C*A =	1.76	Additional Q (cfs)	= 0.00
Q = CA * I (cfs) =	10.53	Line capacity (cfs)	= 75.39
Q catchment (cfs) =	3.35	Inlet length (ft)	= 0.00
Q carryover (cfs) =	8.85	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs) =	0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs) =	12.20	Ponding width (ft)	= N/A

LINE 2 / Q = 7.88 / HT = 18 / WID = 18 / N = .013 / L = 102 / JLC = .9

SS#8-SS#9 / DNLN = 1

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	90.95	18.00	89.00	4.46	91.26	0.00	3.5	1.77
UPSTRM	92.07	12.85	91.00	5.84	92.60	16.27	2.5	1.35

Drainage area (ac) =	0.63	Slope of invert (%)	= 1.9608
Runoff coefficient =	0.90	Slope energy grade line (%)	= 1.3154
Time of conc (min) =	8.85	Critical depth (in)	= 12.85
Inlet time (min) =	4.00	Natural ground elev. (ft)	= 95.00
Intensity (in/hr) =	6.04	Upstream surcharge (ft)	= 0.00
Cumulative C*A =	1.30	Additional Q (cfs)	= 0.00
Q = CA * I (cfs) =	7.88	Line capacity (cfs)	= 14.70
Q catchment (cfs) =	4.14	Inlet length (ft)	= 0.00
Q carryover (cfs) =	4.71	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs) =	0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs) =	8.85	Ponding width (ft)	= N/A

LINE 3 / Q = 4.56 / HT = 15 / WID = 15 / N = .013 / L = 177 / JLC = .9

SS#9-SS#10 / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	92.55	15.00	91.00	3.72	92.76	0.00	2.75	1.23
UPSTRM	96.85	10.25	96.00	5.10	97.26	13.95	2.75	0.89

Drainage area (ac)	= 0.00	Slope of invert (%)	= 2.8249
Runoff coefficient	= 0.00	Slope energy grade line (%)	= 2.5409
Time of conc (min)	= 8.18	Critical depth (in)	= 10.25
Inlet time (min)	= 0.00	Natural ground elev. (ft)	= 100.00
Intensity (in/hr)	= 6.18	Upstream surcharge (ft)	= 0.00
Cumulative C*A	= 0.74	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 4.56	Line capacity (cfs)	= 10.85
Q catchment (cfs)	= 0.00	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 4.71	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 4.71	Ponding width (ft)	= N/A

LINE 4 / Q = 3.58 / HT = 15 / WID = 15 / N = .013 / L = 41 / JLC = .9

SS#10-SS#11 / DNLN = 3

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	97.22	14.62	96.00	2.94	97.35	14.81	2.75	1.22
UPSTRM	99.05	9.08	98.00	4.60	99.38	14.66	.25	0.78

Drainage area (ac)	= 1.15	Slope of invert (%)	= 4.8780
Runoff coefficient	= 0.50	Slope energy grade line (%)	= 4.9521
Time of conc (min)	= 8.00	Critical depth (in)	= 9.08
Inlet time (min)	= 8.00	Natural ground elev. (ft)	= 99.50
Intensity (in/hr)	= 6.22	Upstream surcharge (ft)	= 0.00
Cumulative C*A	= 0.57	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 3.58	Line capacity (cfs)	= 14.26
Q catchment (cfs)	= 3.58	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 3.58	Ponding width (ft)	= N/A

LINE 5 / Q = 0.83 / HT = 15 / WID = 15 / N = .013 / L = 62 / JLC = .9

SS#10-SS#12 / DNLN = 3

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	97.22	14.62	96.00	0.68	97.23	14.81	2.75	1.22
UPSTRM	98.47	4.37	98.00	2.79	98.59	13.63	.25	0.30

Drainage area (ac)	= 0.19	Slope of invert (%)	= 3.2258
Runoff coefficient	= 0.65	Slope energy grade line (%)	= 2.2070
Time of conc (min)	= 6.00	Critical depth (in)	= 4.37
Inlet time (min)	= 6.00	Natural ground elev. (ft)	= 99.50
Intensity (in/hr)	= 6.72	Upstream surcharge (ft)	= 0.00
Cumulative C*A	= 0.12	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 0.83	Line capacity (cfs)	= 11.60
Q catchment (cfs)	= 0.83	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 0.83	Ponding width (ft)	= N/A

LINE 6 / Q = 0.30 / HT = 15 / WID = 15 / N = .013 / L = 62 / JLC = .9

SS#10-SS#13 / DNLN = 3

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	97.22	14.62	96.00	0.24	97.22	14.81	2.75	1.22
UPSTRM	98.28	2.62	98.00	2.07	98.35	11.40	.25	0.14

Drainage area (ac)	= 0.06	Slope of invert (%)	= 3.2258
Runoff coefficient	= 0.65	Slope energy grade line (%)	= 1.7197
Time of conc (min)	= 3.00	Critical depth (in)	= 2.62
Inlet time (min)	= 3.00	Natural ground elev. (ft)	= 99.50
Intensity (in/hr)	= 7.65	Upstream surcharge (ft)	= 0.00
Cumulative C*A	= 0.04	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 0.30	Line capacity (cfs)	= 11.60
Q catchment (cfs)	= 0.30	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 0.30	Ponding width (ft)	= N/A

TOANO BUSINESS CENTER
BMP DESIGN CALCULATIONS

Revised: August 14, 1997

TOTAL SITE DRAINAGE AREA	7.27 AC.
TOTAL AREA SERVED BY BMP	5.95 AC.
OPEN SPACE AREA	2.91 AC.

PROPOSE BMP WET POND DESIGN #6 (8 PTS)

IMPERVIOUS AR	ROADS & BUILDINGS @ 90%	5.47 AC.	4.92 AC.
	OPEN SPACE @ 16%	0.48 AC.	0.077 AC.

TOTAL IMPERVIOUS AREA FOR BMP CALCULATION 5.00 AC.

THEREFORE: DA IMPERVIOUSNESS (5.00 / ~~7.27~~ 5.95) 68.77%

BMP WATER QUALITY VOLUME REQUIREMENTS:

DRAINAGE AREA FOR BMP CALCULATION:	5.00 AC.
% IMPERVIOUSNESS FOR DRAINAGE AREA	68.77%
.009)*(68.77%))]	0.669

DESIGN #6 (2.5Vr):

2.5Vr = 2.5 * (0.5"/AC)*(DA)*(Rv) = 4 * (0.5"/AC)*(5.00)*(0.669)*(1'/12")*(43,560 SF/AC)

= ~~15,176~~ 19,602 C.F. MINIMUM WATER QUALITY VOLUME

MINIMUM POOL ELEVATION FOR BMP QUALITY OCCURS AT EL = ~~87.12~~ 87.7

PROPOSED NP @ 87.50 87.50 < 87.12 OK

$8 \text{ PT} \times \frac{5.95}{7.27} = 6.55$

BMP POINT CALCULATION:

DRAINAGE AREA FOR BMP CALCULATION	5.95 AC.
DRAINAGE AREA TO BMP	5.00 AC.
OFFSITE DRAINAGE	0.00 AC.
DRAINAGE AREA FOR BMP CREDIT	5.00 AC.
OPEN SPACE (40% OF SITE)	2.91 AC.

Void see 5/14/98 Rev

(5.00/5.95)*(8)	~~6.72~~ 6.55 PTS.
40.0% * (.1)	4 PTS.
	10.72 > 10.0PTS OK

ROADSIDE DITCH DESIGN

TC = 30 MIN

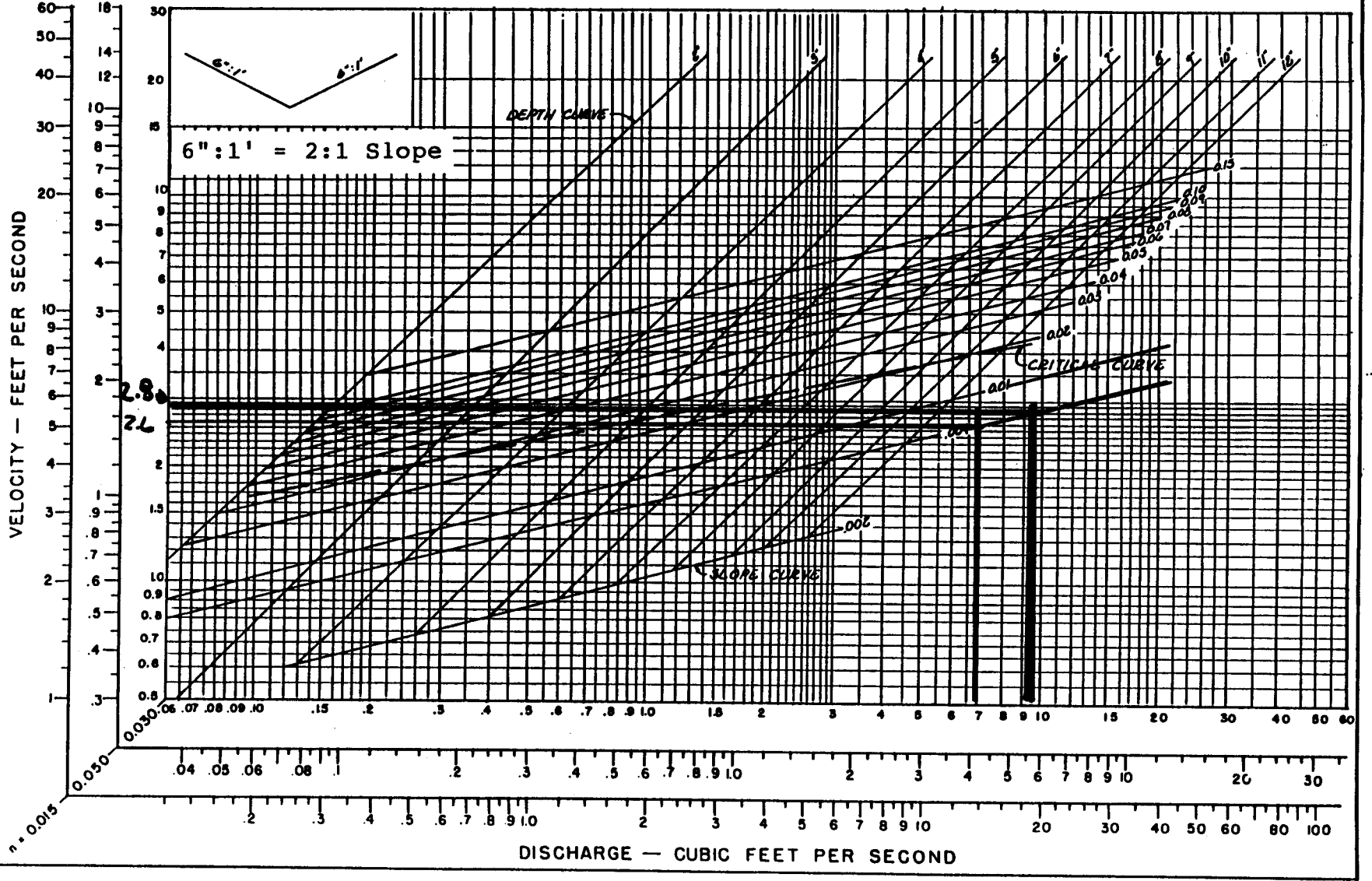
I_{10} = 3.8 IN/HR
I_2 = 2.8 IN/HR

C = .48

PROJECT TOANO BUSINESS CENTER
DATE 7/15/87
PROJ# 8003

NAME OF STREET RICHMOND ROAD

FROM STATION (DIRECTION	TO STATION OF FLOW)	LEFT OR RIGHT	A AC	$Q_2 = CI_2A$ CFS	CUMULA Q_2 CFS	AVG SLOPE FT/FT	ACTUAL VEL_2 FPS	ALLOW VEL_2 FPS	LINING TYPE	$Q_{10} = CI_{10}A$ CFS	CUM Q_{10} CFS	ACT VEL_{10} FPS	DEPTH OF $FLOW_{10}$ IN.	REMARKS
INDUSTRIAL BLVD WEST	CSX	LEFT	5.15	6.92	6.92	.0057	2.6	3.5	GRASS	3.13	9.39	2.8	13"	18" DEPTH MIN



TRIANGULAR MEDIAN DITCH

FIG. 2.8.23

LD-269
Rev. 3-83

Project: TOANO Business Center. 8003

Plan Sheet No. 2 Designer TT
Rev. Date _____ Date 9/15/97

Sheet 1 of 1

HYDROLOGICAL DATA:

D.A. = 3.24 AC.

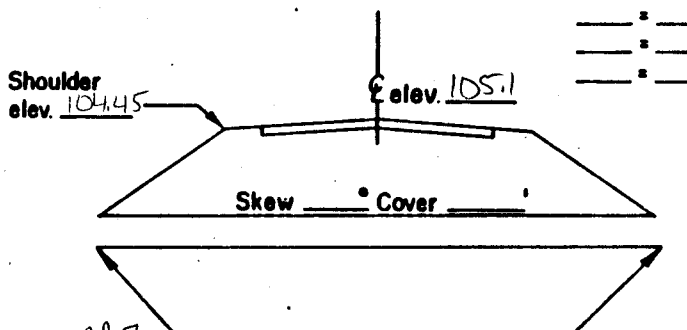
Tc = 25 MIN
i_{10} = 4.10
i_2 = 3.10
C = .34
Q_{10} = 4.52 cfs

AHW Controls

100 yr. Flood plain _____ elev. _____
Design AHW depth _____ elev. _____
Structures _____ elev. _____

STATION _____

freq. TW elev.
_____ = _____
_____ = _____
_____ = _____
_____ = _____
_____ = _____



DISCHARGES USED

Q 2 = 3.41 CFS
Q 10 = 4.52 CFS
Q ____ = _____ CFS
Q ____ = _____ CFS
Q ____ = _____ CFS
Q ____ = _____ CFS

RISK ASSESSMENT ADT _____

Detours Available _____, Length _____
Overtopping Stage _____
Flood Plain Management _____
Criteria and Significant Impact _____

240 A

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL Ke	dc	(dc+D)/2	ho	H	LSo	HW	CONT. HW. ELEV.	OUTLET VELOCITY C.M.	OUTLET VELOCITY Smooth	End Treat.	COMMENTS
15" RCP	4.52	4.52	1.20	1.50	.5	.64	.95	.95	1.0	3.5	-1.55	1.50				Inlet control

Design Flood Exceed. Prob. _____ Elev. _____

Tc Calcs

L = 420'

C = .25 Grass

Ave slope

150' x 1.33%
85' x 2.35%
80 x 1.5%

315 = 1.65%

Tc = 25 min

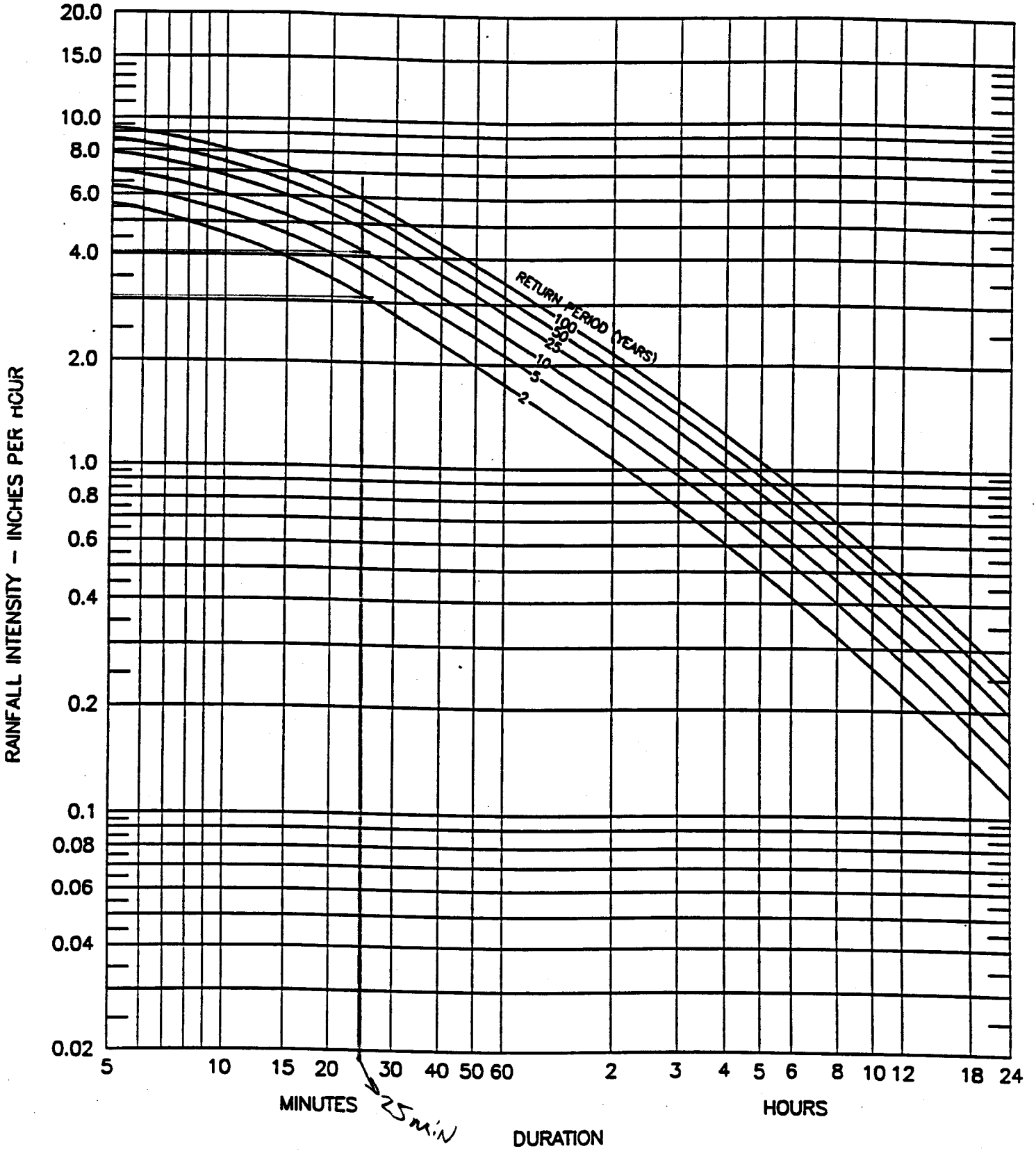
I_{10} = 4.00 cfs

I_2 = 3.00 cfs

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

NORFOLK, VA.

Fig. 1.5.1.7

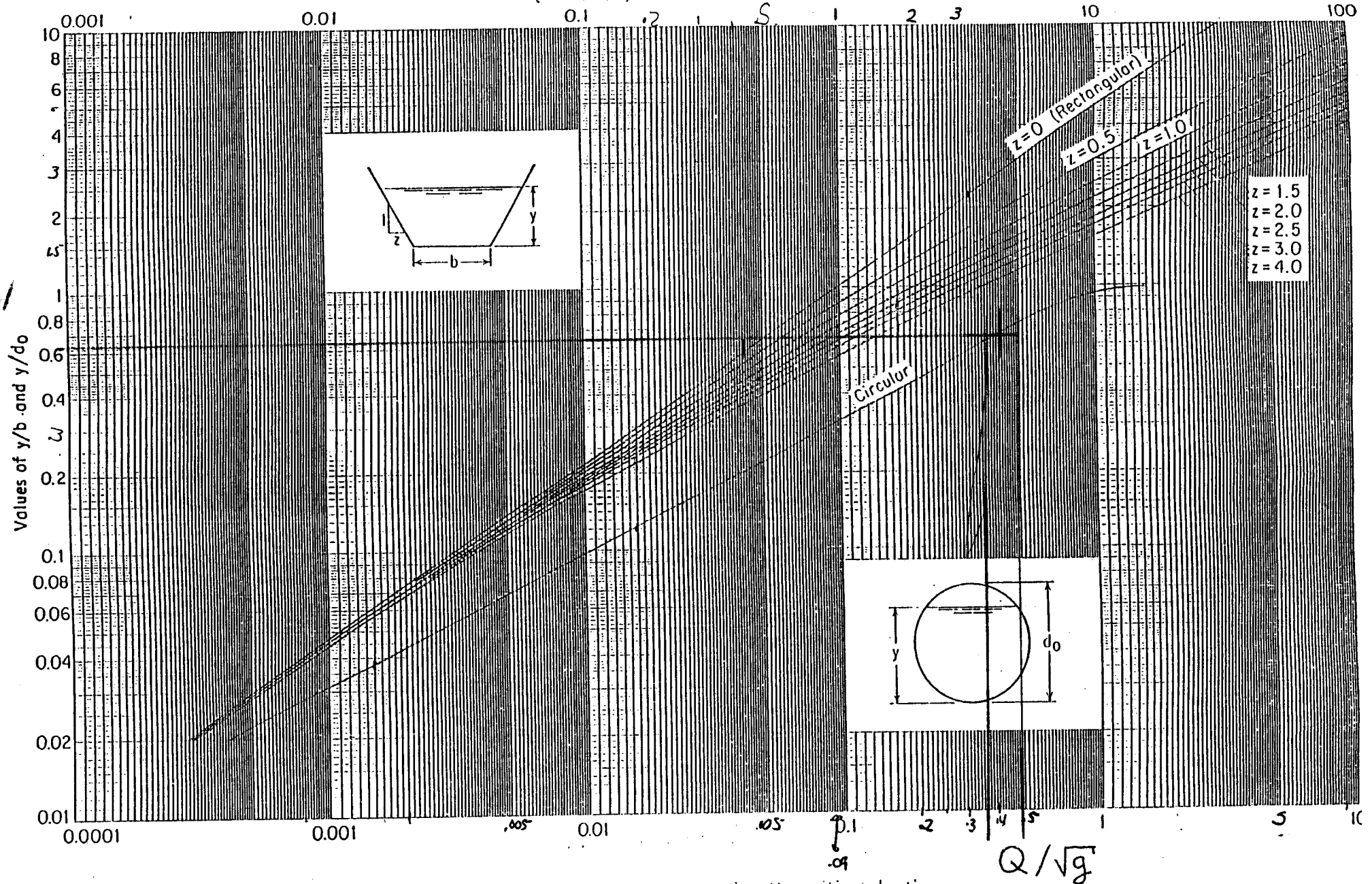


Rev. 6/92

CRITICAL FLOW CHART

$\frac{Q/\sqrt{g}}{b^{2.5}}$

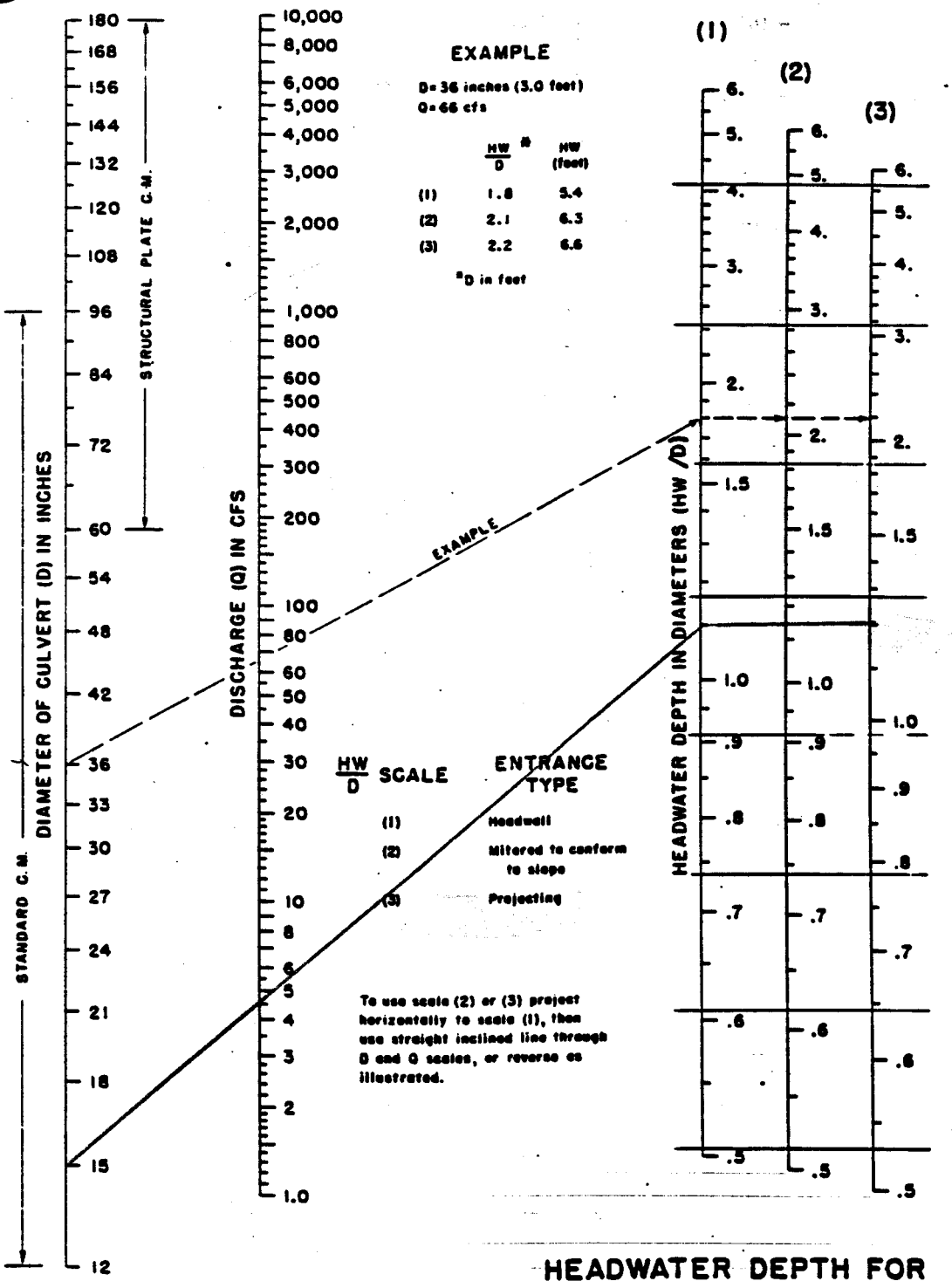
TRAPEZOIDAL SECTIONS



$\frac{Q/\sqrt{g}}{d_0^{2.5}}$

CIRCULAR SECTIONS

CHART 2

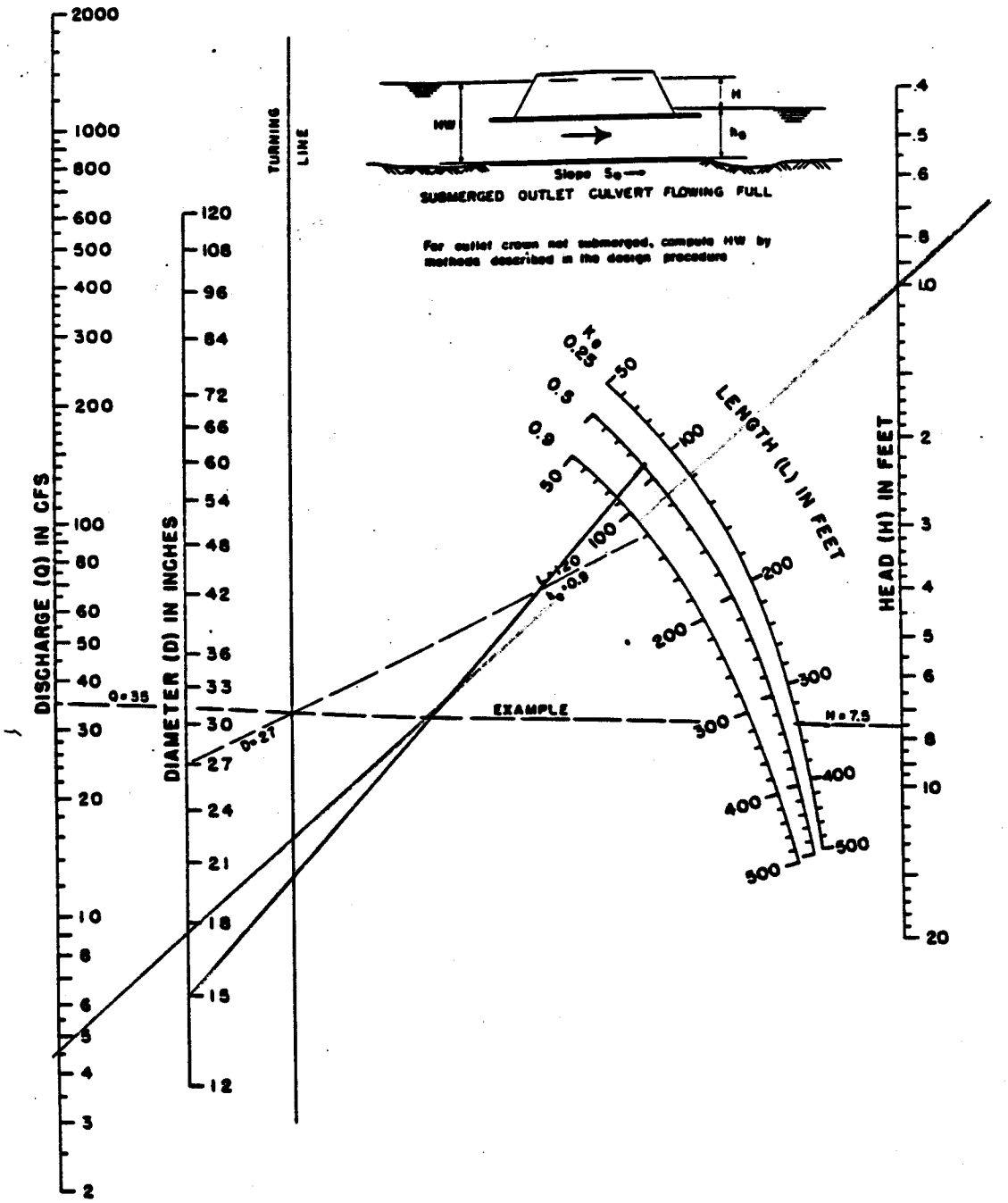


1.20'

HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

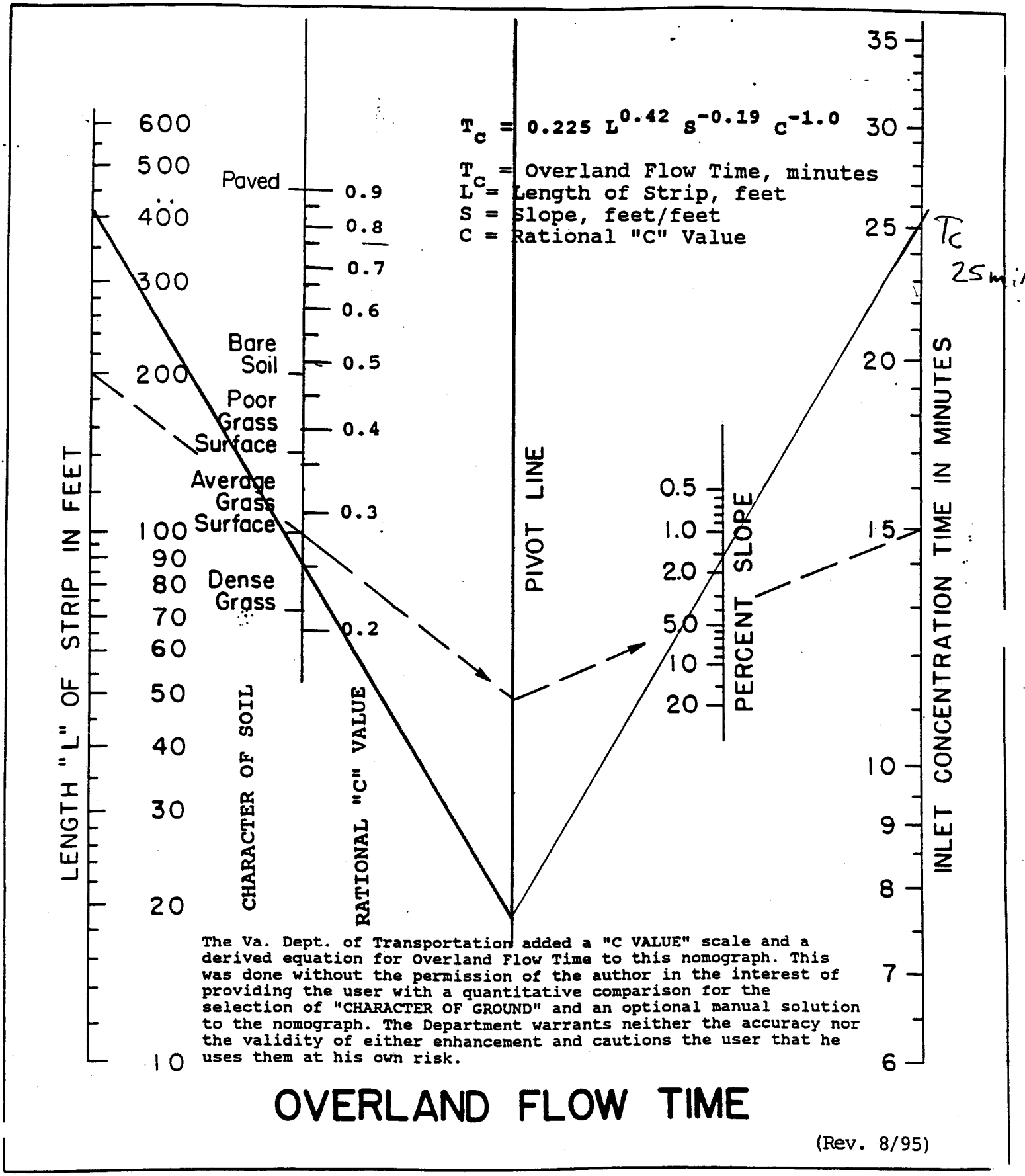
CHART 6



HEAD FOR STANDARD C. M. PIPE CULVERTS FLOWING FULL n = 0.024

BUREAU OF PUBLIC ROADS JAN. 1963

FIG. 1.5.1.1



The Va. Dept. of Transportation added a "C VALUE" scale and a derived equation for Overland Flow Time to this nomograph. This was done without the permission of the author in the interest of providing the user with a quantitative comparison for the selection of "CHARACTER OF GROUND" and an optional manual solution to the nomograph. The Department warrants neither the accuracy nor the validity of either enhancement and cautions the user that he uses them at his own risk.

OVERLAND FLOW TIME

(Rev. 8/95)

REPRINTED WITH PERMISSION FROM "DATA BOOK FOR CIVIL ENGINEERS" VOL. I - DESIGN 2ND EDITION (1951) BY E. E. SEELYE

EROSION AND SEDIMENT CONTROL NARRATIVE
for
TOANO BUSINESS CENTER
8101 Richmond Road
Williamsburg, Virginia 23185

James City County Plan SP-14-98
AES Project #8003
Revised: May 5, 1998

PROJECT DESCRIPTION

The purpose of this project is the construction of 80,500 square feet of office-warehouse space. The subject site is an undeveloped, predominantly wooded parcel of irregular shape consisting of approximately 7.27 acres. The site fronts approximately 947 feet on the west side of Route 60 (Richmond Road). The subject site is located in the western region of James City County approximately 1 mile north of Toano, Virginia, situated at the northwest corner of the intersection of Route 60 (Richmond Road) and CSX Railroad. The developed site will consist of four single story buildings, parking and green areas. A total of 10.15 acres will be disturbed during construction. Disturbed areas include approximately 2 acres offsite, to be utilized for soil stockpiling and approximately 1-acre VDOT right-of-way.

EXISTING SITE CONDITIONS

The proposed site is gently rolling and drains towards the western boundary through a natural drainage channel. Approximately 85% of the site is covered with tree growth. The site is comprised of one distinct drainage areas that serves as the lower end of an approximate 20.2 acre total drainage area.

ADJACENT PROPERTY

Surrounding property to the west is undeveloped woodlands. The site is bounded to the south by the CSX right-of-way. The entire length of the eastern property boundary fronts the Route 60 righ-of-way. Property to the north is undeveloped woodlands with residential beyond.

OFF-SITE AREAS

Topsoil must be stripped from graded areas and stockpiled for use in final grading and permanent stabilization. The stockpiles will be kept off site on 2 acres to the north of the proposed Industrial Blvd. West. The stockpiles will be stabilized with temporary vegetation to prevent soil loss and sediment transport from the stockpile itself until needed. Off-site stockpile areas must be identified and an erosion and sediment plan provided to the appropriate jurisdiction.

SOILS

1. Craven-Uchee complex (11C: 6 to 10 percent slopes). This complex consists of moderately well drained Craven soils and well drained Uchee soils. Areas of this complex are on side slopes and narrow ridge tops. Slopes are uneven and complex and are 100 to 500 feet long. Areas of this complex are long and winding and range from about 4 to 20 acres.

In the Craven soils, permeability is slow; and in the Uchee soils, it is moderate in the upper part of the subsoil and moderately slow in the lower part. The available water capacity is moderate for the Craven soils and low or moderate for the Uchee soils. Surface runoff is rapid. The erosion hazard is severe. The surface layer of both soils is friable and easily tilled. The subsoil of both soils has moderate shrink-swell potential.

2. Emporia complex (15E; 15 to 25 percent slopes). This complex consists of areas of deep, steep, well drained Emporia soils and areas of similar soils that formed over layers of fossil sheets. This complex is on side slopes along rivers, creeks, and drainageways. Slopes are convex and irregularly shaped and range from 50 to 200 feet long. Areas of this complex are long and winding and range from about 2 to 100 acres.

In these Emporia soils, permeability is moderate in the upper part of the subsoil and moderately slow in the lower part. The available water capacity is moderate. Surface runoff is very rapid. The erosion hazard is severe. The subsoil has moderate shrink-swell potential.

3. Slagle fine sandy loam (29B; 2 to 6 percent slopes). The soil is deep, gently sloping, and moderately well drained. It is on terraces and side slopes on the uplands. Slopes range from about 200 to 1,000 feet long. Areas of this soil commonly are elongated, but some smaller areas are irregularly oval or rectangular. They range from about 2 to 80 acres.

In this Slagle soil, permeability is moderate in the upper part of the subsoil and moderately slow or slow in the lower part. The available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer is friable and easily tilled. The subsoil has moderate shrink-swell potential.

CRITICAL EROSION AREAS

No critical areas have been identified on-site. However, an area adjacent to the outfall of the on-site pond has been identified as non-tidal wetlands. This area is not projected to be disturbed during construction of this project.

EROSION AND SEDIMENT CONTROL MEASURES

Unless otherwise indicated, all vegetative and structural erosion and sediment control practices shall be constructed and maintained according to minimum standards and specifications of the handbook. The minimum standards of the VESCR shall be adhered to unless otherwise waived or approved by a variance.

STRUCTURAL PRACTICES

The following sequence of events and erosion control measures shall be incorporated into the construction schedule for this project and shall apply to all construction activities within project limits:

1. a. Temporary construction entrance(s) shall be provided at the location(s) shown on the plans. This entrance(s) shall be constructed in accordance with Virginia Erosion and Sediment Control Handbook (Std. & Spec. 3.02). Washracks are to be provided where water is available.

   b. Where construction vehicle access routes intersect paved public roads, provisions shall be made to minimize the transport of sediment onto the paved surface. Where sediment is transported onto a public road surface, the road shall be cleaned thoroughly at the end of each day. Sediment shall be removed from the roads by shoveling or sweeping and transported to a sediment control disposal area. Street washing shall be allowed only after sediment is removed in this manner. This provision shall apply to all land disturbing activities.

   c. Construction traffic shall be limited to access roads. All traffic is prohibited from crossing drainage swales and streams except where absolutely necessary (Std. & Spec. 3.24 VE&SC Handbook).

2. Temporary sediment traps, sediment barriers, construction entrance, and erosion control stone are to be placed prior to clearing and grubbing prior or the first phase of construction.

3. All permanent storm water management facilities including erosion control are to be installed and made operational at the start of clearing operations, including approved sediment basins.

4. The contractor shall complete drainage facilities within thirty (30) days following completion of rough grading at any point within the project.

5. Construction will be sequenced so that grading operations can begin and end as quickly as possible.

6. Areas which are not to be disturbed will be clearly marked by fencing, flags, signs, etc.

7. a. Permanent or temporary soil stabilization shall be applied to denuded areas within seven (7) days after final grade is reached on any portion of the site. Temporary soil stabilization shall be applied within seven (7) days to denuded areas that may not be at final grade but will remain dormant (undisturbed) for longer than thirty (30) days. Permanent stabilization shall be applied to areas that are to be left dormant for more than one (1) year.

   b. During construction of the project, soil stockpiles shall be stabilized or protected with sediment trapping measures. The applicant is responsible for the temporary protection and permanent stabilization of all soil stockpiles or site as well as soil intentionally transported from the project site.

   c. A permanent vegetative cover shall be established on denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until a ground cover is achieved that, in the opinion of the local program administrator or his designated agent, is uniform, mature enough to survive and will inhibit erosion. Vegetal cover shall be established as follows:

Seed	per Volume III of the PFM
Topsoil	4" thick, per VDOT Spec. 602 (Class B)
Lime	4000#/ac.
Fertilizer	1000#/ac. of 10-10-10
Mulch	2000#/ac.

EC-2 erosion control blanket will be installed over the west fill slope behind building #4 and along the drainage swale behind building #3, once it has been brought to final grade. The slope will then be seeded to protect the slopes from rill and gully erosion and to allow seed to germinate properly. Mulch (straw or fiber) will be used on relatively flat areas and will be applied as a second step in the seeding operation. (Hydroseeding may be used in place of mulching on areas other than ditch banks.) Stabilization measures shall be applied to earthen structures such as dams, diversions, and ditch or watercourse beds and banks immediately after installation (Std. & Spec. 3.36 VE&SC Handbook.)

8. a. All storm sewer inlets that are made operable during construction shall be protected so that sediment-laden water cannot enter the conveyance system without first being filtered or otherwise treated to remove sediment.

   b. Before newly constructed conveyance channels are made operational, adequate outlet protection and any required temporary or permanent channel lining shall be installed in both the conveyance channel and receiving channel.

9. a. Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion. Slopes that are found to be eroding excessively within one (1) year of permanent stabilization shall be provided with additional slope stabilizing measures until the problem is corrected.

   b. Concentrated runoff shall not flow down cut or fill slopes unless contained within an adequate temporary or permanent channel, flume, or slope drain structure.

10. Periodic inspections and required maintenance must be provided, especially after each significant storm. The project superintendent shall be responsible for the installation and maintenance of all erosion and sediment control practices.

11. The plan approving authority must be notified one (1) week prior to the preconstruction conference, one (1) week prior to the commencement of land disturbing activity, and one (1) week prior to the final inspection.

12. All temporary erosion and sediment control measures shall be removed within thirty (30) days after final site stabilization or after the temporary measures are no longer needed, unless otherwise authorized by the local program administrator. Trapped sediment and the disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.

STORMWATER MANAGEMENT

Pre-Development: Toano Business Center (TBC):

The total pre-development drainage area for the TBC is comprised of a total area of 20.2 acres. The area extends from the north of the site along the VDOT right-of-way, south to the CSX bridge overpass, and west to the basin outfall. The VDOT portion of the area is made up of 7.75 acres of ditch lined developed right-of-way. Approximately 9.85 acres of the remaining area is wooded, with 2.60 acres of grass onsite.

This site is influenced by a total of 20.2 pre-development acres, both on and off-site. For purposes of stormwater management routing and BMP analysis, a point-of-influence (POI) was chosen immediately downstream of the on-site pond designated as Basin #1.

The pre-development hydrograph developed for this analysis was based on the conditions described above.

Post Development: Toano Business Center (TBC):
This system is divided into three (3) major drainage areas referred to as: *TBC, Offsite*, and *VDOT.*

a. The *TBC* drainage area is comprised of a total 8.08 acres, 6.93 acres on the site proper, with approximately 1.15 acres of offsite area identified as "*Offsite NW*" (See Sheet #8). This area drains directly into Basin #1.

b. *Offsite* is comprised of approximately 5.15 acres north of Industrial Boulevard West (IBW) and is bordered by IBW and the VDOT drainage ditch along the Route 60 right-of-way. Approximately 2 acres drains into the proposed temporary sediment trap directly from onsite. Approximately 1.75 acres drains to the VDOT ditch and ultimately in the VDOT infiltration trench. The balance of the offsite, approximately 1.15 acres, drains to TBC.

c. *VDOT* is comprised of a total of 7.75 acres stretching from the high point on the CSX bridge overpass 1,150 feet south of IBW, to approximately 875 feet to the north at the next median break. The area essentially extends from ditch to ditch and drains to two separate culverts on each side of the median break at the Industrial Blvd entrance to the site. The culverts thereby divide the total VDOT drainage area into 2 areas, referred to as *VDOT North* and *VDOT South.* The majority of *VDOT South* drains into the proposed VDOT trench on site and eventually is routed through Basin #1. VDOT North eventually drains directly into the proposed VDOT trench on TBC from offsite.

Hydrograph Routings:

Post development hydrographs were developed individually for the 3 principal drainage areas described above. The final routing of Basin #1 is based on combining the flow from *Offsite* with the *VDOT* flows and then routing these flows through the VDOT trench system. This output was then combined with the post development, pre-routed runoff hydrograph of the 8.08 acre *TBC* site and this total was then routed through Basin #1 for the 1, 10, and 100 year storms.

MAINTENANCE

In general, all erosion and sediment control measures will be checked daily and after each significant rainfall. The following items will be checked in particular:

1. The sediment basin will be cleaned out when the level of sediment buildup reaches the cleanout point indicated on the riser pipe.

2. The silt fence barrier will be checked regularly for undermining or deterioration of the fabric. Sediment shall be removed when the level of sediment deposition reaches half way to the top of the barrier. Corrective action will be taken immediately.

3. All seeded areas will be checked regularly to ensure that a good stand is maintained. Areas should be fertilized and reseeded as needed.

4. All temporary erosion and sediment measures shall be disposed of within thirty (30) days after final site stabilization is achieved and vegetation is established.

ECS, Ltd.
Engineering Consulting Services, Ltd.
2119-D North Hamilton Street
Richmond, VA 23230
Phone: (804)353-6333
Fax #: (804)353-9478

LETTER OF TRANSMITTAL

TO: Michael C. Brown, Ltd.
P.O. Box 105
Barhamsville, VA 23011-0150

Date: 06/01/98

RE: Toano Business Center

ATTN: Michael Brown

ECS Job No.: R3697A

Permit #:
Location:
James City County, VA

We are enclosing:

_X_ Attached

___ Under separate cover, via _____, the following item:

___ Prints ___ Boring Logs ___ Specifications ___ Samples

_X_ Materials Engineering Division Reports

Field Reports #5 & #6

___For approval

_X_For your use

_X_As requested

___For review and comment

Stormwater pipe near basin.

CC: C.A. Barrs Contractor, Inc. - Scott St. Claire
The Structures Group - Michael A. Matthews

By: Robert C. Moss, III, P.E.
Principal Engineer

ECS, Ltd.
Engineering Consulting Services, Ltd.
2119-D North Hamilton Street
Richmond, VA 23230
Phone: (804)353-6333
Fax #: (804)353-9478

MATERIALS ENGINEERING DIVISION
FIELD REPORT

Project No. R3697A

Project Toano Business Center Day/Date Friday 05/29/98

Location James City County, VA Weather/Temp Sunny /85 °

Contractor C.A. Barrs Contractor, In Client Michael C. Brown, Ltd.

Equipment $ 0.00 Arrive Job 14:00 Depart Job 17:15

Tolls $ 0.00 Total Hours on Job 3.25

Travel Chg$ 0.00 Laboratory Time 0.50

Mileage 30 Travel Time 0.50

TOTAL CHARGEABLE HOURS 4.25

Permit No. _____

Deficiency Noted (D) _ Nuclear gauge (N) _

Summary of Services Performed. Field Test Data, Locations, Elevations & Depths are Estimated.

The undersigned Engineering Technician arrived on site, as requested, to observe placement and compaction of engineered fill for Building #4 (7' to 5' below finished grade) and the stormwater pipe under the roadway.

The Nuclear Method (ASTM D-2922) was used to test the compaction of soils. Test results indicated that compacted material met or exceeded project requirements at the areas tested with the following exceptions:

At 10' to 20' long along the pipe from the SMB did not meet compaction requirements due to high moisture contents. Contractor was informed and decided to let it sun dry.

By John Rayburn

REPORT # 5

FIELD DENSITY TEST - NUCLEAR METHOD
ASTM D - 2922

1/3

PROJECT: Toano Business Center JOB NO.: R3697 A

SUBJECT: NUCLEAR FIELD DENSITY TESTS DATE: 5/29/98

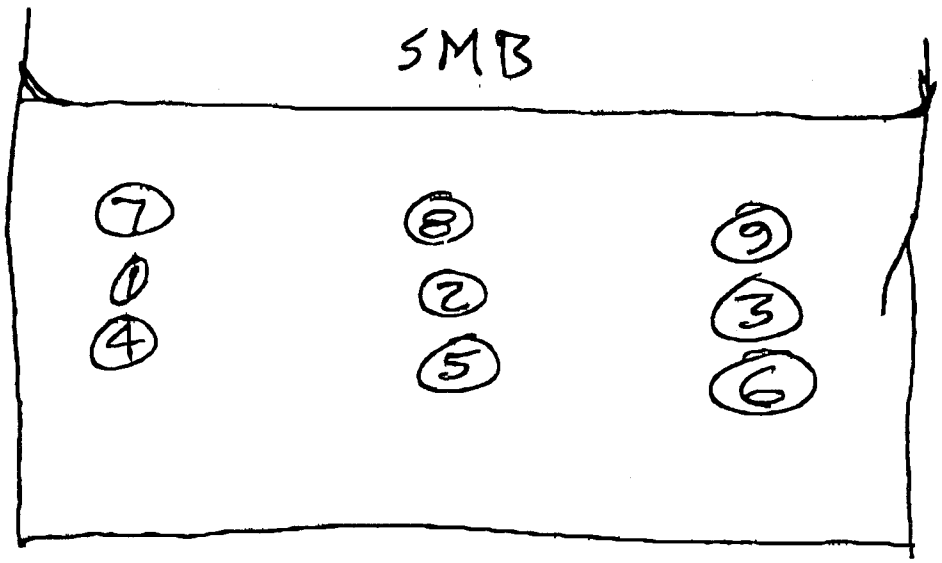
STANDARD COUNTY DENSITY _____ STANDARD COUNT MOISTURE _____

CONTRACTOR: Barrs CLIENT: _____ TECH: Rayburn

TEST NO.	1	2	3	4	5	6	7
MOISTURE CONTENT (PCF)	18.3	19.9	18.8	17.5	20.5	18.0	19.0
WET DENSITY (PCF)	127.4	126.1	127.3	126.2	127.5	127.7	128.7
DRY DENSITY (PCF)	109.1	106.3	108.5	108.7	107.1	109.7	109.6
MOISTURE CONTENT (%)	16.78	18.70	17.38	16.10	19.13	16.38	17.36
STANDARD PROCTOR MODIFIED PROCTOR	110.0	→	→	→	→	→	→
OPT. WATER CONTENT	16.1	→	→	→	→	→	→
DEPT. ELEVATION OR SOIL MARK (BFG)	7.0'	→	→	6.0	→	→	5.0
PROBE DEPTH (INCH)	8"	→	→	→	→	→	→
PERCENT COMPACTION	99	97	99	99	97	100	100
REQUIRED COMPACTION	95	→	→	→	→	→	→
* AR (TEST NO.)							

* AR = Area Rerolled-Retest

Location Diagram/Remarks:



FIELD DENSITY TEST - NUCLEAR METHOD
ASTM D - 2922

2/3

PROJECT: Toano Business Center JOB NO.: R3697A

SUBJECT: NUCLEAR FIELD DENSITY TESTS DATE: 5/29/98

STANDARD COUNTY DENSITY _____ STANDARD COUNT MOISTURE _____

CONTRACTOR: Barcs CLIENT: _____ TECH: Rayburn

TEST NO.	8	9					
MOISTURE CONTENT (PCF)	17.6	18.9					
WET DENSITY (PCF)	124.9	125.1					
DRY DENSITY (PCF)	107.3	106.2					
MOISTURE CONTENT (%)	16.42	17.79					
STANDARD PROCTOR MODIFIED PROCTOR	110.0	110.0					
OPT. WATER CONTENT	16.1	16.1					
LIFT, ELEVATION OR SOIL MARK	5.0	5.0					
PROBE DEPTH (INCH)	8"	8"					
PERCENT COMPACTION	98	97					
REQUIRED COMPACTION	95	95					
* AR (TEST NO.)							

* AR = Area Rerolled-Retest

Location Diagram/Remarks:

FIELD DENSITY TEST - NUCLEAR METHOD
ASTM D - 2922

3/3

PROJECT: Toano Business Center JOB NO.: R3697A

SUBJECT: NUCLEAR FIELD DENSITY TESTS DATE: 5/29/98

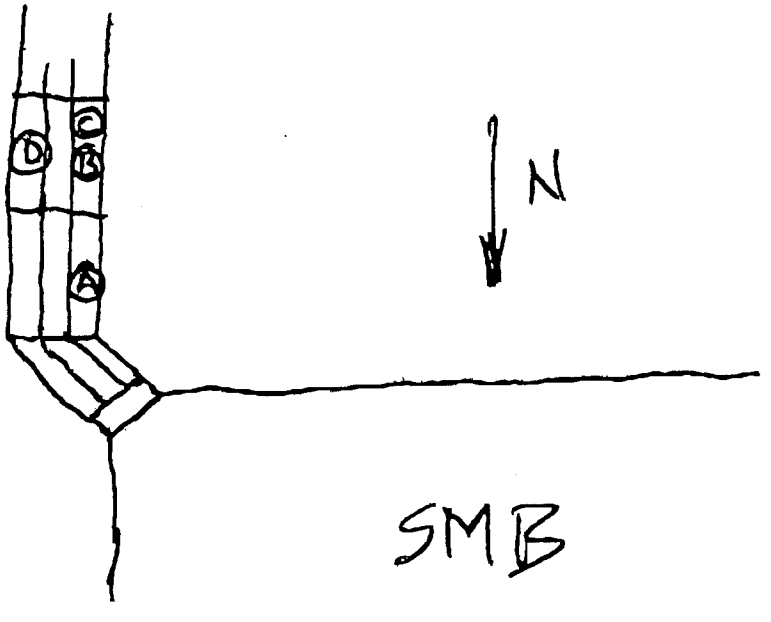
STANDARD COUNTY DENSITY _____ STANDARD COUNT MOISTURE _____

CONTRACTOR: Barrs CLIENT: _____ TECH: Rayburn

TEST NO.	A	B	C	D			
MOISTURE CONTENT (PCF)	27.8	24.8	24.0	19.2			
WET DENSITY (PCF)	122.0	126.4	127.3	123.2			
DRY DENSITY (PCF)	94.2	101.6	103.3	103.9			
MOISTURE CONTENT (%)	29.49	24.43	23.23	18.49			
STANDARD PROCTOR MODIFIED PROCTOR	107.9	→	→	→			
OPT. WATER CONTENT	14.2	→	→	→			
LIFT, ELEVATION OR SOIL MARK	1/2 Pipe	→	→	Top Pipe			
PROBE DEPTH (INCH)	8"	→	→	→			
PERCENT COMPACTION	87	94	96	96			
REQUIRED COMPACTION	95	→	→	→			
* AR (TEST NO.)		C					

* AR = Area Rerolled-Retest

Location Diagram/Remarks:



ECS, Ltd.
Engineering Consulting Services, Ltd.
2119-D North Hamilton Street
Richmond, VA 23230
Phone: (804)353-6333
Fax #: (804)353-9478

MATERIALS ENGINEERING DIVISION
FIELD REPORT

Project No. R3697A

Project Toano Business Center Day/Date Saturday 05/30/98

Location James City County, VA Weather/Temp Sunny / °

Contractor C.A. Barrs Contractor, In Client Michael C. Brown, Ltd.

Equipment $ 0.00 Arrive Job 07:15 Depart Job 15:00

Tolls $ 0.00 Total Hours on Job 7.75

Travel Chg$ 0.00 Laboratory Time 0.50

Mileage 30 Travel Time 0.50

TOTAL CHARGEABLE HOURS 8.75

Permit No. _____

Deficiency Noted (D) _ Nuclear gauge (N) _

Summary of Services Performed. Field Test Data, Locations, Elevations & Depths are Estimated.

The undersigned Engineering Technician arrived on site, as requested, to observe the placement and compaction of engineered fill for **Building #4 and the stormwater pipe backfill.**

The Nuclear Method (ASTM D-2922) was used to test the compaction of soils. Test results indicated that compacted material met or exceeded project requirements at the areas tested with the following exceptions.

Test location 'C' on data sheet 3 **did not meet compaction requirements.** Appeared to be a result of low moisture content in a material with slightly more sand than the rest of the material. Contractor was notified and will attempt to recompact at a later date.

By John Rayburn

REPORT # 6

FIELD DENSITY TEST - NUCLEAR METHOD
ASTM D - 2922

1/3

PROJECT: Toano Business Park JOB NO.: R 3697A

SUBJECT: NUCLEAR FIELD DENSITY TESTS DATE: 5/30/98

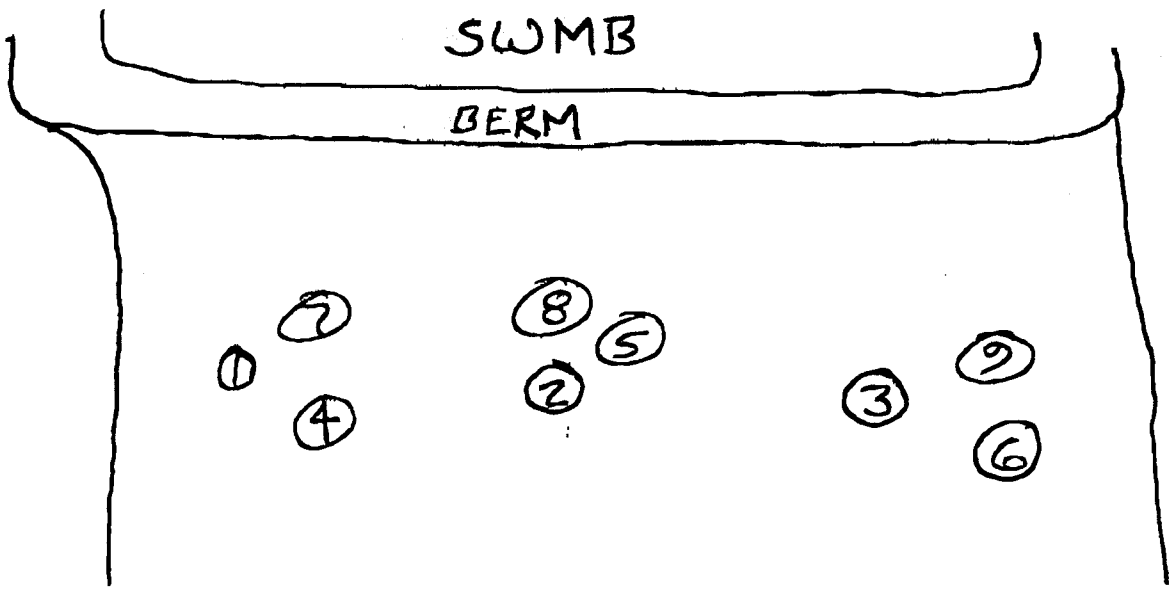
STANDARD COUNTY DENSITY 46241 STANDARD COUNT MOISTURE 9775

CONTRACTOR: Barrs CLIENT: _____ TECH: Rayburn

TEST NO.	1	2	3	4	5	6	
MOISTURE CONTENT (PCF)	17.2	18.9	15.2	16.4	19.0	16.5	15.9
WET DENSITY (PCF)	126.0	127.5	124.8	123.6	129.0	127.4	128.0
DRY DENSITY (PCF)	108.7	108.6	109.6	107.1	110.0	110.9	112.0
MOISTURE CONTENT (%)	15.87	17.36	13.88	15.34	17.25	14.92	14.23
STANDARD PROCTOR MODIFIED PROCTOR	110.0	→	→	→	→	→	→
OPT. WATER CONTENT	16.1	→	→	→	→	→	→
LIFT, ELEVATION OR SOIL MARK BFG	4.0'	→	→	3.5'	→	→	1.0
PROBE DEPTH (INCH)	8"	→	→	→	→	→	→
PERCENT COMPACTION	99	99	100	97	100	100	100
REQUIRED COMPACTION	95	→	→	→	→	→	→
* AR (TEST NO.)							

* AR = Area Rerolled-Retest

Location Diagram/Remarks:



2/3

FIELD DENSITY TEST - NUCLEAR METHOD
ASTM D - 2922

PROJECT: Toano Business Park JOB NO.: R3697A

SUBJECT: NUCLEAR FIELD DENSITY TESTS DATE: 5/30/98

STANDARD COUNTY DENSITY 46.24 STANDARD COUNT MOISTURE 9775

CONTRACTOR: Barrs CLIENT: TECH: Rayburn

TEST NO.	8	9					
MOISTURE CONTENT (PCF)	17.7	17.4					
WET DENSITY (PCF)	126.1	130.3					
DRY DENSITY (PCF)	108.4	112.9					
MOISTURE CONTENT (%)	16.32	15.42					
STANDARD PROCTOR MODIFIED PROCTOR	110.0	110.0					
OPT. WATER CONTENT	16.1	16.1					
LIFT, ELEVATION OR SOIL MARK	1.0	1.0					
PROBE DEPTH (INCH)	8"	8"					
PERCENT COMPACTION	98	100					
REQUIRED COMPACTION	95	95					
* AR (TEST NO.)							

* AR = Area Rerolled-Retest

Location Diagram/Remarks:

FIELD DENSITY TEST - NUCLEAR METHOD
ASTM D - 2922

3/3

PROJECT: Toano Business Park JOB NO.: R3697A

SUBJECT: NUCLEAR FIELD DENSITY TESTS DATE: 5/30/98

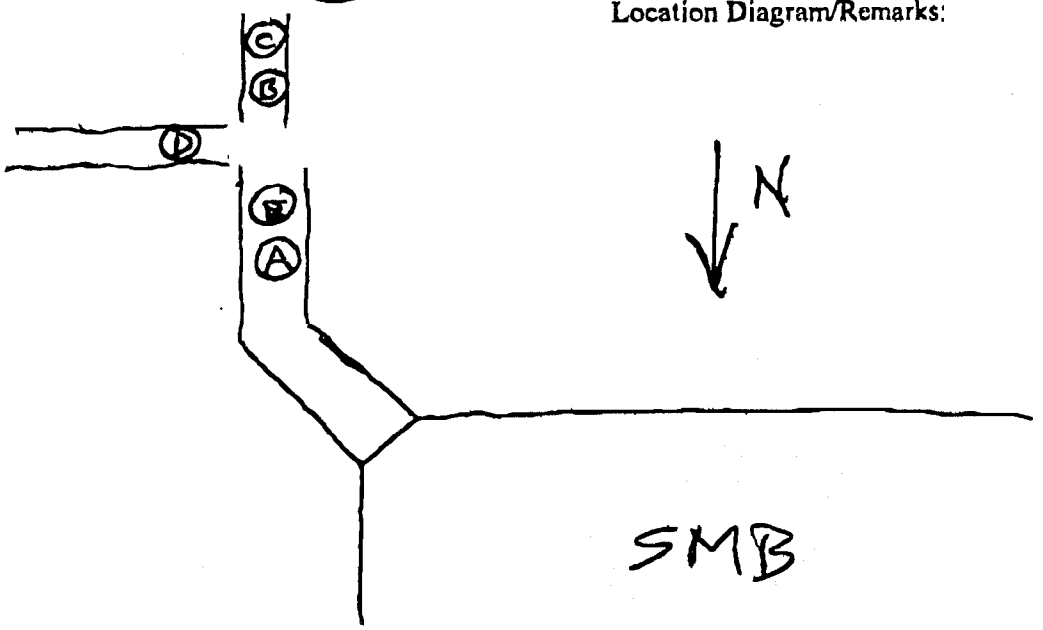
STANDARD COUNTY DENSITY 46 24 STANDARD COUNT MOISTURE 9275

CONTRACTOR: Burrs CLIENT: TECH: Rayburn

TEST NO.	A	B	C	D	E	C1	
MOISTURE CONTENT (PCF)	19.4	20.4	19.6	21.6	17.8	14.0	
WET DENSITY (PCF)	129.4	128.8	111.4	130.9	130.6	1050	
DRY DENSITY (PCF)	110.1	108.4	91.9	109.3	112.8	101.0	
MOISTURE CONTENT (%)	17.60	18.77	21.32	19.77	15.77	13.83	
STANDARD PROCTOR MODIFIED PROCTOR	110.0	→				→	
OPT. WATER CONTENT	16.1	→				→	
LIFT, ELEVATION OR SOIL MARK	Top Pipe 6'	1/2 Pipe	Top Pipe	1/2 Pipe	2' on Pipe 4'	Top Pipe	
PROBE DEPTH (INCH)	8"	→				→	
PERCENT COMPACTION	100	99	84	100	100	92	
REQUIRED COMPACTION	95	→				→	
* AR (TEST NO.)			C1			X	

* AR = Area Rerolled-Retest

Location Diagram/Remarks:



ECS, Ltd.
Engineering Consulting Services, Ltd.
2119-D North Hamilton Street
Richmond, VA 23230
Phone: (804)353-6333
Fax #: (804)353-9478

LETTER OF TRANSMITTAL

TO: Michael C. Brown, Ltd.
P.O. Box 105
Barhamsville, VA 23011-0150

Date: 05/28/98

RE: Toano Business Center

ATTN: Michael Brown

Permit #:
Location:
James City County, VA

ECS Job No.: R3697A

We are enclosing:

_X_ Attached

___ Under separate cover, via _____, the following item:

___ Prints ___ Boring Logs ___ Specifications ___ Samples

_X_ Materials Engineering Division Reports

Field Report #4

___For approval

_X_For your use

_X_As requested

___For review and comment

PROCTORS

CC: C.A. Barrs Contractor, Inc. - Scott St. Claire
The Structures Group - Michael A. Matthews

By: Robert C. Moss, III, P.E.
Principal Engineer

ECS, Ltd.
Engineering Consulting Services, Ltd.
2119-D North Hamilton Street
Richmond, VA 23230
Phone: (804)353-6333
Fax #: (804)353-9478

MATERIALS ENGINEERING DIVISION
FIELD REPORT

Project No. R3697A

Project Toano Business Center Day/Date Thursday 05/28/98

Location James City County, VA Weather/Temp / °

Contractor C.A. Barrs Contractor, In Client Michael C. Brown, Ltd.

Equipment $ 0.00 Arrive Job _____ Depart Job _____

Tolls $ 0.00 Total Hours on Job 0.00

Travel Chg$ 0.00 Laboratory Time 0.00

Mileage 0 Travel Time 0.00

TOTAL CHARGEABLE HOURS 0.00

Permit No. _____

Deficiency Noted (D) _ Nuclear gauge (N) _

Summary of Services Performed. Field Test Data, Locations, Elevations & Depths are Estimated.

Laboratory Proctor results submitted here with

By Robert C. Moss, III

REPORT # 4

Engineering Consulting Services, Ltd.

Richmond, Virginia

Laboratory Testing Summary

Date: 5/28/98

Project Number: R3697A

Project Name: Toano Business Center

Project Engineer: R.C.M.

Principal Engineer: R.C.M.

Summary By: Q.D.F.

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	USC	AASHTO	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction		CBR Value	Other
										Maximum Density (pcf)	Optimum Moisture (%)		
*	S-1	0.0 - 2.0	*	SM	*	*	*	*	17.8	107.9	14.2	*	
*	S-2	2.0 - 4.0	*	SM	*	*	*	*	34.7	117.1	12.4	*	
*	S-3	4.0 - 6.0	*	SM	*	*	*	*	32.5	110.0	16.1	*	

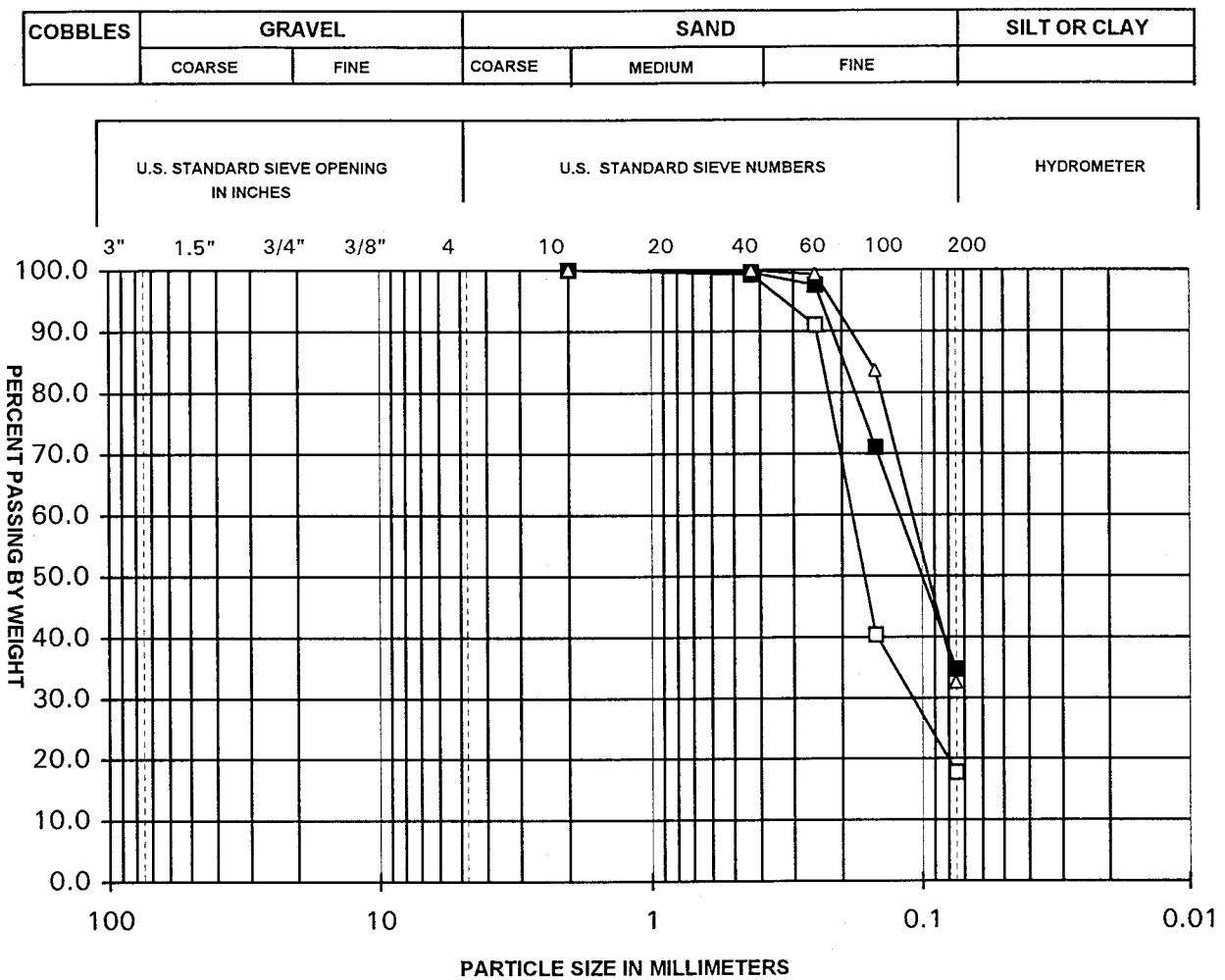
Summary Key:

V = Virginia Test Method
S = Standard Proctor
M = Modified Proctor

Hyd = Hydrometer
Con = Consolidation
DS = Direct Shear
GS = Specific Gravity

UCS = Unconfined Compression Soil
UCR = Unconfined Compression Rock
LS = Lime Stabilization
CS = Cement Staibilization

OC = Organic Content
SA = See Attached
NP = Non Plastic
* = Test Not Conducted

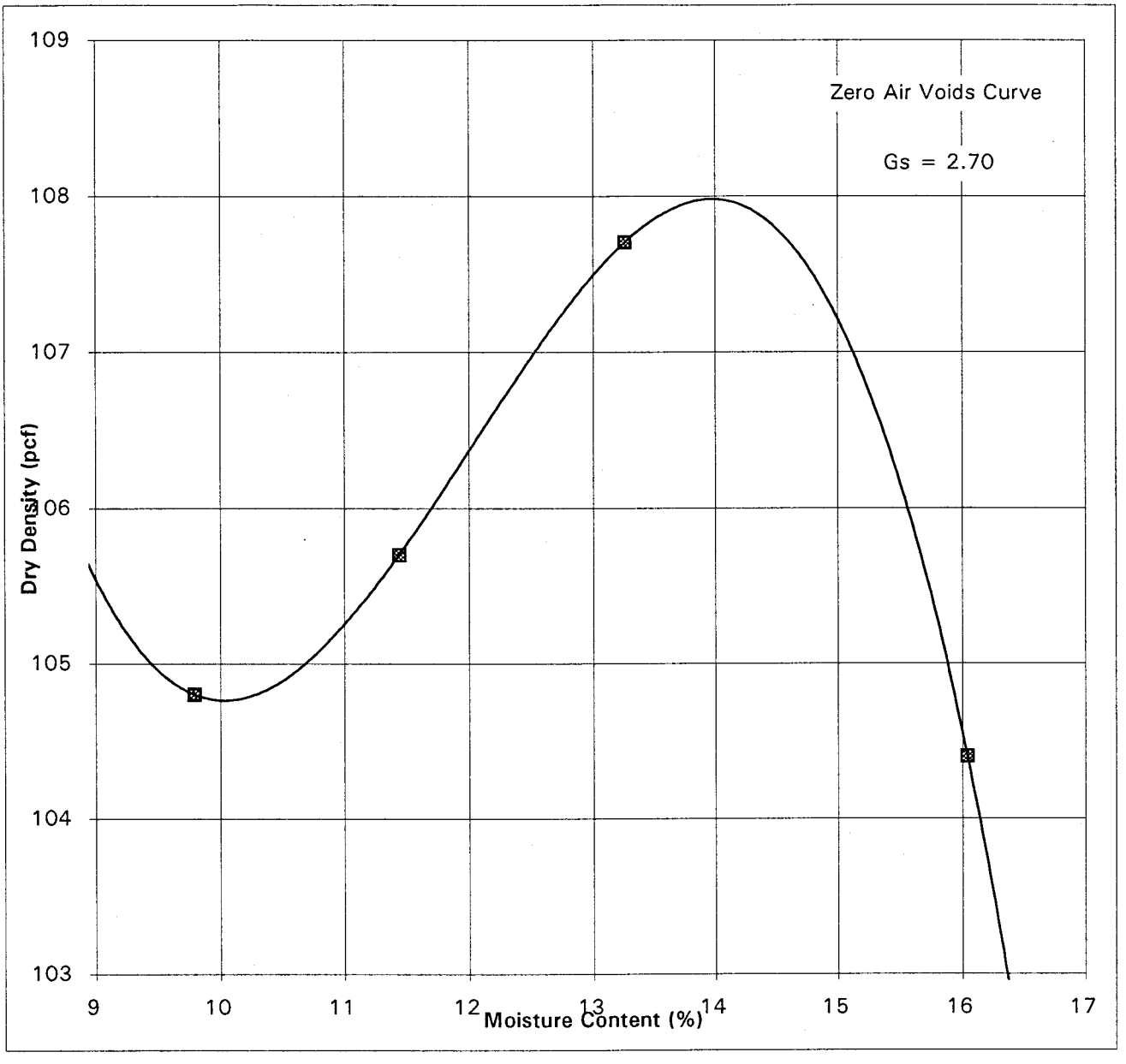


Boring/ Sample No.	Depth (feet)	Symbol	LL	PI	Description
* / S-1	0.0 - 2.0	□	*	*	Tan Silty Fine SAND
* / S-2	2.0 - 4.0	■	*	*	Brown Silty Fine SAND
* / S-3	4.0 - 6.0	△	*	*	Yellow Brown Silty Fine SAND
/		▲			

Project: Toano Business Center
Project No.: R3697A

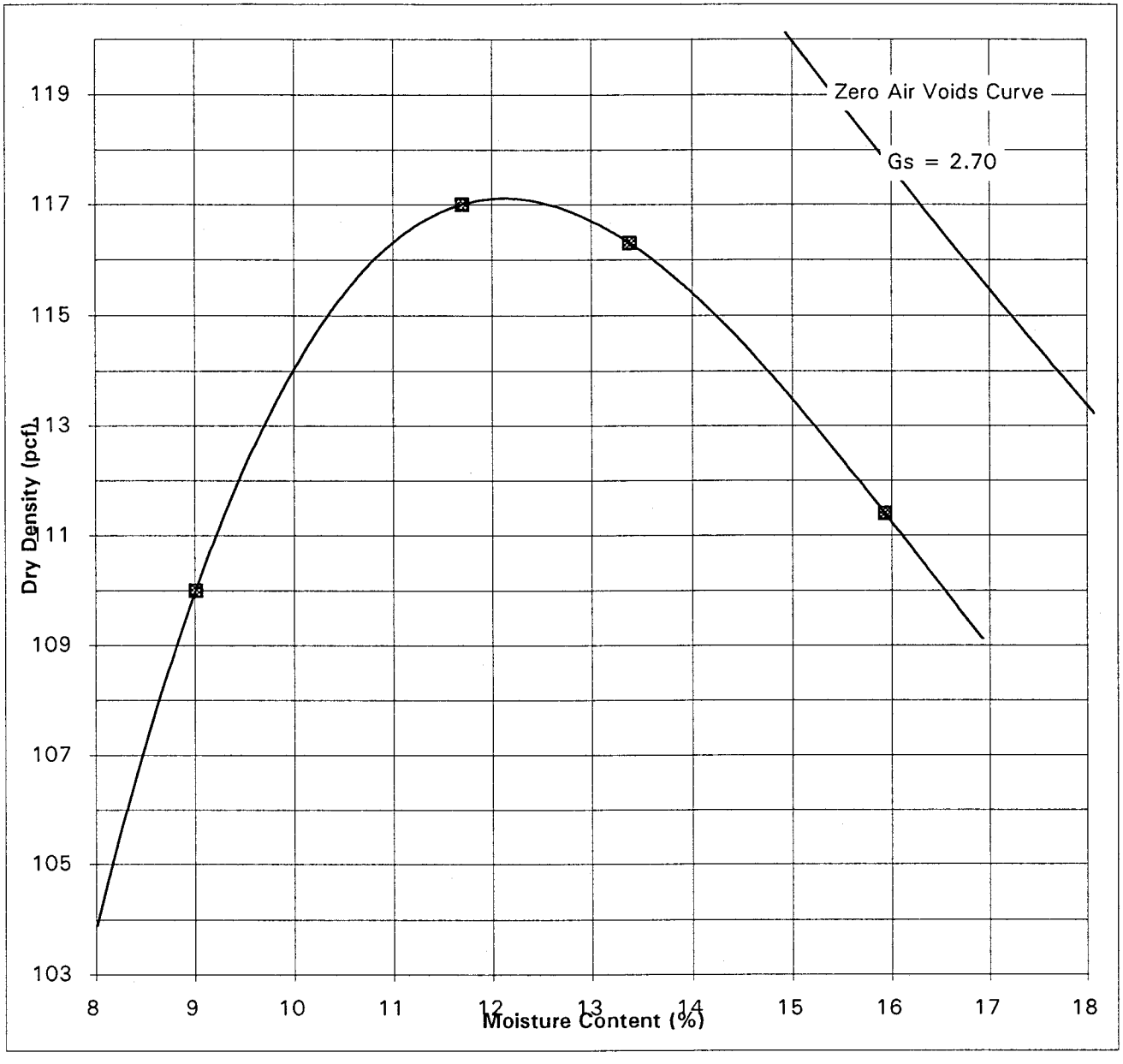
Date: 5/28/98

Engineering Consulting Services, Ltd
Richmond, Virginia
Particle Size Distribution Curves



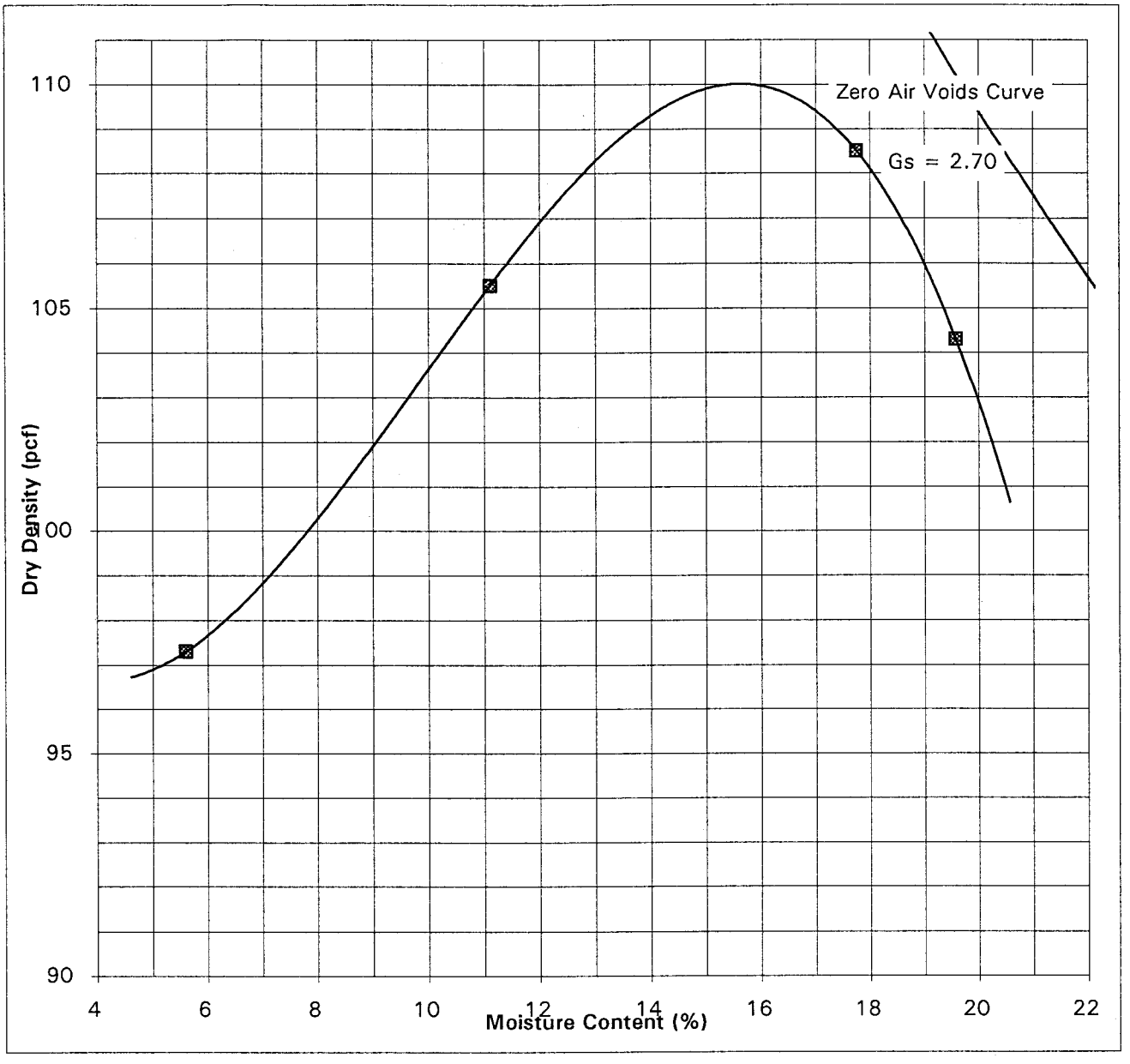
Sample No.	S-1	Natural Moisture Content	*
Street	N/A	Percent Passing No. 200 Sieve	17.8
Station	*	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	*	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	*	Maximum Dry Density (pcf)	107.9
Plasticity Index (PI)	N/A	Optimum Moisture Content (%)	14.2
Liquidity Index (LI)	*	Corr. Maximum Dry Density (pcf)	107.9
Description	Tan Silty Fine SAND	Corr. Optimum Moisture Content (%)	14.2
USC / AASHTO:	SM	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project:	Toano Business Center	**Engineering Consulting Services, Ltd**
Project No:	**R3697A**	**Richmond, Virginia**
Date:	**5/28/98**	**Moisture Density Relationship Curve**



Sample No.	S-2	Natural Moisture Content	*
Street	N/A	Percent Passing No. 200 Sieve	34.7
Station	*	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	*	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	*	Maximum Dry Density (pcf)	117.1
Plasticity Index (PI)	N/A	Optimum Moisture Content (%)	12.4
Liquidity Index (LI)	*	Corr. Maximum Dry Density (pcf)	117.1
Description	Brown, Silty Fine SAND w/ trace Clay	Corr. Optimum Moisture Content (%)	12.4
USC / AASHTO:	SM	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project: Toano Business Center	**Engineering Consulting Services, Ltd**
Project No: R3697A	**Richmond, Virginia**
Date: 5/28/98	**Moisture Density Relationship Curve**



Sample No.	S-3	Natural Moisture Content	*
Street	N/A	Percent Passing No. 200 Sieve	32.5
Station	*	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	*	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	*	Maximum Dry Density (pcf)	110.0
Plasticity Index (PI)	N/A	Optimum Moisture Content (%)	16.1
Liquidity Index (LI)	N/A	Corr. Maximum Dry Density (pcf)	110.0
Description	Yellow Brown Silty Fine SAND	Corr. Optimum Moisture Content (%)	16.1
USC / AASHTO:	SM	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project:	Toano Business Center	**Engineering Consulting Services, Ltd**
Project No:	**R3697A**	**Richmond, Virginia**
Date:	**5/28/98**	**Moisture Density Relationship Curve**

REPORT OF

SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING ANALYSIS PROPOSED TOANO BUSINESS CENTER JAMES CITY COUNTY, VIRGINIA

FOR

Mr. Mike Brown
Michael C. Brown, Ltd.
P.O. Box 150
Barhamsville, Virginia 23011-0150

July 17, 1997

ENGINEERING CONSULTING SERVICES, LTD.
Geotechnical • Construction Materials • Environmental

July 17, 1997

Michael C. Brown, Ltd.
P.O. Box 150
Barhamsville, Virginia 23011-0150
Attn: Mr. Mike Brown

ECS Project No. R3697

Reference: Proposed Toano Business Center
Richmond Road (Route 60)
James City County, Virginia

Dear Mr. Brown:

Engineering Consulting Services, Ltd. is pleased to provide you with this report of subsurface exploration and geotechnical engineering analysis for the above referenced project. The purpose of this exploration and analysis was to explore the soil and groundwater conditions at the site to develop engineering recommendations to aid in the design and construction of this project. This was accomplished by performing handauger borings, performing a site reconnaissance, performing laboratory testing on representative samples obtained from the borings, and analyzing the field and laboratory data to develop appropriate engineering recommendations regarding earthwork specifications and the design of foundations, slabs, and pavements. California Bearing Ratio (CBR) tests were performed to ascertain the subgrade characteristics with regard to support of the new pavement sections.

It is noted that this exploration was limited to handauger borings and Dynamic Cone Penetrometer (DCP) testing. Furthermore, a review of structural loading and foundation design were not within the scope of this exploration.

Project Description:

The site of the proposed development is located on the west side of Richmond Road (Route 60), directly across from Industrial Boulevard, in the Toano area of James City County, Virginia. In general, the project area is situated in the northwest quadrant of the intersection of Richmond Road and the existing C & O Railroad right-of-way. The approximate site location is shown on the Site Vicinity Map included in Appendix I.

It is our understanding that the proposed business center development will consist of the construction of several multi-use buildings (office/warehouse/retail) containing approximately 80,000 +/- square feet of total floor space, associated drive and parking area pavements, and a storm

2119-D North Hamilton Street, Richmond Virginia 23230 • (804) 353-6333 • Fax (804) 353-9478
Offices: Richmond, VA • Washington, D.C. • Norfolk, VA • Williamsburg, VA • Roanoke, VA • Fredericksburg, VA • Danville, VA
Baltimore, MD • Frederick, MD • Research Triangle Park, NC • Wilmington, NC • Charlotte, NC • Greensboro, NC • Atlanta, GA

water management facility (BMP). It is anticipated that the buildings will be one-story, pre-engineered structures of steel frame, metal panels, and masonry construction. The floor system for the buildings will consist of a slab-on-grade. Maximum wall and column loads for the buildings are anticipated to be less than about 3 kips/ft and 60 kips, respectively.

As currently planned, Industrial Boulevard will intersect at Richmond Road (Route 60) opposite of the existing Industrial Boulevard and extend about 300 feet to the west to provide access to the entrance of the business center. The location of the proposed buildings will be along the east and west sides of the site. Drive lanes and parking areas will be located throughout the center of the site and along the east side of the site. A storm water management structure (BMP) will be constructed between the proposed buildings on the west side of the site.

Site Description:

At the time of our field exploration performed between June 26 and July 11, 1997, the easternmost portion of the site (adjacent to Richmond Road) was clear and open, and vegetated with waist high grass and weeds. The northern end and westernmost portions of the site were moderately to heavily wooded with first generation pines and second growth hardwoods. An old dirt road parallels the existing railroad along the south side of the site. Surface grades vary across the site, and range from about elevation 102 feet along the east side of the site to about elevation 84 feet within the west central portion of the site. The site sloped steeply at about a 3H to 1V rise up to Route 60 along the east side of the site with an estimated 8 to 10 foot difference in elevation between the elevated Route 60 and the east side of the site. Surface grades beyond the southwest edge of the site sloped steeply down at about a 1.5H to 1V fall to the railroad tracks. The southwest edge of the site was about 8 to 12 feet higher than the railroad tracks. A swale extended from the northeast corner to the middle of the western boundary line of the site. Site surface grades generally sloped down to the south and west towards the low lying area of the swale at the central western portion of the site. The site boundaries and proposed building and pavement limits were not staked at the time of our field exploration.

Subsurface Exploration:

Our subsurface exploration was accomplished by performing ten (10) handauger borings to depths of about 5.5 feet to 9.5 feet. Six (6) borings were performed within the proposed building areas, three (3) borings were performed within proposed pavement areas, and one (1) boring was performed within the BMP area. Dynamic Cone Penetrometer (DCP) testing was performed at staggered intervals within each boring performed at the building locations. Laboratory testing for soil classification purposes was performed on selected samples from the borings. The approximate boring locations are shown on the Boring Location Diagram included in Appendix II.

Subsurface Conditions:

The results of the handauger borings generallyindicated the presence of approximately 6 to 10 inches of topsoil overlying the surface of the site. In general, the handauger borings encountered erratic deposits of Silty SAND and Sandy CLAY soils. Dynamic Cone Penetrometer (DCP) testing indicated that these soil deposits are of very loose to medium density and/or medium stiff to stiff consistency. The handauger borings were extended to maximum depths of 9.5 feet below existing site grades or to handauger refusal. It is noted that handauger boring B-8 was performed in the low area of the existing swale (proposed BMP area) and encountered very loose and saturated granular soils from depths of 3 feet below the ground surface to the bottom of the boring depth of 9.5 feet. Furthermore, handauger boring B-4 was performed near the northeast corner of the site (approximate building corner) and encountered alluvium soils with a high content of root fragments to a depth of 36 inches below the ground surface. With the exception of boring B-8, the static groundwater table was not encountered within the borings performed for this project. Boring logs describing the soils encountered at the site with dynamic cone penetrometer (DCP) test results are included in Appendix III.

Three handauger borings were performed in proposed pavement areas to maximum depths of 5.0 to 9.5 feet below the existing ground surface. Proctor and CBR testing was performed on bulk samples collected from two of the borings (CBR-1 and CBR-2). Proctor and CBR testing was conducted in accordance with ASTM D-698 and ASTM D-1883 procedures, respectively. Selected samples were also obtained from the borings in proposed building areas and were returned to our Richmond laboratory for classification type testing. This testing included percent passing the No. 200 sieve, moisture content, and Atterberg Limits (plasticity) testing. The results of the testing are noted on the Laboratory Testing Summary included in Appendix IV.

Based on our review of the Soil Survey of James City County by the U.S. Soil Conservation Service, it appears that the shallower soils are of the Slagle, Emporia, and Craven Series. Considering this, and based on the laboratory test results, it is our opinion that the natural bearing soils possess a low shrink-swell potential.

Engineering Evaluation:

- [Foundation Design]:

Based on the results of our subsurface exploration, it is our opinion that the proposed structures can be supported by shallow spread footings bearing in firm, natural soils or properly controlled engineered fill. Based on the borings, the near-surface sands and clays present in the building areas are suitable for shallow footing support.

For footings placed to bear on suitable natural soils or on properly compacted and controlled engineered fill, we recommend that a net allowable soil bearing pressure of 2,000 pounds per square foot (psf) be utilized for the design of strip and column footings. To attain this allowable capacity, a minimum footing width of 20 and 30 inches should be maintained for all wall and column footings, respectively. These minimum dimensions will help reduce the possibility of foundation bearing failure and excessive settlement due to local shear or "punching" action in potentially soft surficial soils. For bearing capacity and frost protection concerns, all footings should bear a minimum of 24 inches below finished grade.

The net allowable soil bearing pressure refers to that pressure which may be transmitted to the foundation bearing soils in excess of the final minimum surrounding overburden pressure. The bearing capacity at the final footing elevation should be verified in the field by an experienced soils engineer to assure that the in-situ bearing capacity at the bottom of each footing excavation is adequate for the design loads. This project will involve substantial cut and fill operations, therefore, site stripping and fill placement and compaction operations are considered critical to achieving a suitable bearing surface for support of foundations.

Any excessively soft or wet soils, including all organic matter and fill materials, encountered in the footing excavations should be removed from below all footings. In areas where soft or unsuitable material (including fill) is undercut, the excavation may be backfilled with a compacted and controlled fill to re-establish the desired footing elevations. We recommend that a crushed angular gravel (VDOT No. 57 Stone) be used for backfilling. This gravel can be readily placed with minimal compaction effort and will not be susceptible to deterioration from moisture. As an alternate, flowable fill having a minimum 28-day compressive strength of 200 psi could be employed.

Provided the foundation design and construction recommendations discussed herein are employed, the total settlement for the proposed structures is estimated to be less than about one inch with differential settlements of approximately one-half this amount. While generally these values are considered acceptable, the project structural engineer should be consulted to assure that the settlements are within tolerable limits.

It is recommended that the footings be constructed structurally independent of floor slabs as differential settlement between the slabs and foundations could occur. In addition, footings should be positioned so as to avoid bearing above or in close proximity to any deep utilities or storm drains, or in close proximity to steep embankments or slopes.

- [Floor Slab Design]:

Prior to construction of interior slabs-on-grade for the proposed structures, it is recommended that all topsoil and rootmat be removed from the building areas. Although the near-surface sand and clays appear to be suitable for slab support, there is the potential for soft, isolated areas of unsuitable

material to be encountered within the building footprint. Any questionable subgrade areas encountered within the footprint of the proposed buildings should be evaluated by the geotechnical engineer prior to slab construction to determine their suitability for slab support. If encountered in slab areas, any unsuitable materials should be undercut and either replaced with engineered fill or recompacted in accordance with the recommendations of this report.

Soil subgrades which will support slabs should be thoroughly compacted. All building area subgrades and subsequent lifts of engineered fill should be compacted to a minimum 95% of the maximum density obtained in accordance with ASTM Specification D 698, Standard Proctor Method. Engineered fill material required to reach the design floor slab subgrade elevation should consist of an approved inorganic material classified as CL, ML, SM, SC, SP or better containing less than about 70% by weight Silt or Clay and free of debris. This project will involve substantial cut and fill operations, therefore site stripping and fill placement and compaction operations are considered critical to achieving a suitable bearing surface for support of slabs-on-grade.

We recommend the slabs-on-grade be underlain by a minimum of 4 inches of clean, angular gravel (crushed stone) having a maximum aggregate size of 1.5 inches. VDOT No. 57 Stone is considered suitable for this purpose. This porous fill layer will facilitate the fine grading of the building pad, provide more uniform bearing conditions, and help prevent the rise of water to the bottom of the slab (capillary action). As an alternative, the porous fill layer can consist of 6 inches of Sand or Gravel classified as SP, SW or better with a maximum 5% passing the No. 200 sieve, or an Aggregate Base Material (such as VDOT 21A). Aggregate Based Material would provide a good working mat for construction and would tend to shed water. Therefore, it is considered the most desirable porous fill material for winter and/or wet season construction. Before placement of slab concrete, a polyethylene vapor barrier should be placed on top of the granular material to provide additional moisture protection. Slabs supported by fill or natural subgrade treated as discussed herein can be designed assuming a Modulus of Subgrade Reaction (K_S) of 150 pci. The contractor should be required to submit fill materials to the Engineer for approval prior to their employment on this project.

We recommend that the floor slab be isolated from the foundation footings so differential settlement of the structure will not induce shear stresses in the floor slab. Also, to minimize the crack width of any shrinkage cracks that may develop near the surface of the slab, we recommend wire mesh reinforcement be included in the design of the floor slab. The mesh should be in the top half of the slab to be effective.

Based on the anticipated finished grade elevations, underdrains for slabs and perimeter drains for footings are not considered necessary. Positive drainage away from the proposed structure is an essential element in minimizing the adverse effects that water might have on the bearing quality of the foundation soils. Positive drainage should be provided around the perimeter of the building to minimize moisture infiltration into the foundation and/or subgrade soils. We recommend landscape areas adjacent to the building be provided with a fall of least six inches for the first ten feet outward from the building. All sidewalks should be sloped away from the proposed buildings.

- [Pavements]:

For the construction of pavements for the drive lanes and parking lots, we recommend that all topsoil and any other soft or unsuitable materials be removed from the construction area. The stripped surface should be proofrolled and carefully observed to aid in identifying any localized soft or unsuitable materials. Such materials should be removed prior to fill placement.

An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should minimize the possibility of the subgrade materials becoming saturated over a long period of time.

The soil test borings performed across the site, to include the proposed pavement areas, encountered erratic soil deposits comprised of Silty SANDS and Sandy CLAYS. Laboratory CBR testing performed on two bulk subgrade samples identified as CBR-1 and CBR-2 indicate soaked CBR values of 29.2 and 14.7, respectively. Based on these values, and considering the substantial cut and fill operations required to achieve pavement subgrade which will result in a blended soil matrix, we recommended using a design CBR (DCBR) value of 10 for pavement design purposes. It is our opinion that this design value will represent the subgrade bearing quality following site grading operations. Given the sensitivity of the subgrade soils to moisture changes, careful observation of subgrades prior to paving should be performed by the Engineer to determine whether undercutting of subgrade materials is required to provide adequate pavement support.

The following minimum pavement sections, based on a 10-year service life and a design CBR value of 10, are recommended for on-site pavements:

Heavy Duty Asphalt Pavements
(Main Drive Lanes / Truck Maneuvering Areas)

- Asphalt Surface: 1.5 inches Asphalt Concrete Surface Material, Type SM-2A or S-5.
- Asphalt Surface: 2.5 inches Asphalt Concrete Base Material, Type BM-2A.
- Aggregate Base: 6.0 inches Aggregate Base Material, Type I, Size 21A/B.
- Subgrade: Stable and compacted to a dry density of at least 95% of that soil's Standard Proctor maximum dry density (ASTM D 698) to a depth of 8.0 inches

Standard Duty Asphalt Pavements
(Automobile Access and Parking Stalls)

- Asphalt Surface: 2.0 inches Asphalt Concrete Surface Material, Type SM-2A or S-5.
- Aggregate Base: 8.0 inches Aggregate Base Material, Type I, Size 21A/B.
- Subgrade: Stable and compacted to a dry density of at least 95% of that soil's Standard Proctor maximum dry density (ASTM D 698) to a depth of 8.0 inches

- [Below-Grade Walls and Site Retaining Walls]

Below-grade structural walls including site retaining walls must be designed to resist lateral earth pressures of adjacent fill. The on-site Silty Sands and Sandy Clays are not particularly desirable for use as backfill behind below-grade structural walls, but can be utilized provided the compaction moisture content is carefully controlled and a drainage system is installed behind the walls.

We recommend that the on-site materials used as backfill for below-grade structural walls and site retaining walls be compacted to between 92 and 95 percent of the standard Proctor maximum dry density (ASTM D-698) at a moisture content within 3 percentage points of the optimum moisture content as determined by the same test. Hand-held compaction equipment must be used to avoid placing high stresses on the walls during compaction.

Assuming below-grade structural walls will be designed to resist lateral movement (at-rest lateral earth pressures) and will have a level backfill, we recommend using an equivalent fluid pressure of 65 pounds per square foot per foot of wall height for on-site materials used as backfill. Similarly, assuming site retaining walls will be designed to tolerate small movements (active lateral earth pressures) and will also have a level backfill, we recommend using an equivalent fluid pressure of 45 pounds per square foot per foot of wall height for on-site materials used as backfill.

Each type of wall should have a drainage system installed for the entire length of the wall. We recommend a blanket drain consisting of a prefabricated drain board directly against the back of the wall with a two-foot-wide zone of clean coarse sand placed between the drain board and the on-site soil backfill. The drain board should tie in to a perforated drain pipe located at the base of the wall which runs the entire length of the wall to an outlet. The drain pipe should be wrapped in filter fabric to avoid plugging by the backfill soils.

Subgrade Preparation and Earthwork Operations:

The surficial Silty SANDS and Sandy CLAYS that contain a high percentage of fines are moisture-sensitive and will be difficult to adequately compact and subject to excessive deflection under wheel loads when they are wet. To reduce the potential for moisture-related soil problems, we recommend that site grading operations be performed during the typically drier months of the year (May through October). If this is not possible, substantial undercutting of these soils may be required to achieve stable subgrade conditions.

All topsoil and other deleterious, non-soil materials should be stripped from the proposed construction areas and either removed from the site or stockpiled for later use during landscaping. Stripping should be accomplished to a distance of at least 5 feet beyond building lines and 2 feet beyond the edge of curbs. Observed topsoil thickness was approximately 6 to 10 inches, but is expected to vary across the site. In this regard, deeper topsoil should be anticipated in areas of the site which are heavily wooded and/or areas of the site which were previously cultivated.

After stripping to the desired grade and prior to fill placement, the stripped surface should be observed by an experienced Geotechnical Engineer or his authorized representative. Proofrolling using a 10-ton drum roller or a loaded dump truck having an axle weight of at least 10 tons should be used at this time to aid in identifying localized soft or unsuitable material. Any soft or unsuitable materials encountered during this proofrolling should be removed and replaced with engineered fill. The excavation and backfilling should be observed by a representative of the Geotechnical Engineer so that excessive or inadequate removal of material can be avoided.

All subgrades should be moisture conditioned to within +/- 3% of the optimum moisture content and compacted to a depth of at least 8 inches to at least 95% of the maximum dry density in accordance with ASTM Specification D 698, Standard Proctor Method.

Following stripping, proofrolling, and subgrade preparation procedures, engineered fill can be placed. Fill used to support any part of the proposed foundation system, slabs-on-grade, and pavements should be placed in lifts not exceeding 8 inches in loose thickness, moisture conditioned to within +/- 3% of the optimum moisture content and compacted to at least 95% of the maximum dry density obtained in accordance with ASTM Specification D 698, Standard Proctor Method.

Field density testing of subgrades and each lift of fill should be performed at a rate of no less than one test per 2,500 square feet in the building area and one test per 5,000 square feet in the pavement areas.

The following fill types are recommended for use on this project:

Engineered Fill: Soil Material classified as CL, ML, SM, SC, SP, or better containing less than about 70% by weight Silt or Clay and free of organics and debris. Suitable material should have a maximum Liquid Limit of 50 and maximum Plasticity Index of 25.

Porous Fill: Clean crushed gravel (VDOT No. 57 Stone) with a maximum aggregate size of 1.5 inches placed in a minimum 4-inch-thick layer or Sand or Gravel classified as SP, SW, or better with a maximum 5% passing the No. 200 Sieve placed in a minimum 6-inch-thick layer. Aggregate Base Material can be employed in this 6-inch layer.

Aggregate Base: Aggregate Base Material Type I, Size 21A/B.

At their natural moisture content, the near-surface clays and sands will likely withstand moderate construction traffic and provide sufficient support for slabs and pavements. These materials are likely to deteriorate with increased moisture due to exposure and excessive wheel loads. Due to the potentially substantial amount of subgrade which may require undercut on this site, we recommend fair unit rates for the above fill types be established in the construction contract for use as backfill. We also recommend the construction contract include a unit rate for employment of a medium-duty geotextile (such as Mirafi 600X or equivalent) for use in stabilization of the subgrade where required.

Construction Considerations:

Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, we recommend that a 1- to 3-inch thick "mud mat" or "lean" concrete be placed on the bearing soils before the placement of reinforcing steel.

Proper compaction control of fill is an essential aspect of this project. All fill materials should be placed, compacted, and tested in accordance with the recommendations contained in this report. We recommend that all cut and fill operations be observed on a full-time basis by a qualified Soil Technician to determine if minimum earthwork and compaction requirements are being met.

In a dry and undisturbed state, the subgrade soils at the site will provide moderate subgrade support for fill placement and construction operations. However, when wet, this soil will degrade quickly with disturbance from contractor operations. Therefore, good site drainage should be maintained during earthwork operations to help maintain the stability of the soil. We recommend that ditching and stormwater management features be constructed as soon as practical after clearing to reduce

subgrade damage due to standing water and runoff. It should be incumbent on the contractor to protect all subgrades from damage due to construction, or to repair all damaged subgrade.

Ditches and swales should be employed around the perimeter of all pavements where possible to minimize water penetration of subgrades. A thorough inspection of pavement subgrades prior to stone placement is considered essential towards maximizing long term pavement performance.

Closing:

The recommendations contained herein were based on the data obtained from the handauger borings which indicate subsurface conditions at these specific locations at the time of the exploration. In this regard, soil conditions may vary between borings. Furthermore, it is sometimes difficult to characterize soil content and consistency using borings alone. Therefore, as a critical part of a complete soil evaluation, all initial subgrades and footing excavations should be observed by the Geotechnical Engineer to ascertain that soil conditions encountered by our exploration are consistent with conditions encountered during construction. If during the course of construction variations appear evident, the Geotechnical Engineer should be informed so that the conditions can be addressed.

We appreciate the opportunity to be of service to you on this project. If we can be of further assistance or should you have questions concerning this subsurface exploration and analysis, please contact our office.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.

for Christopher D. Harris, E.I.T.
Staff Geotechnical Engineer

COMMONWEALTH OF VIRGINIA
7/17/97
DAVID E. STINNETTE
NO. 028419
PROFESSIONAL ENGINEER

David E. Stinnette, P.E.
Engineering Services Manager

Copies: (3) Michael C. Brown, Ltd.
(1) AES Consulting Engineers (Bob Oliver)

L:\GEOTECH\REPORTS\R3697ACH.Doc.

APPENDIX

I. Site Vicinity Map

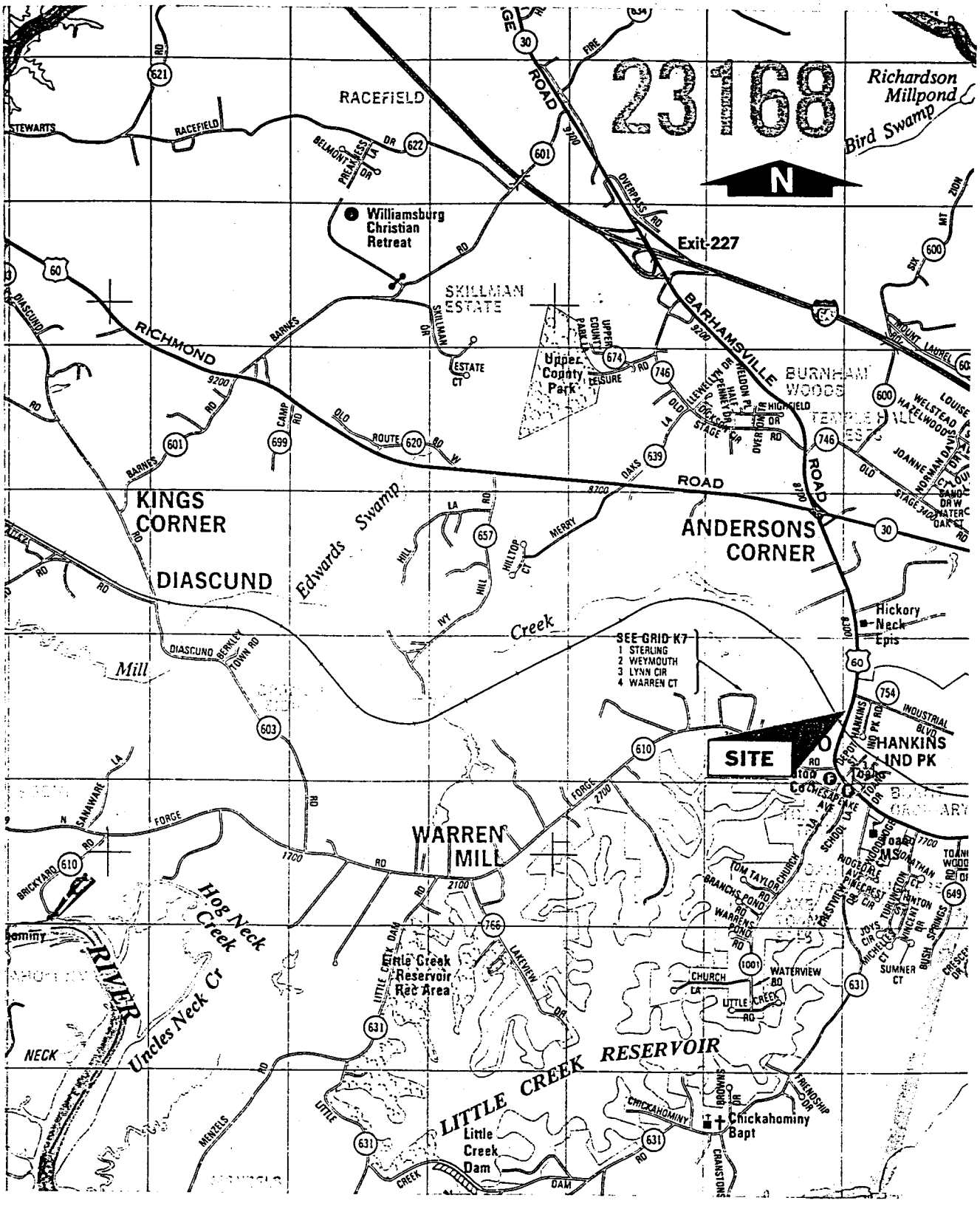
II. Boring Location Diagram

III. Boring Logs

IV. Table I - Summary of Laboratory Test Data

APPENDIX I

SITE VICINITY MAP



ENGINEERING CONSULTING SERVICES, LTD.

2119-D North Hamilton Street
Richmond, VA 23230
PH: (804) 353-6333
FAX: (804) 353-9478

SITE VICINITY MAP

TOANO BUSINESS CENTER

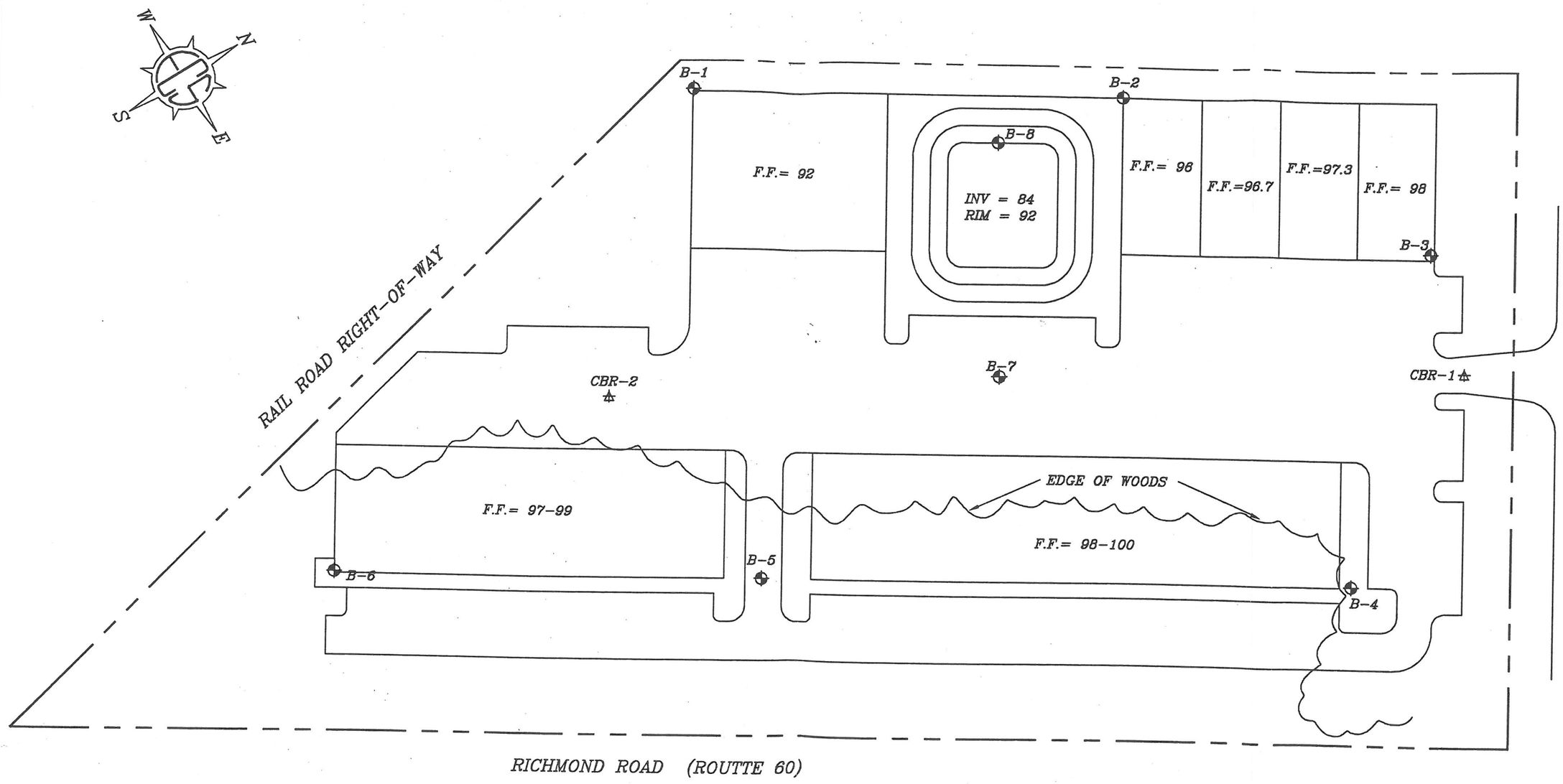
JAMES CITY COUNTY, VIRGINIA
FOR
MICHAEL C. BROWN, LTD.

CDH	NTS	R3697	7-16-97	1 of 1

APPENDIX II

BORING LOCATION DIAGRAM

ECS LTD



REVISIONS	ECS LTD ENGINEERING CONSULTING SERVICES, LTD	BORING LOCATION DIAGRAM TOANO BUSINESS CENTER				
		AES CONSULTING ENGINEERS				
		KLG	CDH	7-3-97	1"=70'	R3697	1 OF 1

APPENDIX III

BORING LOGS

OWNER	JOB #	BORING #	SHEET
MICHAEL C. BROWN, LTD	R3697	B-1	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
TOANO BUSINESS CENTER	AES CONSULTING ENGINEERS

SITE LOCATION
JAMES CITY COUNTY, VIRGINIA

CALIBRATED PENETROMETER TONS/FT.^{2}: 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
					SURFACE ELEVATION 88.00	
0					Silty Fine to Medium SAND With Clay Pockets, Orange, Yellow and Light Gray, Moist, Medium Dense, (SM)	85
5						80
10					END OF BORING @ 9.5'	75
15						70
20					DCP BLOW COUNTS (Blows per increment) (9-40) @ 12" (15-28) @ 24" (12-18) @ 36"	65
25						60
30						

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL DRY WS OR WD	BORING STARTED 7-9-97	TOPSOIL DEPTH: 8 INCHES
WL BCR ACR	BORING COMPLETED 7-9-97	CAVE IN DEPTH @ N/A
WL	RIG FOREMAN CHRIS H.	DRILLING METHOD HANDAUGER

OWNER	JOB #	BORING #	SHEET
MICHAEL C. BROWN, LTD	R3697	B-2	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
TOANO BUSINESS CENTER	AES CONSULTING ENGINEERS

SITE LOCATION
JAMES CITY COUNTY, VIRGINIA

CALIBRATED PENETROMETER TONS/FT.^{2}: 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ: 10 20 30 40 50+

STANDARD PENETRATION BLOWS/FT. ⊗: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
					SURFACE ELEVATION 90.00	
0					Silty Fine to Medium SAND, Trace Roots, Yellowish Brown, Moist, Medium Dense, (SM)	
					Fine Sandy CLAY, Yellow and Orange, Moist, Stiff, (CL)	
5					CLAY With Fine Sand, Orange, Yellow and Gray, Moist, Stiff, (CH)	85
					AUGER REFUSAL @ 5.5'	
10						80
15						75
20						70
25						65
30						

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL DRY WS OR WD	BORING STARTED 7-9-97	TOPSOIL DEPTH: 10 INCHES
WL BCR ACR	BORING COMPLETED 7-9-97	CAVE IN DEPTH @ N/A
WL	RIG FOREMAN CHRIS H.	DRILLING METHOD HANDAUGER

OWNER	JOB #	BORING #	SHEET
MICHAEL C. BROWN, LTD	R3697	B-3	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
TOANO BUSINESS CENTER	AES CONSULTING ENGINEERS

SITE LOCATION
JAMES CITY COUNTY, VIRGINIA

CALIBRATED PENETROMETER TONS/FT.^{2}: 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ: 10 20 30 40 50+

STANDARD PENETRATION BLOWS/FT. ⊗: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
					SURFACE ELEVATION 106.00	
0					Silty Fine SAND, Trace Roots, Yellowish Brown and Tan, Moist, Medium Dense, (SM)	105
					Silty Fine SAND, Yellowish Brown and Tan, Moist, Medium Dense, (SM)	
5					Silty Fine to Medium SAND, Orange and Yellow, Moist, Medium Dense, (SM)	100
					Silty Fine to Medium SAND, Yellow, Orange and Tan, Moist, Medium Dense, (SM)	
10					END OF BORING @ 9.5'	95
15						90
20						85
25						80
30						

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL DRY WS OR WD	BORING STARTED 7-9-97	TOPSOIL DEPTH: 10 INCHES
WL BCR ACR	BORING COMPLETED 7-9-97	CAVE IN DEPTH @ N/A
WL	RIG FOREMAN CHRIS H.	DRILLING METHOD HANDAUGER

OWNER	JOB #	BORING #	SHEET
MICHAEL C. BROWN, LTD	R3697	B-4	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
TOANO BUSINESS CENTER	AES CONSULTING ENGINEERS

SITE LOCATION
JAMES CITY COUNTY, VIRGINIA

CALIBRATED PENETROMETER TONS/FT.^{2}: 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL / SURFACE ELEVATION	ELEVATION (FT)
0					Silty Fine to Coarse SAND With Roots, Trace Fine Gravel, Brown, Tan and Orange, Moist, Medium Dense, (SM-ALLUVIUM)	
5					Silty Fine to Medium SAND With Roots, Brown and Dark Gray, Moist, Medium Dense, (SM-ALLUVIUM)	
					Silty Fine to Medium SAND, Yellowish Brown, Moist, Loose, (SM)	
10					Silty Fine to Coarse SAND With Roots, Yellowish Brown, Moist to Wet, Loose, (SM)	
					Silty Fine to Medium SAND, Yellowish Brown, Moist to Wet, Medium Dense, (SM)	
15					END OF BORING @ 9.5'	
20					DCP BLOW COUNTS (Blows per increment) (4-22) @ 12" (6-11-7) @ 24" (7-7-7) @ 36"	
25						
30						

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL DRY WS OR WD	BORING STARTED 7-9-97	TOPSOIL DEPTH: 6 INCHES
WL BCR ACR	BORING COMPLETED 7-9-97	CAVE IN DEPTH @ N/A
WL	RIG FOREMAN CHRIS H.	DRILLING METHOD HANDAUGER

OWNER	JOB #	BORING #	SHEET
MICHAEL C. BROWN, LTD	R3697	B-5	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
TOANO BUSINESS CENTER	AES CONSULTING ENGINEERS

SITE LOCATION
JAMES CITY COUNTY, VIRGINIA

CALIBRATED PENETROMETER TONS/FT.^{2}: 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ: 10 20 30 40 50+

STANDARD PENETRATION BLOWS/FT. ⊗: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
					SURFACE ELEVATION 100.00	
0					Silty Fine SAND, Trace Roots, Yellowish Brown and Tan, Moist, Medium Dense, (SM)	
					Silty Fine SAND, Yellowish Brown, Tan and Orange, Moist, Loose, (SM)	
5					Fine Sandy CLAY, Orange, Yellow and Gray, Moist, Medium Stiff, (CL)	95
10					Silty Fine to Medium SAND With Fat Clay Pockets, Yellowish Brown, Moist, Medium Dense, (SM)	90
					END OF BORING @ 9.5'	
15						85
20					DCP BLOW COUNTS (Blows per increment) (9-29) @ 24" (6-11-10) @ 36" (4-7-7) @ 48" (6-10-12) @ 60"	80
25						75
30						

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL DRY WS OR WD	BORING STARTED 7-9-97	TOPSOIL DEPTH: 6 INCHES
WL BCR ACR	BORING COMPLETED 7-9-97	CAVE IN DEPTH @ N/A
WL	RIG FOREMAN CHRIS H.	DRILLING METHOD HANDAUGER

OWNER	JOB #	BORING #	SHEET
MICHAEL C. BROWN, LTD	R3697	B-6	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
TOANO BUSINESS CENTER	AES CONSULTING ENGINEERS

SITE LOCATION
JAMES CITY COUNTY, VIRGINIA

CALIBRATED PENETROMETER TONS/FT.^{2}: 1, 2, 3, 4, 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

STANDARD PENETRATION BLOWS/FT.: 10, 20, 30, 40, 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
					SURFACE ELEVATION 101.00	
0					Silty Fine SAND, Trace Roots, Tannish Brown, Moist, Medium Dense, (SM)	100
					Fine to Medium Sandy CLAY, Brown and Tan, Moist, Medium Stiff, (CL)	
5					Silty Fine to Medium SAND, Yellowish Brown Brown Tan, Moist, Loose, (SM)	95
					Fine SAND With Silt, Yellow and Tan, Moist, Loose, (SP-SM)	
10					Clayey Fine to Coarse SAND, Gray, Moist, Loose, (SC)	90
					Silty Fine to Medium SAND With Fat Clay Pockets, Yellowish Brown and Tan, Moist, Loose, (SM)	
15					Silty Fine to Medium SAND, Yellowish Brown and Gray, Moist, Loose, (SM)	85
					END OF BORING @ 9.5'	
20						80
					DCP BLOW COUNTS (Blows per increment) (7-20) @ 24" (7-20) @ 36" (7-11-11) @ 48" (5-13-13) @ 60"	
25						75
30						

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL DRY WS OR WD	BORING STARTED 7-9-97	TOPSOIL DEPTH: 6 INCHES
WL BCR ACR	BORING COMPLETED 7-9-97	CAVE IN DEPTH @ N/A
WL	RIG FOREMAN CHRIS H.	DRILLING METHOD HANDAUGER

OWNER	JOB #	BORING #	SHEET
MICHAEL C. BROWN, LTD	R3697	B-7	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
TOANO BUSINESS CENTER	AES CONSULTING ENGINEERS

SITE LOCATION
JAMES CITY COUNTY, VIRGINIA

-O- CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

10 20 30 40 50+

⊗ STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
					SURFACE ELEVATION 96.00	
0					Silty Fine SAND, Trace Roots, Yellowish Brown, Moist, Very Loose, (SM)	95
5					Silty Fine to Medium SAND, Yellow and Tan, Moist, Loose, (SM)	
					Silty Fine to Medium SAND With Fat Clay Pockets, Yellowish Brown and Tan, Moist, Loose, (SM)	90
10					Silty Fine to Medium SAND With Fat Clay Pockets, Orangish Brown and Gray, Moist, Loose, (SM)	85
					END OF BORING @ 9.5'	
15						80
20					DCP BLOW COUNTS (Blows per increment) (4-6-6) @ 12" (4-5-5) @ 24" (3-6-9) @ 36"	75
25						70
30						

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL DRY WS OR WD	BORING STARTED 7-9-97	TOPSOIL DEPTH: 8 INCHES
WL BCR ACR	BORING COMPLETED 7-9-97	CAVE IN DEPTH @ N/A
WL	RIG FOREMAN CHRIS H.	DRILLING METHOD HANDAUGER

OWNER	JOB #	BORING #	SHEET
MICHAEL C. BROWN, LTD	R3697	B-8	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
TOANO BUSINESS CENTER	AES CONSULTING ENGINEERS

SITE LOCATION
JAMES CITY COUNTY, VIRGINIA

CALIBRATED PENETROMETER TONS/FT.^{2}: 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
					SURFACE ELEVATION 85.00	
0					Silty Fine to Medium SAND With Roots, Dark Brown, Wet to Moist, Very Loose, (SM)	
5					Silty Fine to Medium SAND, Brown, Moist to Wet, Very Loose, (SM-ALLUVIUM)	80
					Silty Fine to Medium SAND With Silt, Tan and Yellow, Wet, Very Loose, (SP-SM)	
10					Silty Fine to Medium SAND, Yellowish Brown, Wet, Very Loose, (SP-SM)	75
					Clayey Fine to Medium SAND, Tan and Yellow, Wet, Very Loose, (SC)	
15					END OF BORING @ 9.5'	70
20					DCP BLOW COUNTS (Blows per increment) (3-4-5) @ 12" (2-4-4) @ 24" (2-1-1) @ 36"	65
25						60
30						

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 3.0' WS OR WD	BORING STARTED 7-9-97	TOPSOIL DEPTH: 12 INCHES
WL BCR ACR	BORING COMPLETED 7-9-97	CAVE IN DEPTH @ N/A
WL	RIG FOREMAN CHRIS H.	DRILLING METHOD HANDAUGER

APPENDIX IV

TABLE I

SUMMARY OF LABORATORY TEST DATA

Engineering Consulting Services, Ltd.

Richmond, Virginia

Laboratory Testing Summary

Date: 7/3/97

Project Number: R3697 **Project Name:** Toano Business Center

Project Engineer: C.D.H. **Principal Engineer:** R.C.M. **Summary By:** T.W.T.

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	USC	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction		CBR Value	Other
									Maximum Density (pcf)	Optimum Moisture (%)		
	CBR-1	0.5-5.0	6.8	SM	*	*	*	34.6	114.1	15.0	29.2	
	CBR-2	0.5-5.0	9.6	CL	24	15	9	49.4	112.4	16.3	14.7	
B-2	3	2.0-3.0	13.3	CL	*	*	*	54.4	*	*	*	
B-5	4	4.5-5.5	23.7	CL	49	19	30	88.4	*	*	*	
B-6	5	4.0-5.0	10.5	SC	*	*	*	15.6	*	*	*	

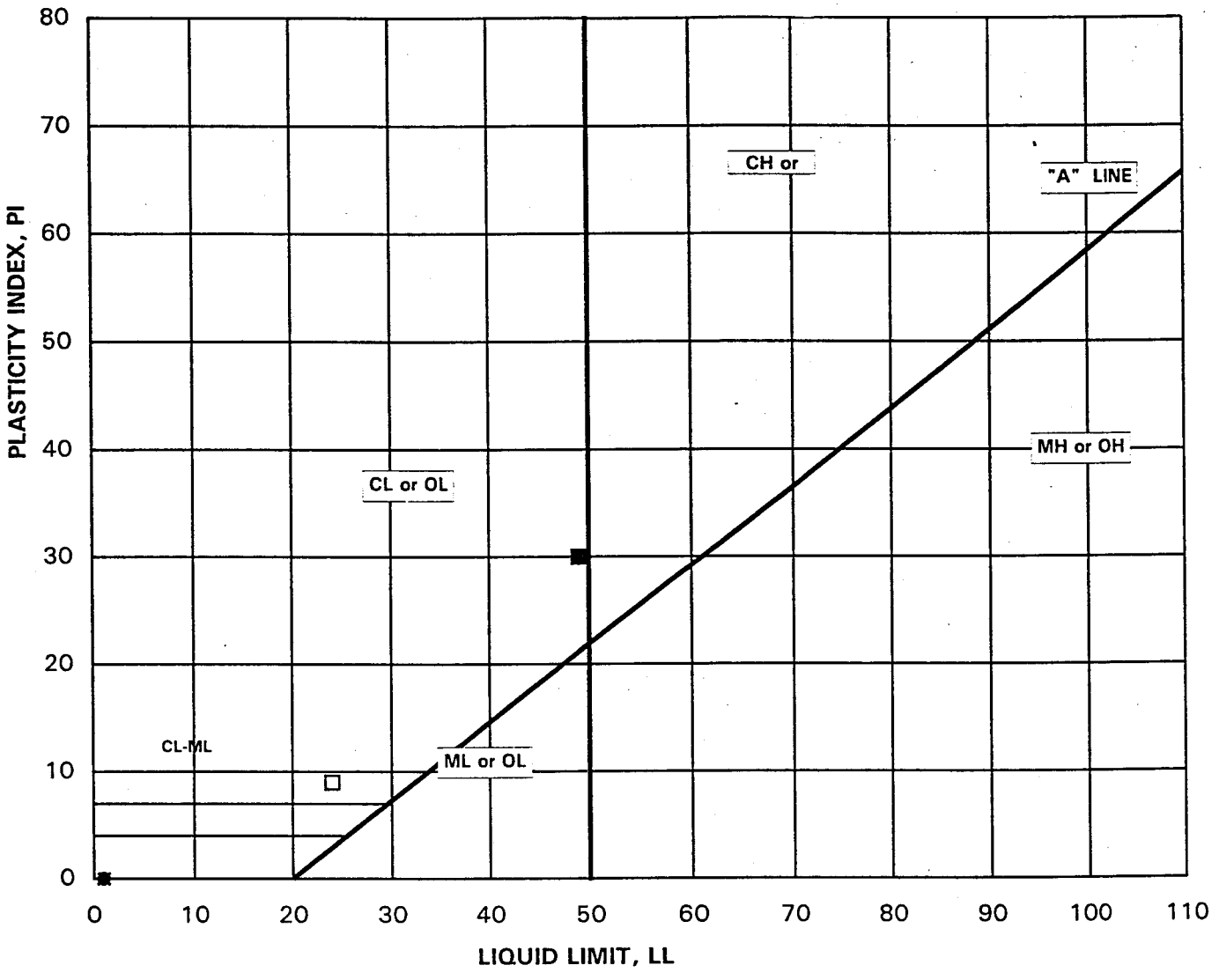
Summary Key:

V = Virginia Test Method
S = Standard Proctor
M = Modified Proctor

Hyd = Hydrometer
Con = Consolidation
DS = Direct Shear
GS = Specific Gravity

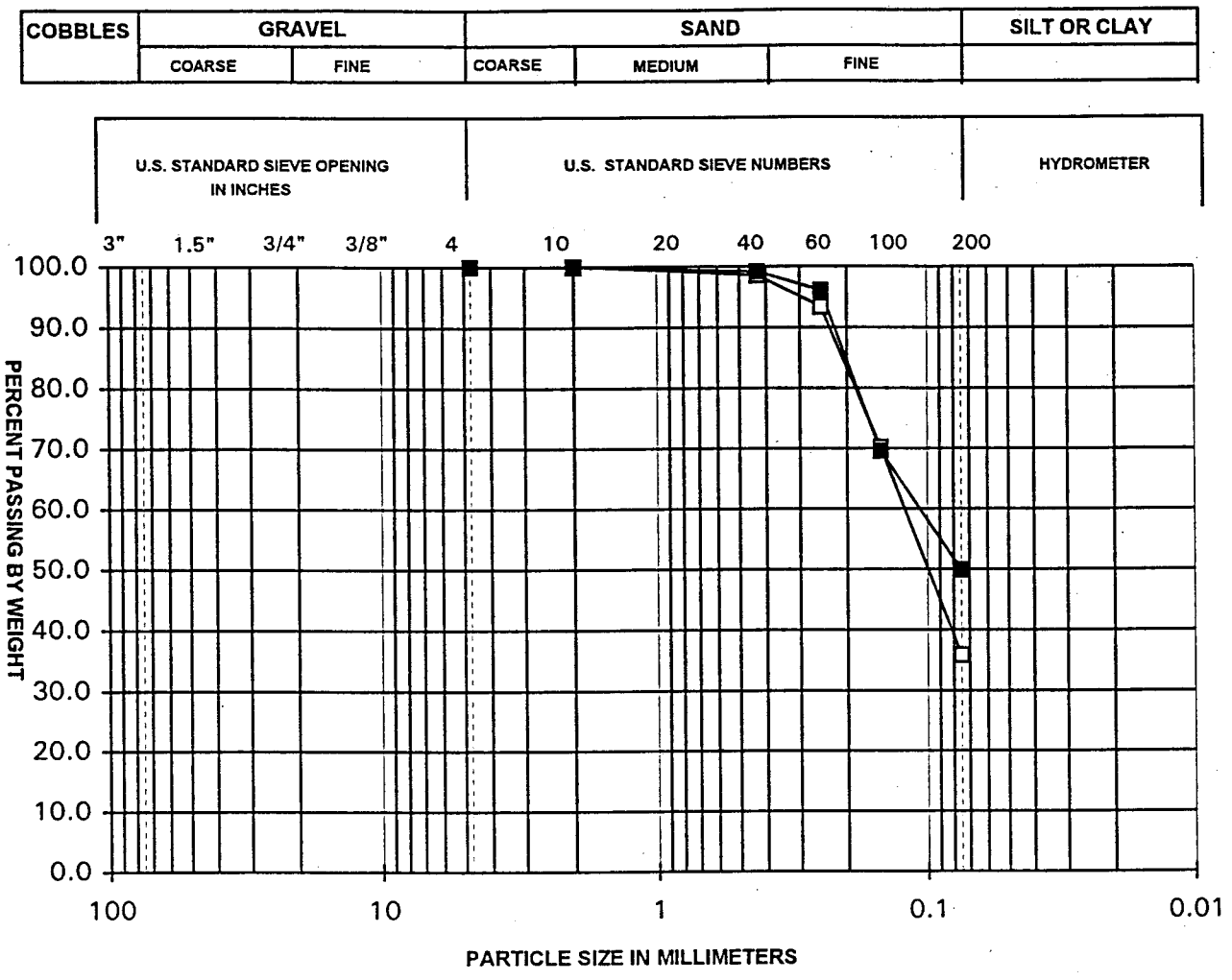
UCS = Unconfined Compression Soil
UCR = Unconfined Compression Rock
LS = Lime Stabilization
CS = Cement Staibilization

OC = Organic Content
SA = See Attached
NP = Non Plastic
* = Test Not Conducted



BORING/ SAMPLE No.	DEPTH (feet)	TEST SYMBOL	DESCRIPTION	WATER CONTENT (%)	LL	PL	PI
/ CBR-2	0.5 - 5.0	□	Lt. Brown Fine Sandy CLAY	9.6	24	15	9
B-5 / 4	4.5-5.5	■		23.7	49	19	30
/		△			-	-	-
/		▲			-	-	-
/		X			-	-	-
/		○			-	-	-
/		●			-	-	-
/		◇			-	-	-
/		◆			-	-	-
/		—			-	-	-
		X					

Project: Toano Business Center	**Engineering Consulting Services Ltd.**
Project No.: R3697	**Richmond, Virginia**
Date: Jul 3,1997	**Plasticity Chart**



Boring/ Sample No.	Depth (feet)	Symbol	LL	PI	Description
/ CBR 1	0.5-5.0	□	NA	NA	Tan Silty F-M Sand
/ CBR 2	0.5-5.0	■	24	9	Lt. Brown Fine Sandy CLAY
/		△			
/		▲			

Project: Toano Business Center
Project No.: R3697

Date: 7/3/97

Engineering Consulting Services, Ltd
Richmond, Virginia
Particle Size Distribution Curves

CBR BORING LOGS

Proposed Toano Business Center
James City County, Virginia

ECS Job No. R3697

CBR-1

0-10"	Topsoil
10-15"	Yellowish Brown, moist, Silty, fine SAND (SM), contains root fragments
15-24"	Orange and Yellow, moist, fine Sandy CLAY (CL)
24-60"	Yellow and Orange, moist, Silty, fine SAND (SM)
	Groundwater not encountered.

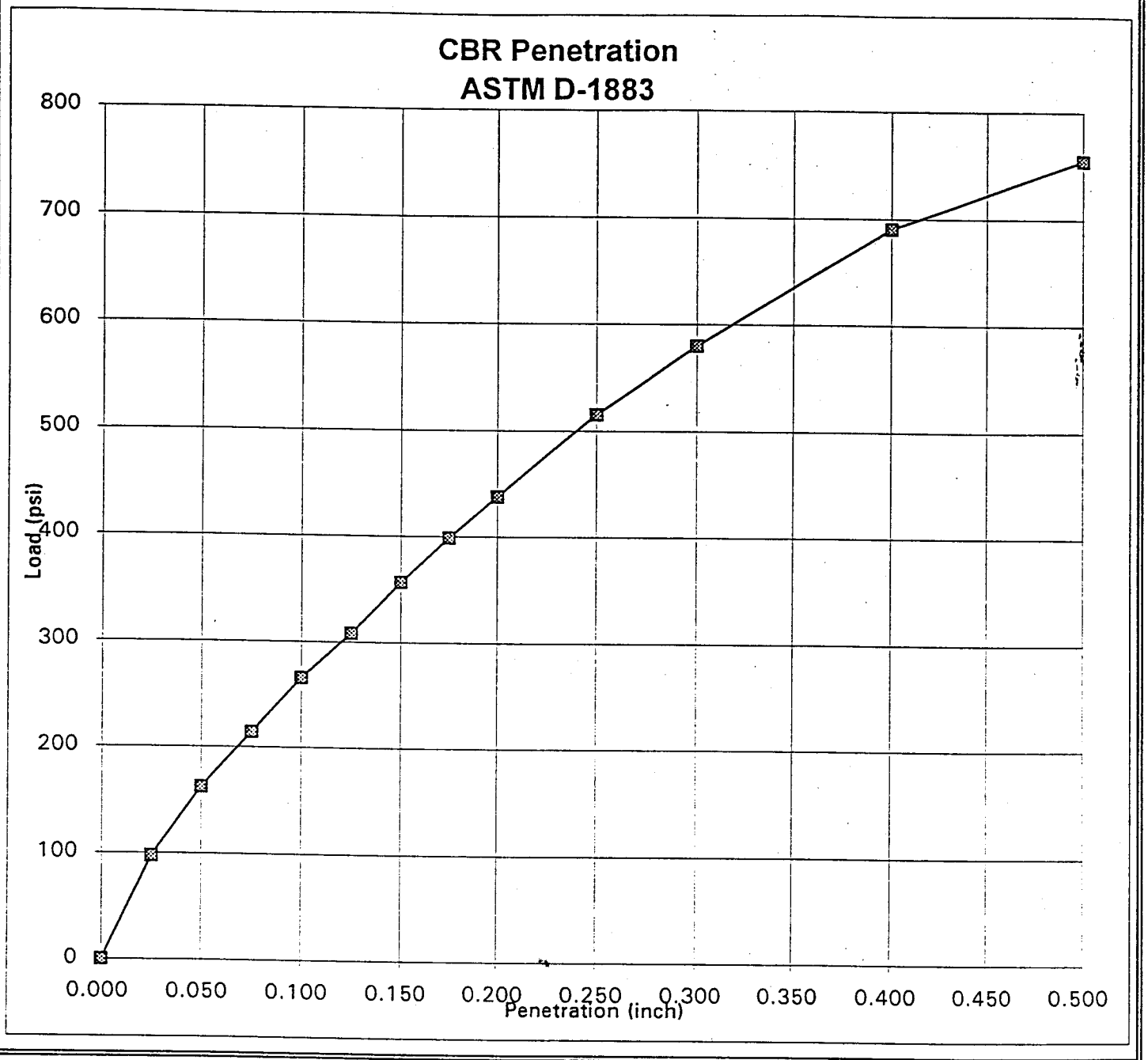
END OF BORING AT 60 INCHES

CBR-2

0-8"	Topsoil
8-15"	Gray and Tan, moist, Silty, fine SAND (SM), contains root fragments
15-24"	Yellow and Tan, moist, Silty, fine SAND (SM)
24-36"	Yellowish Brown, moist, Silty, fine SAND (SM)
36-48"	Yellow, Orange, and Tan, moist, fine Sandy CLAY (CL)
48-60"	Yellow, Orange, and Tan, moist, Silty, fine SAND (SM)
	Groundwater not encountered.

END OF BORING AT 60 INCHES

Note: Soils were classified in general accordance with ASTM D2488 (Description and Identification of Soils - Visual/Manual Procedures)

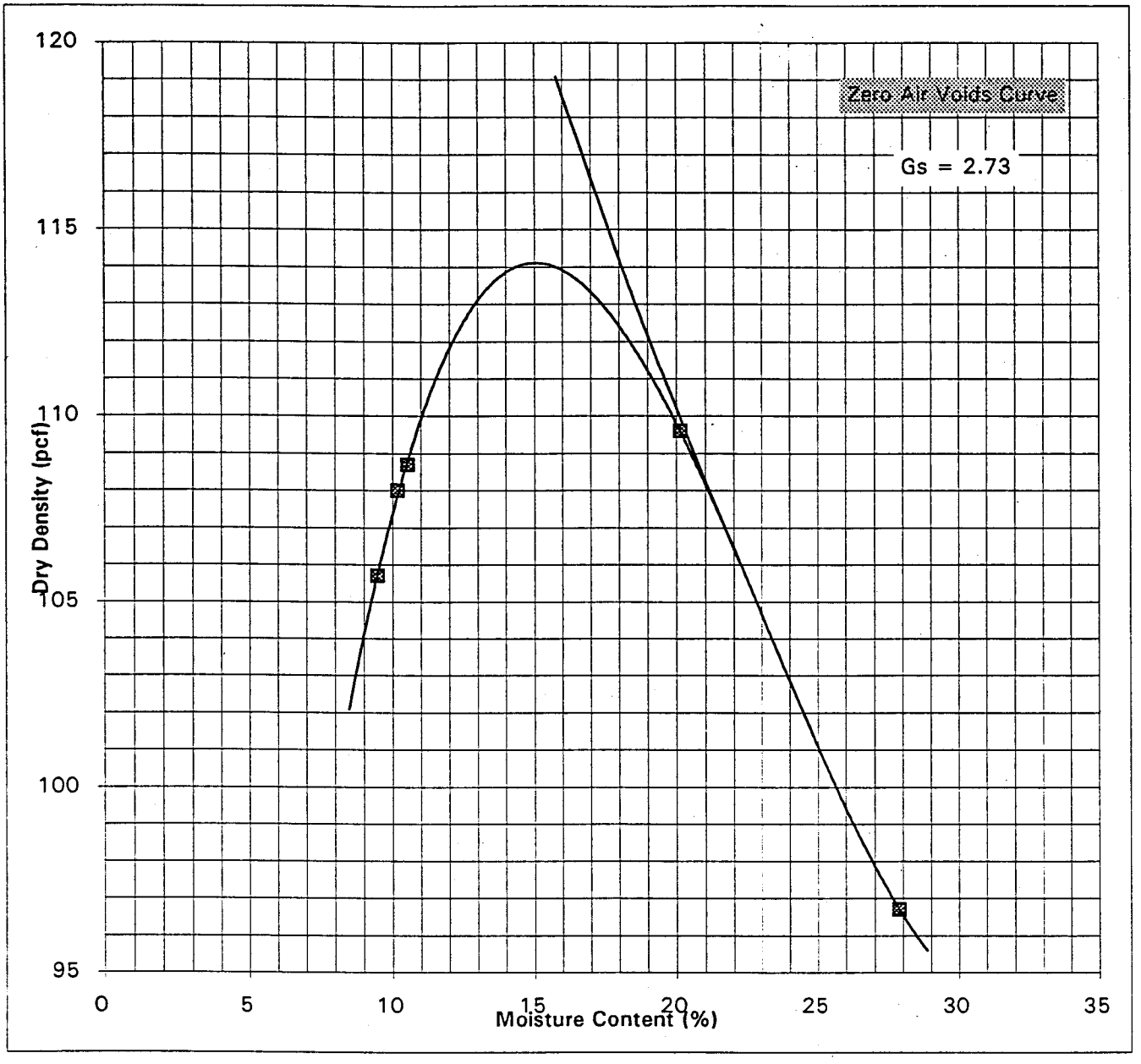


Sample No.:	CBR 1	Street:	NA
Description:	Tan Silty F-M SAND	Station No.:	NA
Classification:	SM	Remark:	

Maximum Dry Density (pcf)	114.1		CBR 1
Opt. Moisture Content (%)	15.0	Corrected CBR @ 0.1"	26.6
Natural Moisture Content	6.9	Corrected CBR @ 0.2"	29.2
Liquid Limit (LL)	NA		
Plastic Limit (PL)	NA	Dry Density as Molded	114.0
Plasticity Index (PI)	NA	Molded Moisture Content	14.5
Liquidity Index (LI)	NA	Percent of Maximum Density	99.9
Percent Retained 3/4" Sieve	NA	Moisture Content +/- Opt	-0.5
Percent Retained No. 4 Sieve	NA	Percent (%)Swell	0.4
Percent Passing No.200 Sieve	34.6		

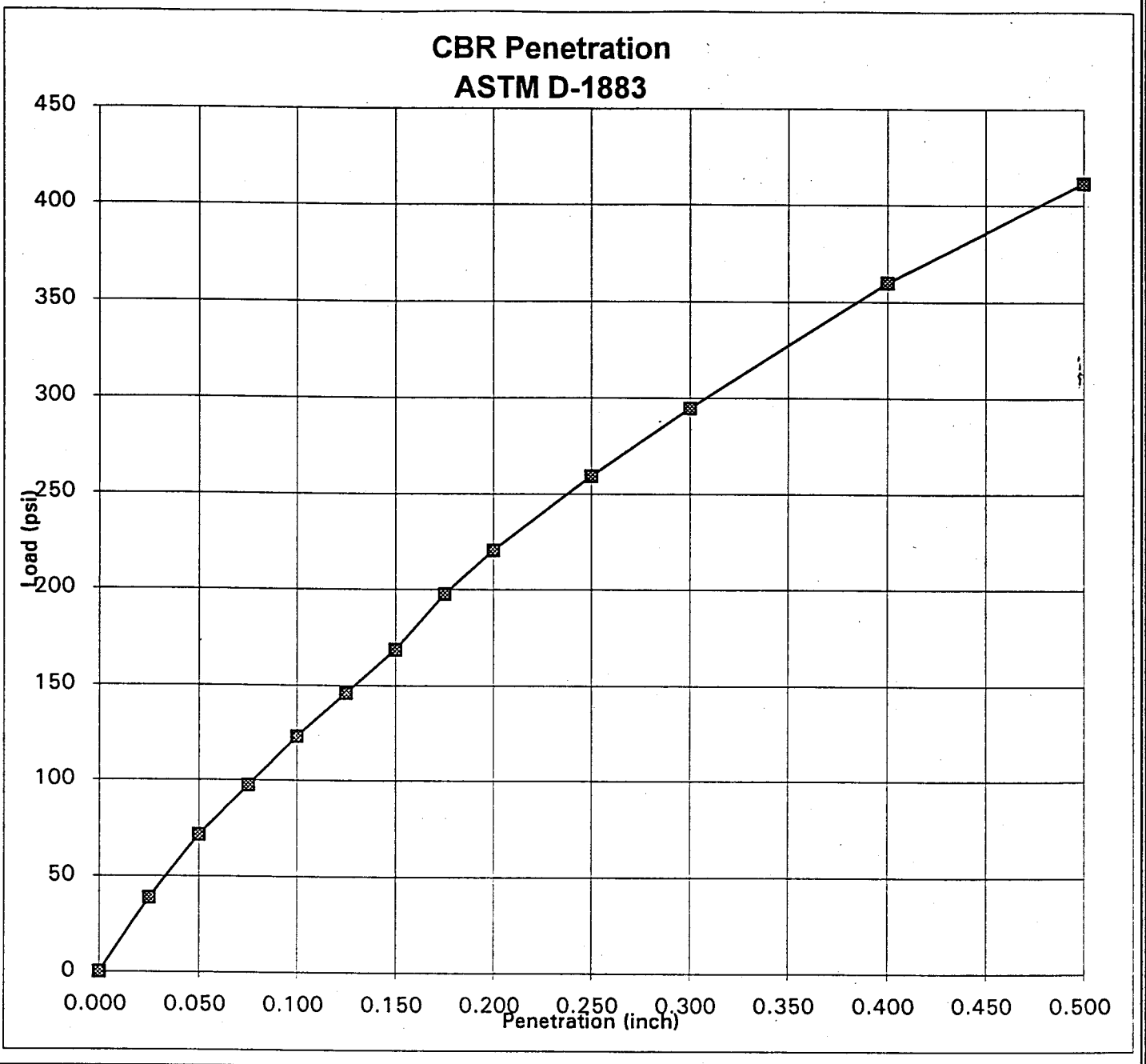
Project: Toano Business Center
Project No.: R3697
Date: 7/9/97

Engineering Consulting Services, Ltd.
Richmond, Virginia
California Bearing Ratio Curves



Sample No.	CBR-1	Natural Moisture Content	6.9
Street	NA	Percent Passing No. 200 Sieve	34.6
Station	NA	Percent Retained on No. 4 Sieve	NA
Liquid Limit (LL)	NA	Percent Retained on 3/4" Sieve	NA
Plastic Limit (PL)	NA	Maximum Dry Density (pcf)	114.1
Plasticity Index (PI)	NA	Optimum Moisture Content (%)	15.0
Liquidity Index (LI)	NA	Corr. Maximum Dry Density (pcf)	114.1
Description	Tan Silty F-M SAND	Corr. Optimum Moisture Content (%)	15.0
Classification	SM	Percent (%) Gravel as Tested	NA
Specific Gravity	2.73	Percent (%) Gravel Total	NA
Test Standard	ASTM D-698	Test Method	A

Project: Toano Business Center	**Engineering Consulting Services, Ltd**
Project No.: R3697	**Richmond, Virginia**
Date: 7/2/7	**Moisture Density Relationship Curve**

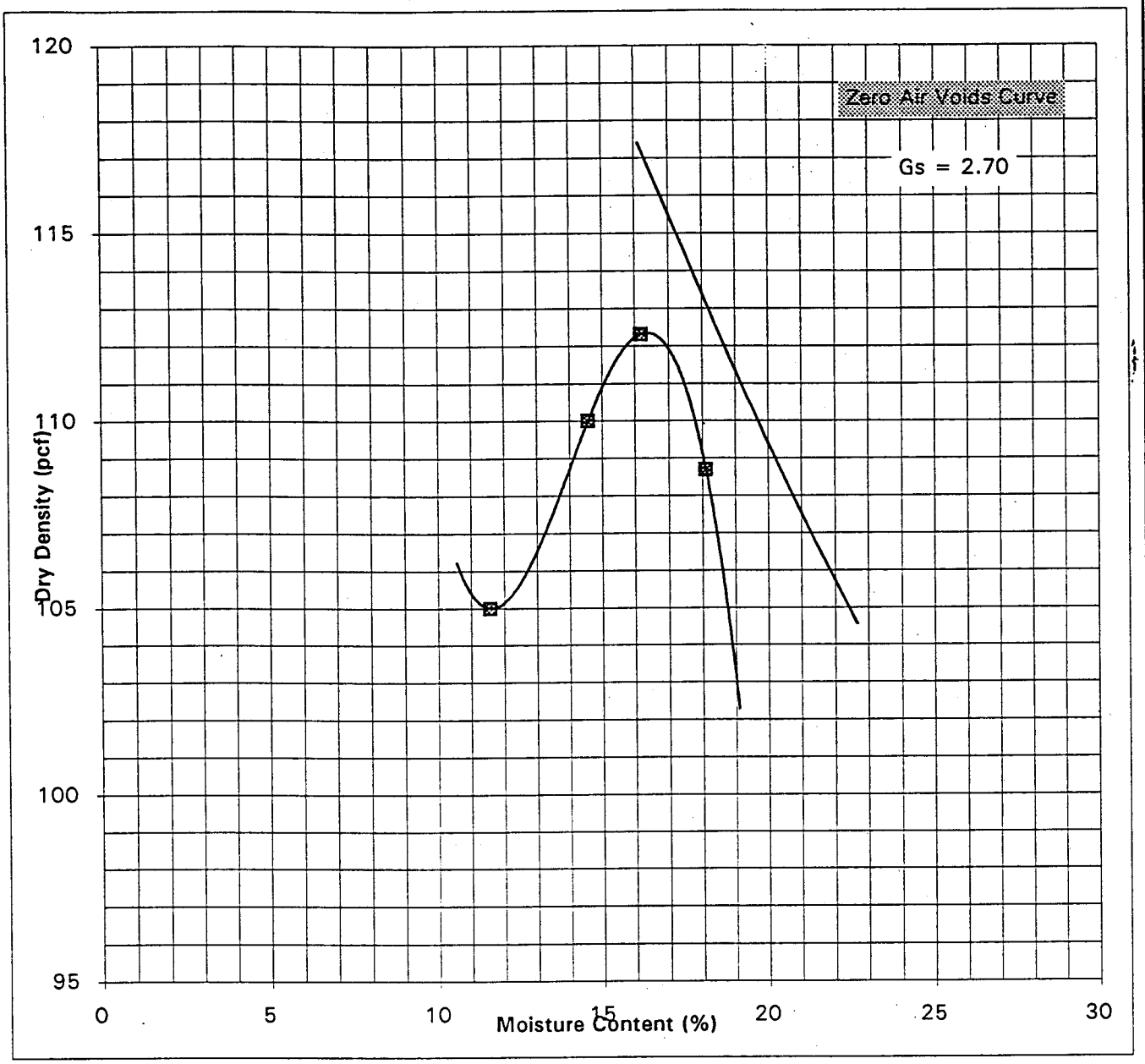


Sample No.:	CBR 2	Street:	NA
Description:	Light Brown Fine Sandy CLAY	Station No.:	NA
Classification:	CL	Remark:	

			CBR 2
Maximum Dry Density (pcf)	112.4		
Opt. Moisture Content (%)	16.3	Corrected CBR @ 0.1"	12.3
Natural Moisture Content	9.6	Corrected CBR @ 0.2"	14.7
Liquid Limit (LL)	24		
Plastic Limit (PL)	15	Dry Density as Molded	116.7
Plasticity Index (PI)	9	Molded Moisture Content	15.7
Liquidity Index (LI)	NA	Percent of Maximum Density	103.8
Percent Retained 3/4" Sieve	NA	Moisture Content +/- Opt	-0.6
Percent Retained No. 4 Sieve	NA	Percent (%)Swell	0.4
Percent Passing No.200 Sieve	49.4		

Project: Toano Business Center
Project No.: R3697
Date: 7/9/97

Engineering Consulting Services, Ltd.
Richmond, Virginia
California Bearing Ratio Curves



Sample No.	CBR-2	Natural Moisture Content	9.6
Street	NA	Percent Passing No. 200 Sieve	49.4
Station	NA	Percent Retained on No. 4 Sieve	NA
Liquid Limit (LL)	24	Percent Retained on 3/4" Sieve	NA
Plastic Limit (PL)	15	Maximum Dry Density (pcf)	112.4
Plasticity Index (PI)	9	Optimum Moisture Content (%)	16.3
Liquidity Index (LI)	NA	Corr. Maximum Dry Density (pcf)	112.4
Description	Lt. Brown Fine Sandy CLAY	Corr. Optimum Moisture Content (%)	16.3
Classification	CL	Percent (%) Gravel as Tested	NA
Specific Gravity	2.70	Percent (%) Gravel Total	NA
Test Standard	ASTM D-698	Test Method	A

Project: Toano Business Center	**Engineering Consulting Services, Ltd**
Project No.: R3697	**Richmond, Virginia**
Date: 7/3/97	**Moisture Density Relationship Curve**

AB FILE

DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
(757) 253-6671 Fax: (757) 253-6850 E-MAIL: devtman@james-city.va.us

CODE COMPLIANCE
(757) 253-6626
codecomp@james-city.va.us

ENVIRONMENTAL DIVISION
(757) 253-6670
environ@james-city.va.us

PLANNING
(757) 253-6685
planning@james-city.va.us

COUNTY ENGINEER
(757) 253-6678
INTEGRATED PEST MANAGEMENT
(757) 253-2620

April 14, 2003

Mr. Michael C. Brown
Michael C. Brown LTD
P.O. Box 188
Toano, Va. 23168

Re: Toano Business Center (8105 Richmond Road)
County Plan No. SP-14-98
County BMP ID Code: DC 013

Dear Mr. Brown:

The Environmental Division has reviewed a record drawing and construction testing information as submitted to our office on April 4th 2003. The record drawing provides as-built information for a dry detention BMP (BMP # 1) situated in the back of the property between Building Units 3 and 4.

There was also a second BMP facility proposed at the site. The second BMP was a 135 ft. long by 7 ft. deep underground infiltration facility situated along Richmond Road near the front parking area for Building 1. This BMP was proposed to be installed following completion of land-disturbing activities and stabilization of the site. Refer to Sheets 2, 2A and 11 of the approved plan for plans, details and sequence of construction associated with this BMP.

Based on our review of the project and a concurrent field inspection as performed on April 14th 2003, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facilities at the site and to proceed with closing out the project:

Construction Certification:

1. In accordance with the Note # 18 on Sheet 10 and Note # 4 and Construction Note # 1 on Sheet 11 of the approved plan, construction certifications were required for each of the BMP facilities. No construction certifications were provided. Although numerous field inspection logs and test reports were submitted for our review, none of the geotechnical documentation submitted appears to support certification of the BMP facilities. Documentation submitted includes Proctor test results, compaction for storm drains, building pad compaction, concrete cylinder tests, turning and driving lane soil and stone compaction tests and asphalt compaction tests. Most of these items are for site-related, not BMP related construction activities. Construction certification is especially important since the dry pond BMP has a 11 ft. high engineered and compacted earthen embankment and the infiltration basin is a subsurface facility.

Certification for each of the BMP's can be in letter format or by use of the certification statements in Section 4 of the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions*. A copy of these requirements are attached.

Record Drawing:

2. Along with the record drawing set, submit completed record drawing and construction certification forms, Sections 1 through 5, from the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions* (packet). The Environmental Division began use of the forms and checklists in this packet effective February 1st 2001.

3. The record drawing requires a certification statement. In addition, the professional seal on the record drawing set requires signature. Refer to pages 3 and 4 of the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions* (packet) for record drawing certification statements.

4. If constructed, provide asbuilt information for the VDOT Infiltration Trench BMP. In addition to the dry pond BMP, this was a second BMP as proposed onsite in order to achieve 10 BMP points for the site. The proposed infiltration trench BMP was to be a 135 ft. long subsurface stone trench with triple 48-inch diameter perforated underground storm pipes. The BMP is situated between Richmond Road and the parking area for Building 1. No asbuilt information was shown for the Infiltration Trench BMP as elevation and dimensional data on the record drawing set matches the approved design plan exactly.

5. Provide asbuilt spot elevation data to show that design top of dam elevation (El. 94.0) was achieved for dry detention basin BMP # 1.

6. If possible add the following County identifiers to the lower right hand corner of the record drawing: County Plan Number SP-14-98 and BMP ID Code: DC 013.

Construction - Related Items:

7. Remove silt fence from along the downstream (west) toe of the dam.

8. Based on field observations, it does not appear that the VDOT Infiltration Trench BMP was constructed on the site. This infiltration BMP was a proposed 135 ft. long subsurface stone trench with triple 48-inch diameter perforated underground storm pipes. The BMP is situated between Richmond Road and the parking area for Building 1. Provide documentation to substantiate construction per approved plan Sheets 2 and 11.

9. The facility is intended to be a dry-type detention practice. Based on our field observations, standing water approximately 5 ft. deep was present within the facility. This is indicative of improper conversion from a temporary sediment basin mode to BMP mode (ie. removal of the dewatering orifice) or clogging of the low flow water quality control orifice. The water quality (or BMP) control orifice intended for this structure is a 2-inch at Elevation 84. The basin must be properly converted to a BMP device prior to release of bond.

10. An excessive amount of large and small size trash (cardboard, cups, construction debris, paper, plastic, foam, insulation, tires, etc.) is situated within the interior side slopes and shoreline of the dry detention pond. This trash could pose a significant threat to the function of the principal spillway device. Clean and remove all trash from the interior of the BMP.

11. Clean and remove all trash and debris from within storm drainage structure SS # 2. This inlet is a curb-type inlet situated near the southeast corner of the basin.

12. The stormwater conveyance channel which enters into the basin at the northwest corner (near Building # 4) is extremely eroded and EC-3 matting was not installed per the approved plan. Regrade the channel and install matting per the approved plan.

13. Once drained, observe the locations of pipes which flow into the basin. Clean and remove any trash, debris or sediment from the pipe outfalls. Due to water depth in the pond, these outfalls were submerged and not visible for inspection. Pipe inflows consist of a 36-inch storm pipe which enters the southeast corner of the basin from storm inlet structure SS # 2 and a 24-inch storm pipe which enters the northeast corner of the basin from storm inlet structure SS # 8.

Once this work is satisfactorily completed, contact our office appropriately for reinspection. We can then proceed with final release of the surety and/or closing out the project. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed.

Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Jim Rudnicky at 757-259-4026 if you have any further comments or questions.

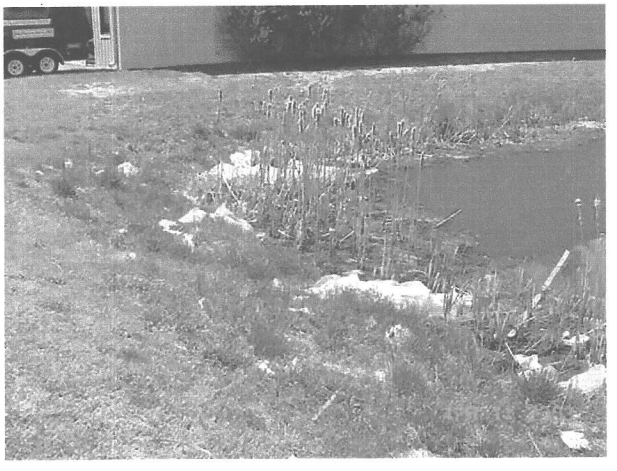
Sincerely,

Scott J. Thomas, P.E.
Civil Engineer
Environmental Division

Attachments
SJT/sjt

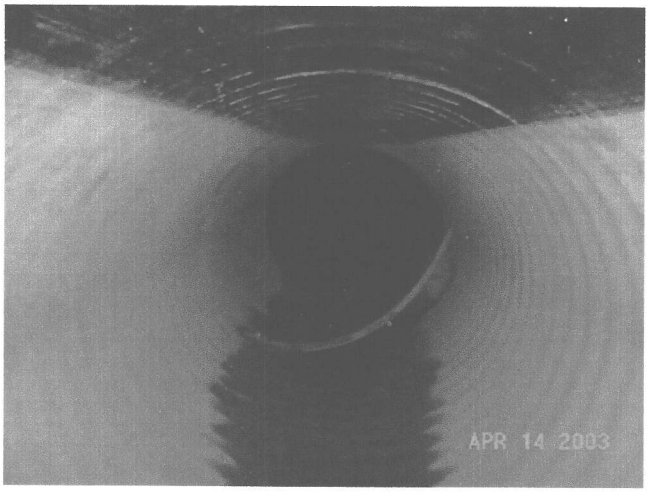
cc: Arch Marston, AES Consulting Engineers - via fax
J.H. Pruden, C.A. Barrs - via fax
Jim Rudnicky, JCC Environmental Division Inspector

G:\AsBuilts\SP1498.dc013



APR 14 2003

APR 14 2003


APR 14 2003

APR 14 2003

ENGINEERING CONSULTING SERVICES, LTD.
Geotechnical • Construction Materials • Environmental

May 28, 2004

Mr. Scott St. Claire
C.A. Barrs Contractors
PO Box 1489
Grafton, Virginia 23192

ECS Project No. 07:6914

Reference: BMP Dam Evaluation
Toano Business Center
James City County, Virginia

DC 013
SP-14-98

Dear Mr. St. Claire:

Engineering Consulting Services (ECS), Ltd. was requested to observe and evaluate the condition of the existing stormwater management pond dam constructed as a BMP facility for the above referenced project. Our records indicate the dam was constructed around 1998. Personnel with ECS, Ltd. provided limited earthwork observation and testing during the construction of the dam embankment.

Our site visits and the compaction testing of the embankment fill were provided on an on-call basis during construction. Please note that we were not requested to provide full-time construction monitoring services for this project. Our density tests indicated compaction of the fill material to at least 95 percent of the Standard Proctor maximum dry density per ASTM D698 at the elevations tested.

We understand the county is requiring a construction certification of the dam for final closure. Additionally, we understand the BMP was constructed as a temporary wet pond. However, the dam is being converted to its final intended design as a dry pond. Considering the limited testing that was performed on the dam during construction, we recommended hand auger borings be performed through the dam to evaluate the general consistency of the embankment soils.

Field Exploration Procedures and Subsurface Conditions

ECS, Ltd. personnel from our office conducted two hand auger probes within the central portions of the dam utilizing a 3-inch diameter bucket auger. The auger is screwed into the ground generally in 6-inch intervals and soil can be extracted for visual inspection. This method can not determine the exact consistency or density of in-place soils. It is used to determine the general soil types but can provide a relative determination of the consistency or density of in-place soils

108 Ingram Road, Unit 1 • Williamsburg, Virginia 23188 • (757) 229-6677 • Fax (757) 229-9978

Offices: Richmond, VA • Chesapeake, VA • Washington, D.C. • Williamsburg, VA • Roanoke, VA • Fredericksburg, VA • Danville, VA • Winchester, VA
Aberdeen, MD • Baltimore, MD • Frederick, MD • Research Triangle Park, NC • Wilmington, NC • Charlotte, NC • Greensboro, NC • Greenville, SC • Atlanta, GA

by the ease of which the auger turns and advances. The soil samples were classified on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS).

Presented below are the results of our hand auger probes:

Hand Auger 1:
0-39 inches: Fine to Medium Silty Sand (SM), Moist, Medium Dense, Red-Brown and Gray
39-51 inches: Fine Sandy Lean and Fat Clay (CL and CH), Moist, Medium Stiff, Red-Brown
51-72 inches: Fine to Medium Clayey Sand and Sandy Clay (SC-CL), Moist, Medium Stiff, Red-Brown

Hand Auger 2:
0-44 inches: Fine to Medium Silty Sand (SM), Moist, Medium Dense, Red-Brown and Gray
44-64 inches: Fine Sandy Lean and Fat Clay (CL and CH), Moist, Medium Stiff, Gray
64-72 inches: Fine to Medium Silty Clayey Sand (SM-SC), Moist, Medium Dense, Gray

Conclusions and Recommendations

Construction of the BMP facility was completed around 1998. ECS, Ltd. performed limited observation and testing during the construction of the dam embankment for this facility. We understand that little or no maintenance and repairs have been required since its completion in 1998 and that the BMP facility has been acting as a wet pond since its completion.

We observed heavy vegetation on the embankment slopes. At the time of this site visit on May 27, 2004 the dam appeared to be in generally good condition. However, as part of routine maintenance we recommend the embankment slopes be cut regularly.

Based on our initial (but limited) test data, our recent subsurface exploration and site observations, and also considering that the dam has remained in generally good condition since its construction, it is our professional opinion that the BMP embankment appears to have been constructed in accordance with acceptable construction practices. Also, although we encountered coarse-grained soils at the higher elevations of the dam embankment, we understand the facility is being converted to a dry pond storage basin. We believe this facility will function adequately for its final intended design purpose as a dry storage basin.

General Comments

This report has been prepared in order to aid in the evaluation of this stormwater management facility. The report scope is limited to the specific project and location described, and the project description represents our understanding of the significant aspects relevant to the embankment characteristics.

We appreciate being of continued service to you on this project. If you should have any questions regarding the information and recommendations contained in this report or if we can be of any further assistance, please contact our office.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.

COMMONWEALTH OF VIRGINIA
MICHAEL J. GALLI
No. 030084
PROFESSIONAL ENGINEER

Michael J. Galli, P.E.
Principal Engineer

Attachment: JCC Stormwater Management Construction Certification Form

Copy: JCC Environmental Division (Mr. Scott Thomas)

MJG/let/6914.doc

SJT FILE

DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
(757) 253-6671 Fax: (757) 253-6850 E-MAIL: devtman@james-city.va.us

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

April 14, 2003

Mr. Michael C. Brown
Michael C. Brown LTD
P.O. Box 188
Toano, Va. 23168

Reinspect 5/28/04

Re: Toano Business Center (8105 Richmond Road)
County Plan No. SP-14-98
County BMP ID Code: DC 013

Dear Mr. Brown:

The Environmental Division has reviewed a record drawing and construction testing information as submitted to our office on April 4th 2003. The record drawing provides as-built information for a dry detention BMP (BMP # 1) situated in the back of the property between Building Units 3 and 4.

There was also a second BMP facility proposed at the site. The second BMP was a 135 ft. long by 7 ft. deep underground infiltration facility situated along Richmond Road near the front parking area for Building 1. This BMP was proposed to be installed following completion of land-disturbing activities and stabilization of the site. Refer to Sheets 2, 2A and 11 of the approved plan for plans, details and sequence of construction associated with this BMP.

Based on our review of the project and a concurrent field inspection as performed on April 14th 2003, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facilities at the site and to proceed with closing out the project:

Construction Certification:

1. In accordance with the Note # 18 on Sheet 10 and Note # 4 and Construction Note # 1 on Sheet 11 of the approved plan, construction certifications were required for each of the BMP facilities. No construction certifications were provided. Although numerous field inspection logs and test reports were submitted for our review, none of the geotechnical documentation submitted appears to support certification of the BMP facilities. Documentation submitted includes Proctor test results, compaction for storm drains, building pad compaction, concrete cylinder tests, turning and driving lane soil and stone compaction tests and asphalt compaction tests. Most of these items are for site-related, not BMP related construction activities. Construction certification is especially important since the dry pond BMP has a 11 ft. high engineered and compacted earthen embankment and the infiltration basin is a subsurface facility.

Received June 4 2004

Michael C. Brown LTD
P.O. Box 1105
WMBG VA 23187-1105
(757) 566-3254

P.O. Box 188
Toano VA 23168

PARCEL

James City County Environmental Division
Stormwater Management / BMP Inspection Report
Detention and Retention Pond Facilities

SP-14-98
GPIN 1240100009

County BMP ID Code (if known): DC 013

Name of Facility: Toano Business Center BMP No.: 1 of 2 Date: 4/14/03

Location: 8105 Richmond Road (BACK OF SITE BETWEEN BLDG 3 & 4)

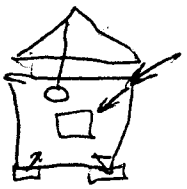
Name of Owner: MICHAEL BROWN LTD

Name of Inspector: SJ Thomas

Type of Facility: Dry Pond

Weather Conditions: Sunny, Hot, 70's Type: ☑ Final Inspection ☐ County BMP Inspection Program ☐ Owner Inspection

N



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 Embank; 3H:1V D/S; 2H:1V U/S; 10' WIDE TOP
Grass Height	✓			Mostly grass
Vegetation Condition	✓			Cut to 6" height.
Tree Growth	✓			None. Some along toe.
Erosion	✓			None
Trash & Debris	✓			None
Seepage	✓			None Observed
Fencing or Benches				Remove SF D/S toe
Interior Landscaping/Planted Areas:	☑ None	☐ Constructed Wetland/Shallow Marsh	☐ Naturally Established Vegetation	
Vegetated Conditions				Wet pool present.
Trash & Debris				Design is dry pond.
Floating Material				
Erosion				
Sediment				
Dead Plant				
Aesthetics				
Other				
Notes: Services Building, Driveway & Parking Area onsite; offsite.				

Facility Item	O.K.	Routine	Urgent	Comments
Water Pools: ☒ Permanent Pool (Retention Basin) ☐ Shallow Marsh (Detention Basin) ☐ None, Dry (Detention Basin)				
Shoreline Erosion	✓			
Algae	✓			Algae along shore. 10' WIDE
Trash & Debris			✓	Severe trash problem.
Sediment	✓			
Aesthetics		✓		Trash
Other				5' deep wet pool. Convert
Inflows (Describe Types/Locations): (1) Channel NW Corner; (2) 24" pipe NE corn; 36" pipe SE corner				
Condition of Structure				pipe 2 & 3 submerged. Can't see.
Erosion				(1) channel Eroded, NEED EC-3
Trash and Debris			✓	Inlet SS#2 needs cleaned
Sediment				
Outlet Protection				
Other				
Principal Flow Control Structure - Riser, Intake, etc. (Describe Type):				
Condition of Structure				
Corrosion				
Trash and Debris				
Sediment				
Vegetation				
Other				
Principal Outlet Structure - Barrel, Conduit, etc.: 30" CMP				
Condition of Structure	✓			Some Rust, corrosion
Settlement	✓			
Trash & Debris	✓			Some, Unobstructive
Erosion/Sediment	✓			
Outlet Protection	✓			Class I RR; 20' L x 15' WIDE
Other				
Emergency Spillway (Overflow): Cone-Lined; 10' BW; 3:1 IN SS; 2' depth				
Vegetation	✓			Some Weeds
Lining	✓			
Erosion	✓			
Trash & Debris	✓			
Other	✓			
Notes:				

Facility Item	O.K.	Routine	Urgent	Comments
Nuisance Type Conditions:				
Mosquito Breeding	✓			None observed. High Risk due to trash.
Animal Burrows	✓			
Graffiti				
Other				
Surrounding Perimeter Conditions: West Wooded; North-Bldg; South Bldg; East Road				
Land Uses	✓			Warehouse
Vegetation	✓			Grass + Parking
Trash & Debris			✓	Severe!
Aesthetics			✓	Trash
Access /Maintenance Roads or Paths	✓			Easy Richmond Road to driveway to BMP
Other				

Remarks:

- Remove SF along D/S toe of dam.
- Clean trash from interior slopes & shoreline. Severe problem. Could float + obstruct principal spillway
- 5' deep wet pool. Supposed to be dry. Convert to final BMP Mode or unclog Low flow orifice
- INFLOW #1 = channel sev. eroded; regrade + apply EC-3 per plan.
- Clean trash + debris (SS#2) from inlet # SS 2
- Once drained clean outfall end of inflow pipes of debris.

Overall Environmental Division Internal Rating: 2 Trash, Wet pool

Signature: Scott J. Thomas P.E. **Date:** 4/14/03

Title: Civil Engineer Env Div

SWMProg\BMP\CoInspProg\DetRet.wpd

SURETY REQUEST FORM

Project Name: Toano Business Center SP-14-98

Requested By: Michael Brown

Phone Number: 566-8900

Date Requested: 6/14/04

Date Completed & Requester Notified: _____

Action Requested

☐ Subdivision Surety — Calculate ☐ Reduce ☐ Release ☐

Checklist

☐ JCSA $ _____
☐ Streetlights / Street Signs _____
☐ Street Dedication / VDOT _____

Surety Amount Needed $ _____

Comments _____

☐ Erosion Control Surety — Calculate ☐ Reduce ☐ Release ☒

Checklist Two onsite BMPs
Dry Pond DC03; INFIL Trench DC015

☐ BMP Certification / Record Drawings After long process, all asbuilt, construction cert, + field-related items complete. INFIL Trench asbuilt only. OK to release 100% of bond for BMP.

Surety Amount Needed $ _____

Comments _____

INDICATE YOUR APPROVAL BY INITIALING THE APPROPRIATE BLANK:

INSP. _____ DEC _____ ST SJT 6-14-04 PTM _____

Date Record Created:

Created By:

WS_BMPNO: DC013

Print Form

PRINTED ON:
Monday, March 15, 2010
12:36:50 PM

WATERSHED	DC
BMP ID NO	013
PLAN NO	SP-14-98
TAX PARCEL	(12-4)(1-9)
PIN NO	1240100009
CONSTRUCTION DATE	6/1/1998
PROJECT NAME	Toano Business Center BMP # 1
FACILITY LOCATION	8105 Richmond Road
CITY-STATE	Williamsburg, Va. 23168
CURRENT OWNER	Michael C. Brown LTD
OWNER ADDRESS	P.O. Box 188
OWNER ADDRESS 2	
CITY-STATE-ZIP CODE	Toano, Va. 23168
OWNER PHONE	566-8900
MAINT AGREEMENT	Yes
EMERG ACTION PLAN	No

Get Last BMP No

Return to Menu

MAINTENANCE PLAN	No	CTRL STRUC DESC	Alum Riser P
SITE AREA acre	7.27	CTRL STRUC SIZE inches	48
LAND USE	Office/Warehouse	OTLT BARRL DESC	Alum Barrel
old BMP TYP	Dry Pond	OTLT BARRL SIZE inch	30
JCC BMP CODE	F2 Dry ED with forebay		
POINT VALUE	6	EMERG SPILLWAY	Yes
		DESIGN HW ELEV	92.98
		PERM POOL ELEV	na
SVC DRAIN AREA acres	11.79	2-YR OUTFLOW cfs	32.13
		10-YR OUTFLOW cfs	
		REC DRAWING	Yes
SERVICE AREA DESCRI	Building, Parking and Offsite area		
IMPERV AREA acres	4.93	CONSTR CERTIF	No
RECV STREAM	UT of Diascund Creek		
EXT DET-WQ-CTRL	Yes	LAST INSP DATE	4/14/2003
WTR QUAL VOL acre-ft	0.539	INTERNAL RATING	
CHAN PROT CTRL	No		
CHAN PROT VOL acre-ft	0	MISC/COMMENTS	
SW/FLOOD CONTROL	Yes	Design 3 Dry Pond. WQ 1" storm detained for 24 hrs. 2" LF orif.	
GEOTECH REPORT	Yes		

Inspected by:

Additional Comments:

All these test reports & logs do not pertain at all to any of the onsite BMPs. Do not support BMP certifications.

INCLUDED IN THIS PACKET:

- Building SLAB PAD Compaction
- Conc. cylinder tests
- turn lane compaction
- Drive lane compaction
- Stone compaction (turn lanes
- BM 3 asphalt compaction
- Proctor Agg base for Parkloto Dones

Need CC!

Proctor Results
and storm drain
pipe near BMP.

No apparent test reports
or logs for BMP work.

Does not support CC for
BMPs.

Need CC!

Record Drawing / Construction Certification Submittal for a BMP

Date: 4/4/03

Inspector:
- ☑ Pat Menichino
- ☐ Joe Buchite
- ☐ Beth Davis
- ☐ Gerry Lewis
- ☐ Jim Rudnicky
- ☐ Other: _____

TALK TO DARRYL
Arch thinks it went in!!

Project: Toano Business Center
BMP Facility: Dry Pond BMP
Plan No.: SP-14-98
Assigned County BMP ID Code: DC 013

I have received a transmittal for a ☑ Record Drawing and ☐ Construction Certification for the above referenced facility on 4/4/03. 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 may make comment in the following areas: Inspection/Maintenance agreement, Record Drawings (RD), Construction Certification (CC) and Construction-Related (CR) field items as it pertains to the BMP. If you have any other related non-BMP site issues such as site erosion, stabilization, removal of erosion & sediment controls, etc. that are not related to the BMP, you must proceed with closing out these items on your own accord. If needed, I can easily add these items to any comment letter that I may generate the Owner/Engineer for the BMP. Let me know if I need to add items for site issues to my process.

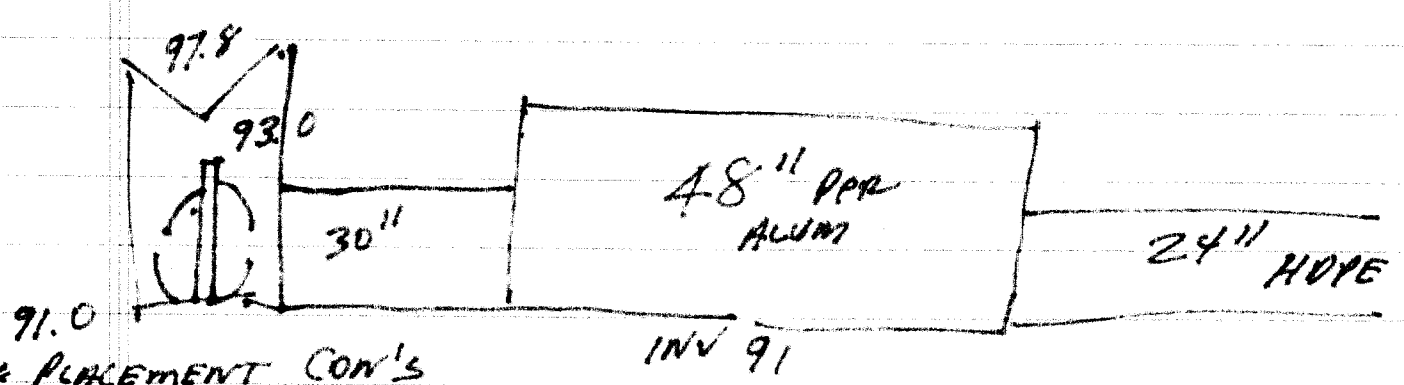
Scott

AsBuilts\Admin\z-inspector

WAS the 2ND onsite BMP, an underground infiltration trench built?

INFIL Trench

DA = 11.92 AC
Design DA = 7.75 AC
DRY POND = 4.70 PTS
VOOT INFIL = 7.87 PTS



* PLACEMENT CON'S

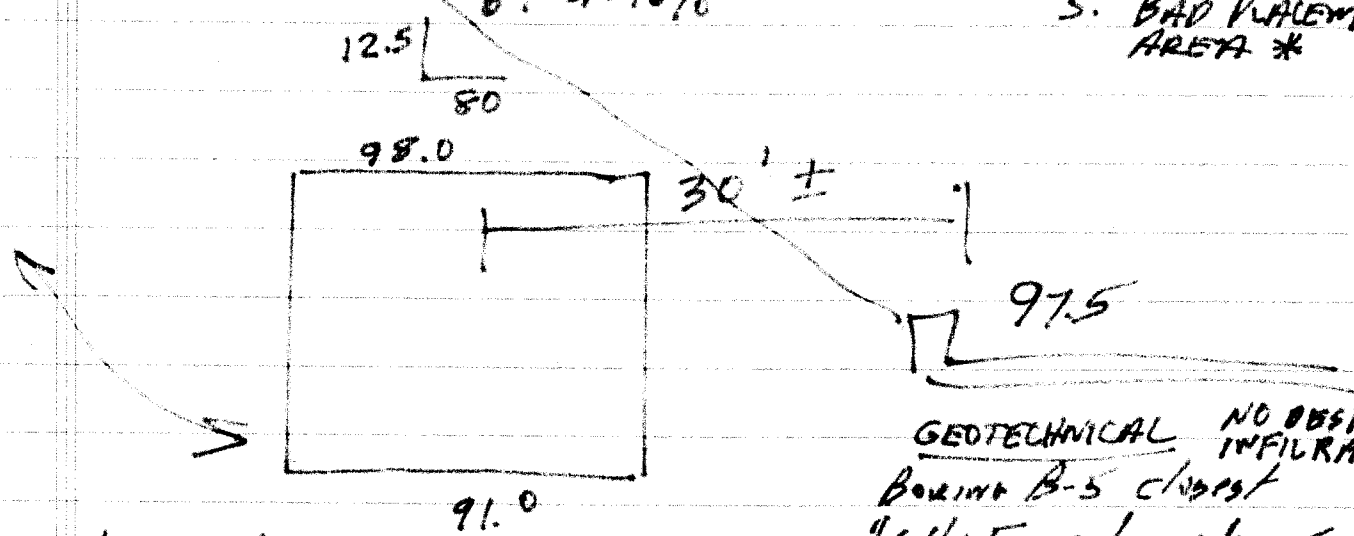
- ON-LINE FACILITY
- SPILL, (RICHMOND ROAD) GW CONTAM. HOT SPOT.
- PROXIMITY TO RICHMOND ROAD
- MAINTENANCE — COMM. SITE

RICHMOND ROAD 110

- After the FACT
- ~~FACT~~ Use as a tool to focus on dry pond, site issues.

1. NO Design INFIL RATE
2. SOC — after site IS STABIL
3. NOT PUT IN?
4. NO GEOT DATA
5. BAD PLACEMENT AREA *

CUT SLOPE
6:1 or 16%



GEOTECHNICAL NO DESIGN INFILRATE
Boring B-5 closest
"silty Fine to medium Sand with FAT Clay pockets

UNDERLYING SOILS
29 B SOILS
C SOILS

Scott Thomas

From: Scott Thomas
Sent: Friday, April 02, 2004 5:42 PM
To: Darryl Cook
Cc: Pat Menichino; Jim Rudnicky
Subject: RE: Toano Business Center

County BMP ID Code: DC 013
Plan No. SP-14-98

I had a message from Arch and talked to him today also. The record drawings are now ok. The two hold ups were needing a construction certification and to finish field-related items for the onsite dry pond BMP. I issued a letter on this project on April 14th 2003 listing the deficiencies on the CC, AB and CR (field) BMP items. For the two outstanding items, construction certifications were clearly needed for the BMPs on this project, even though it may have been built "5" years ago. The plan was approved in 1998. The approved plan has notes all over it for the need for CC including:

Note # 18 on Sheet 10
Note # 4 on Sheet 11
Construction Note # 1 on Sheet 11

For the field-related items, there were 6 items that needed addressed. During my inspection on April 14th 2003, the dry pond BMP up there was a mess. The basin was not converted yet and there was trash everywhere. I had an onsite meeting with Arch and the contractor some time ago and they were clear what items were needed to be done to bring this to resolution. Nobody has yet to inform me that the field-related items were completed to do a reinspection.

My letter to Michael Brown dated April 14th 2003 is attached. Also, I've attached some photographs showing you what I mean about the trash in the inlets and the BMP. I will not follow up with him as Arch Marston said that he would.

(I have done everything that is required from our end. It is in their court to finish this up. It has been almost a year now.)

Scott J. Thomas, P.E.
James City County
Environmental Division