Stormwater Division

MEMORANDUM

Date: March 29, 2012

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

From: Leah Hardenbergh

PO: 110426

Re: Files Approved for Scanning

General File ID or BMP ID:	**MC035**
PIN:	**4710100026**
Owner Name (if known):	**BRADY JEANETTE DESCENDANTS TRUST**
Legal Property Description:	**J B WOODCOCK**
Site Address:	**3356 IRONBOUND ROAD**

(For internal use only):

Box # 14

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

MC-035

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

1.

Maintenance agreement

DEED OF EASEMENT

THIS DEED OF EASEMENT, made this 4th day of May, 1998, by and between **THOMAS R. O'ROURK and MARIA DIGGES O'ROURK**, O'malley ~~husband~~ and daughter ~~wife~~, hereinafter referred to as "Grantor"; and **JEANETTE BRADY, AS TRUSTEE OF THE JEANETTE BRADY DESCENDANT'S TRUST**, hereinafter referred to as "Grantee".

Her

WITNESSETH: That for and in consideration of the sum of ONE DOLLAR ($1.00) and other valuable consideration, cash in hand paid by the Grantee to the Grantor, the receipt of which is hereby acknowledged, the Grantor does hereby grant and convey unto the Grantee the following rights and privileges with regard to the following described property, to-wit:

> The perpetual, non-exclusive right and privilege to construct, lay, maintain, repair, inspect, improve, replace and alter, and at will remove within the easements hereinafter described, works, systems and pipes for the transmission of stormwater, under property of the Grantor described below, as may be deemed proper by the Grantee.
>
> That certain lot, piece or parcel of land lying and situate in James City County, Virginia, shown and designated as "20' DRAINAGE EASEMENT" on that certain plat entitled "EASEMENT PLAT SHOWING A 20' DRAINAGE EASEMENT ACROSS THOMAS R. O'ROURK and MARIA DIGGES O'ROURK JAMES CITY COUNTY, VIRGINIA" dated 4/9/98, consisting of one sheet and made by HIS Land Surveying Inc., Providence Forge, Virginia, which plat is to be recorded herewith for a more complete description of the property herein conveyed, together with a temporary construction easement 10' in width located on either side of the permanent easement granted above.

Grantee covenants to use reasonable care to protect Grantor's property located outside the easements herein granted from damage resulting from the exercise by Grantee of the rights herein granted, and except for loss or damage resulting from an act of God or other occurrence beyond Grantee's control, Grantee shall promptly repair any such damage to property of Grantor located outside the easements herein granted from damage resulting from the exercise by Grantee of the rights herein granted.

Grantee covenants to restore Grantor's property within the easements herein granted to as near the same condition as existed prior to the exercise of Grantee's rights hereunder as is reasonably possible.

Grantor shall have no right, title, interest, estate or claim in or to any equipment, piping or accessories installed within the easements herein granted.

The easement granted hereby shall be appurtenant to the land of Grantee described on Exhibit A hereto attached. The terms and conditions hereof shall bind and inure to the benefit of the parties hereto and their successors and assigns.

WITNESS the following signatures and seal:

[SEAL]
THOMAS R. O'ROURK

[SEAL]
MARIA DIGGES O'ROURK

STATE OF VIRGINIA

~~CITY~~/COUNTY OF James City, to-wit:

The foregoing Deed of Easement was acknowledged before me by Thomas R. O' Rourk and Maria Digges O' Rourk, ~~husband~~ and ~~wife.~~ O'malley, father and daughter.

Gloria M. Judah

NOTARY PUBLIC

My commission expires on : August 31, 2000

PREPARED BY AND RETURN TO:
VERNON M. GEDDY, III, ESQUIRE
GEDDY, HARRIS & GEDDY
516 SOUTH HENRY STREET
WILLIAMSBURG, VA 23183

2.

Completed construction certification

3.

As-built plan

OAK TREE OFFICE PARK
AND AIRTIGHT SELF STORAGE

FEBUARY 24,1998

FEB 1999
RECEIVED
PLANNING DEPARTMENT

COUNTY OF JAMES CITY
FINAL SITE PLAN

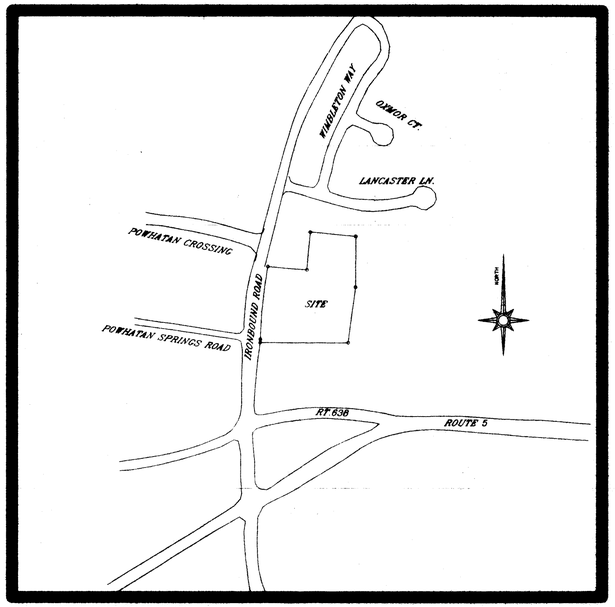
APPROVALS		DATE
Fire Dept		
Health Dept		
VDOT		
Planning		
Environ		
Zoning Adm.		
JCSA		
County Eng.		
REA		
Other		

SP-21-99

LAND USE SUMMARY:
GROSS SITE AREA=5.674 ACRES
DISTURBED AREA= 4.47 ACRES
EXISTING ZONING: B-1
PROPOSED USE: OFFICE PARK AND MINI- STORAGE
SITE COVERAGE BY BUILDINGS: 1.26 ACRES
PERCENT OF COVERAGE BY BUILDINGS: 24%
OPEN SPACE : 2.62 ACRES

BUILDING DATA:
TOTAL FLOOR OF OFFICE PARK: 12000 S.F.
TOTAL FLOOR SPACE MINI-STORAGE: 68600 S.F.
FLOOR SPACE RATIO: 0.33

PROPOSED FLOORS IN OFFICE PARK 1 1/2
PROPOSED FLOORS IN MINI-STORAGE: 1STORY AND 2 STORY
PROPOSED CONSTRUCTION OF OFFICE BUILDINGS: BRICK AND FRAME
PROPOSED CONSTRUCTION OF MINI-STORAGE : METAL BUILDINGS
FIRST FLOOR = 40000
SECOND FLOOR= 22550
PARKING REQUIREMENTS:
USE CATEGORY: CATEGORY 8
PARKING REQUIRED: 1 SPACE PER 250 S.F. OF FLOOR SPACE =48 SPACES
HANDICAPPED SPACES REQUIRED 3 SPACES
HANDICAPPED SPACES PROVIDED 4 SPACES
SPACES PROVIDED 59 SPACES
B-1 DISTRICT REGULATIONS:
MINIMUM SETBACKS:
FRONT:50'
SIDE:50'
REAR:20'
~~MAXIMUM~~ BUILDING HGT.: 60'
BUILDING HGT.:
OFFICE BUILDING:30'
ONE STORY SELF STORAGE:13'
TWO STORY SELF STORAGE:25'
PROPERTY IS TAX PARCEL 47-1-1-26
ALL NEW SIGNS SHALL BE IN ACCORDANCE WITH ARTICLE II. DIVISION 3 OF JAMES CITY COUNTY ZONING ORDINANCE.
ALL NEW UTILITIES WILL BE UNDERGROUND
THE VERTICAL DATUM IS TIED TO J.C.C. MONUMENTATION



VICINITY MAP SCALE:1"=400'

THIS IS A SITE PLAN AMENDMENT TO SP-23-98. THE PURPOSE OF THE AMENDMENT IS TO SHOW A REVISED BUILDING FOOTPRINT FOR MINI-STORAGE BUILDING "C". NO OTHER CHANGES WERE MADE.

SHEET INDEX:

1 TITLE SHEET
2. EXISTING CONDITIONS
3. SITE, GRADING, AND UTILITIES PLAN
4. EROSION AND SEDIMENT CONTROL PLAN
5. STORM WATER MANAGMENT PLAN AND DETAILS.
6. STORM SEWER PROFILES AND STORM SEWER DETAILS
7. SANITARY SEWER PROFILES AND E AND S DETAILS
8. LANDSCAPE AND LIGHTING PLAN
9. DRAINAGE AREA PLAN
10. DETAILS
11 IRONBOUND ROAD WIDENING

REVISIONS: 5/12/98
5/16/98
5/19/98
6/6/98
6/25/98
2/9/99

COMMONWEALTH OF VIRGINIA
DEAN E. RAYNES
REG # NO.
1633
LAND SURVEYOR

NOTE: THESE PLANS WERE PREPARED BY DEAN E. RAYNES 3-A SURVEYOR. ALL DRAINAGE DESIGN AND STORM WATER MANAGEMENT WAS REVIEWED BY JAMES MITCHELL 3-B SURVEYOR. ALL DRAINAGE CALCULATION AND STORM WATER MANAGEMENT WERE DONE BY JAMES MITCHELL AND WERE SUBMITTED TO JAMES CITY COUNTY ENVIRONMENTAL DIVISION . SAID CALCULATIONS WERE SIGNED AND SEALED BY JAMES MITCHELL.

PREPARED FOR: OWNER
ALBERT WAYNE AND JEANETTE BRADY
2501 MANION DRIVE
WILLIAMSBURG, VIRGINIA 23185

HIS LAND SURVEYING INC.
P.O. BOX 100
PROVIDENCE FORGE, VIRGINIA 23140
(804)966-7017 FAX(804)966-7140

OAK TREE OFFICE PARK
AND AIRTIGHT SELF STORAGE

PREPARED BY:
HIS LAND SURVEYING
P.O. BOX 100
PROVIDENCE FORGE , VA. 23140
(804)966-7017
FAX:(804)966-7140

SCALE:	N/A
DATE:	2/24/98
JOB NO.	121.7
SHEET	1 OF 11

MC035

NOTE: GRAVEL ACCESS TO BE CONSTRUCTED TO SUPPORT THE WEIGHT OF FIRE EQUIPMENT.

VARIABLE 20' DRAINAGE EASEMENT AND FIRE ACCESS

EXISTING 18" RCP

EXISTING DI TOP=86.48 INV. OUT=84.78

EXIST. FIRE HYD.

GRAVEL FIRE ACCESS ONLY

30' GATE FOR ACCESS FOR FIRE CONTROL

TYPE 2 FIRE LANE

TWO STORY MINI-STORAGE F.F.=78.2

STEP-DOWN IN SLAB

F.F.=80.2

ONE STORY MINI-STORAGE OR TWO STORY F.F.=81.76

ONE STORY MINI-STORAGE F.F.=82.0

TWIN 15" RCP

LOADING AND UN-LOADING AREA

ONE STORY MINI-STORAGE F.F.=78.5

LIMITS OF CLEARING

3' HIGH BERM

BLACK OR GREEN VINYL COATED 8' CHAIN LINK FENCE

STW. DMP.

MC035

Bldg C

DIVERSION

EXISTING MANHOLE

EXISTING 24" RCP

NORTH

FIRE LANE NOTES:

1. FIRE LANES SHALL BE MARKED WITH SIGNS.
2. THE WORDS "NO PARKING FIRE LANE" PAINTS IN RED ON A WHITE BACKGROUND
3. THE WORDS ARE VISIBLE FROM DIRECTION OF TRAVEL.
4. BOOTOM OF SIGN LOCATED NO LESS THAN FOUR FEET AND NO HIGHER THAN SIXTEN FEET ABOVE GRADE.
5. SIGNS ARE FREE-STANDING
6. SIGNS ARE LOCATED NO FURTHER THAN THREE FEET FROM CURB OR EDGE OF PAVEMENT.

GENERAL EROSION AND SEDIMENT CONTROL NOTES

ES-1:UNLESS OTHERWISE INDICATED,ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENT CONTROL PRACTICES WILL BE CONSTRUCTED AND MAINTAINED ACCORING TO MINIMUM STANDARDS AND SPECIFICATIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK AND VIRGINIA REGULATIONS VR625-02-00 EROSION AND SEDIMENT CONTROL REGULATIONS.

ES-2: THE PLAN APPROVING AUTHORITY MUST BE NOTIFIED ONE WEEK PRIOR TO THE PRE-CONSTRUCTION CONFERENCE, ONE WEEK PRIOR TO THE COMMENCEMENT OF LAND DISTURBING ACTIVITY, AND ONE WEEK PRIOR TO THE FINAL INSPECTION.

ES-3: ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE PLACED PRIOR TO OR AS THE FIRST STEP IN CLEARING.

ES-4: A COPY OF THE APPROVED EROSION AND SEDIMENT CONTROL PLAN SHALL BE MAINTAINED ON SITE AT ALL TIMES.
ES-5: PRIOR TO COMMENCING LAND DISTURBING ACTIVITIES INAREAS OTHER THAN INDICATED ON THESE PLANSUNCLUDING, BUT NOT LIMITED TO , OFF SITE BORROW OR WASTE AREAS) THE CONTRACTOR SHALL SUBMIT A SUPPLEMENTARY EROSION CONTROL PLAN TO THE OWNER FOR REVIEW AND APPROVAL BY THE PLAN APPROVING AUTHORITY.

ES-6: THE CONTRACTOR IS RESPONSIBLE FOR INSTALLATION OF ANY ADDITIONAL EROSION CONTROL MEASURES NECESSARY TO PREVENT EROSION AND SEDIMENTATION AS DETERMINED BY THE PLAN APPROVING AUTHORITY.

ES-7: ALL DISTURBED AREAS ARE TO DRAIN TO APPROVED SEDIMENT CONTROL MEASURES AT ALL TIMES DURING LAND DISTURBING ACTIVITIES AND DURING SITE DEVELOPMENT UNTIL FINAL STABILIZATION IS ACHIEVED.

ES-8: DURING DEWATERING OPERATIONS, WATER WILL PUMPED INTO AN APPROVED FILTERING DEVICE.

ES-9: THE CONTRACTOR SHALL INSPECT ALL EROSION CONTROL MEASURES PERIODICALLY AND AFTER EACH RUN-OFF PRODUCING RAINFALL EVENT. ANY NECESSARY REPAIRS OR CLEANUP TO MAINTAIN THE EFFECTIVENESS OF THE EROSION CONTROL DEVICES SHALL BE MADE IMMEDIATELY.

1992 3.02

STONE CONSTRUCTION ENTRANCE

SIDE ELEVATION

PLAN VIEW

SECTION A-A

SECTION B-B

Source: Adapted from 1983 Maryland Standards for Soil Erosion and Sediment Control, and Va. DSWC

Plate 3.02-1

III - 9

MC035

1992 3.13

TEMPORARY SEDIMENT TRAP

CROSS SECTION OF OUTLET

OUTLET (PERSPECTIVE VIEW)

Source: Va. DSWC

Plate 3.13-2

III - 76

PROPOSED BRICK TWO STORY OFFICE

PROPOSED BRICK TWO STORY OFFICE F.F.=86.8

PROPOSED BRICK TWO STORY OFFICE F.F.=85.5

2 STORY OFFICE AND APARTMENT

30' GREENBELT

4' CONC. WALK

@ 0.49%

IRONBOUND ROAD

ROUTE 615

ROUTE 640

POWHATAN SPRINGS ROAD

SITE DISTANCE 575' 850'

EXIST. FIRE HYD.

EXIST. WATER LINE

TAPPING SADDLE AND CORPORATION STOP

NOTE: THE PARKING LOT ENCROACHES INTO GREENSPACE HAS BEEN ALLOWED BY JCC PLANNING FOR SAVING LARGE OAK TREE IN OFFICE PARK

FUTURE DRIVE

50'X 100' JOINT ACCESS EASEMENT

30' VDOT DRAINAGE EASEMENT

EXISTING M.H. TOP=84.48 INV OUT=78.48 INV IN= 78.55 MANHOLE CHANNEL WILL NEED TO BE RE-BUILT

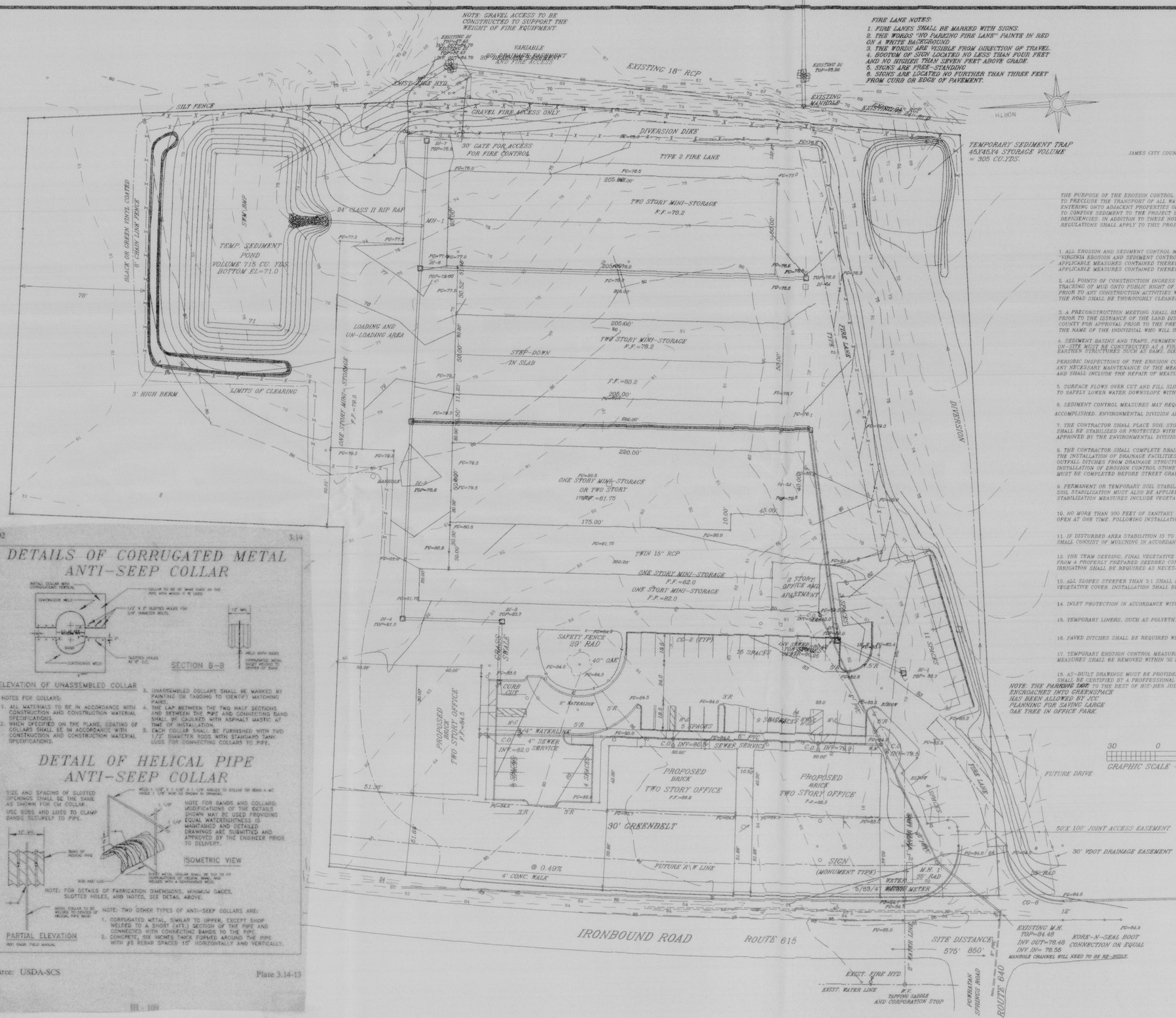
KORE-N-SEAL BOOT CONNECTION OR EQUAL

GRAPHIC SCALE - FEET (30 0 30 60 90)

OAKTREE OFFICE PARK AND AIRTIGHT SELF STORAGE SITE, GRADING, AND UTILITIES PLAN

PREPARED BY:
HIS LAND SURVEYING
P.O. BOX 100
PROVIDENCE FORGE , VA. 23140
(804)966-7017
FAX:(804)966-7140

SCALE	1"=30'
DATE	2/24/98
JOB NO.	121.7
SHEET	3 OF 11



FIRE LANE NOTES:

1. FIRE LANES SHALL BE MARKED WITH SIGNS.
2. THE WORDS "NO PARKING FIRE LANE" PAINTS IN RED ON A WHITE BACKGROUND.
3. THE WORDS ARE VISIBLE FROM DIRECTION OF TRAVEL.
4. BOOTOM OF SIGN LOCATED NO LESS THAN FOUR FEET AND NO HIGHER THAN SEVEN FEET ABOVE GRADE.
5. SIGNS ARE FREE-STANDING
6. SIGNS ARE LOCATED NO FURTHER THAN THREE FEET FROM CURB OR EDGE OF PAVEMENT.

JAMES CITY COUNTY EROSION AND SEDIMENT CONTROL NOTES

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

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

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

3. A PRECONSTRUCTION MEETING SHALL BE HELD ON SITE BETWEEN COUNTY, THE DEVELOPER, THE PROJECT ENGINEER, AND THE CONTRACTOR PRIOR TO THE ISSUANCE OF THE LAND DISTURBANCE PERMIT. THE CONTRACTOR SHALL SUBMIT A SEQUENCE OF CONSTRUCTION TO THE COUNTY FOR APPROVAL PRIOR TO THE PRECONSTRUCTION MEETING. THE CONTRACTOR WILL SUPPLY 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, PERIMENTER 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 IMMEDIATLY 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 IMMEDIATLY 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 DIRECTIED 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 TO THE IMPORT OF ANY BORROW OR EXPORT OF ANY WASTE TO OF FROM THE PROJECT SITE.

8. THE CONTRACTOR SHALL COMPLETE DRAINAGE FACILITIES WITHIN 30 DAYS FOLLOWING COMPLETION OF ROUGH GRADING AT ANY POINT WITHIN THIS PROJECT. THE INSTALLATION OF DRAINAGE FACILITIES SHALL TAKE PRECEDANCE OVER ALL UNDERGROUND UTILITIES. OUTFALL DITCHES FROM DRAINAGE STRUCTURES SHALL BE STABILIZED IMMEDIATLY 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 GRADE IS REACHED ON ANY FORION 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 IMMEDIATLY STABILIZED(I.E., THE SAME DAY).

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

12. THE TERM SEEDING, FINAL VEGETATIVE COVER OR STABILIZATION, ON THIS PLAN SHALL MEAN 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. PERMINANT SEEDING. IRRIGATION SHALL BE REQUIRED AS NECESSARY TO INSURE 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 MANAFACTURER'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%.

17. TEMPORARY EROSION CONTROL MEASURES ARE NOT TO BE REMOVED UNTIL 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 PROFFESSIONAL ENGINEER WHO INSPECTED THE STRUCTURE DURING CONSTRUCTION. THE CERTIFICATION SHALL INCLUDE THE STATEMENT THAT TO THE BEST OF HIS\HER JUDGMENT, KNOWLEDGE, AND BELIEF, THE STRUCTURE WAS CONSTRUCTED IN ACCORDANCE WITH THE APPROVAL PLANS AND SPECIFICATIONS.

NOTE: THE PARKING LOT TO THE BEST OF HIS\HER JUDGMENT, KNOWLEDGE, AND BELIEF, THE STRUCTURE WAS CONSTRUCTED IN ACCORDANCE WITH THE APPROVAL PLANS AND SPECIFICATIONS. ENCROACHES INTO GREENSPACE HAS BEEN ALLOWED BY JCC PLANNING FOR SAVING LARGE OAK TREE IN OFFICE PARK.

1992 3.14

DETAILS OF CORRUGATED METAL ANTI-SEEP COLLAR

NOTES FOR COLLARS:

1. ALL MATERIALS TO BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
2. WHEN SPECIFIED ON THE PLANS, COATING OF COLLARS SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
3. UNASSEMBLED COLLARS SHALL BE MARKED BY PAINTING OR TAGGING TO IDENTIFY MATCHING PAIRS.
4. THE LAP BETWEEN THE TWO HALF SECTIONS AND BETWEEN THE PIPE AND CONNECTING BAND SHALL BE CAULKED WITH ASPHALT MASTIC AT TIME OF INSTALLATION.
5. EACH COLLAR SHALL BE FURNISHED WITH TWO 1/2" DIAMETER RODS WITH STANDARD TANK LUGS FOR CONNECTING COLLARS TO PIPE.

DETAIL OF HELICAL PIPE ANTI-SEEP COLLAR

SIZE AND SPACING OF SLOTTED OPENINGS SHALL BE THE SANE AS SHOWN FOR CM COLLAR.

USE RODS AND LUGS TO CLAMP BANDS SECURELY TO PIPE.

NOTE FOR BANDS AND COLLARS: MODIFICATIONS OF THE DETAILS SHOWN MAY BE USED PROVIDING EQUAL WATERTIGHTNESS IS MAINTAINED AND DETAILED DRAWINGS ARE SUBMITTED AND APPROVED BY THE ENGINEER PRIOR TO DELIVERY.

NOTE: FOR DETAILS OF FABRICATION DIMENSIONS, MINIMUM GAGES, SLOTTED HOLES, AND NOTES, SEE DETAIL ABOVE.

NOTE: TWO OTHER TYPES OF ANTI-SEEP COLLARS ARE:

1. CORRUGATED METAL, SIMILAR TO UPPER, EXCEPT SHOP WELDED TO A SHORT (4FT.) SECTION OF THE PIPE AND CONNECTED WITH CONNECTING BANDS TO THE PIPE.
2. CONCRETE, SIX INCHES THICK FORMED AROUND THE PIPE WITH #3 REBAR SPACED 15" HORIZONTALLY AND VERTICALLY.

Source: USDA-SCS

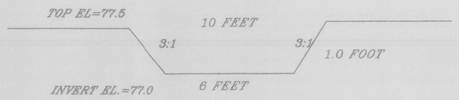
Plate 3.14-13

III - 109

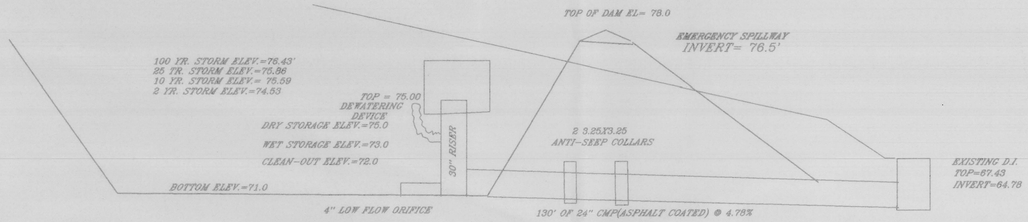
OAKTREE OFFICE PARK AND AIRTIGHT SELF STORAGE EROSION AND SEDIMENT CONTROL PLAN

PREPARED BY:
HIS LAND SURVEYING
P.O. BOX 100
PROVIDENCE FORGE, VA. 23140
(804)966-7017
FAX:(804)966-7140

SCALE:	1"=30'
DATE:	2/24/98
JOB NO.	121.7
SHEET	1 OF 1

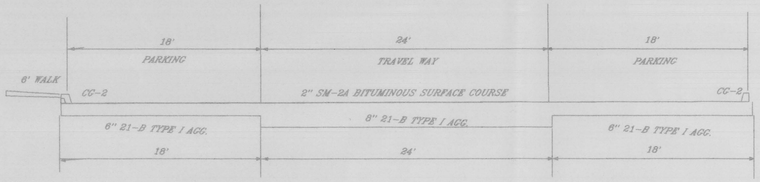


CONCRETE EMERGENCY SPILLWAY



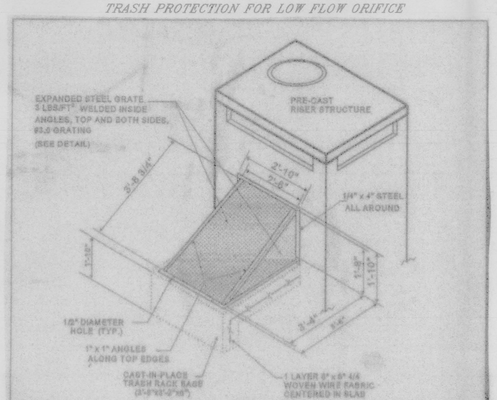
SWM\BMP DETAIL

NOT TO SCALE



TYPICAL PARKING LOT SECTION

TRASH PROTECTION FOR LOW FLOW ORIFICE



NOTE: THIS DETAIL IS FOR GRATE ONLY, NOT RISER STRUCTURE.

SWM\BMP POND

SCALE:1"=20'

20 0 20 40 60

GRAPHIC SCALE - FEET

SWM\BMP INFILTRATION BASIN NOTES:

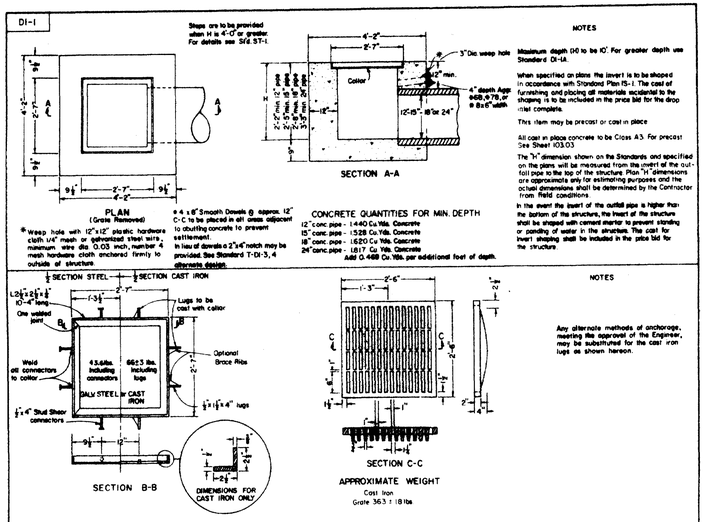
1. THIS POND IS TO SERVE AS A SEDIMENT BASIN AND THEN WILL BE CONVERTED TO BMP\SWM.
2. AFTER CONSTRUCTION IS COMPLETE BASIN WILL BE CLEANED OUT OF ALL SEDIMENT AND BOTTOM WILL BE LEVELED.
3.AN AS BUILT SURVEY WILL BE MADE OF THIS BASIN TO INSURE CONFORMITY WITH THIS PLAN.
5. THE BASIN SHALL BE IMMEDIATLY STABILISED WITH SEED AND MULCH IMMEDIATLY AFTER CONSTRUCTION. THE USE OF LOE MAINTENANCE , RAPID GERMINATING GRASSES SUCH AS FESCUES SHALL BE USED.

OAK TREE OFFICE PARK AND AIRTIGHT SELF STORAGE SWM\BMP DETAILS

PREPARED BY:
HIS LAND SURVEYING
P.O. BOX 100
PROVIDENCE FORGE , VA. 23140
(804)966-7017
FAX:(804)966-7140

SCALE:	N\A
DATE:	2/24/98
JOB NO.	121.7
SHEET	5OF 1

DI-1



NOTES

Minimum depth (H) to be 10'. For greater depth use Standard DI-1A.

When specified on plans the invert is to be shaped in accordance with Standard Plan IS-1. The cost of furnishing and placing all materials incidental to the shaping is to be included in the price bid for the drop inlet complete.

This item may be precast or cast in place

All cast in place concrete to be Class A3. For precast See Sheet 103.03.

The "H" dimension shown on the Standards and specified on the plans will be measured from the invert of the outfall pipe to the top of the structure. Plan "H" dimensions are approximate only for estimating purposes and the actual dimensions shall be determined by the Contractor from field conditions.

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. The cost for invert shaping shall be included in the price bid for the structure.

NOTES

Any alternate methods of anchorage, meeting the approval of the Engineer, may be substituted for the cast iron lugs as shown hereon.

DETAILS OF COLLAR AND GRATE

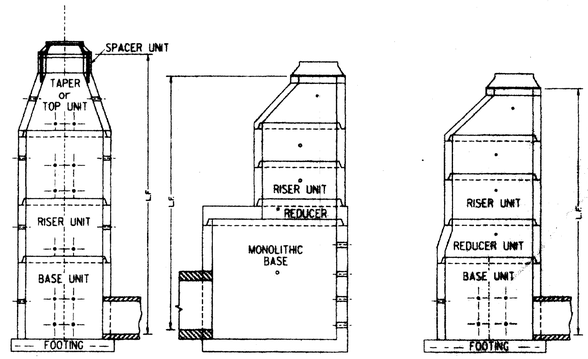
STANDARD DROP INLET
12"-24" PIPE MAXIMUM DEPTH (H) - 10'
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
105
302

104.01

MH-2

For details of all component parts and "General Notes - Precast" see sheets 103.01 - 103.11

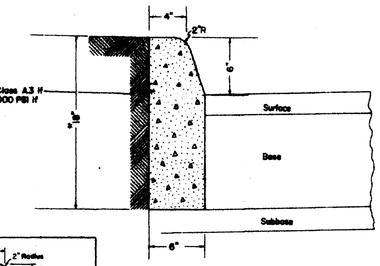


PRECAST MANHOLE
VIRGINIA DEPARTMENT OF TRANSPORTATION

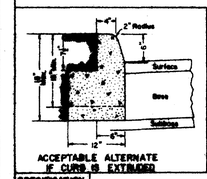
SPECIFICATION REFERENCE
105
302

106.07

C6-2



This item may be precast or cast in place.



ACCEPTABLE ALTERNATE IF CURB IS EXTRUDED

This curb is to be used when design speed is 40 MPH or less on Rural highways and 45 MPH or less in developed urban and suburban areas.

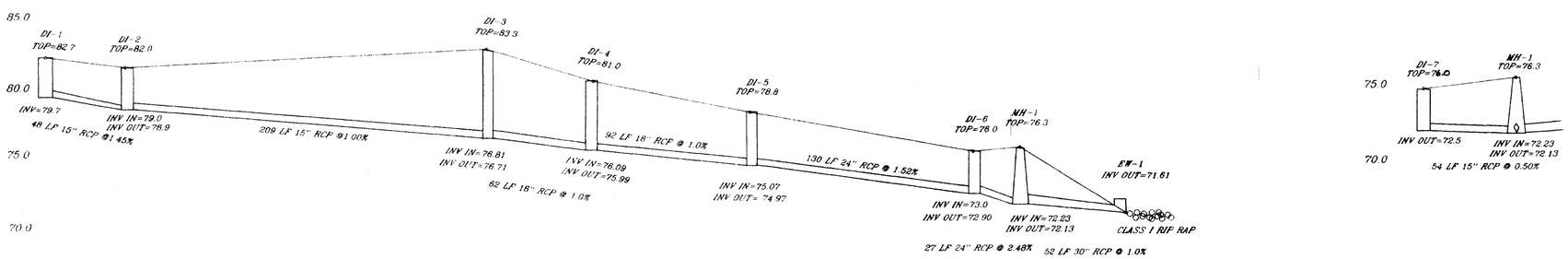
Note: Curb having a radius of 300 ft. or less (along face of curb) will be paid for as radial curb.

* The depth of curb may be reduced as much as 3" (15" depth) or increased as much as 3" (21" depth) in order that the bottom of curb will coincide with the top of a course of the pavement substructure. Otherwise the depth is to be 18" as shown. No adjustment in the price bid is to be made for a decrease or an increase in depth.

STANDARD 6" CURB
VIRGINIA DEPARTMENT of TRANSPORTATION

SPECIFICATION REFERENCE
105
502

201.01



STORM SEWER STRUCTURES

DI-1
VDOT DI-
TOP= 82.7
INV OUT=79.7

DI-2
VDOT DI-1
TOP=82.0
INV IN = 79.0
INV OUT=78.9

DI-3
VDOT DI-1
TOP=83.3
INV IN=76.81
INV OUT=76.71

DI-4
VDOT DI-1
TOP=81.0
INV IN=76.09
INV OUT=75.99

DI-5
VDOT DI-1
TOP=78.8
INV IN=75.07
INV OUT=74.97

DI-5A
VDOT DI-1
TOP=79.3
INV OUT=76.3

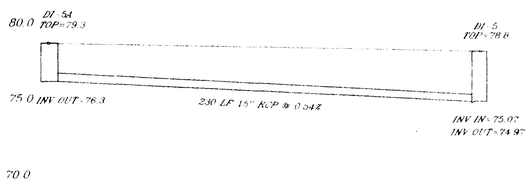
DI-6
VDOT DI-1
TOP= 77.0
INV IN=73.0
INV OUT= 72.90

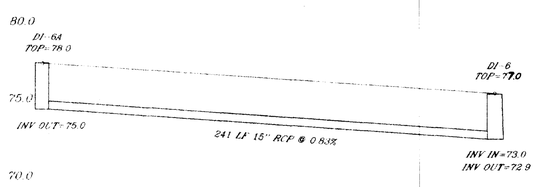
DI-6A
VDOT DI-1
TOP=78.0
INV OUT=75.0

MH-1
TOP=76.3
INV IN=72.23
INV OUT=72.13

DI-7
VDOT DI-1
TOP=76.0
INV OUT=72.5

EW-1
VDOT EW-1
INV 71.61





STORM SEWER PROFILES

HOR. SCALE: 1"=40'

VERT. SCALE: 1"=5'

COMMONWEALTH OF VIRGINIA
DEAN E. RAYNES
REG. NO. 1633
LAND SURVEYOR

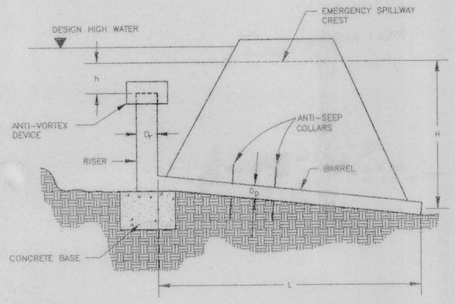
STORM SEWER PROFILES
STORM SEWER DETAILS

PREPARED BY
HIS LAND SURVEYING
P.O. BOX 100
PROVIDENCE FORGE VA 23140
(804)966-7017
FAX (804)966-7140

SCALE N/A
DATE 2/24/98
JOB NO. 121.7
SHEET 6 OF 18

1992 3.14

PRINCIPAL SPILLWAY DESIGN

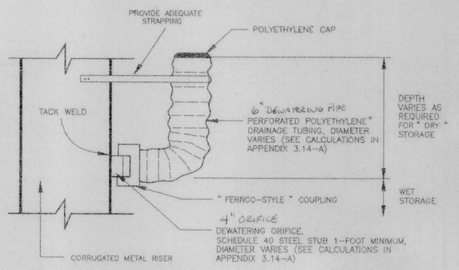


H = HEAD ON PIPE THROUGH EMBANKMENT
h = HEAD OVER RISER CREST
L = LENGTH OF PIPE THROUGH EMBANKMENT
D_p = DIAMETER OF PIPE THROUGH EMBANKMENT
D_r = DIAMETER OF RISER

Source: Va. DSWC Plate 3.14-7

1992 3.14

RECOMMENDED DEWATERING SYSTEM FOR SEDIMENT BASINS



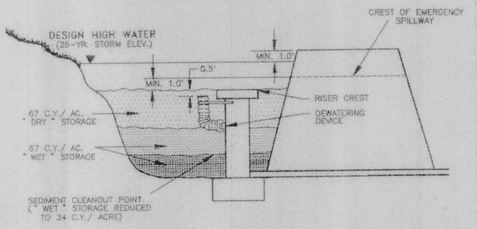
NOTE: WITH CONCRETE RISER, USE PVC SCHEDULE 40 STUB FOR DEWATERING ORIFICE

*DRAINAGE TUBING SHALL COMPLY WITH ASTM F667 AND AASHTO M294

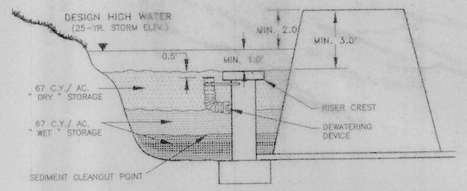
Source: Va. DSWC Plate 3.14-15

1992 3.14

SEDIMENT BASIN SCHEMATIC ELEVATIONS



DESIGN ELEVATIONS WITH EMERGENCY SPILLWAY



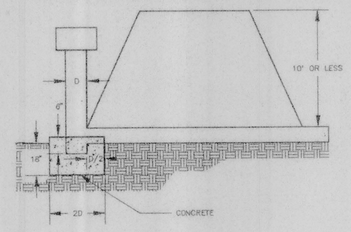
DESIGN ELEVATIONS WITHOUT EMERGENCY SPILLWAY
(RISER PASSES 25-YR. EVENT)

Source: Va. DSWC Plate 3.14-2

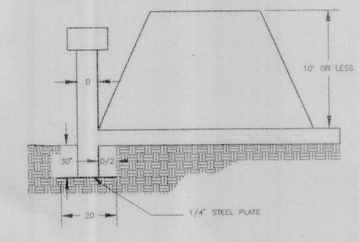
1992 3.14

RISER PIPE BASE CONDITIONS FOR EMBANKMENTS LESS THAN 10' HIGH

CONCRETE BASE FOR EMBANKMENT 10' OR LESS IN HEIGHT



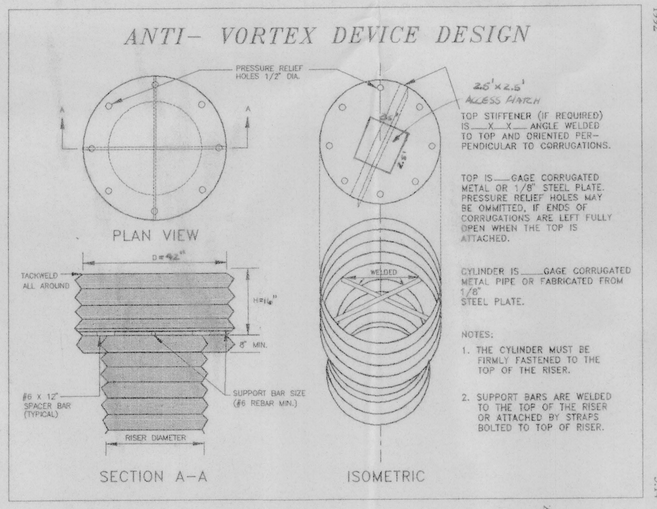
STEEL BASE FOR EMBANKMENT 10' OR LESS IN HEIGHT



Source: Va. DSWC Plate 3.14-14

Source: USDA-SCS

ANTI- VORTEX DEVICE DESIGN



2.5'x2.5' ACCESS HATCH

TOP STIFFENER (IF REQUIRED) IS ___X___X___ ANGLE WELDED TO TOP AND ORIENTED PERPENDICULAR TO CORRUGATIONS.

TOP IS ____GAGE CORRUGATED METAL OR 1/8" STEEL PLATE. PRESSURE RELIEF HOLES MAY BE OMMITTED, IF ENDS OF CORRUGATIONS ARE LEFT FULLY OPEN WHEN THE TOP IS ATTACHED.

CYLINDER IS ____GAGE CORRUGATED METAL PIPE OR FABRICATED FROM 1/8" STEEL PLATE.

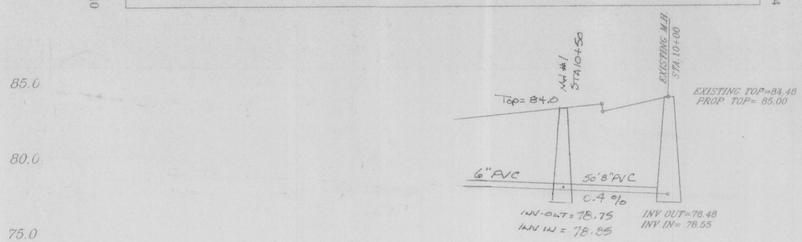
NOTES:

1. THE CYLINDER MUST BE FIRMLY FASTENED TO THE TOP OF THE RISER.
2. SUPPORT BARS ARE WELDED TO THE TOP OF THE RISER OR ATTACHED BY STRAPS BOLTED TO TOP OF RISER.

1992 3.14

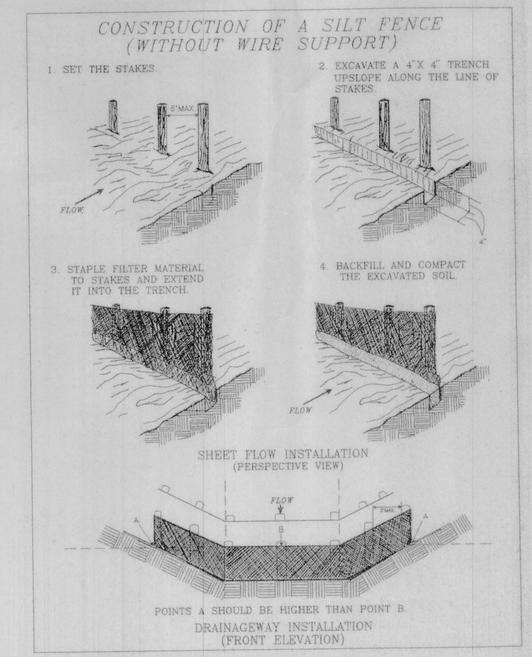
Plate 3.14-10

III - 103



SANITARY SEWER PROFILE
HOR. SCALE= 1"=40'
VERT. SCALE= 1"=5'

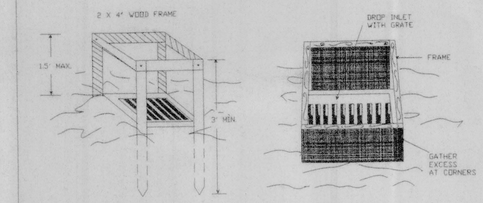
CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)



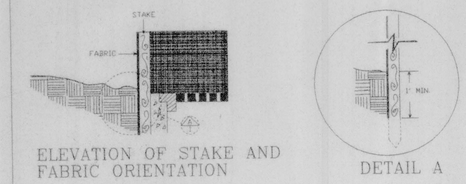
Source: Adapted from Installation of Straw and Fabric Filter Barriers for Sediment Control, Sherwood and Wyant Plate 3.05-2

1992 3.07

SILT FENCE DROP INLET PROTECTION



PERSPECTIVE VIEWS



ELEVATION OF STAKE AND FABRIC ORIENTATION

DETAIL A

SPECIFIC APPLICATION

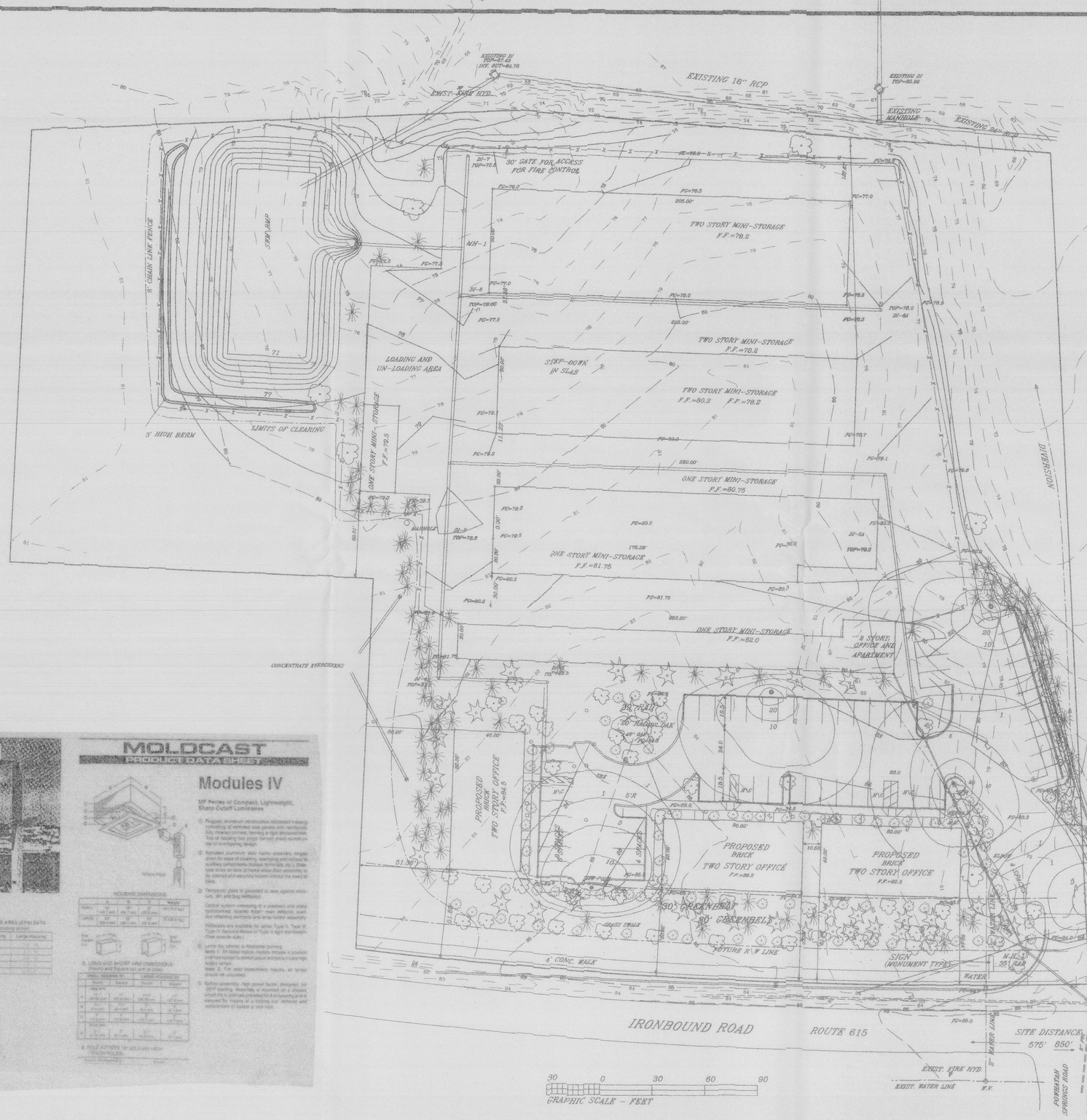
THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE THE INLET DRAINS A RELATIVELY FLAT AREA (SLOPE NO GREATER THAN 5%) WHERE THE INLET SHEET OR OVERLAND FLOWS (NOT EXCEEDING 1 C.F.S.) ARE TYPICAL. THE METHOD SHALL NOT APPLY TO INLETS RECEIVING CONCENTRATED FLOWS, SUCH AS IN STREET OR HIGHWAY MEDIANS.

Source: N.C. Erosion and Sediment Control Planning and Design Manual, 1988 Plate 3.07-1

SANITARY SEWER PROFILES
EROSION AND SEDIMENT CONTROL DETAILS

PREPARED BY:
HIS LAND SURVEYING
P.O. BOX 100
PROVIDENCE FORGE, VA 23140
(804)966-7017
FAX (804)966-7140

SCALE: N/A
DATE: 2/24/98
JOB NO. 121.7
SHEET 7 OF 11



LANDSCAPE REQUIREMENTS:

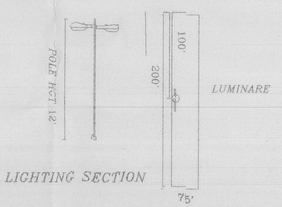
AREA	REQUIRED TREES	REQUIRED SHRUBS	PROVIDED TREES	PROVIDED SHRUBS
RIGHT OF WAY= 12588.35SF (1 TREE/3 SHRUBS PER 400S.F.)	32	95	42	124 NOTE: PROVIDED IS 30% MORE THAN REQUIRED.
OFFICE BUILDINGS 18000 s.f. (1 TREE/6 SHRUBS PER 200 s.f.)	60 OR	300	35	125
PARKING: 52 SPACES (1 TREE/ 2 SHRUBS PER 5 SPACES)	10	20	10	20

NOTE: SIX LARGE PINE TREES ARE TO REMAIN IN 30' BUFFER AREA

KEY	NO.	BOTANICAL NAME	COMMON NAME	PLANTING INSTRUCTIONS
A	36	QUERCUS PHELLOS	WILLOW OAK	2" -21/2" B&B
B	35	PINUS VIRGINIA	WHITE PINE	8'-10' B&B
C	60	PHOTINIA	PHOTINIA	2"- 21/2" B&B
D	70	RHODENDRON	AZALIA	22"-24" PLANT IN MULCH
E	54	ILEX CRORNUTA 'CARISSA'	CARISSA HOLLY	18"-24" PLANT IN MULCH
F	40	MYRICA CERIFERA	WAX MYRTLE	3'-5' B&B

NOTE: ALL REQUIRED PLANTING SHALL CONFORM WITH THE MOST RECENT EDITION OF "AMERICAN STANDARD FOR NURSERY STOCK" PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN AND INSTALLATION SHALL BE IN ACCORDANCE WITH THE MOST RECENT EDITION OF " GUIDELINE FOR PLANTING LANDSCAPE TREES AND SHRUBS" PUBLISHED IN THE VIRGINIA COOPERATIVE EXTENSION SERVICE.

NOTE: THE LANDSCAPE CALCULATIONS SHOWN ABOVE TAKE PREVEDENCE OVER THE PLANTING SYMBOLS SHOWN ON THIS PLAN. THE PLANT COUNTS SHOULD BE COMPLIED WITH WHEN LANDSCAPING IS DONE.



LIGHTING SECTION

ILLUMINATION PATTERN

NOTE: THE PARKING LOT ENCROACHES INTO GREENSPACE HAS BEEN ALLOWED BY JCC PLANNING FOR SAVING LARGE OAK TREE IN OFFICE PARK.

NOTE:

1.) RECOMMENDED ILLUMINATION GUIDELINES FOR PUBLIC PARKING LOT= 1-2 AVG. MAINTAINED FOOTCANDLES.

2.) CALCULATED FOOTCANDLES FOR NOTED LUMINARES.

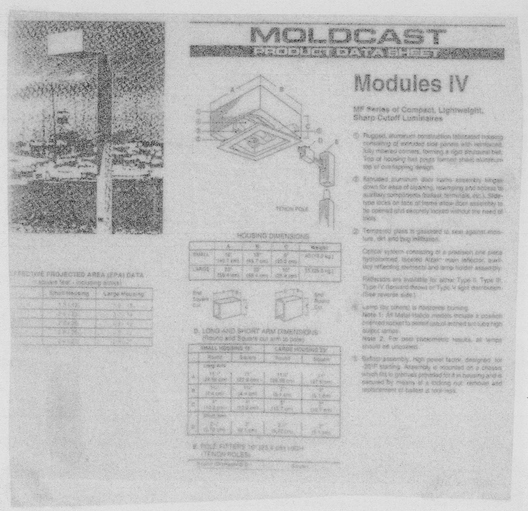
$$FC = \frac{N \times BLL \times CU \times LLF}{A}$$

$$FC = \frac{2 \times 9500 \times 4.7 \times 0.75}{26250} = 2.5 \text{ AVG.}$$

WHERE: N= QUANTITY OF LUMINARES
BLL= BARE LAMP LUMINS (INITIAL)
CU= COEFFICIENT OF UTILIZATION.
LLF= LIGHT LOOS FACTOR
A= AREA IN SQ. FT.

* CHECK SPECIFIC LAMP LITURATURE FOR CORRECT DATA AND RESTRICTIONS. THIS DATA IS GENERAL IN NATURE AND TO BE USED AS A GUIDE ONLY.

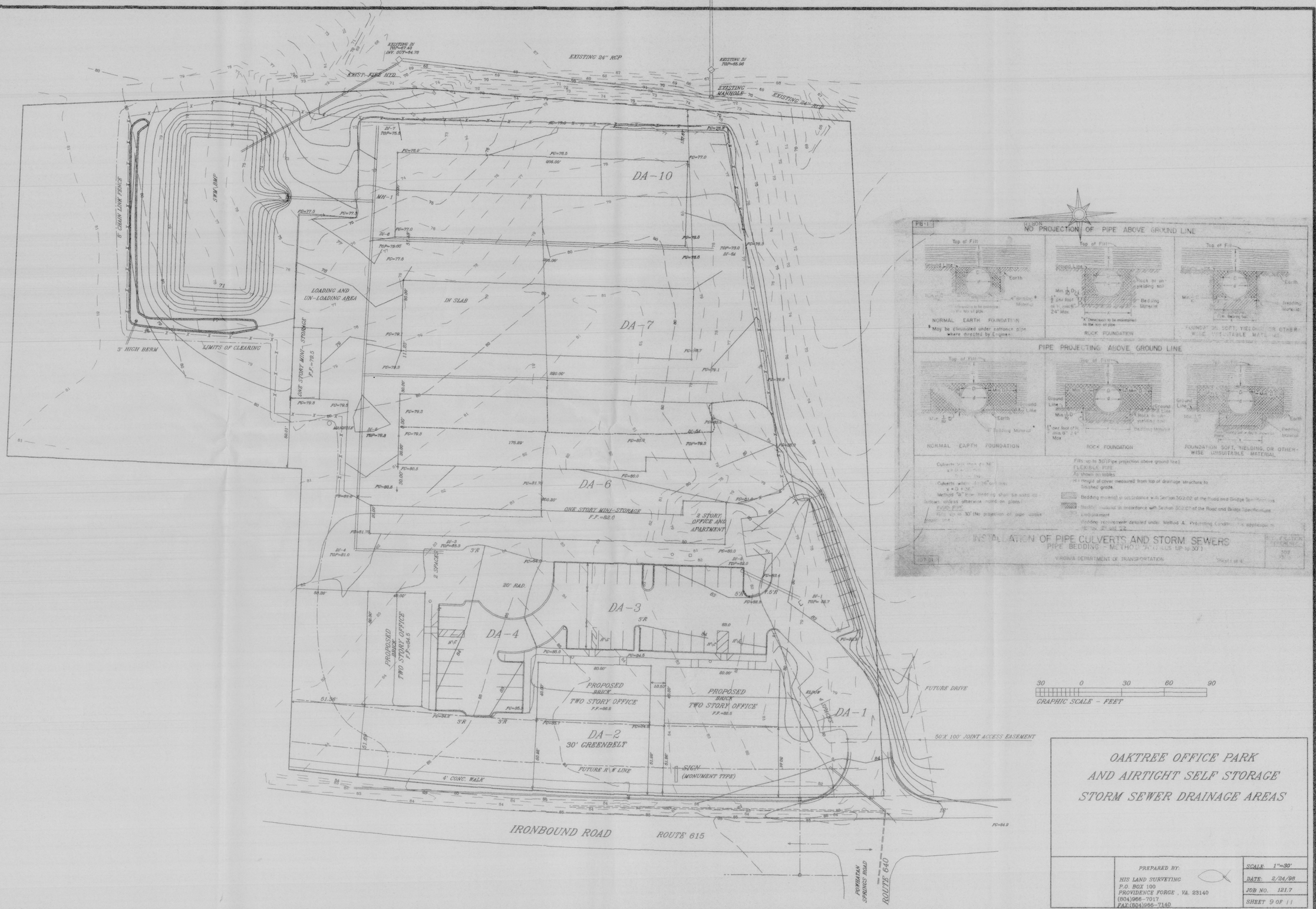
NOTE: ADDITIONAL LIGHTING IS TO BE PLACED ON SELF STORAGE BUILDINGS.



OAK TREE OFFICE PARK AND AIRTIGHT SELF STORAGE LANDSCAPE AND LIGHTING PLAN

PREPARED BY:
HIS LAND SURVEYING
P.O. BOX 100
PROVIDENCE FORGE, VA. 23140
(804)966-7017
FAX:(804)966-7140

SCALE: 1"=30'
DATE: 2/24/98
JOB NO. 121.7
SHEET 8 OF 11



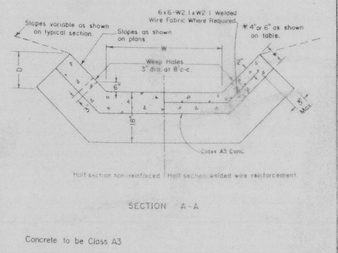
OAKTREE OFFICE PARK AND AIRTIGHT SELF STORAGE STORM SEWER DRAINAGE AREAS

PREPARED BY:
HIS LAND SURVEYING
P.O. BOX 100
PROVIDENCE FORGE, VA. 23140
(804)966-7017
FAX:(804)966-7140

SCALE	1"=30'
DATE	2/24/98
JOB NO.	121.7
SHEET	9 OF 11

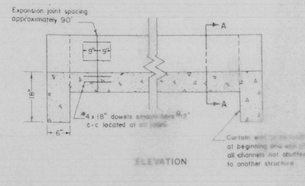
PG-5

Indicates channel where wire mesh reinforcement is not required.



SECTION A-A

Concrete to be Class A3



ELEVATION

NOTES

Depth (D) and width (W) to be as shown on plans.
Weep holes are to be provided at approximately where W is equal to or greater than 4' and D is equal to or greater than 3'.

SQ. YDS. PER LIN. FT. OF PAVED CHANNEL

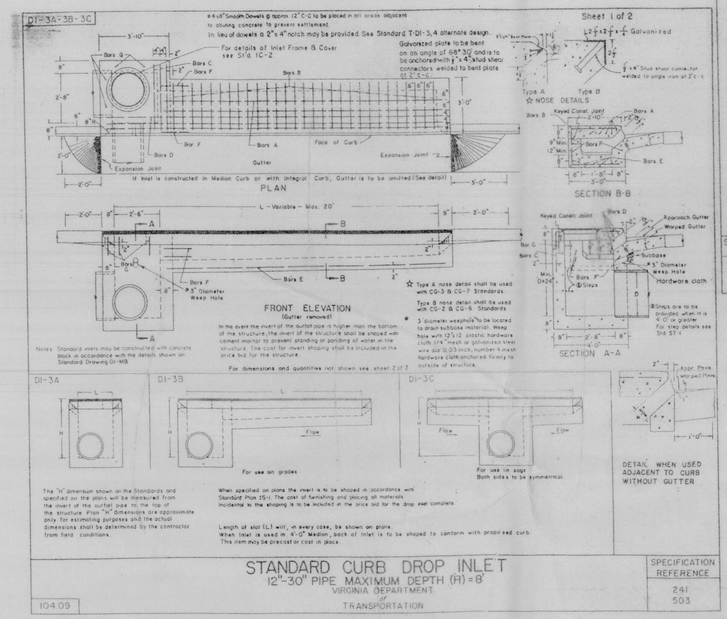
CONCRETE THICKNESS	D	W = 1'	2'	3'	4'	5'	6'	7'	8'	9'	10'
		1:1 SIDE SLOPES									
4"	1'	0.425	0.536	0.648	0.759	0.870	0.981	1.092	1.203	1.314	1.425
	2'	0.740	0.851	0.962	1.073	1.184	1.295	1.406	1.517	1.629	1.740
	3'	1.054	1.165	1.276	1.387	1.498	1.609	1.721	1.832	1.943	2.054
	4'	1.368	1.479	1.590	1.702	1.813	1.924	2.035	2.146	2.257	2.368
6"	5'	1.682	1.794	1.905	2.016	2.127	2.238	2.349	2.460	2.571	2.682
	6'	1.997	2.108	2.219	2.330	2.441	2.552	2.663	2.774	2.886	2.997
	7'	2.311	2.422	2.533	2.644	2.755	2.866	2.977	3.089	3.200	3.311
	8'	2.625	2.736	2.848	2.959	3.070	3.181	3.292	3.403	3.514	3.625
	9'	2.940	3.051	3.162	3.273	3.384	3.495	3.606	3.717	3.828	3.939
	10'	3.254	3.365	3.476	3.587	3.698	3.809	3.920	4.032	4.143	4.254
		1½:1 SIDE SLOPES									
4"	1'	0.512	0.623	0.734	0.845	0.956	1.067	1.178	1.290	1.401	1.512
	2'	0.912	1.023	1.135	1.246	1.357	1.468	1.579	1.690	1.801	1.912
	3'	1.313	1.424	1.535	1.646	1.757	1.869	1.980	2.091	2.202	2.313
	4'	1.714	1.825	1.936	2.047	2.158	2.269	2.380	2.491	2.602	2.714
6"	5'	2.114	2.225	2.336	2.448	2.559	2.670	2.781	2.892	3.003	3.114
	6'	2.515	2.626	2.737	2.848	2.959	3.070	3.181	3.293	3.404	3.515
	7'	2.915	3.027	3.138	3.249	3.360	3.471	3.582	3.693	3.804	3.915
	8'	3.316	3.427	3.538	3.649	3.760	3.872	3.983	4.094	4.205	4.316
	9'	3.717	3.828	3.939	4.050	4.161	4.272	4.383	4.494	4.606	4.717
	10'	4.117	4.228	4.340	4.451	4.562	4.673	4.784	4.895	5.006	5.117
		2:1 SIDE SLOPES									
4"	1'	0.608	0.719	0.830	0.941	1.052	1.164	1.275	1.386	1.497	1.608
	2'	1.105	1.216	1.327	1.438	1.549	1.660	1.772	1.883	1.994	2.105
	3'	1.602	1.713	1.824	1.935	2.046	2.157	2.268	2.380	2.491	2.602
	4'	2.099	2.210	2.321	2.432	2.543	2.654	2.765	2.876	2.988	3.099
6"	5'	2.596	2.707	2.818	2.929	3.040	3.151	3.262	3.373	3.485	3.596
	6'	3.093	3.204	3.315	3.426	3.537	3.648	3.759	3.870	3.981	4.093
	7'	3.589	3.701	3.812	3.923	4.034	4.145	4.256	4.367	4.478	4.589
	8'	4.086	4.197	4.309	4.420	4.531	4.642	4.753	4.864	4.975	5.086
	9'	4.583	4.694	4.805	4.917	5.028	5.139	5.250	5.361	5.472	5.583
	10'	5.080	5.191	5.302	5.413	5.525	5.636	5.747	5.858	5.969	6.080

SPECIFICATION REFERENCE
502

STANDARD PAVED DITCHES

VIRGINIA DEPARTMENT of TRANSPORTATION

109.03



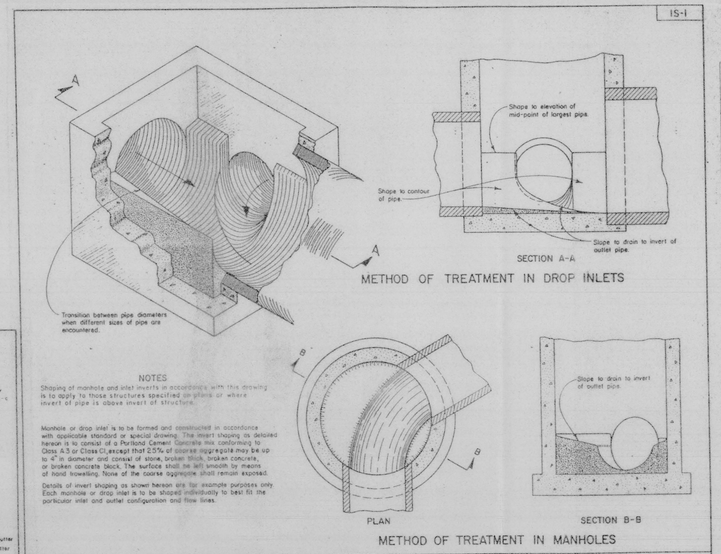
STANDARD CURB DROP INLET

12"-30" PIPE MAXIMUM DEPTH (H) = 8'

VIRGINIA DEPARTMENT of TRANSPORTATION

SPECIFICATION REFERENCE
241 503

104.09



NOTES

Shaping of manhole and inlet inverts in accordance with this drawing is to apply to those structures specified on plans or where invert of pipe is above invert of structure.

Manhole or drop inlet is to be formed and constructed in accordance with applicable standard or special drawing. The invert shaping as detailed herein is to consist of a Portland Cement Concrete mix conforming to Class A3 or Class CI, except that 25% of coarse aggregate may be up to 4" in diameter and consist of stone, broken brick, broken concrete, or broken concrete block. The surface shall be left smooth by means of hand troweling. None of the coarse aggregate shall remain exposed.

Details of invert shaping as shown hereon are for example purposes only. Each manhole or drop inlet is to be shaped individually to best fit the particular inlet and outlet configuration and flow lines.

SPECIFICATION REFERENCE
NONE

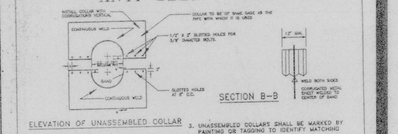
STANDARD METHOD OF SHAPING MANHOLE & INLET INVERTS

VIRGINIA DEPARTMENT of TRANSPORTATION

106.08

1992 3.14

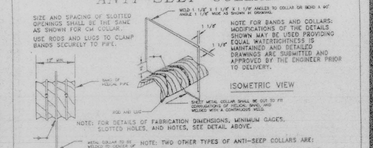
DETAILS OF CORRUGATED METAL ANTI-SEEP COLLAR



NOTES FOR COLLARS:

1. ALL MATERIALS TO BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
2. WHEN SPECIFIED ON THE PLANS, COATING OF COLLARS SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
3. UNASSEMBLED COLLARS SHALL BE MARKED BY PAINTING OR TAGGING TO IDENTIFY MATCHING PARTS.
4. THE LAP BETWEEN THE TWO HALF SECTIONS AND BETWEEN THE PIPE AND CONNECTING BAND SHALL BE CAULKED WITH ASPHALT MASTIC AT TIME OF INSTALLATION.
5. EACH COLLAR SHALL BE FURNISHED WITH TWO 1/2" DIAMETER RODS WITH STANDARD TANK LUGS FOR CONNECTING COLLARS TO PIPE.

DETAIL OF HELICAL PIPE ANTI-SEEP COLLAR



NOTE: FOR BANDS AND COLLARS: MODIFICATIONS OF THE DETAILS SHOWN MAY BE USED PROVIDING EQUAL WATERTIGHTNESS IS MAINTAINED AND DETAILED DRAWINGS ARE SUBMITTED AND APPROVED BY THE ENGINEER PRIOR TO DELIVERY.

NOTE: FOR DETAILS OF FABRICATION DIMENSIONS, MINIMUM GAGES, SLOTTED HOLES, AND NOTES, SEE DETAIL ABOVE.

NOTE: TWO OTHER TYPES OF ANTI-SEEP COLLARS ARE:

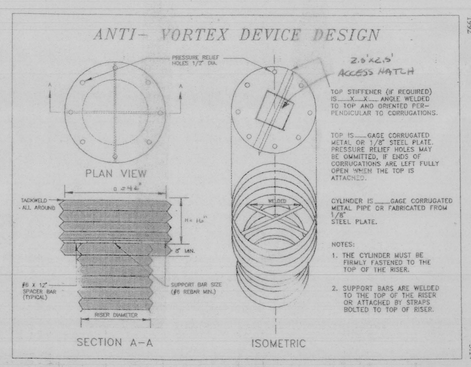
1. CORRUGATED METAL, SIMILAR TO UPPER, EXCEPT SHOP WELDED TO A SINGLE SECTION OF THE PIPE AND CONNECTED TO CONNECTING BANDS TO THE PIPE.
2. CONCRETE, TWO INCHES THICK FORMED AROUND THE PIPE WITH #3 REBAR SPACED 12" HORIZONTALLY AND VERTICALLY.

Source: USDA-SCS

Plate 3.14-13

Source: USDA-SCS

ANTI- VORTEX DEVICE DESIGN



TOP STIFFENER (IF REQUIRED) IS ___X___X___ ANGLE WELDED TO TOP AND ORIENTED PERPENDICULAR TO CORRUGATIONS.

TOP IS ____GAGE CORRUGATED METAL OR 1/8" STEEL PLATE. PRESSURE RELIEF HOLES MAY BE OMMITTED, IF ENDS OF CORRUGATIONS ARE LEFT FULLY OPEN WHEN THE TOP IS ATTACHED.

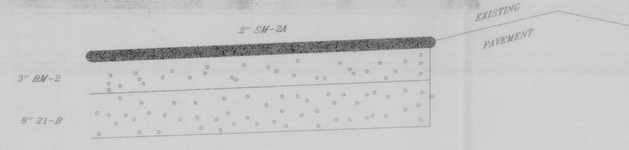
CYLINDER IS ____GAGE CORRUGATED METAL PIPE OR FABRICATED FROM 1/8" STEEL PLATE.

NOTES:

1. THE CYLINDER MUST BE FIRMLY FASTENED TO THE TOP OF THE RISER.
2. SUPPORT BARS ARE WELDED TO THE TOP OF THE RISER OR ATTACHED BY STRAPS BOLTED TO TOP OF RISER.

1992 3.14

Plate 3.14-10



ENTRANCE PAVEMENT DETAIL
NOT TO SCALE

Sheet 2 of 2

DI-3A-3B-3C

TABLE OF QUANTITIES

TYPE	L	AREA OF SLOT	CONCRETE	REINFORCING STEEL																WEIGHT
				BARS A		BARS B		BARS C		BARS D		BARS E		BARS F		BARS G		
	Ft.	Sq. Ft.	Cu. Yds.	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	Lbs.
DI-3A	2'-6"	1.15	2.26	—	—	—	—	3	5'-7"	3	3'-2"	—	—	—	—	6	1'-0"	22
DI-3B	4'	1.83	2.59	5	1'-6"	2	6'-7"@6'-10"	3	5'-7"	3	3'-2"	4	1'-6"	3	1'-6"	4	1'-0"	64
	6'	2.75	3.02	5	3'-6"	6	6'-7"@6'-10"	3	5'-7"	3	3'-2"	4	3'-6"	3	1'-6"	4	1'-0"	111
	8'	3.67	3.46	5	5'-6"	10	6'-7"@6'-10"	3	5'-7"	3	3'-2"	4	5'-6"	3	1'-6"	4	1'-0"	158
	10'	4.58	3.90	5	7'-6"	14	6'-7"@6'-10"	3	5'-7"	3	3'-2"	4	7'-6"	3	1'-6"	4	1'-0"	204
	12'	5.50	4.34	5	9'-6"	18	6'-7"@6'-10"	3	5'-7"	3	3'-2"	4	9'-6"	3	1'-6"	4	1'-0"	251
	14'	6.42	4.78	5	11'-6"	22	6'-7"@6'-10"	3	5'-7"	3	3'-2"	4	11'-6"	3	1'-6"	4	1'-0"	298
	16'	7.33	5.22	5	13'-6"	26	6'-7"@6'-10"	3	5'-7"	3	3'-2"	4	13'-6"	3	1'-6"	4	1'-0"	345
	18'	8.25	5.66	5	15'-6"	30	6'-7"@6'-10"	3	5'-7"	3	3'-2"	4	15'-6"	3	1'-6"	4	1'-0"	391
	20'	9.17	6.09	5	17'-6"	34	6'-7"@6'-10"	3	5'-7"	3	3'-2"	4	17'-6"	3	1'-6"	4	1'-0"	438
DI-3C	6'	2.75	3.01	10	1'-9"	4	6'-7"@6'-10"	5	5'-7"	3	3'-2"	8	1'-9"	6	1'-6"	2	1'-0"	111
	8'	3.67	3.45	10	2'-9"	8	6'-7"@6'-10"	5	5'-7"	3	3'-2"	8	2'-9"	6	1'-6"	2	1'-0"	158
	10'	4.58	3.89	10	3'-9"	12	6'-7"@6'-10"	5	5'-7"	3	3'-2"	8	3'-9"	6	1'-6"	2	1'-0"	205
	12'	5.50	4.33	10	4'-9"	16	6'-7"@6'-10"	5	5'-7"	3	3'-2"	8	4'-9"	6	1'-6"	2	1'-0"	252
	14'	6.42	4.77	10	5'-9"	20	6'-7"@6'-10"	5	5'-7"	3	3'-2"	8	5'-9"	6	1'-6"	2	1'-0"	298
	16'	7.33	5.21	10	6'-9"	24	6'-7"@6'-10"	5	5'-7"	3	3'-2"	8	6'-9"	6	1'-6"	2	1'-0"	345
	18'	8.25	5.65	10	7'-9"	28	6'-7"@6'-10"	5	5'-7"	3	3'-2"	8	7'-9"	6	1'-6"	2	1'-0"	392
	20'	9.17	6.09	10	8'-9"	32	6'-7"@6'-10"	5	5'-7"	3	3'-2"	8	8'-9"	6	1'-6"	2	1'-0"	439

* Denotes length of one (1) bar

Notes: All reinforcing bars to be No. (5)

All cost in place concrete to be Class A3. For acceptable alternate see Precast Standard Designs.

Concrete quantities shown are for depth (H) of 5'-2" without pipes. The amount displaced by pipes must be deducted to obtain true quantities. For inlets of different depths, add or subtract 0.32 cu yds of concrete for each foot of difference in depth.

Length of Angle Iron as shown on Sheet 1 is to be L 1.16" @ 4.10 lbs per ft.

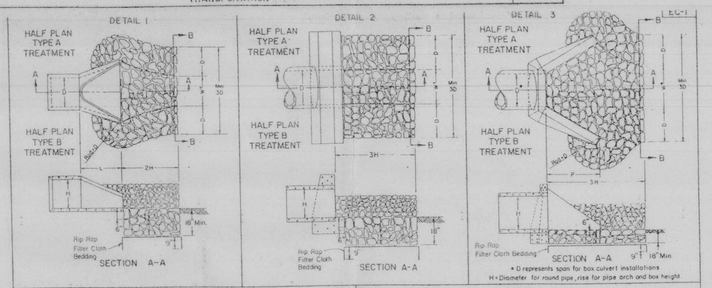
SPECIFICATION REFERENCE
241 503

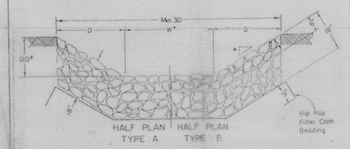
STANDARD CURB DROP INLET

12"-30" PIPE MAXIMUM DEPTH (H) = 8'

VIRGINIA DEPARTMENT of TRANSPORTATION

104.10





* Use Typical Section shown on plans or normal side slope, bottom width, and depth of channel, ditch or natural ground.

NOTES

For multiple box installations Dimension D is to govern the projection outside the channel width (W).

On any Secondary Roads installation requiring erosion control treatment where no endwall or endsection is specified on plans, construction is to be in accordance with Detail 2 shown above.

Type A or B treatment to be as specified on the plans.

Type B ☐ The top 6" of the stone shall be grouted in accordance with section 418.09, except that the portion below the top 6" may be choked with fine material.

Rip Rap Filter Cloth Bedding to be installed under all erosion control stone in accordance with the specifications.

SPECIFICATION REFERENCE
205 303 258 418

STONE FOR EROSION CONTROL

VIRGINIA DEPARTMENT of TRANSPORTATION

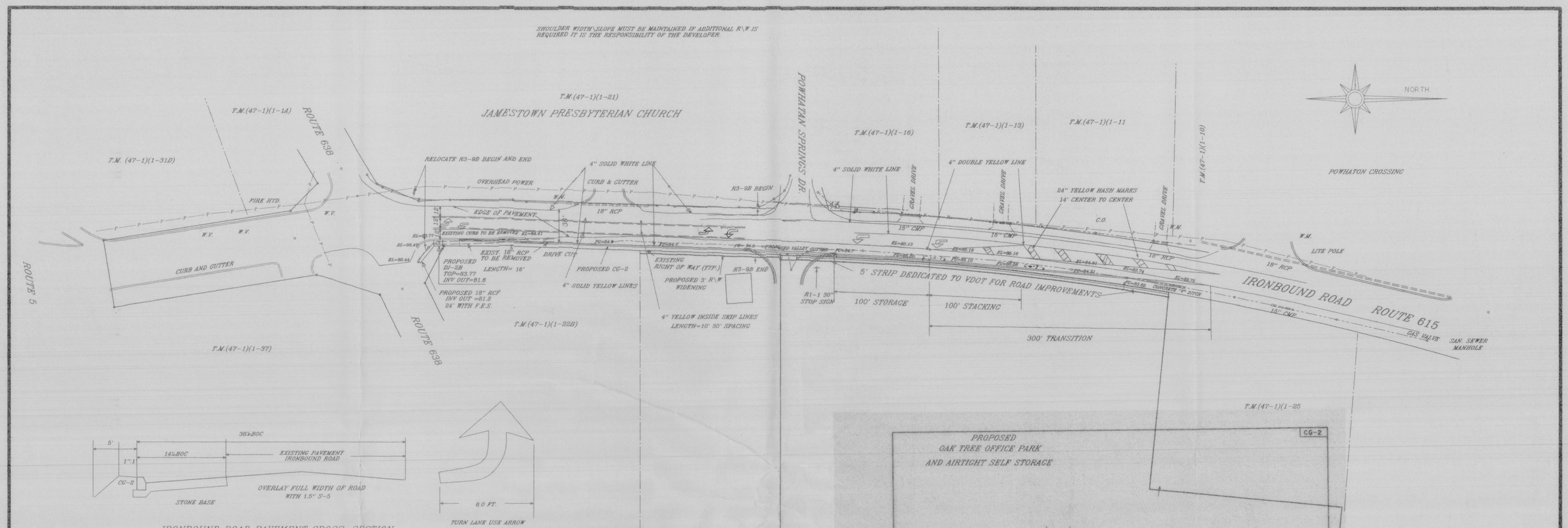
114.01

OAK TREE OFFICE PARK
AND AIRTIGHT SELF STORAGE
DETAILS

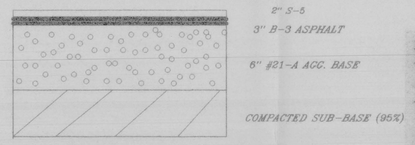
PREPARED BY:
HIS LAND SURVEYING
P.O. BOX 100
PROVIDENCE FORGE, VA 23140
(804) 966-7017

SCALE	N.T.S.
DATE	5/7/98
JOB NO.	121.7
SHEET	10 OF 11

SHOULDER WIDTH\SLOPE MUST BE MAINTAINED IF ADDITIONAL R\W IS REQUIRED IT IS THE RESPONSIBILITY OF THE DEVELOPER.



IRONBOUND ROAD PAVEMENT CROSS-SECTION
NOT TO SCALE



PAVEMENT CROSS-SECTION

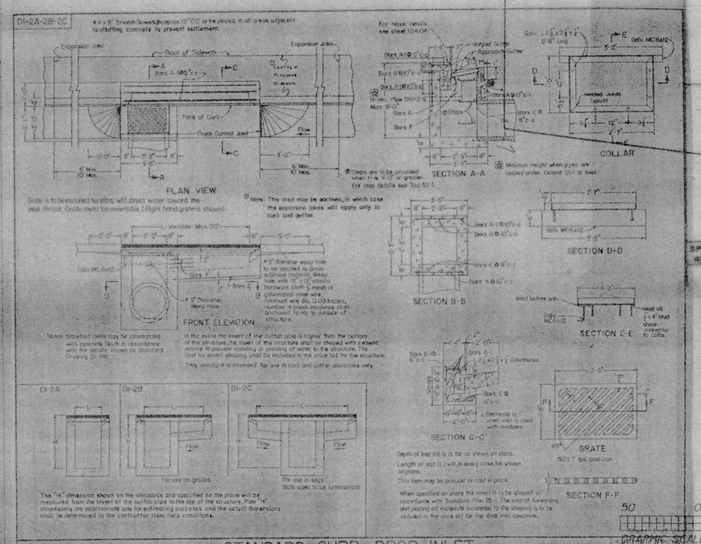
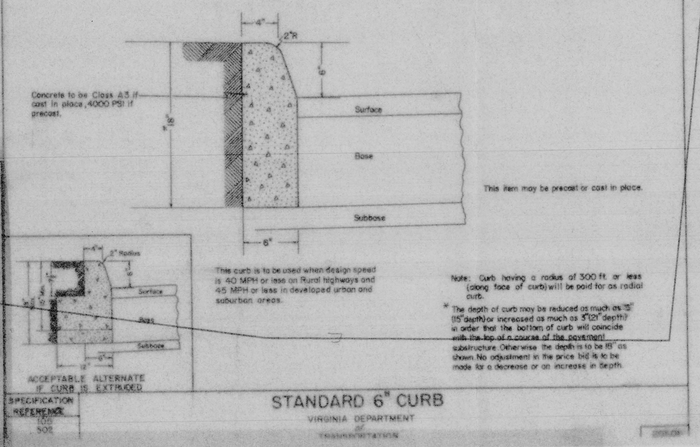


TABLE OF QUANTITIES

TYPE	L	CONCRETE	REINFORCING STEEL															
			BARS A		BARS A-1		BARS B		BARS B-1		BARS C		BARS E		BARS F		WEIGHT
	Ft.	Cu.Yds.	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	Lbs.
DI-2A	2'-2"	1.71	4	3'-2"	5	3'-2"	4	3'-6"	–	—	5	2'-0"	–	—	–	—	55
DI-2B	4'	1.95	4	3'-2"	5	5'-0"	4	3'-6"	3	4'-3"to4'-6"	5	2'-0"	3	2'-0"	3	1'-6"	84
	6'	2.23	4	3'-2"	5	7'-0"	4	3'-6"	7	4'-3"to4'-6"	5	2'-0"	3	4'-0"	3	1'-6"	119
	8'	2.51	4	3'-2"	5	9'-0"	4	3'-6"	11	4'-3"to4'-6"	5	2'-0"	3	6'-0"	3	1'-6"	154
	10'	2.79	4	3'-2"	5	11'-0"	4	3'-6"	15	4'-3"to4'-6"	5	2'-0"	3	8'-0"	3	1'-6"	189
	12'	3.05	4	3'-2"	5	13'-0"	4	3'-6"	19	4'-3"to4'-6"	5	2'-0"	3	10'-0"	3	1'-6"	224
	14'	3.34	4	3'-2"	5	15'-0"	4	3'-6"	23	4'-3"to4'-6"	5	2'-0"	3	12'-0"	3	1'-6"	259
	16'	3.61	4	3'-2"	5	17'-0"	4	3'-6"	27	4'-3"to4'-6"	5	2'-0"	3	14'-0"	3	1'-6"	294
	18'	3.89	4	3'-2"	5	19'-0"	4	3'-6"	31	4'-3"to4'-6"	5	2'-0"	3	16'-0"	3	1'-6"	329
	20'	4.17	4	3'-2"	5	21'-0"	4	3'-6"	35	4'-3"to4'-6"	5	2'-0"	3	18'-0"	3	1'-6"	364
DI-2C	6'	2.24	4	3'-2"	5	7'-0"	4	3'-6"	6	4'-3"to4'-6"	5	2'-0"	6	2'-1"	6	1'-6"	115
	8'	2.55	4	3'-2"	5	9'-0"	4	3'-6"	10	4'-3"to4'-6"	5	2'-0"	6	3'-1"	6	1'-6"	150
	10'	2.82	4	3'-2"	5	11'-0"	4	3'-6"	14	4'-3"to4'-6"	5	2'-0"	6	4'-1"	6	1'-6"	185
	12'	3.09	4	3'-2"	5	13'-0"	4	3'-6"	18	4'-3"to4'-6"	5	2'-0"	6	5'-1"	6	1'-6"	220
	14'	3.37	4	3'-2"	5	15'-0"	4	3'-6"	22	4'-3"to4'-6"	5	2'-0"	6	6'-1"	6	1'-6"	255
	16'	3.65	4	3'-2"	5	17'-0"	4	3'-6"	26	4'-3"to4'-6"	5	2'-0"	6	7'-1"	6	1'-6"	290
	18'	3.93	4	3'-2"	5	19'-0"	4	3'-6"	30	4'-3"to4'-6"	5	2'-0"	6	8'-1"	6	1'-6"	325
	20'	4.20	4	3'-2"	5	21'-0"	4	3'-6"	34	4'-3"to4'-6"	5	2'-0"	6	9'-1"	6	1'-6"	360



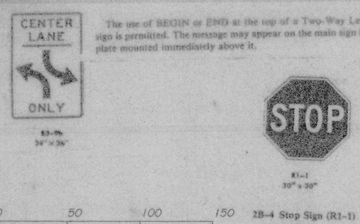
STANDARD 6" CURB
VIRGINIA DEPARTMENT OF TRANSPORTATION

BARON WOODS

PLEASE CALL B.A. CHITTUM AT (757) 925-2666 AT LEAST 48 HRS. PRIOR TO STRIPING. THE FOLLOWING STRIPING IS REQUIRED.

PAVEMENT MARKINGS SHALL BE THERMO PLASTIC
4" SOLID WHITE LINES
4" WHITE MINI-SKIPS, 3' LENGTH 6' SPACING
4" DOUBLE YELLOW LINES
24" YELLOW HASH MARKS, 14' SPACING CENTER TO CENTER
4" OUTSIDE SOLID YELLOW LINES WITH 4" INSIDE YELLOW SKIP-LINES THAT HAVE 10' LENGTHS & 30' SPACING

COMMONWEALTH OF VIRGINIA
DEAN E. RAYMES
REG # NO. 1633
LAND SURVEYOR



The use of BEGIN or END at the top of a Two-Way Left Turn Only sign is permitted. The message may appear on the main sign itself, or on a plate mounted immediately above it.

2B-4 Stop Sign (R1-1)

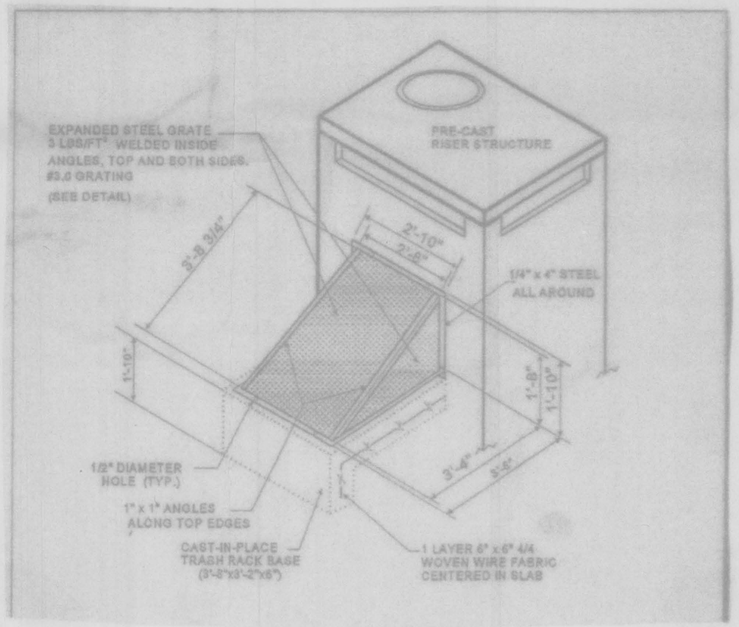
STOP signs are intended for use where traffic is required to stop. The STOP sign shall be an octagon with white message and border on a red background. The standard size shall be 30 x 30 inches. Where greater emphasis or visibility is required, a larger size is recommended.

OAK TREE OFFICE PARK
AND AIRTIGHT SELF-STORAGE
IRONBOUND ROAD WIDENING
AND TURN LANE PLAN.

PREPARED BY:
HIS LAND SURVEYING
P.O. BOX 100
PROVIDENCE FORGE , VA. 23140
(804)968-7017
FAX(804)966-7140

SCALE	1"=50'
DATE	5/18/98
JOB NO.	121.7
SHEET	1 OF 11

APPROVED FEB 6 2001



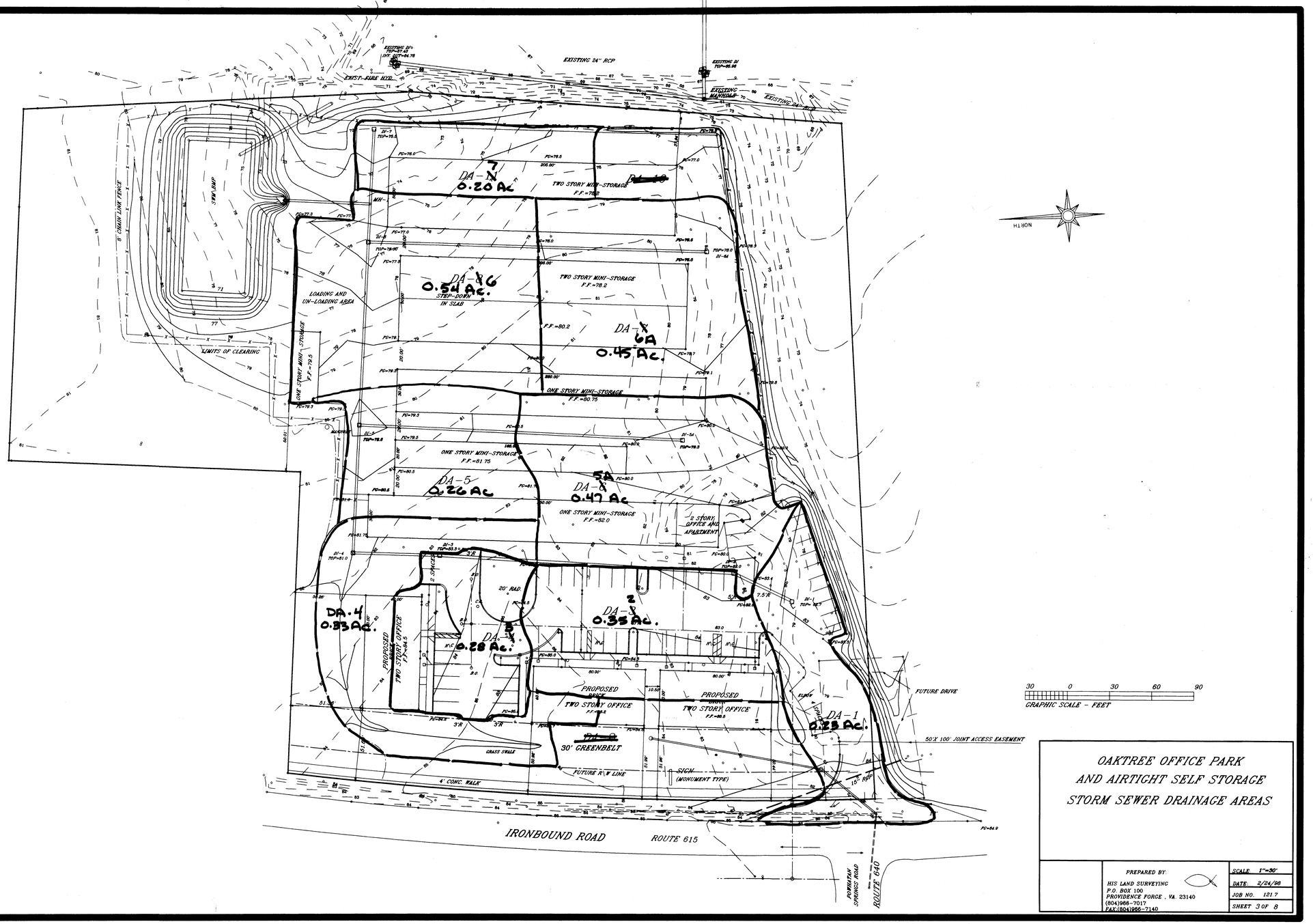
TRASH RACK DETAIL

COMMONWEALTH OF VIRGINIA
DEAN E. RAYNES
No. 1633-A
LAND SURVEYOR

HIS LAND SURVEYING, INC.
P.O. BOX 100
PROVIDENCE FORGE VIRGINIA 23140
(804) 966-7017

AS-BUILT
STORMWATER MANAGEMENT POND
AT OAK TREE OFFICE PARK AND
AIR-TIGHT SELF-STORAGE
LOCATED IN JAMES CITY COUNTY, VIRGINIA
SCALE:1"=20' DATE:01/02/2001
J.N. 121.7

MC 035 SP-21-99



OAKTREE OFFICE PARK AND AIRTIGHT SELF STORAGE STORM SEWER DRAINAGE AREAS

PREPARED BY:
HIS LAND SURVEYING
P.O. BOX 100
PROVIDENCE FORGE, VA. 23140
(804)966-7017
FAX:(804)966-7140

SCALE	1"=30'
DATE	2/24/98
JOB NO.	121.7
SHEET	3 OF 8

4.

Watershed map

5. Construction plan

6.

Design calculations

OAKTREE OFFICE PARK
AND
AIRTIGHT SELF STORAGE

DRAINAGE CALCULATIONS
FOR
STORM DRAIN SYSTEM
AND
STORM WATER MANAGEMENT FACILITY

PREPARED FOR

H.I.S. LAND SURVEYING

P.O. BOX 100

PROVIDENCE FORGE , VIRGINIA 23140

PREPARED BY:

MITCHELL-WILSON ASSOCIATES, P.C.

CIVIL ENGINEERS & LAND SURVEYORS

JAMES E. MITCHELL, L.S.

720 MAIN STREET, SUITE 112, 2ND FLOOR

P.O. BOX 1269

WEST POINT, VIRGINIA 23181

(804) 843-9744

Mitchell-Wilson Associates, P.C. is providing H.I.S. Land Surveying design calculations for the Oaktree Office Park and Airtight Self Storage Site Plan. The design, layout, drainage areas, pipe sizes, pond configuration/storage and grading was prepared by H.I.S. Land Surveying. Mitchell-Wilson Associates, P.C. is providing the necessary calculations to support the size of the storm water management facility, principal spillway(outlet device), emergency spillway and the pipe sizes/hydraulic grade line for the storm drain system.

NARRATIVE REPORT

1.) The property is located at 3356 Ironbound Road, State Route No. 615 in James City County, Virginia and identified as tax map (47-1)(1-26). The location of this property is approximately 850 feet north of the intersection of State Route No. 5 and State Route No. 615.

2.) The site contains 5.674 acres and is currently wooded and has moderate slopes ranging from 3 to 6 percent across the site. The proposed development will utilize 4.47 acres.

3.) The "Soil Survey Of James City, York Counties & City Of Williamsburg, Virginia" identifies the soils to be (10B)Craven fine sandy loam. This soil is listed as being poor roadfill material with low strength; moderate and hard to pack for embankments; erodes easily for grassed waterways and has a hydrologic group classification of "C".

4.) The proposed development is to construct (3) two office buildings, (1) one office/apartment and (6) six mini storage buildings. The project will have asphalt parking with curb and gutter, public water, public sewer, storm drain system and storm water management facility. The outfall from the storm water management facility will be piped directly into a drop inlet located on the adjacent property.

5.) Mitchell-Wilson Associates used TR-20 to model the storm water management pond. The outlet device was set up using storage elevation discharge for the model and hydraulic routing in TR-20. The program modeled the 1 year, 2 year, 5 year, 10 year, 25 year and 100 year storm events. The program provided inflow hydrographs, reservoir routing hydrographs, peak discharge, routed discharge, time of peak flows, length of flow and maximum elevations during the individual storm events.

6.) A concrete emergency spillway is recommended for the storm water management facility. The spillway was designed to handle the 100 year storm in the event the principal spillway should become clogged. The emergency spillway should be excavated in natural soil and lined with concrete. A standard PG-5 detail is provided.

7.) The rational method was used for the storm drain system calculations. The hydraulic grade calculations provided water surface depths within the storm drain manholes or drop inlets. Inlet shaping (IS-1) should be utilizes in all of the inlets and manholes. This will reduce water surface elevations and provide less friction loss in the structures.

4-29-98 OAKTREE OFFICE PARK ; AIRTIGHT SELF STORAGE
DRAINAGE CALCULATIONS FOR
STORM DRAIN SYSTEM

DA-1 AREA = 0.23 AC.
RCN = .90
T_c = SHEET FLOW 160' ΔH = 2.30' S_o = 1.44%
T_c = 6 MIN.
i_{10} = 6.9 IN/HR
Q_{10} = (.90)(.23)(6.9) = 1.42 CFS

DA-2 AREA = 0.35 AC.
RCN = .90
T_c = L = 150' ΔH = 3' S_o = 2.0%
T_c = 5 MIN
i_{10} = 7.2 IN/HR
Q_{10} = (.35)(.90)(7.2) = 2.26 CFS

DA-3 AREA = 0.28 ACRES
RCN = .90
T_c = L = 120' ΔH = 1.70' S_o = 1.4%
T_c = 6 MIN
i_{10} = 6.9 IN/HR.
Q_{10} = (0.28)(.90)(6.9) = 1.74 CFS

DA-4 AREA = 0.33 AC.
RCN = BUILDING = .08 x .90 = .07
GRASS = .25 x .20 = .05
.12 / .33 = .36
RCN = .36
T_c = SHALLOW CONCENTRATE L = 250' ΔH = 4 S_o = 1.6%
T_c = 3 MIN.
i_{10} = 7.5 IN/HR
Q_{10} = (.33)(.36)(7.5) = .89 CFS

DA-5' AREA = 0.26 Ac.

RCN = .90

T_c = L = 110' ΔH = 1.7' S_o = 1.55 %

T_c = 2 MINS

i_{10} = 7.5 IN/HR.

Q_{10} = (.26)(.90)(7.5) = 1.75 CFS

DA-5A' AREA = 0.47 Ac.

RCN : GRASS .05 Ac X .20 = .01

ASPHALT/ROOF .42 Ac X .90 = .38

.39 / .47 = .83

RCN = .83

T_c = L = 120' ΔH = 1.20 S_o = 1.0%

T_c = 2 MIN.

i_{10} = 7.5 IN/HR.

Q_{10} = (.83)(.47)(7.5) = 2.92 CFS

DA-6' AREA = .54 Ac.

RCN = .90

T_c = L = 120' ΔH = 2' S_o = 1.0 %

T_c = 2 MIN

i_{10} = 7.5 IN/HR

Q_{10} = (.54)(.90)(7.5) = 3.64 CFS

DA-6A' AREA = .45 Ac.

RCN = .90

T_c = L = 195 ΔH = 2' S_o = 1.03%

T_c = 3 MIN

i_{10} = 7.2 IN/HR

Q_{10} = (.45)(.90)(7.2) = 2.91 CFS

DA-7' AREA .20 Ac.

RCN = .90

T_c = L = 160' ΔH = 1' S_o = 0.6 % T_c = 3 MIN

i_{10} = 7.2 IN/HR Q_{10} = (.20)(.90)(7.2) = 1.29 CFS

4-29-98

STORM SEWER DESIGN COMPUTATIONS

L & D 229

ROUTE 615 PROJ. OAKTREE OFFICE PARK & AIRTIGHT SELF STORAGE
COUNTY JAMES CITY DISTRICT
DESCRIPTION

SHEET ____ OF ____

FROM POINT	TO POINT	AREA DRAIN. "A" ACRES	RUN-OFF COEF. C	CA INCRE-MENT	CA ACCUM-ULATED	INLET TIME MIN-UTES	RAIN FALL IN./HR.	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER END	INVERT ELEVATIONS LOWER END	LENGTH FT.	SLOPE FT./FT.	DIA. IN.	CAPA-CITY C.F.S.	VEL. F.P.S.	FLOW TIME MIN ~~SEC.~~	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
DI-1	DI-2	.23	.90		.20	6	6.9	1.42	79.7	79.0	48	.0146	15	8	7.0	.11	
DI-2	DI-3	.35	.90	.315	.51	6	6.9	3.55	78.9	76.81	209	.01	15	6.5	6.0	.58	
DI-3	DI-4	.28	.90	.25	.76	7	6.8	5.18	76.71	76.09	62	.01	18	10.9	9.5	.10	
DI-4	DI-5	.33	.36	.12	.88	7	6.8	5.98	75.99	75.07	92	.01	18	10.9	9.5	.16	
DI-5A	DI-5	.47	.83	[illegible]	.39	2	7.5	2.92	76.3	75.07	230	.0053	15	4.8	4.3	.89	
DI-5	DI-6	.26	.90	.23	1.50	8	6.2	9.30	74.97	73.0	130	.015	24	23	8.3	.26	
DI-6A	DI-6	.45	.90		.40	3	7.2	2.91	75.0	73.0	241	.0083	15	6	5.2	.77	
DI-6	MH-1	.54	.90	.48	2.38	9	6.2	14.75	72.90	72.23	27	.0248	24	34	12	.03	
DI-7	MH-1	.20	.90		.18	3	7.2	1.29	72.5	72.23	54	.005	15	4.6	4.2	.21	
MH-1	TO INV OUT				2.56	9	6.2	15.87	72.13	71.61	52	.01	30	41	9	.09	OUTLET PROTECTION NEEDED

4-72

LL 147

HYDRAULIC GRADE LINE

PROJECT OAKTREE OFFICE PARK; AIRTIGHT SELF STOR.

INLET STATION	Outlet Water Surface Elev.	D_o	Q_o	L_o	S_{f_o} %	H_f	JUNCTION LOSS V_o	H_o	Q_i	V_i	Q_iV_i	$\frac{V_i^2}{2g}$	H_i	Angle	H_Δ	H_t	1.3 H_t	0.5 H_t	Final H	Inlet Water Surface Elev.	Rim Elev.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
MH-1	73.61	30"	15.9	52	.0012	.06	9	.31	1.29 / 14.75	4.2 / 12	5.41 / 177	.27 / 2.24	.09 / .78	90°	.19 / 1.50	2.65			1.32	74.93	76.3
(8)25 = +	2.00 / 71.61																				
DI-7	74.93	15"	1.29	54	.0004	.021	4.2	.06								.06	.078		.099	75.02	75.5
DI-6	74.93	24"	14.75	27	.004	.10	12	.55	2.91 / 9.30	5.2 / 8.3	15.13 / 77.19	1.06	.37	90°	.74	1.66	2.15	1.08	1.18	76.11	76.00
																				RAISE RIM ELEV. TO 77.00'	
DI-6A	76.11	15"	2.91	241	.002	.48	5.2	.10								.10	.13		.61	76.72	78.00
DI-5	76.11	24"	9.30	130	.0016	.20	8.3	.26	2.92 / 5.98	4.3 / 9.5	56.81	1.40	.49	90°	.98	1.73	2.24	1.12	1.32	77.43	78.8
DI-5A	77.43	15"	2.92	230	.002	.40	4.3	.07								.07	.09		.49	77.92	79.3
DI-4	76.11	18"	5.98	92	.0032	.29	9.5	.35	5.18	9.5		1.40	.49	90	.98	1.82	2.36		2.65	78.76	81.0
DI-3	78.76	18"	5.18	62	.0025	.15	9.5	.35	3.55	6		.55	.19	180°	—	.54	.70		.85	79.61	83.3
DI-2	79.61	15"	3.55	209	.0028	.58	6	.56	1.42	7		.76	.26	30°	.21	1.03	1.33	.66	1.24	80.85	82.0
DI-1	80.85	15"	1.42	48	.0005	.02	7	.19								.19	.24		.26	81.11	82.7

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

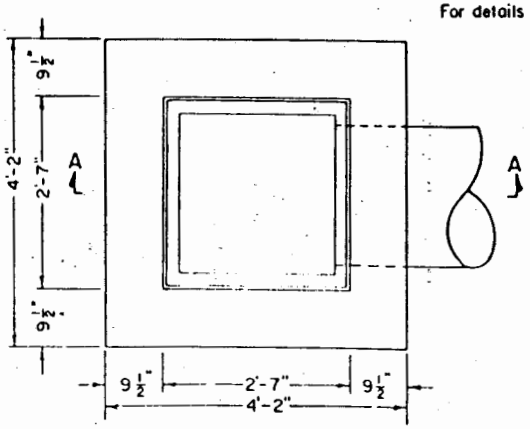
$H_t = H_o + H_i + H_\Delta$

SEE LD-72(D)67

90° K = 0.70	50° K = 0.47	20° K = 0.16
80° K = 0.66	40° K = 0.38	15° K = 0.10
70° K = 0.61	30° K = 0.28	
60° K = 0.55	25° K = 0.22	

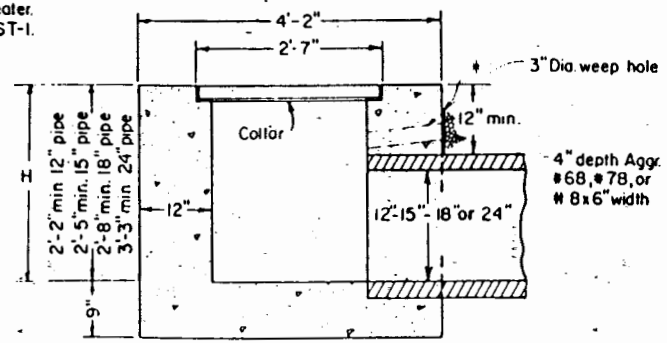
DI-1

Steps are to be provided when H is 4'-0" or greater. For details see Std. ST-1.



PLAN
(Grate Removed)

* 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 to outside of structure.



SECTION A-A

* 4 x 8" Smooth Dowels @ approx. 12" C-C to be placed in all areas adjacent to abuting concrete to prevent settlement.
In lieu of dowels a 2"x4" notch may be provided. See Standard T-DI-3, 4 alternate design.

CONCRETE QUANTITIES FOR MIN. DEPTH

12" conc. pipe - 1.440 Cu. Yds. Concrete
15" conc. pipe - 1.528 Cu. Yds. Concrete
18" conc. pipe - 1.620 Cu. Yds. Concrete
24" conc. pipe - 1.817 Cu. Yds. Concrete
Add 0.469 Cu. Yds. per additional foot of depth.

NOTES

Maximum depth (H) to be 10'. For greater depth use Standard DI-1A.

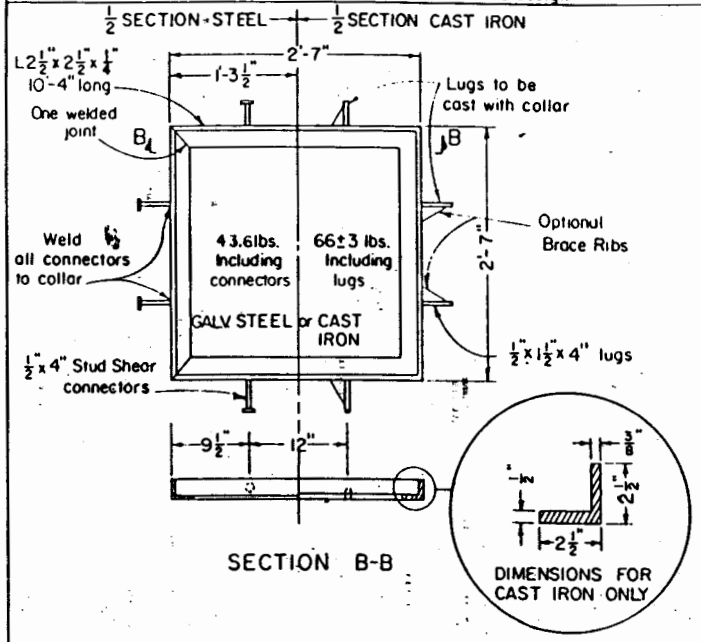
When specified on plans the invert is to be shaped in accordance with Standard Plan IS-1. The cost of furnishing and placing all materials incidental to the shaping is to be included in the price bid for the drop inlet complete.

This item may be precast or cast in place

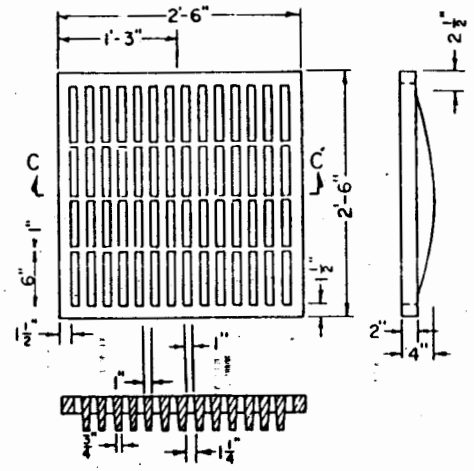
All cast in place concrete to be Class A3. For precast See Sheet 103.03

The "H" dimension shown on the Standards and specified on the plans will be measured from the invert of the outfall pipe to the top of the structure. Plan "H" dimensions are approximate only for estimating purposes and the actual dimensions shall be determined by the Contractor from field conditions.

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. The cost for invert shaping shall be included in the price bid for the structure.



SECTION B-B



SECTION C-C

APPROXIMATE WEIGHT
Cast Iron
Grate 363 ± 18 lbs.

NOTES.

Any alternate methods of anchorage, meeting the approval of the Engineer, may be substituted for the cast iron lugs as shown hereon.

DETAILS OF COLLAR AND GRATE

STANDARD DROP INLET
12"-24" PIPE MAXIMUM DEPTH (H) = 10'
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
241
503

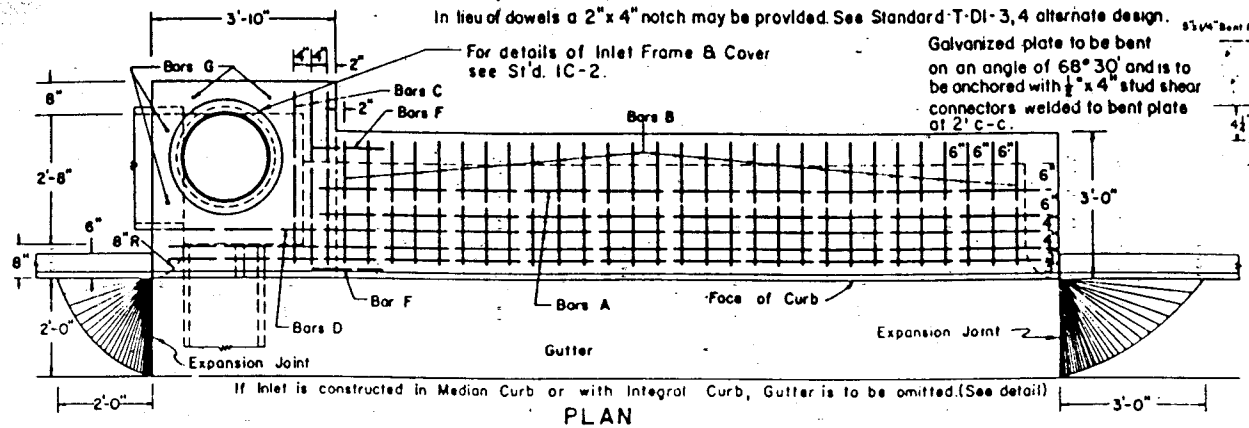
104.01

DI-3A-3B-3C

Sheet 1 of 2

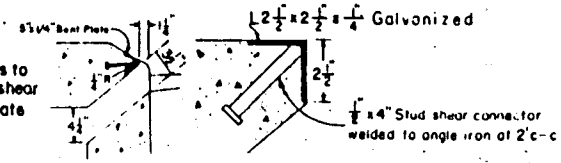
3/4"x8" Smooth Dowels @ approx. 12" C-C to be placed in all areas adjacent to abutting concrete to prevent settlement.

In lieu of dowels a 2"x 4" notch may be provided. See Standard T-DI-3,4 alternate design.

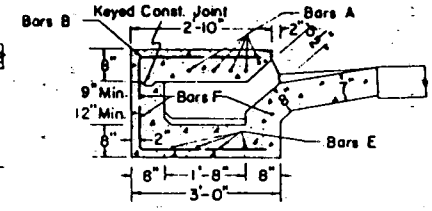


If Inlet is constructed in Median Curb or with Integral Curb, Gutter is to be omitted. (See detail)

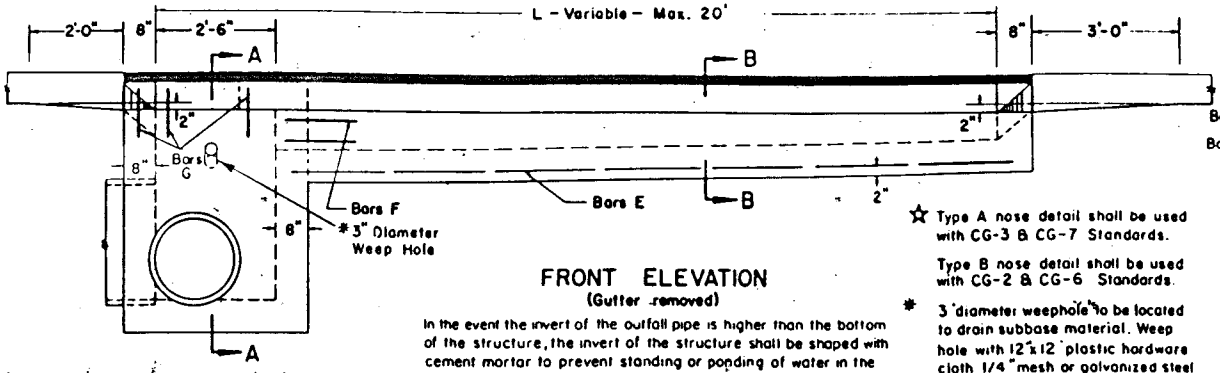
PLAN



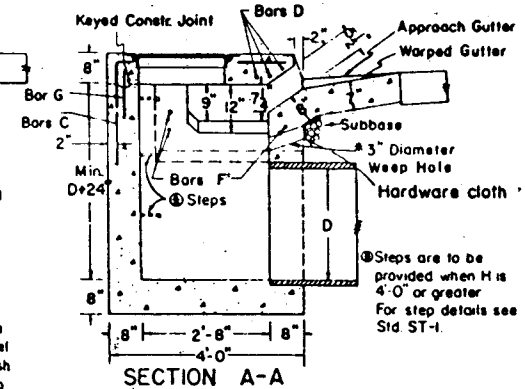
☆ NOSE DETAILS



SECTION B-B



FRONT ELEVATION
(Gutter removed)



Steps are to be provided when H is 4'-0" or greater. For step details see Std. ST-1.

SECTION A-A

Notes: Standard inlets may be constructed with concrete block in accordance with the details shown on Standard Drawing DI-MB.

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. The cost for invert shaping shall be included in the price bid for the structure.

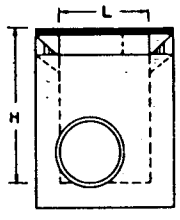
☆ Type A nose detail shall be used with CG-3 & CG-7 Standards.

Type B nose detail shall be used with CG-2 & CG-6 Standards.

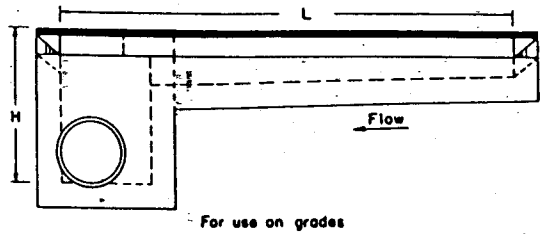
* 3" diameter weephole to be located to drain subbase material. Weep hole with 12"x12" plastic hardware cloth 1/4" mesh or galvanized steel wire dia. 0.03 inch, number 4 mesh hardware cloth anchored firmly to outside of structure.

For dimensions and quantities not shown see sheet 2 of 2

DI-3A

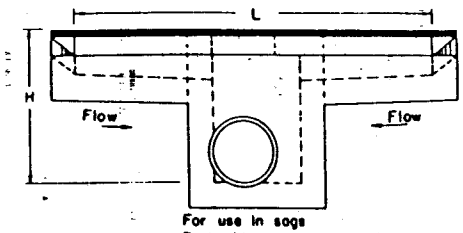


DI-3B

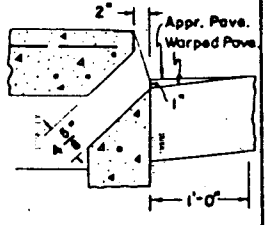


For use on grades

DI-3C



For use in sags
Both sides to be symmetrical



DETAIL WHEN USED ADJACENT TO CURB WITHOUT GUTTER

The "H" dimension shown on the Standards and specified on the plans will be measured from the invert of the outfall pipe to the top of the structure. Plan "H" dimensions are approximate only for estimating purposes and the actual dimensions shall be determined by the contractor from field conditions.

When specified on plans the invert is to be shaped in accordance with Standard Plan IS-1. The cost of furnishing and placing all materials incidental to the shaping is to be included in the price bid for the drop inlet complete.

Length of slot (L) will, in every case, be shown on plans.
When Inlet is used in 4'-0" Median, back of Inlet is to be shaped to conform with proposed curb. This item may be precast or cast in place.

STANDARD CURB DROP INLET
12"-30" PIPE MAXIMUM DEPTH (H) = 8'
VIRGINIA DEPARTMENT of TRANSPORTATION

SPECIFICATION REFERENCE
241
503

104.09

TABLE OF QUANTITIES

TYPE	L	AREA OF SLOT	CON-CRETE	REINFORCING STEEL																WEIGHT
				BARS A		BARS B		BARS C		BARS D		BARS E		BARS F		BARS G		
	Ft.	Sq. Ft.	Cu. Yds.	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	Lbs.
DI-3A	2'-6"	1.15	2.26	—	—	—	—	1	5'-7"	3	3'-2"	—	—	—	—	6	1'-0"	22
DI-3B	4'	1.83	2.59	5	1'-6"	2	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	1'-6"	3	1'-6"	4	1'-0"	64
	6'	2.75	3.02	5	3'-6"	6	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	3'-6"	3	1'-6"	4	1'-0"	111
	8'	3.67	3.46	5	5'-6"	10	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	5'-6"	3	1'-6"	4	1'-0"	158
	10'	4.58	3.90	5	7'-6"	14	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	7'-6"	3	1'-6"	4	1'-0"	204
	12'	5.50	4.34	5	9'-6"	18	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	9'-6"	3	1'-6"	4	1'-0"	251
	14'	6.42	4.78	5	11'-6"	22	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	11'-6"	3	1'-6"	4	1'-0"	298
	16'	7.33	5.22	5	13'-6"	26	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	13'-6"	3	1'-6"	4	1'-0"	345
	18'	8.25	5.66	5	15'-6"	30	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	15'-6"	3	1'-6"	4	1'-0"	391
	20'	9.17	6.09	5	17'-6"	34	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	17'-6"	3	1'-6"	4	1'-0"	438
DI-3C	6'	2.75	3.01	10	1'-9"	4	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	1'-9"	6	1'-6"	2	1'-0"	111
	8'	3.67	3.45	10	2'-9"	8	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	2'-9"	6	1'-6"	2	1'-0"	158
	10'	4.58	3.89	10	3'-9"	12	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	3'-9"	6	1'-6"	2	1'-0"	205
	12'	5.50	4.33	10	4'-9"	16	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	4'-9"	6	1'-6"	2	1'-0"	252
	14'	6.42	4.77	10	5'-9"	20	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	5'-9"	6	1'-6"	2	1'-0"	298
	16'	7.33	5.21	10	6'-9"	24	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	6'-9"	6	1'-6"	2	1'-0"	345
	18'	8.25	5.65	10	7'-9"	28	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	7'-9"	6	1'-6"	2	1'-0"	392
	20'	9.17	6.09	10	8'-9"	32	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	8'-9"	6	1'-6"	2	1'-0"	439

* Denotes length of one (1) bar

Notes: All reinforcing bars to be No. 5.

All cast in place concrete to be Class A3. For acceptable alternate see Precast Standard Designs.

Concrete quantities shown are for depth (H) of 5'-2" without pipes. The amount displaced by pipes must be deducted to obtain true quantities. For inlets of different depths add or subtract 0.32 cu. yds. of concrete for each foot of difference in depth.

Length of Angle Iron as shown on Sheet 1 is to be L + 16" @ 4.10 lbs. per ft.

SPECIFICATION REFERENCE
241 503

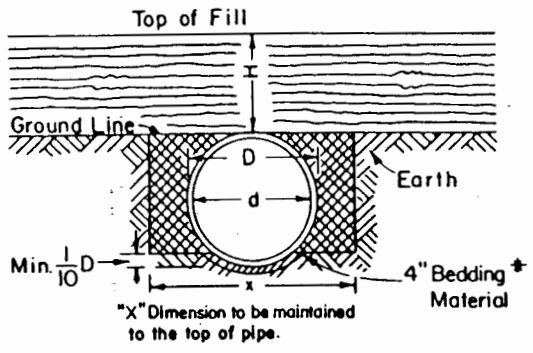
STANDARD CURB DROP INLET

12"-30" PIPE MAXIMUM DEPTH (H) = 8'

VIRGINIA DEPARTMENT OF TRANSPORTATION

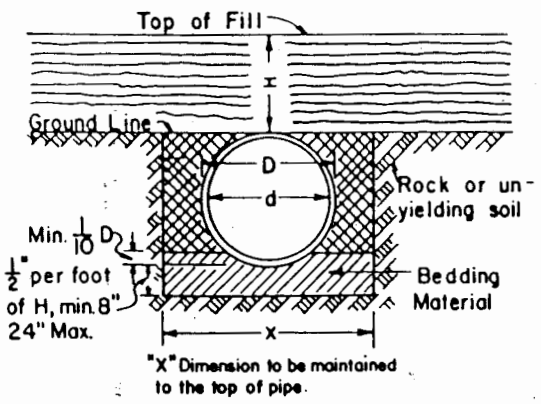
PB-1

NO PROJECTION OF PIPE ABOVE GROUND LINE

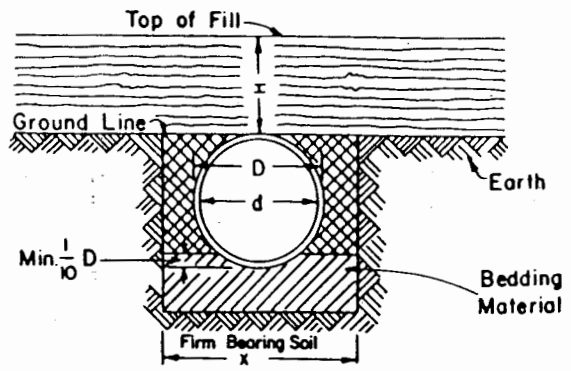


NORMAL EARTH FOUNDATION

* May be eliminated under entrance pipe where directed by Engineer.

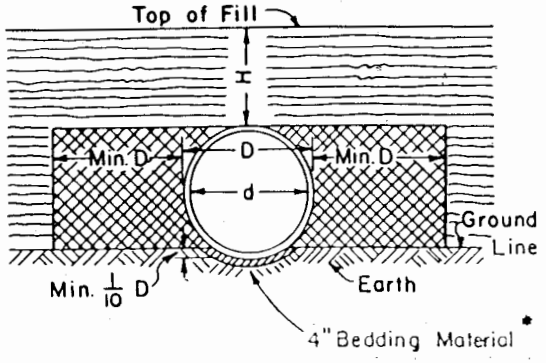


ROCK FOUNDATION

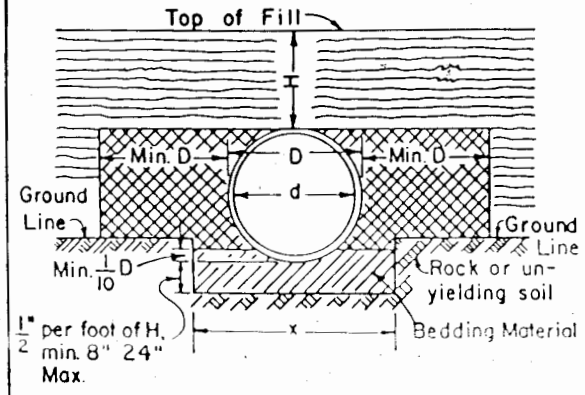


FOUNDATION SOFT, YIELDING, OR OTHERWISE UNSUITABLE MATERIAL

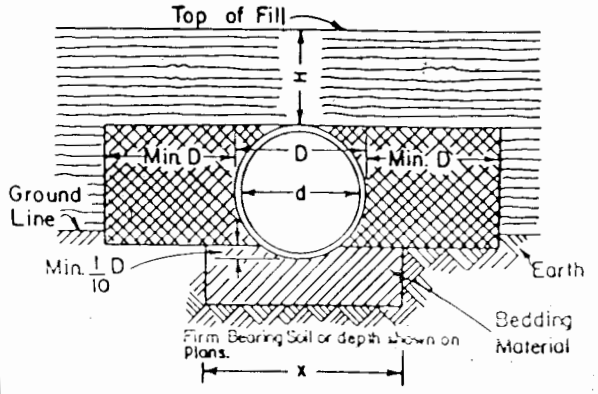
PIPE PROJECTING ABOVE GROUND LINE



NORMAL EARTH FOUNDATION



ROCK FOUNDATION



FOUNDATION SOFT, YIELDING, OR OTHERWISE UNSUITABLE MATERIAL

Culverts less than d = 36"
x = D + 12" min.
D + 24" max.

Culverts where d = 36" and over
x = D + 36"

Method "A" Pipe Bedding shall be used as follows unless otherwise noted on plans:

RIGID PIPE

Fills up to 30' (No projection of pipe above ground line.)

Fills up to 30' (Pipe projection above ground line)

FLEXIBLE PIPE

As shown on tables

H = Height of cover measured from top of drainage structure to finished grade.

- Bedding material in accordance with Section 302.02 of the Road and Bridge Specifications.
- Backfill material in accordance with Section 302.07 of the Road and Bridge Specifications.
- Embankment

Bedding requirements detailed under Method A, Projecting Condition, are applicable to Method B1 and B2.

INSTALLATION OF PIPE CULVERTS AND STORM SEWERS

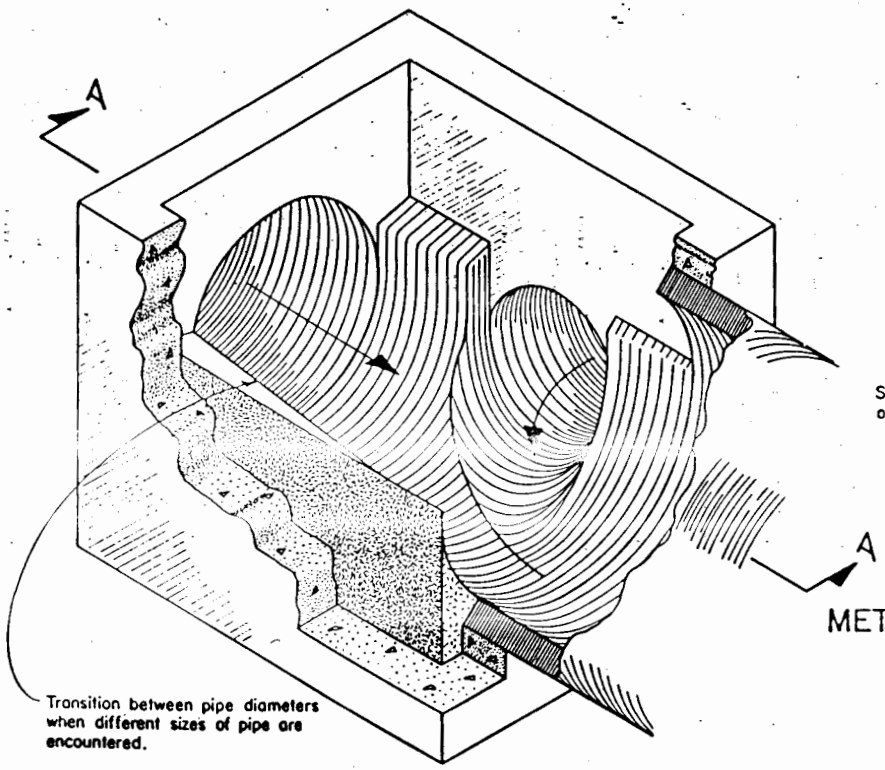
PIPE BEDDING - METHOD "A" (FILLS UP to 30')

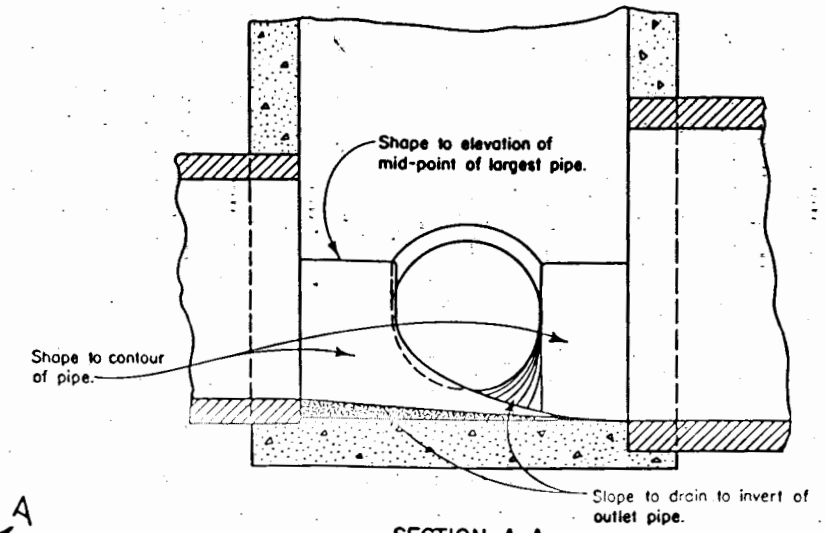
SPECIFICATION REFERENCE

302
303

107.01

VIRGINIA DEPARTMENT OF TRANSPORTATION





SECTION A-A

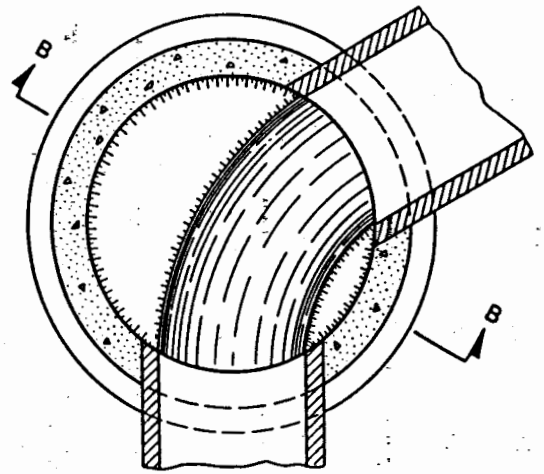
METHOD OF TREATMENT IN DROP INLETS

NOTES

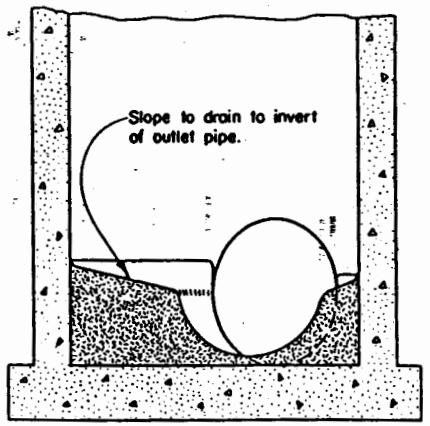
Shaping of manhole and inlet inverts in accordance with this drawing is to apply to those structures specified on plans or where invert of pipe is above invert of structure.

Manhole or drop inlet is to be formed and constructed in accordance with applicable standard or special drawing. The invert shaping as detailed hereon is to consist of a Portland Cement Concrete mix conforming to Class A3 or Class CI, except that 25% of coarse aggregate may be up to 4" in diameter and consist of stone, broken brick, broken concrete, or broken concrete block. The surface shall be left smooth by means of hand trowelling. None of the coarse aggregate shall remain exposed.

Details of invert shaping as shown hereon are for example purposes only. Each manhole or drop inlet is to be shaped individually to best fit the particular inlet and outlet configuration and flow lines.



PLAN

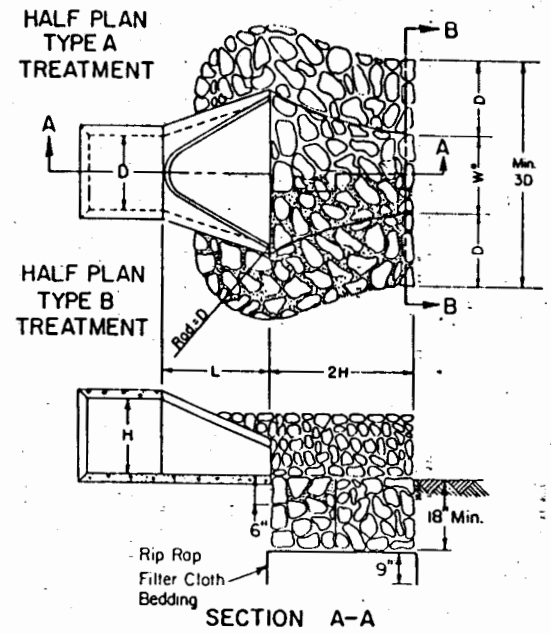


SECTION B-B

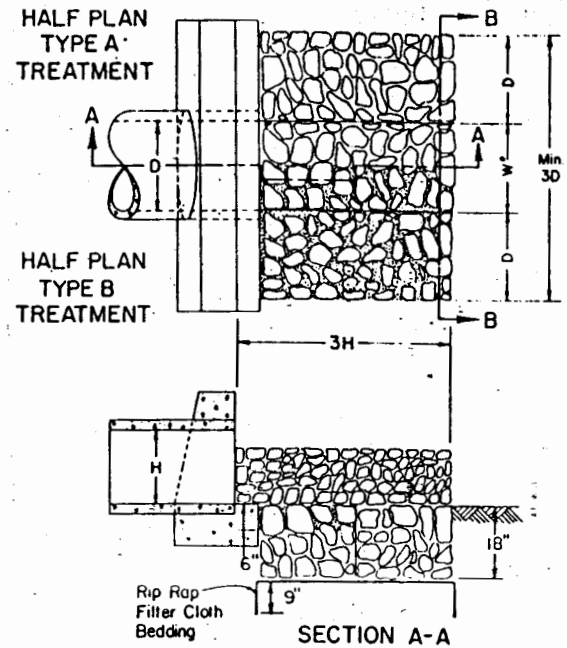
METHOD OF TREATMENT IN MANHOLES

SPECIFICATION REFERENCE	STANDARD METHOD OF SHAPING MANHOLE & INLET INVERTS
NONE	VIRGINIA DEPARTMENT of TRANSPORTATION

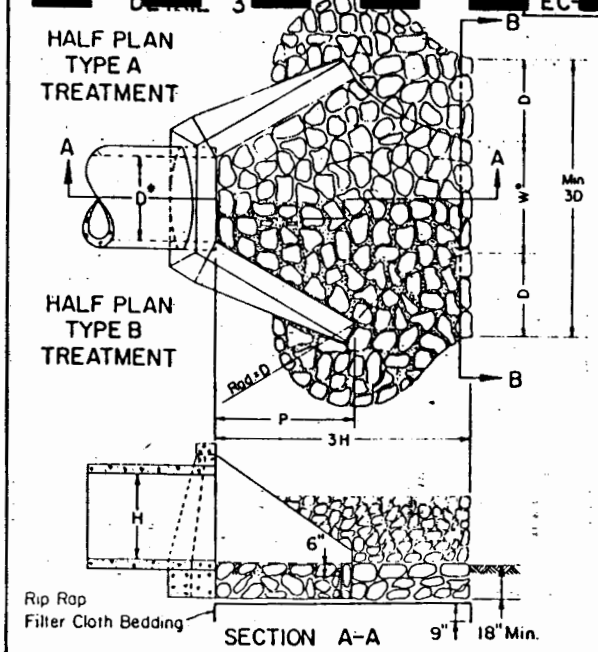
DETAIL 1



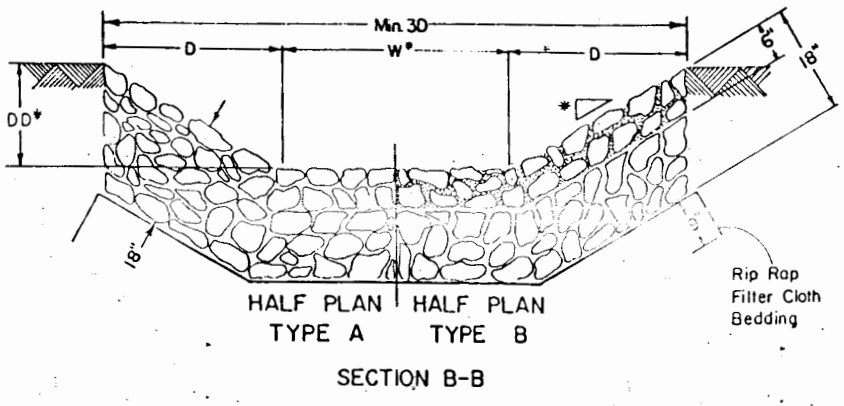
DETAIL 2



DETAIL 3



* D represents span for box culvert installations.
H = Diameter for round pipe, rise for pipe arch and box height.



* Use Typical Section shown on plans or normal side slope, bottom width, and depth of channel, ditch or natural ground.

NOTES

For multiple line installations Dimension D is to govern the protection outside the channel width (W).

On any Secondary Roads installation requiring erosion control treatment where no endwall or endsection is specified on plans, construction is to be in accordance with Detail 2 shown above.

Type A or B treatment to be as specified on the plans.

Type B ▒ The top 6" of the stone shall be grouted in accordance with section 418.09, except that the portion below the top 6" may be choked with fine material.

Rip Rap Filter Cloth Bedding to be installed under all erosion control stone in accordance with the specifications.

SPECIFICATION REFERENCE
205 303 258 418

STONE FOR EROSION CONTROL

VIRGINIA DEPARTMENT of TRANSPORTATION

114.01

CMP / Fully Coated (.024 n)

18" CMP	Elev.	Depth	$\frac{HW}{D}$	Discharge (cfs)
	71	0	0	0
	72	1	.66	3.3
	73	2	1.33	9.0
	74	3	2.0	13.0
	75	4	2.66	15.0
	76	5	3.33	18.0
	77	6	4.00	20.0
	77.5	6.5	4.33	21.0

4" Low Flow Orifice	$Q = CA\sqrt{2gh}$ (.032)	πr^2	$C = .6 - .99$
	71	0	0
	72	1	0.41
	73	2	0.59
	74	3	0.72
	75	4	0.83
	76	5	0.93
	77	6	1.02
	77.5	6.5	1.06

18" CMP (Orifice Flow)	$(1.06)\sqrt{64.40(h)}$	$C = .6$	$CA = 1.06$
	71	0	0
	72	1	8.50
	73	2	12.02
	74	3	14.73
	75	4	17.01
	76	5	19.02
	77	6	20.83
	77.5	6.5	21.68

Project ____ Plan Sheet No. ____ Designer ____ Sheet ____ of ____

Rev. Date ____ Date ____

HYDROLOGICAL DATA:

D.A. = ____ AC.

AHW Controls

100 yr. Flood plain ____ elev. ____

Design AHW depth ____ elev. ____

Structures ____ elev. ____

STATION: ____

freq. TWelev.

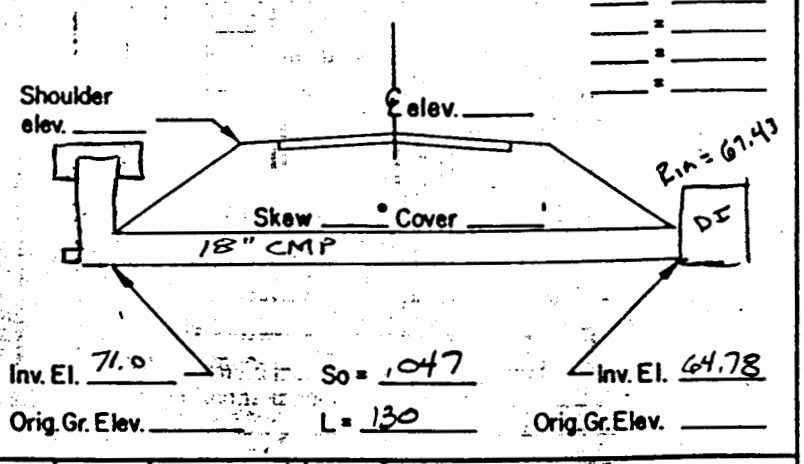
____ = ____

____ = ____

____ = ____

____ = ____

____ = ____



DISCHARGES USED

Q ____ = ____ 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									CONT. HW. ELEV.	OUTLET VELOCITY		End Treat.	COMMENTS
			INLET CONT.		OUTLET CONTROL											
			HW/D	HW	Ke	dc	$\frac{dc+D}{2}$	ho	H	LSo	HW		C.M.	Smooth		
18" CMP	3.3		.66	1.	.5	.6	1.05	2.65	.50	6.11						
	9.0		1.33	2	.5	1.0	1.25	2.65	3.0	6.11	.34					
	13		2	3	.5	1.3	1.40	2.65	8.0	6.11	4.54					
	15		2.66	4	.5	1.4	1.45	2.65	11	6.11	7.54					
	18		3.33	5	.5	1.5	1.5	2.65								
	20		4.0	6	.5	1.5	1.5	2.65								
	21		4.33	6.5	.5	1.5	1.5	2.65								
						1.5	1.5	2.65								

Design Flood Exceed. Prob. ____ Elev. ____

Overtop Flood Exceed. Prob. ____ Elev. ____

Base Flood 1% Exceed. Prob. ____ Elev. ____

Rev. 3-83

Project _____ Plan Sheet No. _____ Designer _____ Sheet ___ of ___

Rev. Date _____ Date _____

HYDROLOGICAL DATA:

D.A. = _____ AC.

AHW Controls

100 yr. Flood plain _____ elev. _____

Design AHW depth _____ elev. _____

Structures _____ elev. _____

STATION: _____

freq. TW elev.

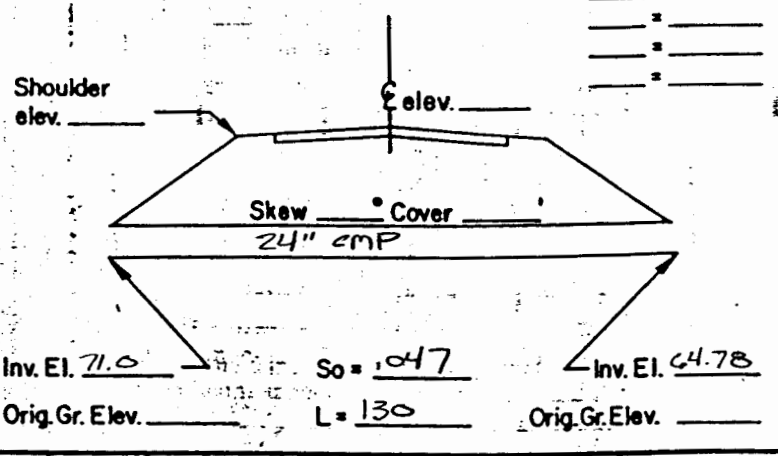
___ = _____

___ = _____

___ = _____

___ = _____

___ = _____



DISCHARGES USED

Q ___ = _____ 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									CONT. HW. ELEV.	OUTLET VELOCITY		End Treat.	COMMENTS
			INLET CONT.		OUTLET CONTROL											
			HW/D	HW	Ke	dc	$\frac{dc+D}{2}$	ho	H	LSo	HW		C.M.	Smooth		
24" CMP	4			1				2.65								
	13			2		1.5	1.75	2.65	2.2	6.11						
	20			3		1.6	1.80	2.65	4.5	"	1.04					
	26			4		1.7	1.85	2.65	7.5	"	4.04					
	30			5		1.8	1.90	2.65	10.5	"	7.04					
	35			6		2.0	2	2.65	14	"	10.54					
	36			6.5		2.0	2	2.65	15	"	11.54					

Design Flood Exceed. Prob. _____ Elev. _____

Overtop Flood Exceed. Prob. _____ Elev. _____

Base Flood 1% Exceed. Prob. _____ Elev. _____

24" CMP (WEIR) $Q = CLH^{3/2}$ $C = 2.65$

$L = 6.28$ ✓

ELEV.	DEPTH	DISCHARGE Q
75	0	0
76	1	16.64
77	2	47.07
77.5	2.5	65.78

INLET CONTROL

24" CMP

ELEV.	DEPTH	$\frac{HW}{D}$	DISCHARGE (CFS)
71	0	0	0
72	1	.50	4
73	2	1	13
74	3	1.5	20
75	4	2	26
76	5	2.5	30
77	6	3	35
77.5	6.5	3.25	36

OUTLET CONTROL

24" CMP (ORIFICE FLOW) $1.88\sqrt{64.4(h)}$

71	0	0
72	1	15
73	2	21.33
74	3	26.13
75	4	30.17
76	5	33.73
77	6	36.95
77.5	6.5	38.46

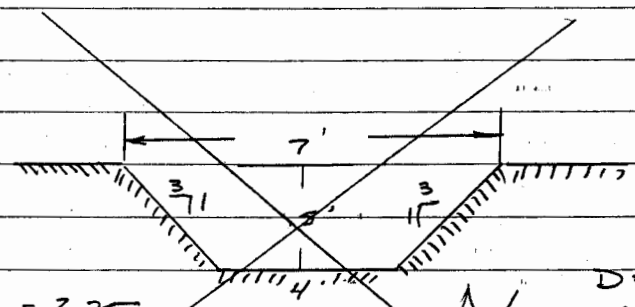
	OUTLET	CONTROL	Q CFS
24" CMP	71	0	0
	72	1	9
	73	2	13
	74	3	16
	75	4	18
	76	5	20
	77	6	22
	77.5	6.5	23

ELEV.	DISCHARGE	STORAGE AC-FT
71	0	0.0
72	0.41	0.122
73	0.59	0.266
74	0.72	0.429
75	0.83	0.609
76	16.64	0.811
77	22	1.036
77.5	23	1.261

EMERGENCY SPILLWAY

$Q_{100} = 38.8$ CFS

$Q_{100\ \text{EOS.}} = 22.06$ CFS ELEV = 77.03



$D = .37'$

$A_{FULL} = (.75) + 2 = 2.75$

$A_{(.75\ FULL)} = 1.89$

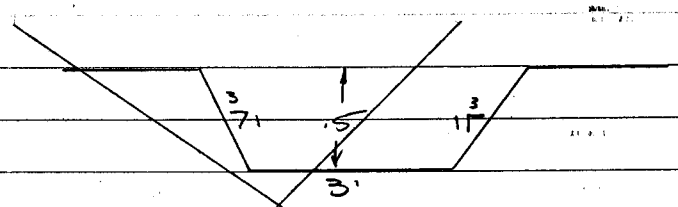
$Q = VA$ $\quad V = \frac{1.49}{n} R^{2/3} S^{1/2}$ $\quad Q = (99.33)(6.36)^{2/3}(.07)(1.89)$

$n = .015$ $\quad = (99.33)(3.39)(.07)(1.89) = 44.$

$S = .005$

$Q = \left(\frac{1.49}{.015}\right)(1.16)^{2/3}(.005)^{.5}(2.75)$

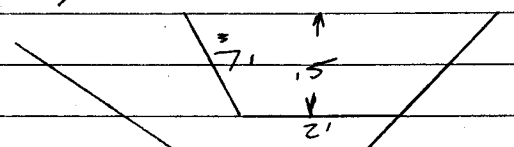
$(99.33)(3.66)(.07)(2.75) = 69.98$ CFS



$$Q_{FULL} = \left(\frac{1.49}{.015}\right)(6.16)^{2/3}(.005)^{.5}(2.25) =$$

$$(99.33)(3.32)(.07)(2.25) = 51.93$$

$$Q_{.5\,FULL} = (99.33)(2.58)^{2/3}(.07)(1.68) = 31.89$$



$$Q_{FULL} = (99.33)(5.16)^{2/3}(.07)(1.75) = 35.93 \text{ CFS}$$

$$Q_{.5\,FULL} = (99.33)(3.58)^{2/3}(.07)(.68) = 10.97 \text{ CFS}$$

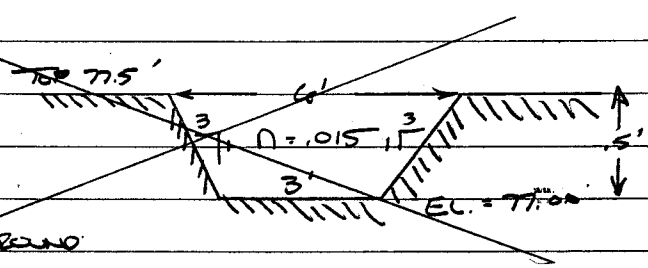
$$Q_{.75\,FULL} = (99.33)(4.36)^{2/3}(.07)(1.15) = 21.13 \text{ CFS}$$

USE:

CONCRETE SPILLWAY

$S = 0.005$

EXCAVATED IN NATURAL GROUND



```
*****************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****************

JOB TR20
TITLE 001
TITLE   DEVELOPED CONDITIONS STORMWATER MANAGEMENT ANALYSIS !!
 3 STRUCT    01
 8           71.0     0.0     0.0
 8           72.0     0.43    0.122
 8           73.0     0.61    0.266
 8           74.0     0.752   0.429
 8           75.0     0.868   0.609
 8           76.0     16.64   0.811
 8           77.0     22.00   1.036
 8           77.5     23.00   1.261
 9 ENDTBL
 6 RUNOFF 1  01   1    0.0083      85     0.251 1  1  1
 6 RESVOR 2  01 1  2 71.0                  1 1 1 1  1
  ENDATA
 7 INCREM 6            0.10
 7 COMPUT 7  01   01     0.00      2.8     1.02 2  02  05
  ENDCMP 1
 7 COMPUT 7  01   01     0.00      3.6     1.02 2  02  01
  ENDCMP 1
 7 COMPUT 7  01   01     0.00      5.8     1.02 2  02  02
  ENDCMP 1
 7 COMPUT 7  01   01     0.00      6.8     1.02 2  02  03
  ENDCMP 1
 7 COMPUT 7  01   01     0.00      8.5     1.02 2  02  04
  ENDJOB 2
0*******************************END OF 80-80 LIST*********************************


EXECUTIVE CONTROL OPERATION INCREM                                    RECORD ID
+                    MAIN TIME INCREMENT =  .10 HOURS


EXECUTIVE CONTROL OPERATION COMPUT                                    RECORD ID

+                    FROM STRUCTURE  1
+                              TO STRUCTURE  1
    STARTING TIME =  .00   RAIN DEPTH = 2.80   RAIN DURATION= 1.00   RAIN TABLE NO.= 2   ANT.
MOIST. COND= 2
    ALTERNATE NO.= 2      STORM NO.= 5   MAIN TIME INCREMENT =  .10 HOURS


OPERATION RUNOFF   STRUCTURE  1

      PEAK TIME(HRS)        PEAK DISCHARGE(CFS)       PEAK ELEVATION(FEET)
        12.06                 8.76                 (RUNOFF)

TIME(HRS)     FIRST HYDROGRAPH POINT =  .00 HOURS    TIME INCREMENT = .10 HOURS
```

DRAINAGE AREA = .01 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.00	.01	.01	.01	.02
9.00	DISCHG	.02	.02	.03	.03	.04	.04	.05	.06	.06	.07
10.00	DISCHG	.07	.08	.09	.10	.11	.13	.14	.17	.19	.22
11.00	DISCHG	.26	.29	.33	.36	.42	.48	.81	1.70	2.62	5.08
12.00	DISCHG	8.12	8.48	5.29	3.13	2.12	1.58	1.33	1.15	1.06	.96
13.00	DISCHG	.87	.81	.74	.70	.66	.62	.59	.55	.52	.50
14.00	DISCHG	.48	.46	.44	.42	.40	.39	.37	.35	.34	.33
15.00	DISCHG	.33	.33	.33	.33	.31	.30	.29	.29	.28	.28
16.00	DISCHG	.28	.28	.29	.29	.29	.29	.28	.26	.25	.24
17.00	DISCHG	.24	.24	.24	.24	.24	.24	.24	.24	.24	.22
18.00	DISCHG	.20	.20	.19	.19	.19	.19	.19	.19	.19	.19
19.00	DISCHG	.19	.19	.19	.19	.19	.19	.19	.19	.19	.18
20.00	DISCHG	.16	.15	.15	.15	.15	.15	.15	.15	.15	.15
21.00	DISCHG	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15
22.00	DISCHG	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15
23.00	DISCHG	.15	.15	.15	.15	.15	.15	.15	.15	.15	.13
24.00	DISCHG	.11	.09	.04	.02	.01	.00				

RUNOFF VOLUME ABOVE BASEFLOW = 1.42 WATERSHED INCHES, 7.63 CFS-HRS, .63 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1

*** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE = .67 CFS.

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.40	.67	73.41

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS
DRAINAGE AREA = .01 SQ.MI.

9.00	DISCHG	.00	.00	.00	.00	.00	.01	.01	.01	.01	.01
9.00	ELEV	71.00	71.00	71.00	71.00	71.00	71.01	71.02	71.02	71.02	71.03
10.00	DISCHG	.01	.01	.02	.02	.02	.02	.03	.03	.04	.04
10.00	ELEV	71.03	71.03	71.04	71.04	71.05	71.06	71.06	71.07	71.08	71.09

1

11.00	DISCHG	.05	.05	.06	.07	.08	.09	.10	.14	.20	.30
11.00	ELEV	71.11	71.12	71.14	71.16	71.18	71.20	71.24	71.32	71.45	71.70
12.00	DISCHG	.45	.53	.59	.62	.64	.65	.65	.66	.66	.66
12.00	ELEV	72.10	72.55	72.91	73.11	73.21	73.27	73.31	73.34	73.36	73.38
13.00	DISCHG	.67	.67	.67	.67	.67	.67	.67	.67	.67	.66
13.00	ELEV	73.39	73.40	73.41	73.41	73.41	73.41	73.41	73.40	73.39	73.39
14.00	DISCHG	.66	.66	.66	.66	.66	.66	.65	.65	.65	.65
14.00	ELEV	73.38	73.37	73.36	73.34	73.33	73.32	73.30	73.29	73.27	73.26
15.00	DISCHG	.64	.64	.64	.64	.64	.63	.63	.63	.63	.62
15.00	ELEV	73.24	73.23	73.21	73.20	73.18	73.16	73.15	73.13	73.11	73.09

16.00	DISCHG	.62	.62	.62	.61	.61	.61	.61	.60	.60	.59
16.00	ELEV	73.08	73.06	73.04	73.03	73.01	72.99	72.97	72.95	72.93	72.91
17.00	DISCHG	.59	.59	.58	.58	.58	.57	.57	.57	.56	.56
17.00	ELEV	72.89	72.87	72.85	72.83	72.81	72.80	72.78	72.76	72.74	72.72
18.00	DISCHG	.56	.55	.55	.55	.54	.54	.53	.53	.53	.52
18.00	ELEV	72.70	72.68	72.66	72.64	72.62	72.60	72.58	72.56	72.54	72.52
19.00	DISCHG	.52	.52	.51	.51	.51	.50	.50	.50	.49	.49
19.00	ELEV	72.50	72.48	72.47	72.45	72.43	72.41	72.39	72.38	72.36	72.34
20.00	DISCHG	.49	.48	.48	.48	.47	.47	.47	.46	.46	.46
20.00	ELEV	72.32	72.30	72.28	72.27	72.25	72.23	72.21	72.19	72.17	72.15
21.00	DISCHG	.45	.45	.45	.45	.44	.44	.44	.43	.43	.42
21.00	ELEV	72.14	72.12	72.10	72.08	72.07	72.05	72.03	72.02	72.00	71.98
22.00	DISCHG	.41	.41	.40	.39	.39	.38	.37	.37	.36	.35
22.00	ELEV	71.96	71.95	71.93	71.91	71.90	71.88	71.86	71.85	71.84	71.82
23.00	DISCHG	.35	.34	.34	.33	.33	.32	.32	.31	.31	.30
23.00	ELEV	71.81	71.79	71.78	71.77	71.76	71.74	71.73	71.72	71.71	71.70
24.00	DISCHG	.30	.29	.28	.28	.27	.26	.25	.25	.24	.23
24.00	ELEV	71.69	71.67	71.66	71.64	71.62	71.61	71.59	71.57	71.56	71.54
25.00	DISCHG	.23	.22	.21	.21	.20	.20	.19	.18	.18	.17
25.00	ELEV	71.52	71.51	71.50	71.48	71.47	71.45	71.44	71.43	71.42	71.40
26.00	DISCHG	.17	.16	.16	.15	.15	.15	.14	.14	.13	.13
26.00	ELEV	71.39	71.38	71.37	71.36	71.35	71.34	71.33	71.32	71.31	71.30
27.00	DISCHG	.13	.12	.12	.12	.11	.11	.11	.10	.10	.10
27.00	ELEV	71.29	71.28	71.28	71.27	71.26	71.25	71.25	71.24	71.23	71.23
28.00	DISCHG	.09	.09	.09	.09	.08	.08	.08	.08	.07	.07
28.00	ELEV	71.22	71.21	71.21	71.20	71.19	71.19	71.18	71.18	71.17	71.17
29.00	DISCHG	.07	.07	.07	.06	.06	.06	.06	.06	.06	.05
29.00	ELEV	71.16	71.16	71.15	71.15	71.15	71.14	71.14	71.13	71.13	71.13

RUNOFF VOLUME ABOVE BASEFLOW = 1.39 WATERSHED INCHES, 7.42 CFS-HRS, .61 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

\+ COMPUTATIONS COMPLETED FOR PASS 1

1

TR20 XEQ 04-23-98 14:51 JOB 1 PASS 2
REV PC 09/83(.2) DEVELOPED CONDITIONS STORMWATER MANAGEMENT ANALYSIS !!
PAGE 2

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID

\+ FROM STRUCTURE 1
\+ TO STRUCTURE 1
STARTING TIME = .00 RAIN DEPTH = 3.60 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2

ALTERNATE NO.= 2 STORM NO.= 1 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF STRUCTURE 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.06	12.88 (RUNOFF)	

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS
DRAINAGE AREA = .01 SQ.MI.

7.00	DISCHG	.00	.00	.00	.01	.01	.01	.02	.02	.02	.02
8.00	DISCHG	.03	.03	.04	.04	.05	.06	.06	.07	.07	.08
9.00	DISCHG	.08	.09	.10	.11	.12	.12	.13	.15	.16	.17
10.00	DISCHG	.17	.18	.20	.21	.24	.27	.30	.34	.38	.43
11.00	DISCHG	.48	.53	.60	.65	.74	.84	1.38	2.81	4.20	7.83
12.00	DISCHG	12.11	12.39	7.65	4.49	3.03	2.24	1.87	1.62	1.49	1.35
13.00	DISCHG	1.22	1.14	1.04	.98	.92	.87	.82	.76	.72	.69
14.00	DISCHG	.66	.64	.61	.59	.56	.54	.51	.48	.47	.46
15.00	DISCHG	.46	.46	.46	.45	.43	.41	.40	.39	.39	.39
16.00	DISCHG	.39	.39	.39	.39	.39	.39	.38	.36	.34	.33
17.00	DISCHG	.33	.33	.33	.33	.33	.33	.33	.33	.33	.31
18.00	DISCHG	.28	.27	.27	.27	.27	.27	.27	.27	.27	.27
19.00	DISCHG	.27	.27	.27	.27	.27	.27	.27	.27	.26	.24
20.00	DISCHG	.22	.21	.20	.20	.20	.20	.20	.20	.20	.20
21.00	DISCHG	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20
22.00	DISCHG	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20
23.00	DISCHG	.20	.20	.20	.20	.20	.20	.20	.20	.20	.18
24.00	DISCHG	.15	.12	.06	.02	.01	.00				

RUNOFF VOLUME ABOVE BASEFLOW = 2.11 WATERSHED INCHES, 11.29 CFS-HRS, .93 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1

*** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE = .81 CFS.

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.60	.81	74.53

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS
DRAINAGE AREA = .01 SQ.MI.

8.00	DISCHG	.00	.00	.00	.01	.01	.01	.01	.01	.01	.01
8.00	ELEV	71.00	71.00	71.00	71.01	71.02	71.02	71.02	71.03	71.03	71.03
9.00	DISCHG	.02	.02	.02	.02	.03	.03	.03	.03	.04	.04
9.00	ELEV	71.04	71.04	71.05	71.05	71.06	71.07	71.07	71.08	71.09	71.10
10.00	DISCHG	.05	.05	.05	.06	.06	.07	.07	.08	.09	.10
10.00	ELEV	71.11	71.11	71.12	71.13	71.15	71.16	71.17	71.19	71.21	71.23

1

11.00	DISCHG	.11	.12	.13	.15	.16	.18	.21	.26	.35	.46
11.00	ELEV	71.25	71.28	71.31	71.34	71.38	71.42	71.48	71.61	71.82	72.17
12.00	DISCHG	.56	.66	.73	.76	.78	.79	.79	.80	.80	.81
12.00	ELEV	72.72	73.34	73.81	74.07	74.21	74.30	74.35	74.40	74.43	74.46
13.00	DISCHG	.81	.81	.81	.81	.81	.81	.81	.81	.81	.81
13.00	ELEV	74.48	74.50	74.51	74.52	74.53	74.53	74.53	74.53	74.53	74.52
14.00	DISCHG	.81	.81	.81	.81	.81	.81	.81	.80	.80	.80
14.00	ELEV	74.52	74.51	74.50	74.49	74.48	74.47	74.46	74.44	74.43	74.41
15.00	DISCHG	.80	.80	.79	.79	.79	.79	.79	.78	.78	.78
15.00	ELEV	74.40	74.38	74.37	74.35	74.33	74.32	74.30	74.28	74.26	74.25
16.00	DISCHG	.78	.78	.77	.77	.77	.77	.77	.76	.76	.76
16.00	ELEV	74.23	74.21	74.19	74.18	74.16	74.14	74.12	74.11	74.09	74.07
17.00	DISCHG	.76	.76	.75	.75	.75	.74	.74	.74	.74	.73
17.00	ELEV	74.05	74.03	74.01	73.99	73.97	73.95	73.93	73.90	73.88	73.86
18.00	DISCHG	.73	.73	.72	.72	.72	.71	.71	.71	.70	.70
18.00	ELEV	73.84	73.82	73.79	73.77	73.75	73.73	73.70	73.68	73.66	73.64
19.00	DISCHG	.70	.69	.69	.69	.69	.68	.68	.68	.67	.67
19.00	ELEV	73.61	73.59	73.57	73.55	73.53	73.51	73.49	73.47	73.44	73.42
20.00	DISCHG	.67	.66	.66	.66	.65	.65	.65	.64	.64	.64
20.00	ELEV	73.40	73.38	73.36	73.33	73.31	73.29	73.26	73.24	73.22	73.20
21.00	DISCHG	.63	.63	.63	.63	.62	.62	.62	.61	.61	.61
21.00	ELEV	73.17	73.15	73.13	73.11	73.09	73.07	73.05	73.02	73.00	72.98
22.00	DISCHG	.60	.60	.59	.59	.59	.58	.58	.57	.57	.57
22.00	ELEV	72.96	72.93	72.91	72.89	72.87	72.85	72.82	72.80	72.78	72.76
23.00	DISCHG	.56	.56	.56	.55	.55	.54	.54	.54	.53	.53
23.00	ELEV	72.74	72.72	72.70	72.68	72.66	72.64	72.62	72.60	72.58	72.56
24.00	DISCHG	.53	.52	.52	.51	.51	.50	.50	.49	.49	.48
24.00	ELEV	72.54	72.52	72.49	72.46	72.44	72.41	72.38	72.35	72.32	72.29
25.00	DISCHG	.48	.47	.47	.46	.46	.45	.45	.44	.44	.44
25.00	ELEV	72.27	72.24	72.21	72.19	72.16	72.13	72.11	72.08	72.06	72.03
26.00	DISCHG	.43	.42	.41	.40	.39	.37	.36	.35	.34	.33
26.00	ELEV	72.01	71.98	71.95	71.92	71.90	71.87	71.85	71.82	71.80	71.77
27.00	DISCHG	.32	.31	.31	.30	.29	.28	.27	.26	.26	.25
27.00	ELEV	71.75	71.73	71.71	71.69	71.67	71.65	71.63	71.61	71.60	71.58
28.00	DISCHG	.24	.23	.23	.22	.22	.21	.20	.20	.19	.19
28.00	ELEV	71.56	71.55	71.53	71.52	71.50	71.49	71.47	71.46	71.45	71.43
29.00	DISCHG	.18	.18	.17	.17	.16	.16	.15	.15	.14	.14
29.00	ELEV	71.42	71.41	71.40	71.39	71.37	71.36	71.35	71.34	71.33	71.32

RUNOFF VOLUME ABOVE BASEFLOW = 2.01 WATERSHED INCHES, 10.78 CFS-HRS, .89 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

\+ COMPUTATIONS COMPLETED FOR PASS 2

1

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID

+ FROM STRUCTURE 1
+ TO STRUCTURE 1
STARTING TIME = .00 RAIN DEPTH = 5.80 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2
ALTERNATE NO.= 2 STORM NO.= 2 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF STRUCTURE 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.05	24.42	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS
DRAINAGE AREA = .01 SQ.MI.

5.00	DISCHG	.00	.01	.01	.02	.02	.02	.03	.03	.04	.04
6.00	DISCHG	.05	.06	.07	.08	.08	.09	.10	.10	.11	.12
7.00	DISCHG	.12	.13	.13	.14	.14	.15	.16	.16	.17	.17
8.00	DISCHG	.18	.19	.21	.23	.25	.27	.29	.30	.31	.32
9.00	DISCHG	.33	.34	.37	.39	.41	.42	.44	.47	.49	.51
10.00	DISCHG	.52	.54	.58	.61	.67	.74	.80	.91	1.00	1.11
11.00	DISCHG	1.22	1.32	1.46	1.57	1.76	1.96	3.14	6.18	8.92	15.82
12.00	DISCHG	23.50	23.39	14.26	8.28	5.53	4.06	3.38	2.92	2.67	2.42
13.00	DISCHG	2.18	2.03	1.86	1.75	1.64	1.54	1.46	1.35	1.28	1.22
14.00	DISCHG	1.17	1.13	1.08	1.04	.99	.95	.91	.85	.82	.81
15.00	DISCHG	.80	.80	.80	.80	.76	.72	.70	.69	.69	.69
16.00	DISCHG	.69	.69	.69	.69	.69	.69	.67	.62	.59	.58
17.00	DISCHG	.58	.58	.58	.58	.58	.58	.58	.58	.57	.53
18.00	DISCHG	.49	.47	.47	.46	.46	.46	.46	.46	.46	.46
19.00	DISCHG	.46	.46	.46	.46	.46	.46	.46	.46	.46	.42
20.00	DISCHG	.38	.36	.35	.35	.35	.35	.35	.35	.35	.35
21.00	DISCHG	.35	.35	.35	.35	.35	.35	.35	.35	.35	.35
22.00	DISCHG	.35	.35	.35	.35	.35	.35	.35	.35	.35	.35
23.00	DISCHG	.35	.35	.35	.35	.35	.35	.35	.35	.35	.31
24.00	DISCHG	.26	.21	.10	.04	.01	.00				

RUNOFF VOLUME ABOVE BASEFLOW = 4.12 WATERSHED INCHES, 22.08 CFS-HRS, 1.82 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1

*** WARNING-MAIN TIME INCREMENT MAY BE TOO LARGE.
COMPUTED PEAK(12.84) AT EXCEEDS MAX. ADJACENT HYDROGRAPH COORDINATE BY 5 %.
+ STRUCTURE 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)

12.24 12.84 75.76

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS
DRAINAGE AREA = .01 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
5.00	ELEV	71.00	71.00	71.00	71.00	71.00	71.00	71.00	71.00	71.00	71.01
6.00	DISCHG	.01	.01	.01	.01	.01	.02	.02	.02	.02	.03

1

TR20 XEQ 04-23-98 14:51 JOB 1 PASS 3
REV PC 09/83(.2) DEVELOPED CONDITIONS STORMWATER MANAGEMENT ANALYSIS !!
PAGE 5

6.00	ELEV	71.02	71.02	71.02	71.03	71.03	71.04	71.04	71.05	71.05	71.06
7.00	DISCHG	.03	.03	.03	.04	.04	.04	.05	.05	.05	.06
7.00	ELEV	71.06	71.07	71.08	71.08	71.09	71.10	71.11	71.11	71.12	71.13
8.00	DISCHG	.06	.06	.07	.07	.08	.08	.09	.09	.10	.10
8.00	ELEV	71.14	71.15	71.15	71.16	71.18	71.19	71.20	71.22	71.23	71.24
9.00	DISCHG	.11	.12	.12	.13	.14	.15	.16	.16	.17	.18
9.00	ELEV	71.26	71.27	71.29	71.31	71.32	71.34	71.36	71.38	71.40	71.42
10.00	DISCHG	.19	.20	.21	.22	.24	.25	.26	.28	.30	.32
10.00	ELEV	71.45	71.47	71.49	71.52	71.55	71.58	71.61	71.65	71.70	71.75
11.00	DISCHG	.35	.37	.40	.43	.44	.46	.48	.52	.60	.68
11.00	ELEV	71.80	71.87	71.93	72.01	72.08	72.16	72.28	72.52	72.92	73.52
12.00	DISCHG	.80	5.91	12.21	11.75	9.39	7.15	5.48	4.34	3.58	3.08
12.00	ELEV	74.44	75.32	75.72	75.69	75.54	75.40	75.29	75.22	75.17	75.14
13.00	DISCHG	2.70	2.41	2.18	2.00	1.85	1.72	1.61	1.51	1.42	1.34
13.00	ELEV	75.12	75.10	75.08	75.07	75.06	75.05	75.05	75.04	75.03	75.03
14.00	DISCHG	1.27	1.21	1.16	1.11	1.07	1.02	.97	.93	.88	.87
14.00	ELEV	75.03	75.02	75.02	75.02	75.01	75.01	75.01	75.00	75.00	75.00
15.00	DISCHG	.87	.87	.87	.87	.87	.87	.86	.86	.86	.86
15.00	ELEV	75.00	74.99	74.99	74.99	74.98	74.98	74.97	74.96	74.95	74.95
16.00	DISCHG	.86	.86	.86	.86	.86	.86	.86	.85	.85	.85
16.00	ELEV	74.94	74.93	74.92	74.91	74.91	74.90	74.89	74.88	74.87	74.86
17.00	DISCHG	.85	.85	.85	.85	.84	.84	.84	.84	.84	.84
17.00	ELEV	74.85	74.83	74.82	74.81	74.80	74.78	74.77	74.76	74.75	74.74
18.00	DISCHG	.84	.83	.83	.83	.83	.83	.82	.82	.82	.82
18.00	ELEV	74.72	74.70	74.69	74.67	74.65	74.64	74.62	74.60	74.59	74.57
19.00	DISCHG	.82	.81	.81	.81	.81	.81	.81	.80	.80	.80
19.00	ELEV	74.56	74.54	74.52	74.51	74.49	74.48	74.46	74.44	74.43	74.41
20.00	DISCHG	.80	.80	.79	.79	.79	.79	.78	.78	.78	.78
20.00	ELEV	74.39	74.37	74.35	74.33	74.31	74.29	74.27	74.25	74.23	74.21
21.00	DISCHG	.77	.77	.77	.77	.77	.76	.76	.76	.76	.75
21.00	ELEV	74.19	74.17	74.16	74.14	74.12	74.10	74.08	74.06	74.04	74.02
22.00	DISCHG	.75	.75	.75	.74	.74	.74	.74	.73	.73	.73
22.00	ELEV	74.00	73.98	73.96	73.94	73.92	73.90	73.88	73.86	73.85	73.83
23.00	DISCHG	.72	.72	.72	.72	.71	.71	.71	.71	.70	.70
23.00	ELEV	73.81	73.79	73.77	73.75	73.73	73.71	73.70	73.68	73.66	73.64
24.00	DISCHG	.70	.69	.69	.69	.68	.68	.67	.67	.66	.66
24.00	ELEV	73.62	73.60	73.57	73.54	73.50	73.47	73.44	73.40	73.37	73.33
25.00	DISCHG	.65	.65	.64	.64	.63	.63	.63	.62	.62	.61
25.00	ELEV	73.30	73.27	73.24	73.20	73.17	73.14	73.11	73.08	73.04	73.01

26.00	DISCHG	.61	.60	.59	.59	.58	.58	.57	.56	.56	.55
26.00	ELEV	72.98	72.94	72.91	72.88	72.84	72.81	72.78	72.74	72.71	72.68
27.00	DISCHG	.55	.54	.54	.53	.52	.52	.51	.51	.50	.50
27.00	ELEV	72.65	72.62	72.59	72.56	72.53	72.50	72.47	72.44	72.41	72.38
28.00	DISCHG	.49	.49	.48	.48	.47	.47	.46	.46	.45	.45
28.00	ELEV	72.35	72.32	72.29	72.27	72.24	72.21	72.19	72.16	72.13	72.11
29.00	DISCHG	.44	.44	.44	.43	.42	.41	.40	.39	.37	.36
29.00	ELEV	72.08	72.06	72.03	72.01	71.98	71.95	71.92	71.90	71.87	71.85

RUNOFF VOLUME ABOVE BASEFLOW = 3.88 WATERSHED INCHES, 20.76 CFS-HRS, 1.72 ACRE-FEET; BASEFLOW = .00 CFS
1

TR20 XEQ 04-23-98 14:51 JOB 1 PASS 4
REV PC 09/83(.2) DEVELOPED CONDITIONS STORMWATER MANAGEMENT ANALYSIS !!
PAGE 6

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

+ COMPUTATIONS COMPLETED FOR PASS 3

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID

+ FROM STRUCTURE 1
+ TO STRUCTURE 1
STARTING TIME = .00 RAIN DEPTH = 6.80 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2
ALTERNATE NO.= 2 STORM NO.= 3 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF STRUCTURE 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.05	29.75 (RUNOFF)	

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS
DRAINAGE AREA = .01 SQ.MI.

4.00	DISCHG	.00	.00	.00	.00	.00	.01	.01	.02	.02	.03
5.00	DISCHG	.04	.04	.05	.06	.06	.07	.07	.08	.09	.09
6.00	DISCHG	.10	.11	.13	.14	.15	.16	.17	.17	.18	.19
7.00	DISCHG	.20	.20	.21	.22	.22	.23	.24	.24	.25	.25
8.00	DISCHG	.26	.27	.30	.33	.36	.39	.41	.43	.44	.45
9.00	DISCHG	.46	.48	.51	.54	.56	.57	.60	.64	.67	.69
10.00	DISCHG	.70	.73	.77	.81	.89	.97	1.06	1.20	1.31	1.45
11.00	DISCHG	1.59	1.71	1.89	2.02	2.26	2.50	3.98	7.78	11.14	19.53
12.00	DISCHG	28.72	28.40	17.26	10.00	6.66	4.88	4.06	3.50	3.20	2.90
13.00	DISCHG	2.62	2.44	2.22	2.09	1.96	1.84	1.75	1.62	1.54	1.46

14.00	DISCHG	1.40	1.36	1.29	1.25	1.19	1.13	1.08	1.02	.98	.97
15.00	DISCHG	.96	.96	.96	.95	.91	.86	.84	.83	.82	.82
16.00	DISCHG	.82	.82	.82	.82	.82	.82	.80	.74	.71	.70
17.00	DISCHG	.69	.69	.69	.69	.69	.69	.69	.69	.68	.64
18.00	DISCHG	.59	.56	.56	.55	.55	.55	.55	.55	.55	.55
19.00	DISCHG	.55	.55	.55	.55	.55	.55	.55	.55	.55	.50
20.00	DISCHG	.45	.43	.42	.42	.42	.42	.42	.42	.42	.42
21.00	DISCHG	.42	.42	.42	.42	.42	.42	.42	.42	.42	.42
22.00	DISCHG	.42	.42	.42	.42	.42	.42	.42	.42	.42	.42
23.00	DISCHG	.42	.42	.42	.42	.42	.42	.42	.42	.41	.36
24.00	DISCHG	.31	.25	.12	.04	.02	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 5.07 WATERSHED INCHES, 27.16 CFS-HRS, 2.24 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.22	17.63	76.18

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS
DRAINAGE AREA = .01 SQ.MI.
1

5.00	DISCHG	.00	.00	.01	.01	.01	.01	.01	.01	.02	.02
5.00	ELEV	71.00	71.00	71.01	71.02	71.02	71.02	71.03	71.03	71.04	71.04
6.00	DISCHG	.02	.02	.03	.03	.03	.04	.04	.04	.05	.05
6.00	ELEV	71.05	71.05	71.06	71.07	71.07	71.08	71.09	71.10	71.11	71.12
7.00	DISCHG	.05	.06	.06	.07	.07	.08	.08	.09	.09	.09
7.00	ELEV	71.13	71.14	71.15	71.16	71.17	71.18	71.19	71.20	71.21	71.22
8.00	DISCHG	.10	.10	.11	.12	.12	.13	.14	.14	.15	.16
8.00	ELEV	71.23	71.24	71.25	71.27	71.28	71.30	71.32	71.34	71.36	71.38
9.00	DISCHG	.17	.18	.19	.20	.21	.22	.23	.24	.25	.26
9.00	ELEV	71.39	71.41	71.44	71.46	71.48	71.51	71.53	71.56	71.58	71.61
10.00	DISCHG	.28	.29	.30	.32	.33	.35	.37	.39	.41	.43
10.00	ELEV	71.64	71.67	71.70	71.73	71.77	71.81	71.85	71.91	71.96	72.02
11.00	DISCHG	.45	.46	.47	.49	.50	.52	.55	.61	.67	.77
11.00	ELEV	72.09	72.15	72.23	72.32	72.41	72.52	72.67	72.98	73.43	74.15
12.00	DISCHG	3.23	15.59	17.55	16.85	13.05	9.50	7.05	5.45	4.43	3.75
12.00	ELEV	75.15	75.93	76.17	76.04	75.77	75.55	75.39	75.29	75.23	75.18
13.00	DISCHG	3.27	2.91	2.63	2.40	2.22	2.06	1.93	1.81	1.70	1.60
13.00	ELEV	75.15	75.13	75.11	75.10	75.09	75.08	75.07	75.06	75.05	75.05
14.00	DISCHG	1.52	1.45	1.39	1.33	1.27	1.22	1.16	1.11	1.05	1.01
14.00	ELEV	75.04	75.04	75.03	75.03	75.03	75.02	75.02	75.02	75.01	75.01
15.00	DISCHG	.99	.98	.97	.96	.95	.92	.88	.87	.87	.87
15.00	ELEV	75.01	75.01	75.01	75.01	75.00	75.00	75.00	75.00	75.00	75.00
16.00	DISCHG	.87	.87	.87	.87	.87	.87	.87	.87	.86	.86

16.00	ELEV	74.99	74.99	74.99	74.99	74.99	74.98	74.98	74.98	74.97	74.96
17.00	DISCHG	.86	.86	.86	.86	.86	.86	.86	.86	.86	.85
17.00	ELEV	74.95	74.95	74.94	74.93	74.92	74.92	74.91	74.90	74.89	74.88
18.00	DISCHG	.85	.85	.85	.85	.85	.85	.84	.84	.84	.84
18.00	ELEV	74.87	74.86	74.85	74.83	74.82	74.81	74.79	74.78	74.77	74.75
19.00	DISCHG	.84	.84	.83	.83	.83	.83	.83	.83	.83	.82
19.00	ELEV	74.74	74.73	74.71	74.70	74.69	74.67	74.66	74.65	74.64	74.62
20.00	DISCHG	.82	.82	.82	.82	.81	.81	.81	.81	.81	.80
20.00	ELEV	74.61	74.59	74.57	74.55	74.53	74.52	74.50	74.48	74.46	74.44
21.00	DISCHG	.80	.80	.80	.80	.79	.79	.79	.79	.79	.78
21.00	ELEV	74.43	74.41	74.39	74.37	74.36	74.34	74.32	74.30	74.29	74.27
22.00	DISCHG	.78	.78	.78	.78	.77	.77	.77	.77	.77	.76
22.00	ELEV	74.25	74.24	74.22	74.20	74.19	74.17	74.15	74.14	74.12	74.11
23.00	DISCHG	.76	.76	.76	.76	.76	.75	.75	.75	.75	.74
23.00	ELEV	74.09	74.07	74.06	74.04	74.03	74.01	74.00	73.98	73.96	73.94
24.00	DISCHG	.74	.74	.73	.73	.72	.72	.71	.71	.70	.70
24.00	ELEV	73.92	73.90	73.87	73.84	73.80	73.77	73.73	73.70	73.66	73.62
25.00	DISCHG	.69	.69	.68	.68	.67	.67	.66	.66	.65	.65
25.00	ELEV	73.59	73.55	73.52	73.48	73.45	73.42	73.38	73.35	73.32	73.28
26.00	DISCHG	.65	.64	.64	.63	.63	.62	.62	.61	.61	.60
26.00	ELEV	73.25	73.22	73.18	73.15	73.12	73.09	73.06	73.03	72.99	72.96
27.00	DISCHG	.60	.59	.58	.58	.57	.57	.56	.55	.55	.54
27.00	ELEV	72.93	72.89	72.86	72.82	72.79	72.76	72.73	72.69	72.66	72.63
28.00	DISCHG	.54	.53	.53	.52	.52	.51	.51	.50	.50	.49
28.00	ELEV	72.60	72.57	72.54	72.51	72.48	72.45	72.42	72.39	72.36	72.33
29.00	DISCHG	.49	.48	.48	.47	.47	.46	.46	.45	.45	.44

1

29.00	ELEV	72.31	72.28	72.25	72.22	72.20	72.17	72.14	72.12	72.09	72.07

RUNOFF VOLUME ABOVE BASEFLOW = 4.79 WATERSHED INCHES, 25.65 CFS-HRS, 2.12 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

\+ COMPUTATIONS COMPLETED FOR PASS 4

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID

\+ FROM STRUCTURE 1
\+ TO STRUCTURE 1
STARTING TIME = .00 RAIN DEPTH = 8.50 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2
ALTERNATE NO.= 2 STORM NO.= 4 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF STRUCTURE 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.04	38.80	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS
DRAINAGE AREA = .01 SQ.MI.

3.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.01	.01
4.00	DISCHG	.02	.03	.04	.05	.06	.07	.08	.09	.10	.11
5.00	DISCHG	.12	.13	.14	.14	.15	.16	.17	.17	.18	.19
6.00	DISCHG	.20	.21	.24	.27	.28	.29	.30	.31	.32	.33
7.00	DISCHG	.34	.35	.36	.36	.37	.38	.39	.40	.40	.41
8.00	DISCHG	.42	.44	.48	.52	.57	.61	.64	.66	.67	.68
9.00	DISCHG	.69	.72	.78	.81	.84	.85	.88	.94	.98	1.01
10.00	DISCHG	1.02	1.06	1.12	1.18	1.28	1.39	1.51	1.71	1.85	2.04
11.00	DISCHG	2.23	2.40	2.63	2.81	3.12	3.44	5.43	10.53	14.93	25.83
12.00	DISCHG	37.57	36.87	22.34	12.91	8.57	6.27	5.20	4.48	4.10	3.71
13.00	DISCHG	3.35	3.12	2.84	2.67	2.50	2.35	2.24	2.07	1.96	1.87
14.00	DISCHG	1.79	1.73	1.64	1.59	1.51	1.44	1.38	1.30	1.25	1.23
15.00	DISCHG	1.22	1.22	1.22	1.21	1.16	1.09	1.06	1.05	1.05	1.05
16.00	DISCHG	1.05	1.05	1.05	1.05	1.05	1.05	1.02	.95	.90	.88
17.00	DISCHG	.88	.88	.88	.88	.88	.88	.88	.88	.87	.81
18.00	DISCHG	.75	.72	.71	.70	.70	.70	.70	.70	.70	.70
19.00	DISCHG	.70	.70	.70	.70	.70	.70	.70	.70	.70	.64
20.00	DISCHG	.57	.54	.53	.53	.53	.53	.53	.53	.53	.53
21.00	DISCHG	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53
22.00	DISCHG	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53
23.00	DISCHG	.53	.53	.53	.53	.53	.53	.53	.53	.52	.46
24.00	DISCHG	.40	.31	.15	.06	.02	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 6.71 WATERSHED INCHES, 35.93 CFS-HRS, 2.97 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1
1

TR20 XEQ 04-23-98 14:51 JOB 1 PASS 5
REV PC 09/83(.2) DEVELOPED CONDITIONS STORMWATER MANAGEMENT ANALYSIS !!
PAGE 9

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.22	22.06	77.03

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS
DRAINAGE AREA = .01 SQ.MI.

4.00	DISCHG	.00	.00	.00	.00	.01	.01	.01	.01	.01	.02
4.00	ELEV	71.00	71.00	71.00	71.00	71.01	71.02	71.02	71.03	71.03	71.04
5.00	DISCHG	.02	.02	.03	.03	.03	.04	.04	.04	.05	.05

5.00	ELEV	71.05	71.05	71.06	71.07	71.07	71.08	71.09	71.10	71.11	71.12
6.00	DISCHG	.06	.06	.06	.07	.08	.08	.09	.09	.10	.11
6.00	ELEV	71.13	71.14	71.15	71.16	71.18	71.19	71.20	71.22	71.23	71.25
7.00	DISCHG	.11	.12	.13	.13	.14	.15	.15	.16	.17	.17
7.00	ELEV	71.26	71.28	71.29	71.31	71.33	71.34	71.36	71.37	71.39	71.41
8.00	DISCHG	.18	.19	.20	.20	.21	.23	.24	.25	.26	.27
8.00	ELEV	71.42	71.44	71.46	71.48	71.50	71.52	71.55	71.58	71.61	71.63
9.00	DISCHG	.28	.30	.31	.32	.34	.35	.37	.38	.40	.42
9.00	ELEV	71.66	71.69	71.72	71.75	71.79	71.82	71.85	71.89	71.93	71.97
10.00	DISCHG	.43	.44	.44	.45	.46	.47	.48	.49	.50	.52
10.00	ELEV	72.01	72.04	72.08	72.12	72.16	72.21	72.27	72.33	72.41	72.49
11.00	DISCHG	.53	.55	.57	.60	.62	.64	.66	.72	.79	3.17
11.00	ELEV	72.58	72.68	72.80	72.92	73.05	73.18	73.37	73.74	74.32	75.15
12.00	DISCHG	16.80	20.46	22.02	21.31	19.42	17.27	12.73	8.88	6.64	5.30
12.00	ELEV	76.03	76.71	77.01	76.87	76.52	76.12	75.75	75.51	75.37	75.28
13.00	DISCHG	4.44	3.85	3.42	3.10	2.85	2.64	2.47	2.32	2.17	2.04
13.00	ELEV	75.23	75.19	75.16	75.14	75.13	75.11	75.10	75.09	75.08	75.07
14.00	DISCHG	1.94	1.85	1.77	1.70	1.62	1.55	1.48	1.41	1.35	1.29
14.00	ELEV	75.07	75.06	75.06	75.05	75.05	75.04	75.04	75.03	75.03	75.03
15.00	DISCHG	1.26	1.24	1.23	1.23	1.21	1.17	1.12	1.09	1.07	1.06
15.00	ELEV	75.02	75.02	75.02	75.02	75.02	75.02	75.02	75.01	75.01	75.01
16.00	DISCHG	1.06	1.05	1.05	1.05	1.05	1.05	1.04	1.01	.97	.93
16.00	ELEV	75.01	75.01	75.01	75.01	75.01	75.01	75.01	75.01	75.01	75.00
17.00	DISCHG	.91	.89	.88	.88	.88	.88	.88	.88	.87	.87
17.00	ELEV	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00
18.00	DISCHG	.87	.87	.87	.87	.86	.86	.86	.86	.86	.86
18.00	ELEV	74.99	74.99	74.98	74.97	74.97	74.96	74.95	74.94	74.94	74.93
19.00	DISCHG	.86	.86	.86	.86	.86	.85	.85	.85	.85	.85
19.00	ELEV	74.92	74.92	74.91	74.90	74.89	74.89	74.88	74.87	74.87	74.86
20.00	DISCHG	.85	.85	.85	.85	.84	.84	.84	.84	.84	.84
20.00	ELEV	74.85	74.83	74.82	74.80	74.79	74.78	74.76	74.75	74.73	74.72
21.00	DISCHG	.83	.83	.83	.83	.83	.83	.82	.82	.82	.82
21.00	ELEV	74.70	74.69	74.68	74.66	74.65	74.63	74.62	74.61	74.59	74.58
22.00	DISCHG	.82	.82	.81	.81	.81	.81	.81	.81	.81	.80
22.00	ELEV	74.57	74.55	74.54	74.53	74.51	74.50	74.49	74.48	74.46	74.45
23.00	DISCHG	.80	.80	.80	.80	.80	.80	.79	.79	.79	.79
23.00	ELEV	74.44	74.43	74.41	74.40	74.39	74.38	74.36	74.35	74.34	74.33
24.00	DISCHG	.79	.79	.78	.78	.78	.77	.77	.76	.76	.75
24.00	ELEV	74.31	74.29	74.26	74.23	74.20	74.16	74.13	74.09	74.06	74.02
25.00	DISCHG	.75	.74	.74	.73	.73	.72	.72	.71	.71	.70
25.00	ELEV	73.99	73.95	73.91	73.88	73.84	73.80	73.76	73.73	73.69	73.66

1

26.00	DISCHG	.70	.69	.69	.68	.68	.67	.67	.66	.66	.65
26.00	ELEV	73.62	73.59	73.55	73.52	73.48	73.45	73.41	73.38	73.35	73.31
27.00	DISCHG	.65	.65	.64	.64	.63	.63	.62	.62	.61	.61
27.00	ELEV	73.28	73.25	73.21	73.18	73.15	73.12	73.09	73.05	73.02	72.99
28.00	DISCHG	.60	.60	.59	.58	.58	.57	.57	.56	.55	.55
28.00	ELEV	72.96	72.92	72.89	72.85	72.82	72.79	72.76	72.72	72.69	72.66
29.00	DISCHG	.54	.54	.53	.53	.52	.52	.51	.51	.50	.49
29.00	ELEV	72.63	72.60	72.57	72.54	72.51	72.48	72.45	72.42	72.39	72.36

RUNOFF VOLUME ABOVE BASEFLOW = 6.27 WATERSHED INCHES, 33.61 CFS-HRS, 2.78 ACRE-FEET;
BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID
1

TR20 XEQ 04-23-98 14:51 JOB 1 SUMMARY
REV PC 09/83(.2) DEVELOPED CONDITIONS STORMWATER MANAGEMENT ANALYSIS !!
PAGE 11

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC COND	MAIN INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 2 STORM 5													
+													
STRUCTURE 1	RUNOFF	.01	2	2	.10	.0	2.80	24.00	1.42	—	12.06	8.76	1055.6
STRUCTURE 1	RESVOR	.01	2	2	.10	.0	2.80	24.00	1.39	73.41	13.40?	.67?	80.5
ALTERNATE 2 STORM 1													
+													
STRUCTURE 1	RUNOFF	.01	2	2	.10	.0	3.60	24.00	2.11	—	12.06	12.88	1552.0
STRUCTURE 1	RESVOR	.01	2	2	.10	.0	3.60	24.00	2.01	74.53	13.60?	.81?	98.1
ALTERNATE 2 STORM 2													
+													
STRUCTURE 1	RUNOFF	.01	2	2	.10	.0	5.80	24.00	4.12	—	12.05	24.42	2942.0
STRUCTURE 1	RESVOR	.01	2	2	.10	.0	5.80	24.00	3.88	75.76	12.24	12.84	1547.2
ALTERNATE 2 STORM 3													
+													
STRUCTURE 1	RUNOFF	.01	2	2	.10	.0	6.80	24.00	5.07	—	12.05	29.75	3584.9
STRUCTURE 1	RESVOR	.01	2	2	.10	.0	6.80	24.00	4.79	76.18	12.22	17.63	2123.6
ALTERNATE 2 STORM 4													
+													
STRUCTURE 1	RUNOFF	.01	2	2	.10	.0	8.50	24.00	6.71	—	12.04	38.80	4674.2
STRUCTURE 1	RESVOR	.01	2	2	.10	.0	8.50	24.00	6.27	77.03	12.22	22.06	2657.9

1

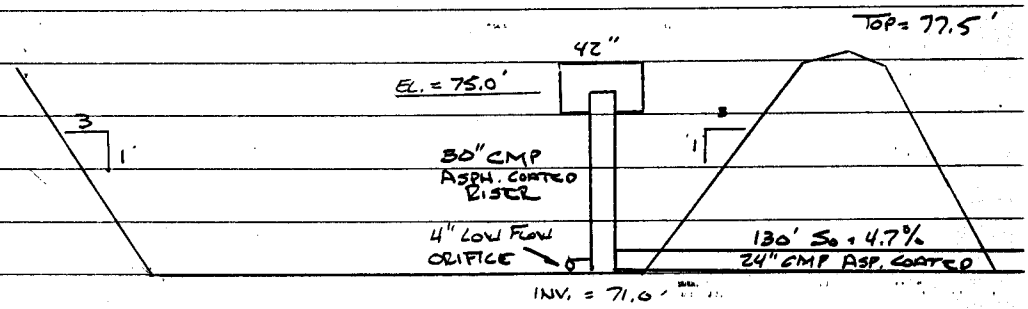
TR20 XEQ 04-23-98 14:51 JOB 1 SUMMARY
REV PC 09/83(.2) DEVELOPED CONDITIONS STORMWATER MANAGEMENT ANALYSIS !!
PAGE 12

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2	3	4	5
0 STRUCTURE 1	.01					
+ ALTERNATE 2		.81	12.84	17.63	22.06	.67

1END OF 1 JOBS IN THIS RUN

OAKTREE OFFICE PARK & AIRTIGHT SELF STORAGE



POST DEV.	(RUNOFF) Q (CFS)	ROUTED FLOW Q (CFS)	ELEV.	DRAW DOWN TIME
1 YEAR 2.80 IN.	8.76	0.67	73.41	29.9 HOURS
2 YEAR 3.60 IN	12.88	0.81	74.53 ✓	
10 YEAR 5.80 IN	24.42	12.84	75.76	
25 YEAR 6.80 IN	29.75	17.63	76.18	
100 YEAR 8.50 IN	38.80	22.06	77.03 ✓	

EMERGENCY SPILLWAY

EXCAVATED IN NATURAL GROUND

DESIGN TO HANDLE 100% OF 100 YEAR STORM

CONCRETE LINED

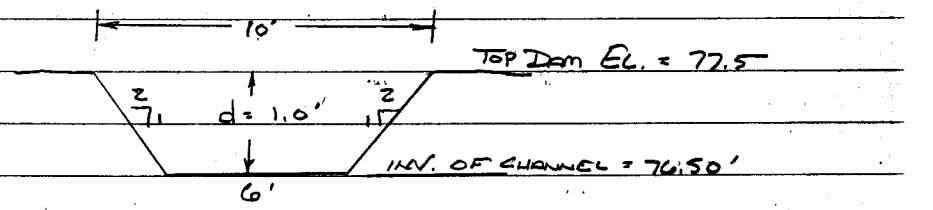
$n = .015$

$S_o = 0.005$

$Q_{100} = 38.80$ CFS

$d_n = 0.90'$

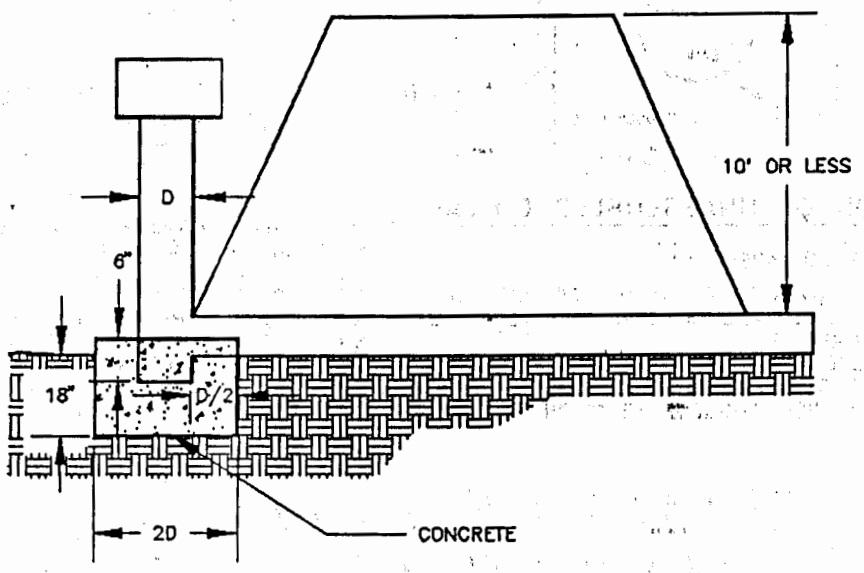
$d_c = 0.97$



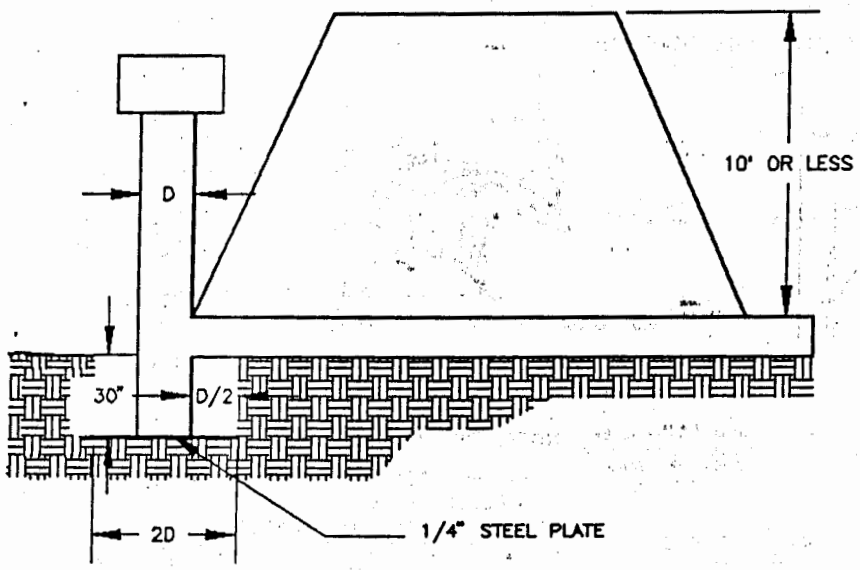
USE STANDARD PG-5

RISER PIPE BASE CONDITIONS FOR EMBANKMENTS LESS THAN 10' HIGH

CONCRETE BASE FOR EMBANKMENT 10' OR LESS IN HEIGHT



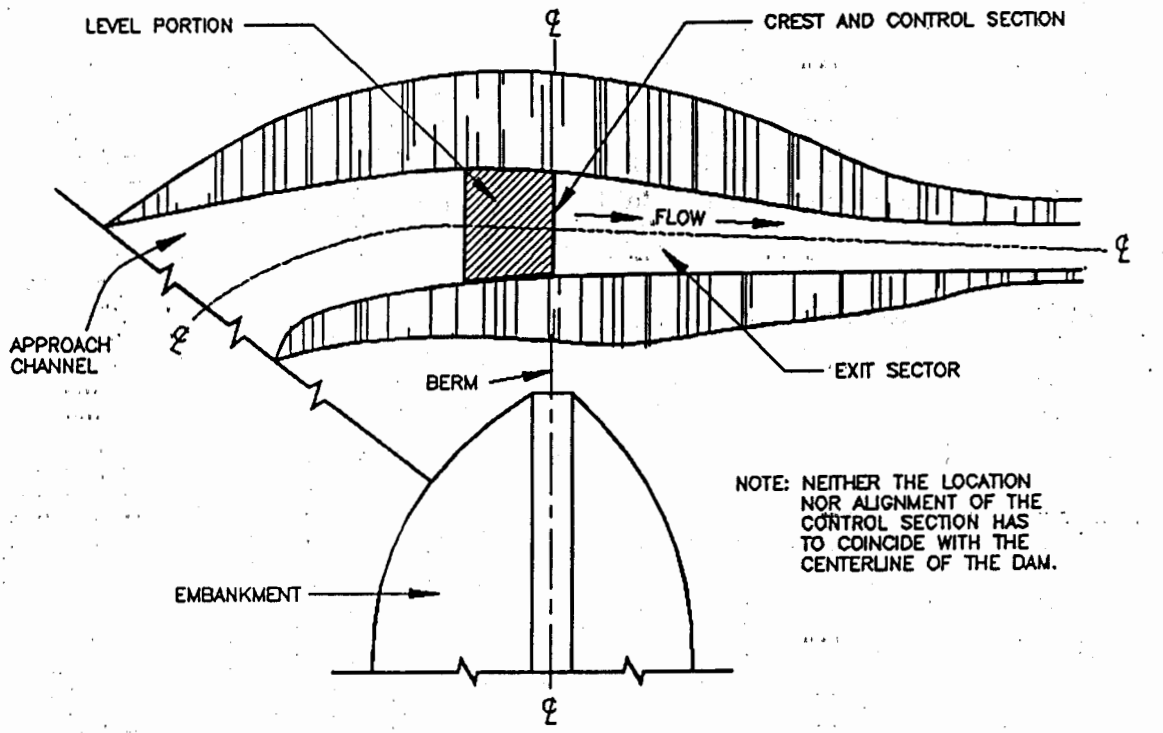
STEEL BASE FOR EMBANKMENT 10' OR LESS IN HEIGHT



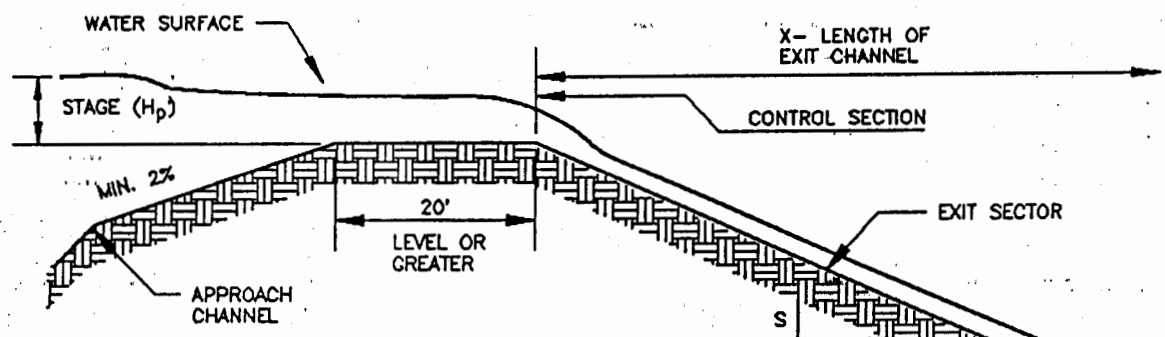
Source: Va. DSWC

Plate 3.14-14

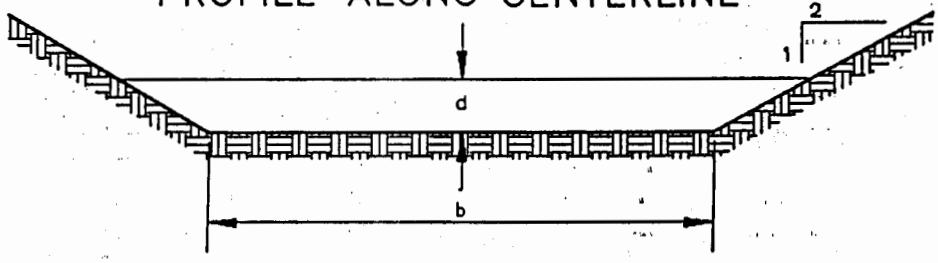
EXCAVATED EARTH SPILLWAY



PLAN VIEW



PROFILE ALONG CENTERLINE

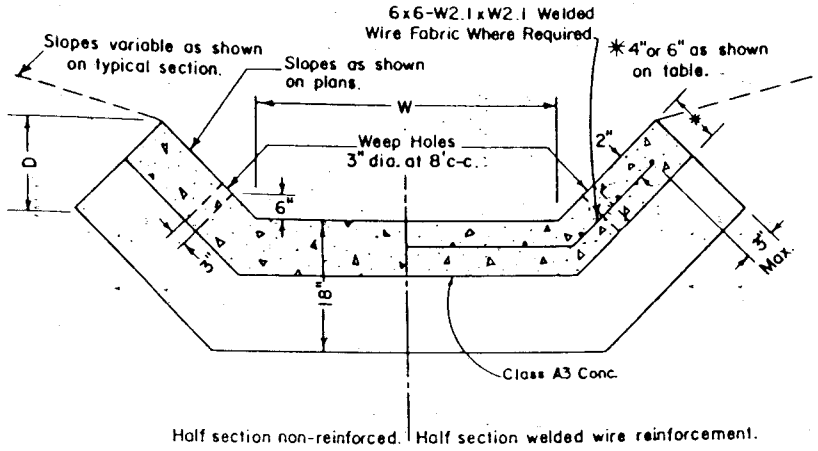


CROSS-SECTION AT CONTROL SECTION

Source: USDA-SCS

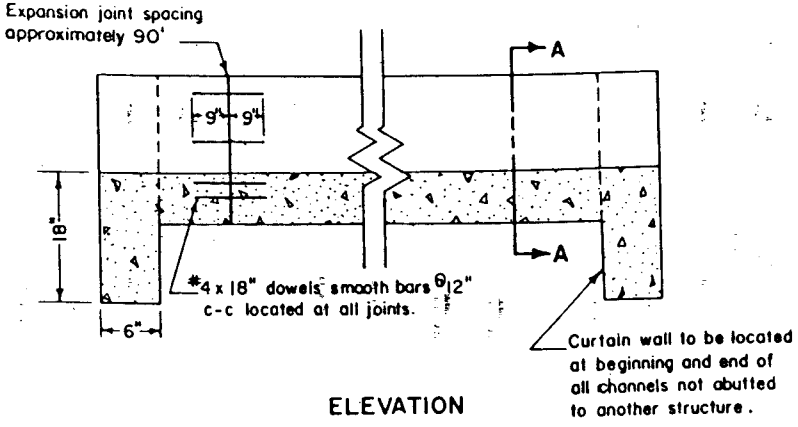
Plate 3.14-9

Indicates channel where wire mesh reinforcement is not required.



SECTION A-A

Concrete to be Class A3



ELEVATION

SQ. YDS. PER LIN. FT. OF PAVED CHANNEL

CONCRETE THICKNESS	D	W 1'	2'	3'	4'	5'	6'	7'	8'	9'	10'
1:1 SIDE SLOPES											
4"	1'	0.425	0.536	0.648	0.759	0.870	0.981	1.092	1.203	1.314	1.425
	2'	0.740	0.851	0.962	1.073	1.184	1.295	1.406	1.517	1.629	1.740
	3'	1.054	1.165	1.276	1.387	1.498	1.609	1.721	1.832	1.943	2.054
	4'	1.368	1.479	1.590	1.702	1.813	1.924	2.035	2.146	2.257	2.368
6"	5'	1.682	1.794	1.905	2.016	2.127	2.238	2.349	2.460	2.571	2.682
	6'	1.997	2.108	2.219	2.330	2.441	2.552	2.663	2.774	2.886	2.997
	7'	2.311	2.422	2.533	2.644	2.755	2.866	2.977	3.089	3.200	3.311
	8'	2.625	2.736	2.848	2.959	3.070	3.181	3.292	3.403	3.514	3.625
	9'	2.940	3.051	3.162	3.273	3.384	3.495	3.606	3.717	3.828	3.939
	10'	3.254	3.365	3.476	3.587	3.698	3.809	3.920	4.032	4.143	4.254
1½:1 SIDE SLOPES											
4"	1'	0.512	0.623	0.734	0.845	0.956	1.067	1.178	1.290	1.401	1.512
	2'	0.912	1.023	1.135	1.246	1.357	1.468	1.579	1.690	1.801	1.912
	3'	1.313	1.424	1.535	1.646	1.757	1.869	1.980	2.091	2.202	2.313
	4'	1.714	1.825	1.936	2.047	2.158	2.269	2.380	2.491	2.602	2.714
6"	5'	2.114	2.225	2.336	2.448	2.559	2.670	2.781	2.892	3.003	3.114
	6'	2.515	2.626	2.737	2.848	2.959	3.070	3.181	3.293	3.404	3.515
	7'	2.915	3.027	3.138	3.249	3.360	3.471	3.582	3.693	3.804	3.915
	8'	3.316	3.427	3.538	3.649	3.760	3.872	3.983	4.094	4.205	4.316
	9'	3.717	3.828	3.939	4.050	4.161	4.272	4.383	4.494	4.606	4.717
	10'	4.117	4.228	4.340	4.451	4.562	4.673	4.784	4.895	5.006	5.117
2:1 SIDE SLOPES											
4"	1'	0.608	0.719	0.830	0.941	1.052	1.164	1.275	1.386	1.497	1.608
	2'	1.105	1.216	1.327	1.438	1.549	1.660	1.772	1.883	1.994	2.105
	3'	1.602	1.713	1.824	1.935	2.046	2.157	2.268	2.380	2.491	2.602
	4'	2.099	2.210	2.321	2.432	2.543	2.654	2.765	2.876	2.988	3.099
6"	5'	2.596	2.707	2.818	2.929	3.040	3.151	3.262	3.373	3.485	3.596
	6'	3.093	3.204	3.315	3.426	3.537	3.648	3.759	3.870	3.981	4.093
	7'	3.589	3.701	3.812	3.923	4.034	4.145	4.256	4.367	4.478	4.589
	8'	4.086	4.197	4.309	4.420	4.531	4.642	4.753	4.864	4.975	5.086
	9'	4.583	4.694	4.805	4.917	5.028	5.139	5.250	5.361	5.472	5.583
	10'	5.080	5.191	5.302	5.413	5.525	5.636	5.747	5.858	5.969	6.080

NOTES

Depth (D) and width (W) to be as shown on plans.
Weep holes are to be provided on all channels where W is equal to or greater than 4' and D is equal to or greater than 2'.

SPECIFICATION REFERENCE
502

STANDARD PAVED DITCHES

VIRGINIA DEPARTMENT of TRANSPORTATION

109.03

OAKTREE OFFICE PARK & AIRTIGHT SELF STORAGE

CALCULATIONS FOR ANTI-SEEP COLLARS

$$L_s = Y(Z+4)\left(1+\frac{S}{0.25-S}\right)$$

$= W_s$ ELEV. 25 YR $= 76.18$

$Y = 5.18'$

$Z = 3:1$

$S = \quad L = 130' \quad S_o = 4.78'$

$$L_s = (5.18)(.0478+4)\left(1+\frac{.0478}{.25-.0478}\right)$$

$$L_s = (5.18)(4.0478)(1.23) = 25.79$$

NUMBER OF ANTI-SEEP COLLARS

PLATE 3.14-2

(2) COLLARS SIZE $Y = 3.25' \times 3.25'$

ANTI-VORTEX DEVICE DESIGN

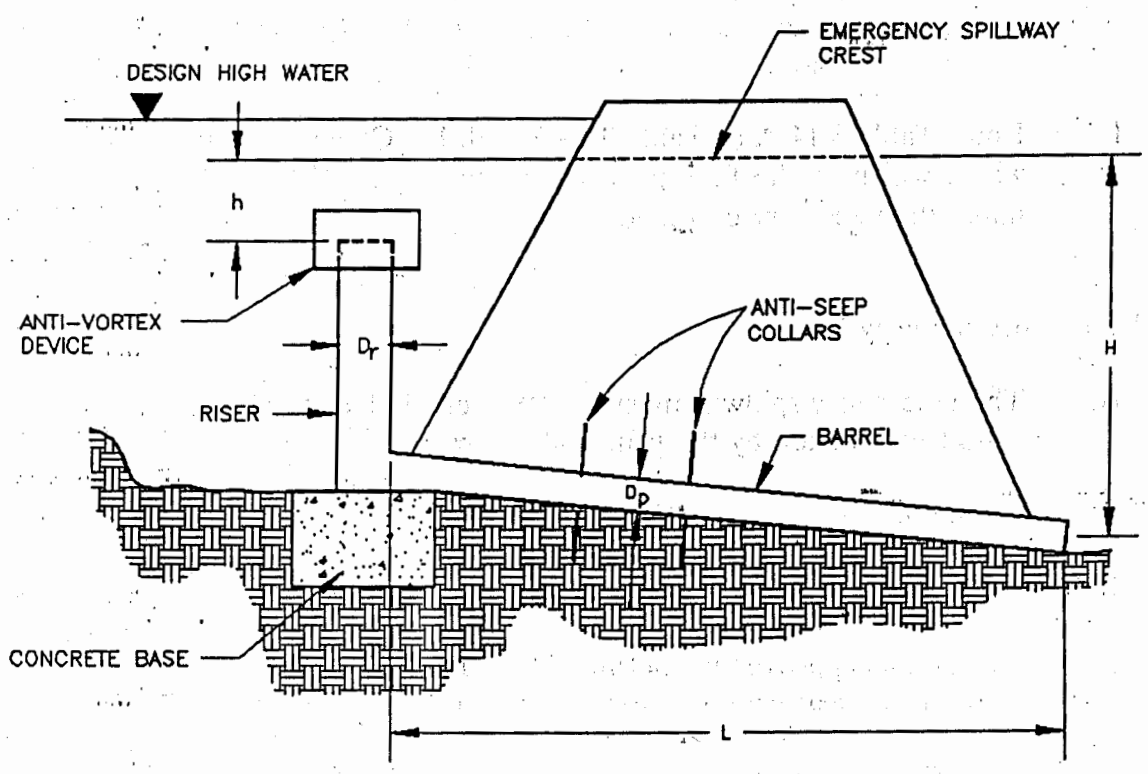
BARREL : 24" CMP ASPHALT COATED

$L = 130' \quad S_o = 4.78'$

RISER 30" CMP ASPHALT COATED

TABLE 3.14 D USE 42" DIA TRASH RACK

PRINCIPAL SPILLWAY DESIGN

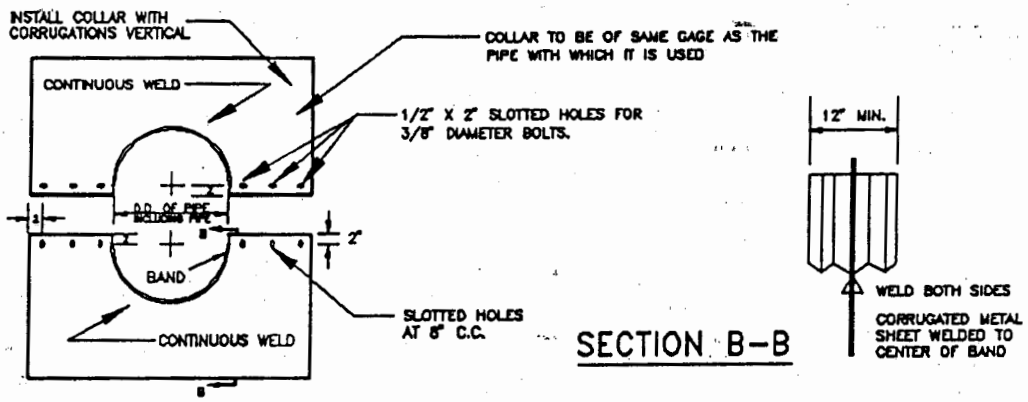


H = HEAD ON PIPE THROUGH EMBANKMENT
h = HEAD OVER RISER CREST
L = LENGTH OF PIPE THROUGH EMBANKMENT
D_p = DIAMETER OF PIPE THROUGH EMBANKMENT
D_r = DIAMETER OF RISER

Source: Va. DSWC

Plate 3.14-7

DETAILS OF CORRUGATED METAL ANTI-SEEP COLLAR



SECTION B-B

ELEVATION OF UNASSEMBLED COLLAR

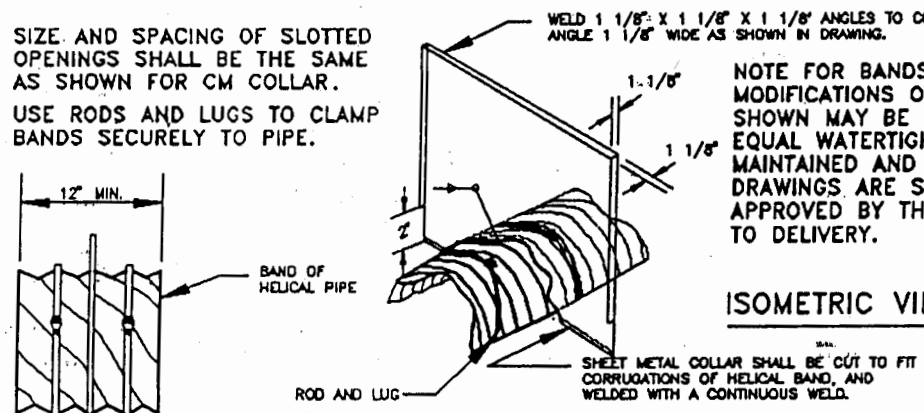
NOTES FOR COLLARS:

1. ALL MATERIALS TO BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
2. WHEN SPECIFIED ON THE PLANS, COATING OF COLLARS SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
3. UNASSEMBLED COLLARS SHALL BE MARKED BY PAINTING OR TAGGING TO IDENTIFY MATCHING PAIRS.
4. THE LAP BETWEEN THE TWO HALF SECTIONS AND BETWEEN THE PIPE AND CONNECTING BAND SHALL BE CAULKED WITH ASPHALT MASTIC AT TIME OF INSTALLATION.
5. EACH COLLAR SHALL BE FURNISHED WITH TWO 1/2" DIAMETER RODS WITH STANDARD TANK LUGS FOR CONNECTING COLLARS TO PIPE.

DETAIL OF HELICAL PIPE ANTI-SEEP COLLAR

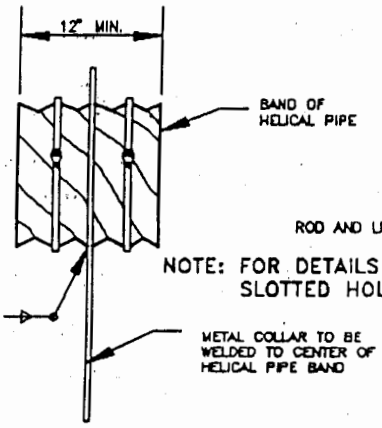
SIZE AND SPACING OF SLOTTED OPENINGS SHALL BE THE SAME AS SHOWN FOR CM COLLAR.

USE RODS AND LUGS TO CLAMP BANDS SECURELY TO PIPE.



NOTE FOR BANDS AND COLLARS: MODIFICATIONS OF THE DETAILS SHOWN MAY BE USED PROVIDING EQUAL WATERTIGHTNESS IS MAINTAINED AND DETAILED DRAWINGS ARE SUBMITTED AND APPROVED BY THE ENGINEER PRIOR TO DELIVERY.

ISOMETRIC VIEW



PARTIAL ELEVATION

REF: ENGR. FIELD MANUAL

NOTE: FOR DETAILS OF FABRICATION DIMENSIONS, MINIMUM GAGES, SLOTTED HOLES, AND NOTES, SEE DETAIL ABOVE.

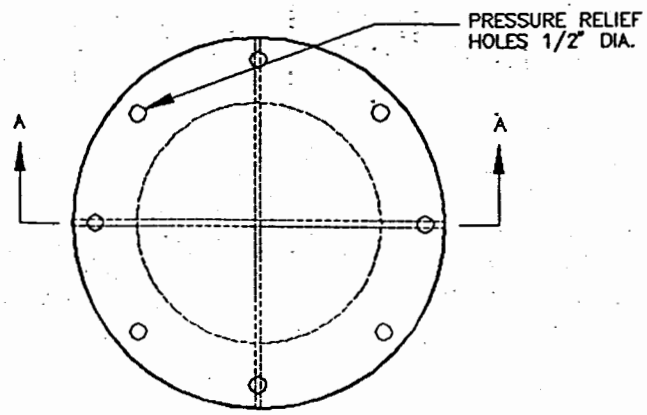
NOTE: TWO OTHER TYPES OF ANTI-SEEP COLLARS ARE:

1. CORRUGATED METAL, SIMILAR TO UPPER, EXCEPT SHOP WELDED TO A SHORT (4FT.) SECTION OF THE PIPE AND CONNECTED WITH CONNECTING BANDS TO THE PIPE.
2. CONCRETE, SIX INCHES THICK FORMED AROUND THE PIPE WITH #3 REBAR SPACED 15" HORIZONTALLY AND VERTICALLY.

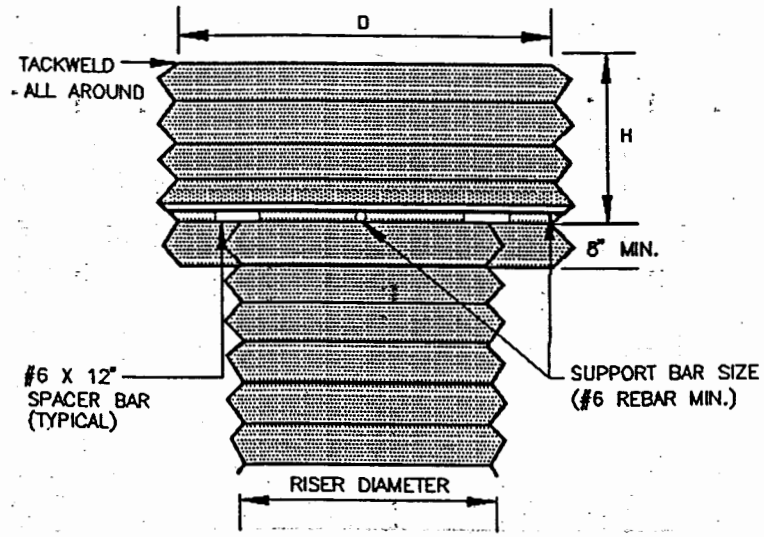
Source: USDA-SCS

Plate 3.14-13

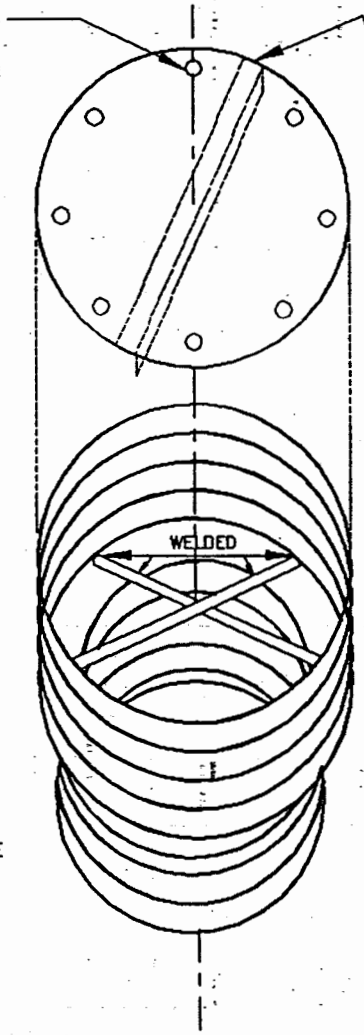
ANTI- VORTEX DEVICE DESIGN



PLAN VIEW



SECTION A–A



ISOMETRIC

TOP STIFFENER (IF REQUIRED) IS ___X___X___ ANGLE WELDED TO TOP AND ORIENTED PER-PENDICULAR TO CORRUGATIONS.

TOP IS ___ GAGE CORRUGATED METAL OR 1/8" STEEL PLATE. PRESSURE RELIEF HOLES MAY BE OMMITTED, IF ENDS OF CORRUGATIONS ARE LEFT FULLY OPEN WHEN THE TOP IS ATTACHED.

CYLINDER IS ___ GAGE CORRUGATED METAL PIPE OR FABRICATED FROM 1/8" STEEL PLATE.

NOTES:

1. THE CYLINDER MUST BE FIRMLY FASTENED TO THE TOP OF THE RISER.
2. SUPPORT BARS ARE WELDED TO THE TOP OF THE RISER OR ATTACHED BY STRAPS BOLTED TO TOP OF RISER.

Source: USDA-SCS

Plate 3.14-10

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

Project OAK TREE OFFICE PARK & AIRTIGHT SELF STORAGE

Basin # 1 Location _____

Total area draining to basin: 3.4 acres.

Basin Volume Design

Wet Storage:

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

   67 cu. yds. x 3.4 acres = ~~428~~ 228 cu. yds.

2. Available basin volume = ~~529~~ 279 cu. yds. at elevation ~~94~~ 73. (From storage - elevation curve)

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

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

4. Available volume before cleanout required.

   33 cu. yds. x 3.4 acres = 112.2 cu. yds.

5. Elevation corresponding to cleanout level = 72'.

   (From Storage - Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 1 ~~8~~ ft. (Min. = 1.0 ft.)

Dry Storage:

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

   67 cu. yds. x 3.4 acres = ~~428~~ 228 cu. yds.

8. Total available basin volume at crest of riser* = 752 cu. yds. at elevation 75. (From Storage - Elevation Curve)

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

9. Diameter of dewatering orifice = 4 in.

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

Preliminary Design Elevations

11. Crest of Riser = 75

Top of Dam = 77.5

Design High Water = 76.18

Upstream Toe of Dam = 71

Basin Shape

12. $\frac{\text{Length of Flow}}{\text{Effective Width}}$ $\frac{L}{We}$ = _____

If > 2, baffles are not required _____

If < 2, baffles are required _____

Runoff

13. Q_2 = 12.88 cfs (From Chapter 5)

14. Q_{25} = 29.75 cfs (From Chapter 5)

Principal Spillway Design

15. With emergency spillway, required spillway capacity $Q_p = Q_2 =$ 12.88 cfs. (riser and barrel)

Without emergency spillway, required spillway capacity $Q_p = Q_{25} =$ 29.75 cfs. (riser and barrel)

16. With emergency spillway:

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

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

Without emergency spillway:

Assumed available head (h) = 1.18' ft. (Using Q_{25})

h = Design High Water Elevation - Crest of Riser Elevation

17. Riser diameter (D_r) = 30 in. Actual head (h) = 1.18 ft.

(From Plate 3.14-8.)

Note: Avoid orifice flow conditions.

18. Barrel length (l) = 130 ft.

Head (H) on barrel through embankment = 5.18 ft.

(From Plate 3.14-7).

19. Barrel diameter = 24 in.

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

20. Trash rack and anti-vortex device

Diameter = 42 inches.

Height = 15 inches.

(From Table 3.14-D).

Emergency Spillway Design

21. Required spillway capacity $Q_e = Q_{25} - Q_p$ = 16.87 cfs.

22. Bottom width (b) = 3 ft.; the slope of the exit channel (s) = .5% ft./foot; and the minimum length of the exit channel (x) = 8' ft.
(From Table 3.14-C).

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = 6 ft.

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

Slope of principal spillway barrel (S_b) = 4.7 %

Length of barrel in saturated zone (L_s) = 55 ft.

24. Number of collars required = 2 dimensions = 4.7x4.7

(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 77.5

Design High Water = 76.18

Emergency Spillway Crest = 77

Principal Spillway Crest = 75

Dewatering Orifice Invert = 73

Cleanout Elevation = 72

Elevation of Upstream Toe of Dam
or Excavated Bottom of "Wet Storage
Area" (if excavation was performed) = 71

TABLE 3

WORKSHEET FOR BMP POINT SYSTEM

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
DESIGN 3	6	x	1	=	6
DESIGN 15	2	x	.25	=	.5
		x		=	
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS:

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit (0.1 per 1%)		Points for Natural Open Space
21 %	x	.1	=	2.1

C. TOTAL WEIGHTED POINTS

Structural BMP Points	+	Natural Open Space Points	=	TOTAL
6.5	+	2.1	=	8.6

James City County, Virginia
Environmental Division

Oak Tree Office Park & Airtight Self Storage
(SP-21-99; Amendment SP-23-98)

Hydrology & Hydraulics

(MC 035)

Mitchell-Wilson Associates, P.C.
Civil Engineers & Land Surveyors

P.O. Box 1269, 720 Main Street, 2nd Floor
West Point, Virginia 23181
804-843-9744
Fax: 804-843-9744

September 16, 1998

FAX TRANSMITTAL 3 PAGES

Darryl Cook,
James City County
P.O. Box 8784
101-E Mounts Bay Road
Williamsburg, Virginia 23187-8784

RE: OAKTREE OFFICE PARK & AIRTIGHT SELF STORAGE

Dear Darryl:

Mitchell-Wilson Associates, P.C. was asked by Wayne Brady and Dean Raynes with HIS Land Surveying to revise the storm drain calculations and hydraulic grade line for the field change that was made for this project. The approved plans were designed for the storm drain system to run from DI-2 to DI-3, the system was modified to DI-2 to DI-5A. The storm drain system from DI-5A to DI-5 will not handle the additional discharge with a single 15" RCP. There needs to be an additional 15" RCP storm drain line added from DI-5A to DI-5 to make the hydraulic grade line not exceed the rim elevation of the drop inlet at DI-5A. I talked with Mr. Brady after our conversation on Tuesday, September 15, 1998 and told him that an additional storm drain line would make this part of the system function without the water exceeding the rim at DI-5A.

DI-5A TO DI-5 (TWIN 15" RCP'S @ 0.004 ft/ft or 0.40 percent)

If you should have any questions please call

Sincerely,

James E. Mitchell, L.S.

cc: Wayne Brady
Dean Raynes

REVISED COMPUTATIONS TO SUPPORT STORM DRAIN MODIFICATION 9-15-98

DI-2 - 5A-5B-5

STORM SEWER DESIGN COMPUTATIONS

L & D 229

ROUTE 615 PROJ. OAKTREE OFFICE PARK - AIRTIGHT SELF STORAGE
COUNTY _____ DISTRICT _____
DESCRIPTION _____
SHEET ____ OF ____

FROM POINT (1)	TO POINT (2)	AREA DRAIN. "A" ACRES (3)	RUN-OFF COEF. C (4)	CA INCRE-MENT (5)	CA ACCUM-ULATED (6)	INLET TIME MINUTES (7)	RAIN FALL IN./HR. (8)	RUNOFF Q C.F.S. (9)	INVERT ELEVATIONS UPPER END (10)	INVERT ELEVATIONS LOWER END (11)	LENGTH FT. (12)	SLOPE FT./FT. (13)	DIA. IN. (14)	CAPA-CITY C.F.S. (15)	VEL. F.P.S. (16)	FLOW TIME MIN SEC. (17)	REMARKS (18)
DI-1	DI-2	.23	.90		.20	6	6.9	1.42	78.47	78.08	44.25	.0088	15	6.2	5.5	.13	
DI-2	DI-5A	.35	.90	.315	.51	6.13	6.9	3.55	78.08	76.2	89.87	.0209	15	9.4	8.4	.18	
DI-5A	DI-5B	.47	.83	.39	.90	6.31	6.9	0.24 / 3.10	76.2	75.68	129.51	.004	15	4.2	3.7	.58	
Twin 15" RCP								3.10									
DI-5B	DI-5							3.10	75.68	75.15	124.03	.0043	15	4.3	3.8	.54	
DI-5A	DI-5							3.10	76.2	75.15	254	.004	15	4.2	3.7	1.14	
DI-3	DI-4	.28	.90		.25	6	6.9	1.73	76.71	76.09	62	.01	18	10.9	6.5	.15	
DI-4	DI-5	.33	.36	.12	.37	6.15	6.9	2.54	75.99	75.15	92	.009	18	10	6.4	.24	
DI-5	DI-6	.26	.90	.23	1.49	7	6.8	10.13	75.15	72.67	130	.019	24	31.8	11	.19	
DI-6A	DI-6	.45	.90		.40	3	7.2	2.91	74.97	72.67	241	.0095	15	6.5	5.4	.72	
DI-6	MH-1	.54	.90	.48	2.38	9	6.2	14.75	72.67	72.23	27	.016	24	29	10	.04	
DI-7	MH-1	.20	.90		.18	3	7.2	1.29	72.5	72.23	54	.005	15	4.6	4.2	.21	
MH-1	TO OUTLET				2.56	9	6.2	15.87	72.13	71.61	52	.01	30	41	9	.09	
		3.11															
				2.56	=C(3.11)												
					C=0.82												

4-72

SEP-16-98 09:40 AM MITCHELL WILSON 804 843 9744 P.02

REVISED COMPUTATIONS TO SUPPORT STORM DRAIN MODIFICATION

9-15-98

HYDRAULIC GRADE LINE

PROJECT: ORCHARD OFFICE PARK / AIRTIGHT SELF STORAGE

INLET STATION	Outlet Water Surface Elev.	D_o	Q_o	L_o	S_{f_o} %	H_f	JUNCTION LOSS V_o	H_o	Q_i	V_i	Q_iV_i	$\frac{V_i^2}{2g}$	H_i	Angle	H_Δ	H_t	1.3 H_t	0.5 H_t	Final H	Inlet Water Surface Elev.	Rim Elev.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
DI-6	75.91	24"	14.75																	77.12	77.0
DI-6A	77.12	15	2.91	241	.002	.48	5.6	.12								.12	.15		.63	77.75	78.12
DI-5	77.12	24"	10.13	130	.002	.26	11	.46	6.21	3.8	23.59	.22	.07	90°	.15	.68	.88	.44	.70	77.82	79.37
DI-5B	77.82	15"	3.10	124.03	.0023	.28	3.8	.05								.05			.33	78.15	79.92
DI-5A	77.12	15"	3.10	254	.0023	.58	3.8	.05	3.55	8.4		1.09	.38	80°	.71	1.14	1.48	.74	1.32	78.44	78.97
DI-2	78.44	15"	3.55	89.5	.0029	.26	8.4	.27	1.42	5.5		.46	.16	60°	.25	.68	.88		1.14	79.58	81.37
DI-1	79.58	15"	1.42	44.25	.0046	.02	5.5	.11								.11	.14		.16	79.74	81.47

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

FINAL $H = H_f + H_t$

$H_t = H_o + H_i + H_\Delta$

SEE LD-72(D)67

90° K = 0.70	50° K = 0.47	20° K = 0.16
80° K = 0.66	40° K = 0.38	15° K = 0.10
70° K = 0.61	30° K = 0.28	
60° K = 0.55	25° K = 0.22	

LD 347

HYDRAULIC GRADE LINE

REVISED WATER SURFACE PROFILES 6-1-98 USING 2 YEAR POND W/S ELEV.

JAMES E. MITCHELL

MITCHELL-WILSON ASSOC., P.C.

PROJECT OAKTREE OFFICE PARK; AIRTIGHT SELFSTOR.

4-29-98

INLET STATION	Outlet Water Surface Elev.	D_o	Q_o	L_o	S_{f_o} %	H_f	JUNCTION LOSS V_o	H_o	Q_i	V_i	Q_iV_i	$\frac{V_i^2}{2g}$	H_i	Angle	H_Δ	H_t	1.3 H_t	0.5 H_t	Final H	Inlet Water Surface Elev.	Rim Elev.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
MH-1	74.53 / ~~73.61~~	30"	15.9	52	.0012	.06	9	.31	1.29 / 14.75	4.2 / 12	5.41 / 177	.27 / 2.24	.09 / .78	90°	.19 / 1.50	2.65			1.32	~~74.93~~ 75.85	76.3
(.8)(2.5) = +	2.00 / 71.61																				
DI-7	75.85 / ~~74.93~~	15"	1.29	54	.0004	.021	4.2	.06								.06	.078		.099	75.94 / ~~75.02~~	75.5
																				RAISE TO EL 76.0	
DI-6	75.85 / ~~74.93~~	24"	14.75	27	.004	.10	12	.55	2.91 / 9.30	5.2 / 8.3	15.13 / 77.19	1.06	.37	90°	.74	1.66	2.15	1.08	1.18	77.03 / ~~76.11~~	76.00
																				RAISE RIM ELEV. TO 77.00'	
DI-6A	77.03 / ~~76.11~~	15"	2.91	241	.002	.48	5.2	.10								.10	.13		.61	~~76.72~~ 77.64	78.00
DI-5	77.03 / ~~76.11~~	24"	9.30	130	.0016	.20	8.3	.26	2.92 / 5.98	4.3 / 9.5	52.81	1.40	.49	90°	.98	1.73	2.24	1.12	1.32	~~77.43~~ 78.35	78.8
DI-5A	78.35 / ~~77.43~~	15"	2.92	230	.002	.40	4.3	.07								.07	.09		.49	~~77.92~~ 78.84	79.3
DI-4	77.03 / ~~76.11~~	18"	5.98	92	.0032	.29	9.5	.35	5.18	9.5		1.40	.49	90	.98	1.82	2.36		2.65	79.68 / ~~78.76~~	81.0
DI-3	79.68 / ~~78.76~~	18"	5.18	62	.0025	.15	9.5	.35	3.55	6		.55	.19	180°	—	.54	.70		.85	80.53 / ~~79.61~~	83.3
DI-2	80.53 / ~~79.61~~	15"	3.55	209	.0028	.58	6	.56	1.42	7		.76	.26	30°	.21	1.03	1.33	.66	1.24	81.77 / ~~80.85~~	82.0
DI-1	~~80.85~~ 81.77	15"	1.42	48	.0005	.02	7	.19								.19	.24		.26	~~81.11~~ 82.03	82.7

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

$H_t = H_o + H_i + H_\Delta$

SEE LD-72(D)67

90° K = 0.70	50° K = 0.47	20° K = 0.16
80° K = 0.66	40° K = 0.38	15° K = 0.10
70° K = 0.61	30° K = 0.28	
60° K = 0.55	25° K = 0.22	

OAK TREE OFFICE PARK AND
AIRTIGHT SELF- STORAGE

BMP WORKSHEET AND
TR-20 LOGS

PREPARED BY: HIS LAND SURVEYING
P.O. BOX 100
PROVIDENCE FORGE VA. 23140

NARRATIVE REPORT

EXISTING SITE CONDITIONS:The existing site is a total of 5.674 ac. being tax map (47-1)(1-26). The property is wooded in medium pines and hardwoods. There are two old home sites on property no dwelling in place.

The soil conditions per the "Soil Survey of James City County and York County, and The City of Williamsburg" lists the soil type to be 10b craven.

The existing drainage is overland flow to existing storm sewer on tax parcel (47-1)(1-7). This storm sewer is tied to a regional BMP.

DEVELOPED CONDITIONS: This plan is to develope a office park and mini-storage. The office are two story and have 12000s.f. of floor space. The mini-storage is one and two story. Access to property is to be by one entrance opposite Powhatan Springs Road. The facility will tie into JCCSA Sewer and water.

The developed drainage will use storm sewer to direct flow to a stormwater managment facility. the facility will handle 5.32 ac of the total 5.674 ac..

The stormwater management facility will be a stormwater detention pond . the detention basin will control the increase runoff from the 2.10.25.100 year storms due to the development.

```
*****************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****************

JOB TR20
TITLE 001
TITLE     EXISTING CONDITIONS STORMWATER MANAGEMENT ANALYSIS !!
 3 STRUCT      01
 9 ENDTBL
 3 STRUCT      02
 9 ENDTBLE     STRUC NO   OUTPUT   Area -1.92   RCN      Tc=22.8 min
 6 RUNOFF 1    01    1     0.003 - 3.2/5.12     76       0.381 1   1   1
 6 RUNOFF 1    02    2     0.005                76       0.331 1   1   1
   ENDATA
 7 INCREM 6                 0.10 - Stop Time   Rainfall   - Rainfall dur
 7 COMPUT 7    01    01    0.00 - Start Time    3.6       1.02 2  02  01
   ENDCMP 1
 7 COMPUT 7    01    01    0.00                 5.8       1.02 2  02  02
   ENDCMP 1
 7 COMPUT 7    01    01    0.00                 6.8       1.02 2  02  03
   ENDCMP 1
 7 COMPUT 7    01    01    0.00                 8.5       1.02 2  02  04
   ENDCMP 1
 7 COMPUT 7    02    02    0.00                 3.6       1.02 2  02  01
   ENDCMP 1
 7 COMPUT 7    02    02    0.00                 5.8       1.02 2  02  02
   ENDCMP 1
 7 COMPUT 7    02    02    0.00                 6.8       1.02 2  02  03
   ENDCMP 1
 7 COMPUT 7    02    02    0.00                 8.5       1.02 2  02  04
   ENDJOB 2
*****************************END OF 80-80 LIST*******************************


EXECUTIVE CONTROL OPERATION INCREM                                          RECORD ID
                                   MAIN TIME INCREMENT =   .10 HOURS


EXECUTIVE CONTROL OPERATION COMPUT                                          RECORD ID
                                   FROM STRUCTURE  1
                                                     TO STRUCTURE  1
      STARTING TIME =   .00    RAIN DEPTH =  3.60    RAIN DURATION=  1.00    RAIN TABLE NO.= 2    ANT. MOIST. COND= 2
      ALTERNATE NO.= 2         STORM NO.= 1    MAIN TIME INCREMENT =   .10 HOURS


OPERATION RUNOFF   STRUCTURE  1

         PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
            12.13                          2.62                        (RUNOFF)

TIME(HRS)        FIRST HYDROGRAPH POINT =   .00 HOURS      TIME INCREMENT =  .10 HOURS      DRAINAGE AREA =    .00 SQ.MI.
 10.00    DISCHG        .00       .00       .00       .00       .01       .01       .01       .02       .02       .03
 11.00    DISCHG        .04       .05       .06       .07       .08       .10       .15       .30       .54      1.05
 12.00    DISCHG       1.90      2.58      2.44      1.82      1.26       .93       .71       .58       .50       .44
 13.00    DISCHG        .40       .36       .33       .30       .28       .27       .25       .24       .22       .21
 14.00    DISCHG        .20       .19       .18       .18       .17       .16       .16       .15       .14       .14
 15.00    DISCHG        .14       .13       .13       .13       .13       .13       .12       .12       .12       .12
 16.00    DISCHG        .12       .12       .12       .12       .12       .12       .11       .11       .11       .10
 17.00    DISCHG        .10       .10       .10       .10       .10       .10       .10       .10       .10       .10
```

18.00	DISCHG	.09	.08	.08	.08	.08	.08	.08	.08	.08	.08
19.00	DISCHG	.08	.08	.08	.08	.08	.08	.08	.08	.08	.08
20.00	DISCHG	.07	.07	.06	.06	.06	.06	.06	.06	.06	.06
21.00	DISCHG	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
22.00	DISCHG	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
23.00	DISCHG	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
24.00	DISCHG	.05	.04	.03	.02	.01	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 1.44 WATERSHED INCHES, 2.78 CFS-HRS, .23 ACRE-FEET; BASEFLOW = .00 CFS

XECUTIVE CONTROL OPERATION ENDCMP RECORD ID

COMPUTATIONS COMPLETED FOR PASS 1

XECUTIVE CONTROL OPERATION COMPUT RECORD ID

FROM STRUCTURE 1

TO STRUCTURE 1

STARTING TIME = .00 RAIN DEPTH = 5.80 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2

ALTERNATE NO.= 2 STORM NO.= 2 MAIN TIME INCREMENT = .10 HOURS

'ERATION RUNOFF STRUCTURE 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.12	5.96	(RUNOFF)

'ME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .00 SQ.MI.

8.00	DISCHG	.00	.01	.01	.01	.01	.02	.02	.02	.03	.03
9.00	DISCHG	.03	.03	.04	.04	.05	.05	.06	.06	.07	.07
10.00	DISCHG	.08	.08	.09	.10	.10	.12	.13	.15	.17	.19
11.00	DISCHG	.22	.24	.27	.30	.34	.39	.53	.95	1.59	2.77
12.00	DISCHG	4.60	5.92	5.42	3.96	2.71	1.96	1.49	1.20	1.02	.90
13.00	DISCHG	.79	.71	.65	.60	.56	.52	.49	.46	.44	.41
14.00	DISCHG	.39	.38	.36	.35	.33	.32	.30	.29	.28	.27
15.00	DISCHG	.26	.26	.26	.26	.25	.24	.23	.23	.23	.22
16.00	DISCHG	.22	.22	.22	.22	.22	.22	.22	.21	.20	.20
17.00	DISCHG	.19	.19	.19	.19	.19	.19	.19	.19	.19	.18
18.00	DISCHG	.17	.16	.16	.15	.15	.15	.15	.15	.15	.15
19.00	DISCHG	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15
20.00	DISCHG	.14	.13	.12	.12	.12	.11	.11	.11	.11	.11
21.00	DISCHG	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
22.00	DISCHG	.11	.11	.11	.11	.11	.11	.11	.11	.11	.11
23.00	DISCHG	.11	.11	.11	.11	.11	.12	.12	.12	.11	.11
24.00	DISCHG	.10	.08	.06	.04	.02	.01	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 3.21 WATERSHED INCHES, 6.21 CFS-HRS, .51 ACRE-FEET; BASEFLOW = .00 CFS

ECUTIVE CONTROL OPERATION ENDCMP RECORD ID

COMPUTATIONS COMPLETED FOR PASS 2

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID

FROM STRUCTURE 1

TO STRUCTURE 1

STARTING TIME = .00 RAIN DEPTH = 6.80 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2

ALTERNATE NO.= 2 STORM NO.= 3 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF STRUCTURE 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.12	7.57	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .00 SQ.MI.

7.00	DISCHG	.00	.00	.01	.01	.01	.01	.01	.02	.02	.02
8.00	DISCHG	.02	.02	.03	.03	.04	.04	.05	.05	.06	.06
9.00	DISCHG	.06	.07	.07	.08	.09	.09	.10	.10	.11	.12
10.00	DISCHG	.12	.13	.14	.15	.16	.18	.20	.22	.25	.28
11.00	DISCHG	.32	.35	.39	.43	.48	.54	.73	1.29	2.13	3.63
12.00	DISCHG	5.92	7.53	6.84	4.98	3.40	2.44	1.85	1.49	1.27	1.11
13.00	DISCHG	.98	.88	.80	.74	.69	.64	.61	.57	.54	.51
14.00	DISCHG	.48	.46	.44	.43	.41	.39	.37	.35	.34	.33
15.00	DISCHG	.32	.32	.32	.32	.31	.30	.28	.28	.28	.27
16.00	DISCHG	.27	.27	.27	.27	.27	.27	.27	.26	.25	.24

17.00	DISCHG	.23	.23	.23	.23	.23	.23	.23	.23	.23	.22
18.00	DISCHG	.21	.20	.19	.19	.19	.18	.18	.18	.18	.18
19.00	DISCHG	.18	.18	.18	.18	.18	.18	.18	.18	.18	.18
20.00	DISCHG	.16	.15	.15	.14	.14	.14	.14	.14	.14	.14
21.00	DISCHG	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14
22.00	DISCHG	.14	.14	.14	.14	.14	.14	.14	.14	.14	.14
23.00	DISCHG	.14	.14	.14	.14	.14	.14	.14	.14	.14	.13
24.00	DISCHG	.12	.10	.07	.04	.02	.01	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 4.08 WATERSHED INCHES, 7.89 CFS-HRS, .65 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

COMPUTATIONS COMPLETED FOR PASS 3

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID

FROM STRUCTURE 1

TO STRUCTURE 1

STARTING TIME = .00 RAIN DEPTH = 8.50 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2

ALTERNATE NO.= 2 STORM NO.= 4 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF STRUCTURE 1

PEAK TIME(HRS) 12.12 | PEAK DISCHARGE(CFS) 10.36 | PEAK ELEVATION(FEET) (RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .00 SQ.MI.

6.00	DISCHG	.00	.00	.01	.01	.01	.02	.02	.02	.03	.03
7.00	DISCHG	.03	.04	.04	.04	.04	.05	.05	.05	.06	.06
8.00	DISCHG	.06	.06	.07	.08	.09	.09	.10	.11	.12	.12
9.00	DISCHG	.13	.13	.14	.15	.16	.17	.17	.18	.20	.21
10.00	DISCHG	.22	.22	.24	.25	.27	.30	.33	.36	.40	.45
11.00	DISCHG	.50	.55	.61	.66	.73	.82	1.09	1.90	3.09	5.16
12.00	DISCHG	8.23	10.31	9.30	6.73	4.57	3.27	2.47	1.98	1.68	1.46
13.00	DISCHG	1.29	1.16	1.05	.97	.90	.85	.80	.75	.70	.66
14.00	DISCHG	.63	.61	.58	.56	.53	.51	.49	.46	.44	.43
15.00	DISCHG	.42	.42	.41	.41	.40	.39	.37	.36	.36	.36
16.00	DISCHG	.36	.36	.36	.36	.36	.36	.35	.34	.32	.31
17.00	DISCHG	.30	.30	.30	.30	.30	.30	.30	.30	.30	.29
18.00	DISCHG	.27	.26	.25	.24	.24	.24	.24	.24	.24	.24
19.00	DISCHG	.24	.24	.24	.24	.24	.24	.24	.24	.24	.23
20.00	DISCHG	.21	.20	.19	.18	.18	.18	.18	.18	.18	.18
21.00	DISCHG	.18	.18	.18	.18	.18	.18	.18	.18	.18	.18
22.00	DISCHG	.18	.18	.18	.18	.18	.18	.18	.18	.18	.18
23.00	DISCHG	.18	.18	.18	.18	.18	.18	.18	.18	.18	.17
24.00	DISCHG	.15	.13	.09	.06	.03	.02	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 5.61 WATERSHED INCHES, 10.87 CFS-HRS, .90 ACRE-FEET; BASEFLOW = .00 CFS

XECUTIVE CONTROL OPERATION ENDCMP RECORD ID

COMPUTATIONS COMPLETED FOR PASS 4

XECUTIVE CONTROL OPERATION COMPUT RECORD ID

FROM STRUCTURE 2
TO STRUCTURE 2

STARTING TIME = .00 RAIN DEPTH = 3.60 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2
ALTERNATE NO.= 2 STORM NO.= 1 MAIN TIME INCREMENT = .10 HOURS

PERATION RUNOFF STRUCTURE 2

PEAK TIME(HRS) 12.11 | PEAK DISCHARGE(CFS) 4.75 | PEAK ELEVATION(FEET) (RUNOFF)

IME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .00 SQ.MI.

10.00	DISCHG	.00	.00	.00	.01	.01	.02	.02	.03	.04	.06
11.00	DISCHG	.07	.09	.10	.12	.15	.18	.29	.59	1.05	2.08
12.00	DISCHG	3.70	4.74	3.97	2.68	1.82	1.33	1.04	.88	.77	.69
13.00	DISCHG	.62	.57	.52	.49	.46	.43	.41	.38	.36	.34
14.00	DISCHG	.33	.32	.30	.29	.28	.27	.26	.24	.23	.23
15.00	DISCHG	.22	.22	.22	.22	.22	.21	.20	.19	.19	.19

16.00	DISCHG	.19	.19	.19	.19	.19	.19	.19	.18	.17	.17
17.00	DISCHG	.16	.16	.16	.16	.16	.16	.16	.16	.16	.16
18.00	DISCHG	.15	.14	.13	.13	.13	.13	.13	.13	.13	.13
19.00	DISCHG	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13
20.00	DISCHG	.12	.11	.10	.10	.10	.10	.10	.10	.10	.10
21.00	DISCHG	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10
22.00	DISCHG	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10
23.00	DISCHG	.10	.10	.10	.10	.10	.10	.10	.10	.10	.09
24.00	DISCHG	.08	.07	.05	.02	.01	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 1.44 WATERSHED INCHES, 4.64 CFS-HRS, .38 ACRE-FEET; BASEFLOW = .00 CFS

XECUTIVE CONTROL OPERATION ENDCMP RECORD ID

COMPUTATIONS COMPLETED FOR PASS 5

XECUTIVE CONTROL OPERATION COMPUT RECORD ID

FROM STRUCTURE 2

TO STRUCTURE 2

STARTING TIME = .00 RAIN DEPTH = 5.80 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2

ALTERNATE NO.= 2 STORM NO.= 2 MAIN TIME INCREMENT = .10 HOURS

PERATION RUNOFF STRUCTURE 2

20 XEQ 02-23-98 14:15 JOB 1 PASS 6

REV PC 09/83(.2) EXISTING CONDITIONS STORMWATER MANAGEMENT ANALYSIS !! PAGE 4

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.10	10.73	(RUNOFF)

ME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .00 SQ.MI.

7.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
8.00	DISCHG	.01	.01	.01	.02	.02	.03	.03	.04	.05	.05
9.00	DISCHG	.05	.06	.07	.08	.08	.09	.10	.11	.12	.12
10.00	DISCHG	.13	.14	.15	.16	.18	.20	.23	.26	.29	.33
11.00	DISCHG	.38	.42	.47	.53	.59	.68	.99	1.85	3.04	5.38
12.00	DISCHG	8.83	10.73	8.72	5.78	3.86	2.77	2.15	1.79	1.56	1.39
13.00	DISCHG	1.24	1.13	1.04	.97	.91	.85	.80	.75	.71	.67
14.00	DISCHG	.64	.62	.59	.57	.55	.52	.50	.47	.45	.44
15.00	DISCHG	.43	.43	.43	.43	.42	.40	.38	.38	.37	.37
16.00	DISCHG	.37	.37	.37	.37	.37	.37	.37	.35	.33	.32
17.00	DISCHG	.32	.31	.31	.31	.31	.31	.31	.31	.31	.30
18.00	DISCHG	.28	.26	.26	.25	.25	.25	.25	.25	.25	.25
19.00	DISCHG	.25	.25	.25	.25	.25	.25	.25	.25	.25	.24
20.00	DISCHG	.22	.20	.20	.19	.19	.19	.19	.19	.19	.19
21.00	DISCHG	.19	.19	.19	.19	.19	.19	.19	.19	.19	.19
22.00	DISCHG	.19	.19	.19	.19	.19	.19	.19	.19	.19	.19
23.00	DISCHG	.19	.19	.19	.19	.19	.19	.19	.19	.19	.18
24.00	DISCHG	.16	.13	.09	.04	.02	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 3.21 WATERSHED INCHES, 10.36 CFS-HRS, .86 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

COMPUTATIONS COMPLETED FOR PASS 6

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID

FROM STRUCTURE 2

TO STRUCTURE 2

STARTING TIME = .00 RAIN DEPTH = 6.80 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2

ALTERNATE NO.= 2 STORM NO.= 3 MAIN TIME INCREMENT = .10 HOURS

)PERATION RUNOFF STRUCTURE 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.10	13.60	(RUNOFF)

'IME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .00 SQ.MI.

7.00	DISCHG	.00	.01	.01	.01	.02	.02	.03	.03	.03	.04
8.00	DISCHG	.04	.04	.05	.06	.06	.07	.08	.09	.10	.10
9.00	DISCHG	.11	.11	.13	.14	.15	.15	.16	.18	.19	.20
10.00	DISCHG	.21	.22	.24	.25	.28	.31	.34	.39	.44	.49
11.00	DISCHG	.55	.61	.67	.74	.83	.95	1.37	2.51	4.05	7.03
12.00	DISCHG	11.33	13.60	10.98	7.24	4.82	3.44	2.67	2.21	1.92	1.71

13.00	DISCHG	1.52	1.39	1.28	1.19	1.11	1.04	.99	.92	.87	.83
14.00	DISCHG	.79	.76	.73	.70	.67	.64	.61	.58	.55	.54
15.00	DISCHG	.53	.53	.53	.52	.51	.49	.47	.46	.46	.45
16.00	DISCHG	.45	.45	.45	.45	.45	.45	.45	.43	.40	.39
17.00	DISCHG	.39	.38	.38	.38	.38	.38	.38	.38	.38	.36
18.00	DISCHG	.34	.32	.31	.31	.31	.31	.31	.31	.31	.31
19.00	DISCHG	.31	.31	.31	.31	.31	.31	.31	.31	.31	.29
20.00	DISCHG	.27	.25	.24	.23	.23	.23	.23	.23	.23	.23
21.00	DISCHG	.23	.23	.23	.23	.23	.23	.23	.23	.23	.23
22.00	DISCHG	.23	.23	.23	.23	.23	.23	.23	.23	.23	.23
23.00	DISCHG	.23	.23	.23	.23	.23	.23	.23	.23	.23	.22
24.00	DISCHG	.19	.16	.10	.05	.03	.01	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 4.08 WATERSHED INCHES, 13.18 CFS-HRS, 1.09 ACRE-FEET; BASEFLOW = .00 CFS

:ECUTIVE CONTROL OPERATION ENDCMP RECORD ID

COMPUTATIONS COMPLETED FOR PASS 7

:ECUTIVE CONTROL OPERATION COMPUT RECORD ID

FROM STRUCTURE 2

TO STRUCTURE 2

STARTING TIME = .00 RAIN DEPTH = 8.50 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2

ALTERNATE NO.= 2 STORM NO.= 4 MAIN TIME INCREMENT = .10 HOURS

)PERATION RUNOFF STRUCTURE 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.09	18.57	(RUNOFF)

IME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .00 SQ.MI.

6.00	DISCHG	.00	.01	.01	.02	.02	.03	.03	.04	.05	.05
7.00	DISCHG	.06	.06	.07	.07	.08	.08	.08	.09	.09	.10
8.00	DISCHG	.10	.11	.12	.13	.15	.16	.18	.19	.20	.20
9.00	DISCHG	.21	.22	.24	.26	.27	.28	.29	.31	.34	.35
10.00	DISCHG	.36	.38	.40	.43	.46	.51	.56	.63	.70	.78
11.00	DISCHG	.87	.95	1.05	1.15	1.27	1.44	2.04	3.69	5.86	9.93
12.00	DISCHG	15.68	18.55	14.87	9.75	6.47	4.60	3.55	2.93	2.54	2.25
13.00	DISCHG	2.00	1.83	1.68	1.56	1.46	1.37	1.30	1.21	1.14	1.08
14.00	DISCHG	1.03	.99	.95	.91	.88	.83	.80	.76	.72	.70
15.00	DISCHG	.69	.69	.69	.69	.67	.64	.61	.60	.60	.59
16.00	DISCHG	.59	.59	.59	.59	.59	.59	.58	.56	.53	.51
17.00	DISCHG	.50	.50	.50	.50	.50	.50	.50	.50	.49	.47
18.00	DISCHG	.44	.42	.41	.40	.40	.40	.40	.40	.40	.40
19.00	DISCHG	.40	.40	.40	.40	.40	.40	.40	.40	.40	.38
20.00	DISCHG	.35	.32	.31	.30	.30	.30	.30	.30	.30	.30
21.00	DISCHG	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30
22.00	DISCHG	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30

23.00	DISCHG	.30	.30	.30	.30	.30	.30	.30	.30	.30	.28
24.00	DISCHG	.25	.20	.13	.07	.03	.02	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 5.62 WATERSHED INCHES, 18.13 CFS-HRS, 1.50 ACRE-FEET; BASEFLOW = .00 CFS

ECUTIVE CONTROL OPERATION ENDJOB RECORD ID

MMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

CTION/ RUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)

ALTERNATE 2 STORM 1

STRUCTURE 1	RUNOFF	.00	2	2	.10	.0	3.60	24.00	1.44	---	12.13	2.62	874.3
ALTERNATE 2	STORM 2												
STRUCTURE 1	RUNOFF	.00	2	2	.10	.0	5.80	24.00	3.21	---	12.12	5.96	1987.8
ALTERNATE 2	STORM 3												
STRUCTURE 1	RUNOFF	.00	2	2	.10	.0	6.80	24.00	4.08	---	12.12	7.57	2524.0
ALTERNATE 2	STORM 4												
TRUCTURE 1	RUNOFF	.00	2	2	.10	.0	8.50	24.00	5.61	---	12.12	10.36	3452.1
ALTERNATE 2	STORM 1												
TRUCTURE 2	RUNOFF	.00	2	2	.10	.0	3.60	24.00	1.44	---	12.11	4.75	949.9
ALTERNATE 2	STORM 2												
TRUCTURE 2	RUNOFF	.00	2	2	.10	.0	5.80	24.00	3.21	---	12.10	10.73	2145.7
ALTERNATE 2	STORM 3												
TRUCTURE 2	RUNOFF	.00	2	2	.10	.0	6.80	24.00	4.08	---	12.10	13.60	2720.1
ALTERNATE 2	STORM 4												
TRUCTURE 2	RUNOFF	.00	2	2	.10	.0	8.50	24.00	5.62	---	12.09	18.57	3713.3

UMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

SECTION/ TRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2	3	4
STRUCTURE 2	.00				
ALTERNATE 2		4.75	10.73	13.60	18.57
STRUCTURE 1	.00				
ALTERNATE 2		2.62	5.96	7.57	10.36

D OF 1 JOBS IN THIS RUN

7.

Geotechnical reports

8. Correspondence

9.

Inspection records

10. Enforcement actions

11.

Miscellaneous

```
******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY******************

JOB TR20
TITLE 001 DEVELOPED
TITLE     ~~EXISTING~~ CONDITIONS STORMWATER MANAGEMENT ANALYSIS !!
 3 STRUCT      01
 8                    71.0        0.0        0.0
 8                    72.0        0.43       0.122
 8                    73.0       0.61        0.266
 8                    74.0       0.752       0.429
 8                    75.0       0.868       0.609
 8                    76.0       26.00       0.811
 8                    77.0       30.00       1.036
 9 ENDTBL                                 5.3lac  RCN   Tc=15min
 6 RUNOFF 1    01     1       0.0083          85        0.251 1   1   1
 6 RESVOR 2    01 1   2 71.0                              1 1 1 1   1
   ENDATA
 7 INCREM 6                   0.10
 7 COMPUT 7    01    01        0.00        3.6         1.02 2  02  01
   ENDCMP 1
 7 COMPUT 7    01    01        0.00        5.8         1.02 2  02  02
   ENDCMP 1
 7 COMPUT 7    01    01        0.00        6.8         1.02 2  02  03
   ENDCMP 1
 7 COMPUT 7    01    01        0.00        8.5         1.02 2  02  04
   ENDJOB 2
)******************************END OF 80-80 LIST******************************


EXECUTIVE CONTROL OPERATION INCREM                                          RECORD ID
+                                  MAIN TIME INCREMENT =   .10 HOURS


EXECUTIVE CONTROL OPERATION COMPUT                                          RECORD ID
+                                  FROM STRUCTURE  1
+                                                   TO STRUCTURE  1
       STARTING TIME =   .00    RAIN DEPTH =  3.60    RAIN DURATION=  1.00    RAIN TABLE NO.= 2    ANT. MOIST. COND= 2
       ALTERNATE NO.= 2         STORM NO.= 1    MAIN TIME INCREMENT =   .10 HOURS


OPERATION RUNOFF   STRUCTURE  1

          PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
             12.06                          12.88                        (RUNOFF)

TIME(HRS)        FIRST HYDROGRAPH POINT =   .00 HOURS     TIME INCREMENT =  .10 HOURS     DRAINAGE AREA =    .01 SQ.MI.
   7.00    DISCHG        .00       .00       .00       .01       .01       .01       .02       .02       .02       .02
   8.00    DISCHG        .03       .03       .04       .04       .05       .06       .06       .07       .07       .08
   9.00    DISCHG        .08       .09       .10       .11       .12       .12       .13       .15       .16       .17
  10.00    DISCHG        .17       .18       .20       .21       .24       .27       .30       .34       .38       .43
  11.00    DISCHG        .48       .53       .60       .65       .74       .84      1.38      2.81      4.20      7.83
  12.00    DISCHG      12.11     12.39      7.65      4.49      3.03      2.24      1.87      1.62      1.49      1.35
  13.00    DISCHG       1.22      1.14      1.04       .98       .92       .87       .82       .76       .72       .69
  14.00    DISCHG        .66       .64       .61       .59       .56       .54       .51       .48       .47       .46
  15.00    DISCHG        .46       .46       .46       .45       .43       .41       .40       .39       .39       .39
  16.00    DISCHG        .39       .39       .39       .39       .39       .39       .38       .36       .34       .33
  17.00    DISCHG        .33       .33       .33       .33       .33       .33       .33       .33       .33       .31
```

APR 1998
RECEIVED
ENVIRONMENTAL DIVISION

FOR: D. Cook

From: D. RAYNER

RE: OAK TREE OFFICE PARK

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

July 17, 2000

HIS Land Surveying, Inc.
P.O. Box 100
Providence Forge, Va. 23140
Attn: Mr. Dean E. Raynes

MC035

Re: Oak Tree Office Park & Airtight Self Storage (Plan No. SP-21-99)
Ironbound Road
Stormwater Management/BMP Facility

Dear Mr. Raynes:

The Environmental Division has reviewed a record drawing as submitted to our office on June 5th for the above referenced project. The record drawing dated July 10th 1999 provides as-built information for a stormwater management/BMP detention facility located in the northeast corner of the site and a portion of its associated onsite storm drainage system.

Based on our review of the drawing and a concurrent field observation, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility:

1. In accordance with Sheet 4, Note # 18 of the approved plan, construction certification for the BMP is required and was not provided.

2. Add the concrete emergency spillway and dam profile from Sheet 5 of the approved plan, annotated as necessary, to the record drawing. These details show important information relative to the facility.

3. Show the following additional information on the record drawing: low flow orifice size and trash rack type; location of the riser; riser size; riser crest elevation; emergency spillway dimensions and crest elevation; spot elevations along the top of dam (berm) perimeter at sufficient intervals; invert out, slope and length of the outlet barrel; and construction data for the primary inflow storm drain located southwest of the riser including size, length, slope and invert elevations. Also show spot elevations in the pond bottom to show if positive drainage to the riser exists.

4. Identify the type, location and invert elevation of the last access structure connected to the primary storm drain which flows into the BMP. The approved plan shows a MH-1 structure.

5. Note 3 on Sheet 5 of the approved plan states that after construction is complete, the basin will be cleaned out of sediment and the bottom will be leveled. Based on our field observation, standing water 6 to 12 inches deep was present in the bottom of the facility. Since this facility is intended to function as a dry detention basin, this is indicative of sediment or debris accumulations around the low flow (water quality) orifice. The orifice for this structure is a 4 inch size circular opening with a upstream cage-type trash rack. Sediment and debris must be removed and the low flow orifice unrestricted and fully operational prior to approval.

6. The dewatering orifice was still present on the riser. It was our understanding that this feature was only provided to operate during the temporary sediment basin mode. Based on the approved pond hydraulics and routings (Mitchell Wilson Assoc. dated 5-4-98), the 4 inch low flow orifice, 30 inch diameter riser and 24 inch diameter outlet barrel are the only controls provided on the principal flow control structure. Therefore, it appears the dewatering orifice requires removal for formal conversion from a temporary sediment basin mode to permanent SWM/BMP mode.

7. The outlet barrel was exposed just downstream of the riser section and prior to the inside pond embankment toe. The outlet barrel should be protected with soil covering or berming to the greatest extent possible.

8. There is a considerable amount of large construction debris present in the pond's bottom area. Debris observed included broken pipe sections, tree branches, large chunks of concrete and soil piles. All debris requires removal prior to final approval and surety release.

9. Vegetation on bare soil areas present on the graded side slopes and embankment needs re-established. Slope erosion was evident between near the building located southwest of the riser.

10. Some concern is forwarded pertaining to an outdoor, above-ground fuel storage tank located along north side of the building nearest to the BMP. Coordination with the owner is requested to relocate this feature, if temporary, or if permanent, provide for pollution prevention measures such as containment dikes, etc. around the feature to avoid accidental spills to the BMP.

11. A professional seal and signature is required on the record drawing(s).

Please contact me at 757-253-6639 if you have any further comments or questions relative to record drawing or construction certification requirements for this project or facility.

Sincerely,

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

G:\SWMProg\AsBuilts\SP-21-99.cert

Mitchell-Wilson Associates, P.C.
Civil Engineers & Land Surveyors

P.O. Box 1269
West Point, Virginia 23181
(804) 843-9744
Fax: (804) 843-9744

FEB 2001
RECEIVED
ENVIRONMENTAL DIVISION

February 7, 2001

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

Dear Mr. Thomas:

RE: Engineer's Certification, Stormwater Management BMP Facility Oak Tree Office Park and Airtight Self Storage, James City County, Virginia

In accordance with a request from Wayne Brady, the following is provided for your information:

Engineer's Certification

Based on a site visit conducted on August 1, 2000 and based on the information provided by Wayne Brady (project owner) including:

- Construction plan entitled Oak Tree Office Park and Airtight Self Storage, prepared by H.I.S. Land Surveying, dated 2/24/98 and revised through 6/25/98;
- As-built survey entitled As-Built Survey SWM\BMP on property known as Oak Tree Office Park and Airtight Self-Storage, prepared by H.I.S. Land Surveying, dated 7/10/99; and a subsequent as-built survey prepared by H.I.S. Land Surveying, dated 1/02/2001; and
- Field Density Test - Nuclear Method ASTM D-2922 log (single test no. 3) location only specified as BMP Pond.

The stormwater management detention facility appears to have been constructed in *general* conformance with the approved plan dated 2/24/98 and revised through 6/25/98, to the best of my knowledge, judgement and belief. It appears based on the as-built survey dated 1/02/2001, that many of the items indicated in your letter dated July 17, 2000 to H.I.S. Land Surveying, Inc. (copy attached) have been adequately addressed, and that guarantees and performance sureties being held by the County for the completion of the stormwater management facility construction could be released.

Please contact me if you have any questions or need additional information relative to the Oak Tree Office Park stormwater management facility. Attached are four (4) copies of the as-built survey dated 1/02/2001 referenced above for your records.

Sincerely,

Jonathan Blair Wilson, P.E.

President

COMMONWEALTH OF PENNSYLVANIA
JONATHAN BLAIR WILSON
NO. 019961
2-7-01
PROFESSIONAL ENGINEER

cc. Wayne Brady

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

July 17, 2000

HIS Land Surveying, Inc.
P.O. Box 100
Providence Forge, Va. 23140
Attn: Mr. Dean E. Raynes

FAX TO: Wayne Brady 229-3431 DOW 966-2140

Re: Oak Tree Office Park & Airtight Self Storage (Plan No. SP-21-99)
Ironbound Road
Stormwater Management/BMP Facility

Dear Mr. Raynes:

The Environmental Division has reviewed a record drawing as submitted to our office on June 5th for the above referenced project. The record drawing dated July 10th 1999 provides as-built information for a stormwater management/BMP detention facility located in the northeast corner of the site and a portion of its associated onsite storm drainage system.

Based on our review of the drawing and a concurrent field observation, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility:

1. In accordance with Sheet 4, Note # 18 of the approved plan, construction certification for the BMP is required and was not provided. Blair

Wayne needs to construct

2. Add the concrete emergency spillway and dam profile from Sheet 5 of the approved plan, annotated as necessary, to the record drawing. These details show important information relative to the facility. Wayne

DEAN

3. Show the following additional information on the record drawing: low flow orifice size and trash rack type; location of the riser; riser size; riser crest elevation; emergency spillway dimensions and crest elevation; spot elevations along the top of dam (berm) perimeter at sufficient intervals; invert out, slope and length of the outlet barrel; and construction data for the primary inflow storm drain located southwest of the riser including size, length, slope and invert elevations. Also show spot elevations in the pond bottom to show if positive drainage to the riser exists. Dean

4. Identify the type, location and invert elevation of the last access structure connected to the primary storm drain which flows into the BMP. The approved plan shows a MH-1 structure. Dean

5. Note 3 on Sheet 5 of the approved plan states that after construction is complete, the basin will be cleaned out of sediment and the bottom will be leveled. Based on our field observation, standing water 6 to 12 inches deep was present in the bottom of the facility. Since this facility is intended to function as a dry detention basin, this is indicative of sediment or debris accumulations around the low flow (water quality) orifice. The orifice for this structure is a 4 inch size circular opening with a upstream cage-type trash rack. Sediment and debris must be removed and the low flow orifice unrestricted and fully operational prior to approval.

Wayne

6. The dewatering orifice was still present on the riser. It was our understanding that this feature was only provided to operate during the temporary sediment basin mode. Based on the approved pond hydraulics and routings (Mitchell Wilson Assoc. dated 5-4-98), the 4 inch low flow orifice, 30 inch diameter riser and 24 inch diameter outlet barrel are the only controls provided on the principal flow control structure. Therefore, it appears the dewatering orifice requires removal for formal conversion from a temporary sediment basin mode to permanent SWM/BMP mode.

Wayne

7. The outlet barrel was exposed just downstream of the riser section and prior to the inside pond embankment toe. The outlet barrel should be protected with soil covering or berming to the greatest extent possible.

observation

8. There is a considerable amount of large construction debris present in the pond's bottom area. Debris observed included broken pipe sections, tree branches, large chunks of concrete and soil piles. All debris requires removal prior to final approval and surety release.

Wayne

9. Vegetation on bare soil areas present on the graded side slopes and embankment needs re-established. Slope erosion was evident between near the building located southwest of the riser.

Wayne

10. Some concern is forwarded pertaining to an outdoor, above-ground fuel storage tank located along north side of the building nearest to the BMP. Coordination with the owner is requested to relocate this feature, if temporary, or if permanent, provide for pollution prevention measures such as containment dikes, etc. around the feature to avoid accidental spills to the BMP.

observation

11. A professional seal and signature is required on the record drawing(s).

Dean

Please contact me at 757-253-6639 if you have any further comments or questions relative to record drawing or construction certification requirements for this project or facility.

Sincerely,

Scott J. Thomas

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

G:\SWMProg\AsBuilts\SP-21-99.cert

FILE - Oaktree

Jamestown Construction Company, LLC
2501 Manion Drive
Williamsburg. VA 23185
(757) 220-1193

JUL 1998
RECEIVED
PLANNING DEPARTMENT

July 17, 1998
James City County
~~Paul Holt~~

Dear Mr. Holt,

I am requesting a change in the storm sewer pipe from R.C.P. to Pro-Link S.T., size and roughness coefficient to remain the same.

smooth HDPE -

Sincerely,

Wayne Brady

Wayne Brady
President

Approved DEC 7/20/98
AOS N-12 Pipe - see attached.

PERATION RESVOR STRUCTURE 1

*** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE = .81 CFS.

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVA ON(FEET)
13.60	.81	74.5

IME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .
HOURS DRAINAGE AREA = .01 SQ.MI.

8.00	DISCHG	.00	.00	.00	.01	.01	.01	.01	.01
8.00	ELEV	71.00	71.00	71.00	71.01	71.02	71.02	71.02	71.03
9.00	DISCHG	.02	.02	.02	.02	.03	.03	.03	.03

R20 XEQ 02-23-98 07:41

JOB 1 PASS 1

REV PC 09/83(.2) EXISTING CONDITIONS STORMWATER MANAGEMENT ANALYS

!! PAGE 1

9.00	ELEV	71.04	71.04	71.05	71.05	71.06	71.07	71.07	71.08
10.00	DISCHG	.05	.05	.05	.06	.06	.07	.07	.08
10.00	ELEV	71.11	71.11	71.12	71.13	71.15	71.16	71.17	71.19
11.00	DISCHG	.11	.12	.13	.15	.16	.18	.21	.26
11.00	ELEV	71.25	71.28	71.31	71.34	71.38	71.42	71.48	71.61
12.00	DISCHG	.56	.66	.73	.76	.78	.79	.79	.80
12.00	ELEV	72.72	73.34	73.81	74.07	74.21	74.30	74.35	74.40
13.00	DISCHG	.81	.81	.81	.81	.81	.81	.81	.81
13.00	ELEV	74.48	74.50	74.51	74.52	74.53	74.53	74.53	74.53
14.00	DISCHG	.81	.81	.81	.81	.81	.81	.81	.80
14.00	ELEV	74.52	74.51	74.50	74.49	74.48	74.47	74.46	74.44
15.00	DISCHG	.80	.80	.79	.79	.79	.79	.79	.78
15.00	ELEV	74.40	74.38	74.37	74.35	74.33	74.32	74.30	74.28
16.00	DISCHG	.78	.78	.77	.77	.77	.77	.77	.76
16.00	ELEV	74.23	74.21	74.19	74.18	74.16	74.14	74.12	74.11
17.00	DISCHG	.76	.76	.75	.75	.75	.74	.74	.74
17.00	ELEV	74.05	74.03	74.01	73.99	73.97	73.95	73.93	73.90

WATER WORKS SUPPLY CO., INC.
4873 Bonney Rd. Va. Beach Va. 23462
(757)499-4157/fax: (757)499-2465

TO: Darrel Cook **DATE:** 7-20-98

ATTENTION:

FAX.#: 253-6850
# of pages including cover sheet 5

Ref: Catalog cut on ADS
Storm Drainage Pipe for
Air Tight Self Storage

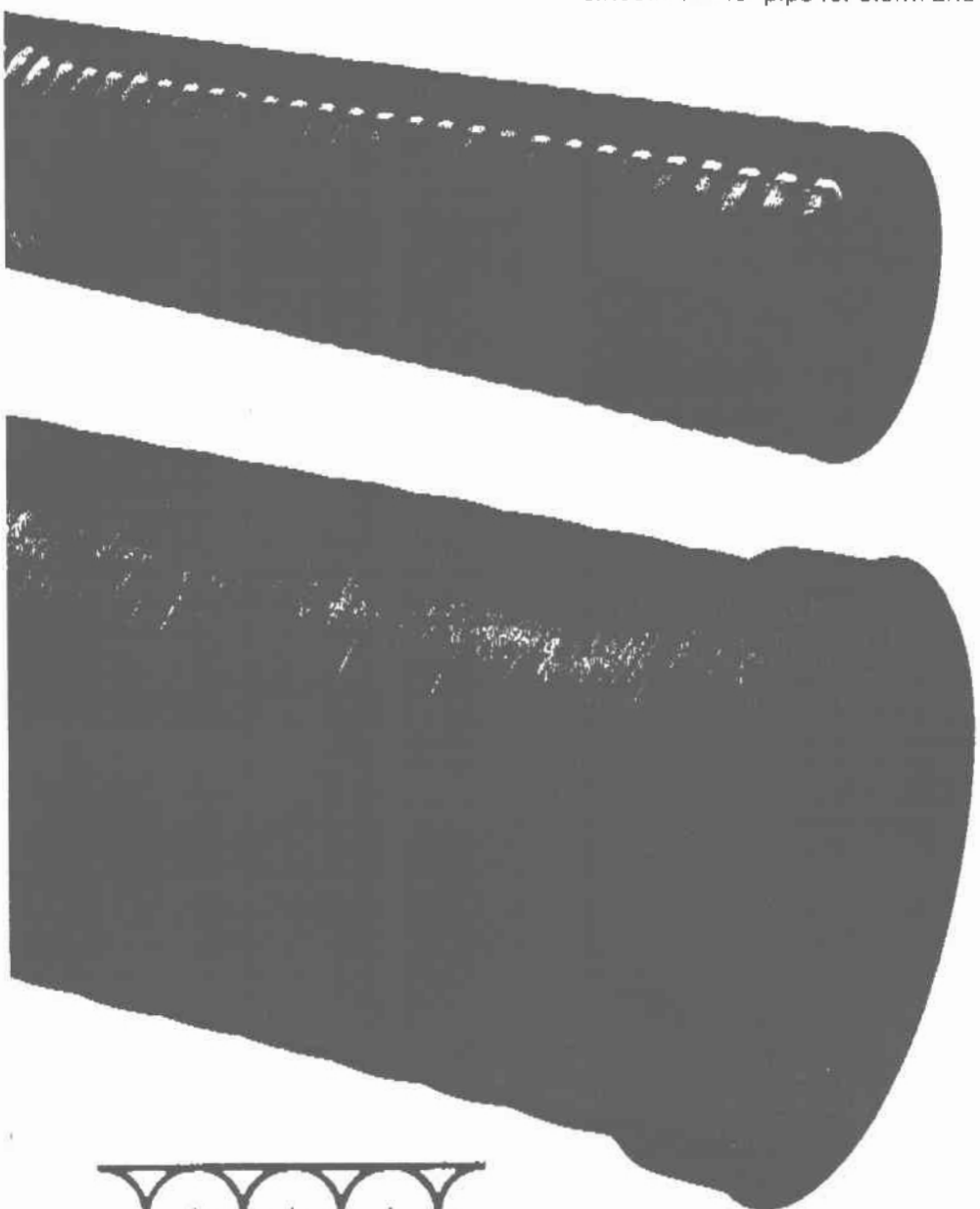
If you have any questions please call.

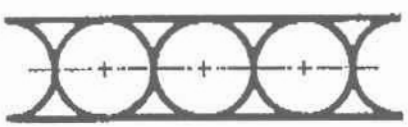
FROM: *E. SCOTT BLAND*

The new standard in drainage pipe

Every day for more than 30 years, Advanced Drainage Systems corrugated high density polyethylene HDPE pipe has been building its reputation for economy, durability, and superior performance in gravity-flow drainage applications. During the 1970's and 1980's, ADS single wall pipe became the preferred product for agricultural, mining, turf/recreation, and residential drainage markets.

The hydraulic capabilities of the product were significantly improved in 1987 when ADS introduced N-12® smooth interior pipe for storm and sanitary sewers, highways, airports, and other engineered construction. ADS extended its capabilities in these markets with the 1994 introduction of N-12® HC large diameter pipe.





N-12 HC's innovative "honeycomb" wall section draws on the structural strengths of the circle, the I-beam, and the classic arch.

N-12 (4" - 36")

Named for its excellent Manning's "n" rating of 0.012, N-12 was the first HDPE drainage pipe to combine an annular corrugated exterior for strength with a smooth inner wall for maximum flow capacity. Through extensive field and university testing, ADS engineers were able to refine the corrugated wall design for successfully larger diameters without compromising the pipe's excellent strength-to-weight ratio. Its performance and economy have led to rapid acceptance by contractors and official approval by most state and municipal specifying agencies.

N-12 HC (42"& 48")

Soon after the introduction of N-12, ADS engineers began a major program to develop an alternative wall profile that would provide the strength, stiffness, and production efficiencies required in pipe diameters above 36". An 8-year development and testing program produced a revolutionary pipe design called N-12 HC. The product features smooth inner and outer walls, and a unique "honeycomb" wall section using closely spaced circular ribs that brace the pipe circumferentially for added ring stiffness and structural strength. Soil loading tests at Utah State University indicate that N-12 HC may have the most stable wall profile ever manufactured for large diameter flexible pipe.

Applications

N-12 meets the requirements for Type S pipe under AASHTO M 294, and N-12 HC qualifies as Type D pipe under AASHTO MP6. Both products can be specified for culverts, cross drains, storm sewers, landfills, and other public and private construction.

Technology creates a superior pipe material

Gone are the days when plastic pipe was specified only for cost reasons. Advances in polymer science and structural design have created a product that ***actually outperforms and outlasts concrete and metal pipe while maintaining its installed cost advantage.*** By any measure, ADS N-12 and N-12 HC compare favorably to conventional materials.

Structural Strength

As a flexible conduit, HDPE pipe withstands vertical pressure by transferring most of the load to the surrounding soil. N-12 and N-12 HC will support H-20 live loads with 12" minimum cover and E-80 loads under 24" cover. Maximum cover will vary with design conditions, but can usually extend from 30 to 50 feet. In controlled tests, N-12 has performed well at fill heights of more than 100 feet, and N-12 HC has withstood soil pressures equivalent to 180 feet of cover before significant deformation occurred.

Durability

High density polyethylene is an extremely tough material that can easily withstand the normal impacts involved in shipping and installation. It is highly resistant to chemical attack and is unaffected by soils or effluents with pH ranges from 1 to 14.

HDPE's ductility and molecular structure result in excellent resistance to abrasion. Polyethylene pipe shows less than 20% of the material loss of concrete pipe in abrasive environments, and is often specified for harsh mine slurries and as a slip liner for deteriorated metal culverts.

Hydraulic efficiency

The smooth interior of N-12 and N-12 HC pipe provides superior flow characteristics. It has a tested Manning's "n" value of 0.012, which is slightly better than that of concrete and substantially better than the 0.024 value for corrugated metal pipe. This makes N-12 and N-12 HC preferred for drainage projects where flow volumes can fluctuate rapidly.

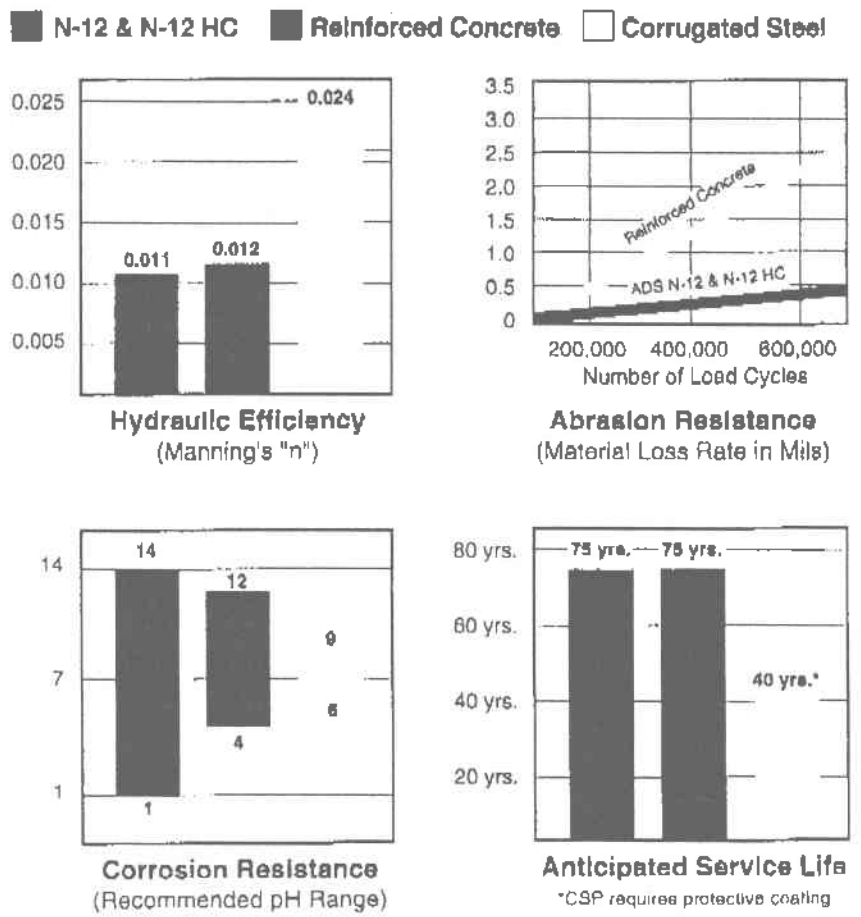
Light weight

HDPE pipe is up to 30 times lighter than concrete pipe, making it far easier to transport and handle. On-site labor and equipment requirements are reduced, with a corresponding reduction in the potential risk of injury.

Fast installation

Long 20-foot lengths mean fewer joints. Soil or water tight connections are quick and easy with either standard split couplers or gasketed bell-and-spigot couplers. The pipe cuts easily and does not need to be beveled for joining. Contractors report installation rates of 800 feet per day of 15"-18" pipe, and 400 feet per day of 48" pipe.

How HDPE stacks up against the competition:



The lowest installed cost of any drainage pipe

The material cost of HDPE is extremely competitive with concrete and corrugated metal. When installation costs are factored in, the savings really start to multiply.

- Polyethylene's light weight cuts shipping charges. More pipe per truck means fewer delivery loads.
- Fewer people are needed for on-site unloading and handling.
- Heavy equipment requirements are reduced.
- 20-foot lengths are easy to handle and require fewer joints.

A recent survey of state Departments of Transportation revealed that reductions in installed cost for HDPE pipe were 12 to 38 percent compared to concrete, and 5 to 28 percent vs. corrugated steel.

A choice of joining systems

1. ***Hinged split couplers and fabricated fittings*** provide cost effective connections for normal drainage installations. A split premium coupler, with internal neoprene gasket, is available to prevent infiltration of fine or sandy soils.

2. ***Pro Link™ molded HDPE couplers*** are another source of installation savings. Just align the pipe sections, lubricate the spigot, and push together. Bell/bell couplers are offered in 12" through 24" diameters, and single bell styles are factory welded to 30" through 48" pipe. Two levels of joint security are available:

   - Pro Link ST™ provides a soil tight joint for normal storm sewer/culvert applications.
   - Pro Link WT™ is an ASTM D 3212 pressure-tested coupler that insures water tight connections when required by high water tables or environmental considerations.

3. ***Series 35 thermo-molded PVC sanitary fittings*** include couplers, tees, wyes, elbows, caps and adaptors. Each is fitted with an O-ring seal and will connect not only corrugated HDPE pipe, but also PVC, concrete and other materials.

All molded couplers are designed to permit up to 3° of directional deflection with no loss of joint integrity or flow capacity. This allows the pipe to be laid on a curvilinear track when necessary to avoid underground obstacles or to parallel curves in roadways and ramps.

Installation recommendations

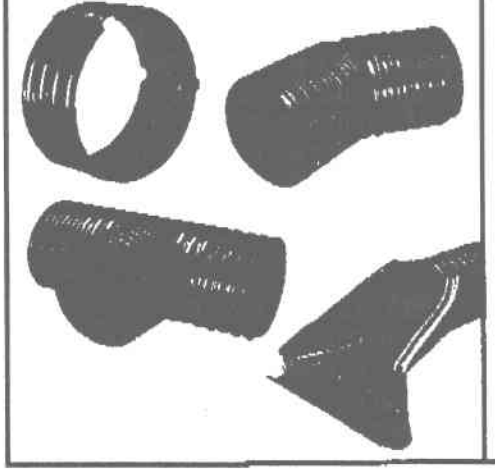
Proper installation is perhaps the major determinant of long-term performance of any drainage pipe, and the basic procedures and precautions for corrugated polyethylene are in fact quite similar to those for concrete and metal pipe.

N-12 and N-12 HC are flexible conduits which transfer live and dead loads to the surrounding soil. Particular care is therefore required in bedding, backfilling and compaction, and in the selection of backfill material.

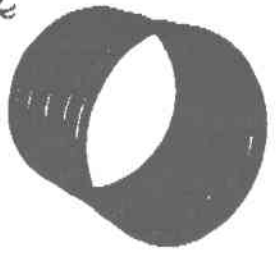
Class I, II, or III soils may be used for backfill, and should be compacted to at least 90% Standard Proctor Density. Complete instructions for underground installation of thermoplastic drainage pipe are contained in ASTM D 2321.

Water- or Soil-Tight Joints

Split Couplers and Fabricated Fittings

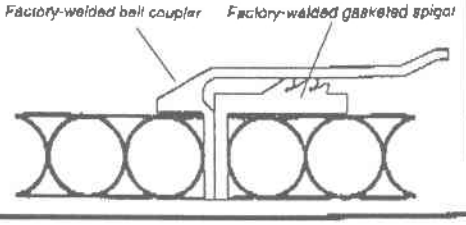


Pro Link™ Molded HDPE Couplers

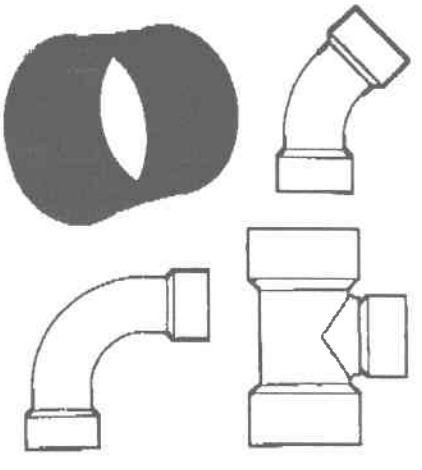


Bell/Bell Coupler (12"–24")

Integral Coupler (30"–48")

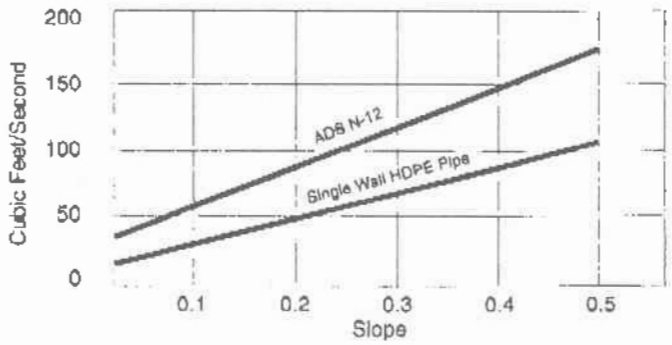


Series 35 Molded PVC Sanitary Fittings



Specifications

Flow Capacity



Pipe Stiffness

Pipe Diameter	Minimum Pipe Stiffness (psi)
4", 6", 8"	50
10"	50
12"	50
15"	42
18"	40
24"	34
30"	28
36"	22
42"	19
48"	17

Weight Comparison

	Pounds per Foot		
Pipe Dia.	N-12/N-12 HC	Concrete	Corrugated Steel
10"	2.0	50	9.0
12"	3.2	79	10.5
15"	4.6	103	12.9
18"	6.4	131	15.6
24"	11.5	217	19.4
30"	15.4	384	30.4
36"	18.1	524	36.0
42"	26.5	650	57.0
48"	32.0	780	65.0

Manning's "n" for Design

Pipe Dia.	N-12 & N-12 HC	Std. Corrugated HDPE Pipe	Concrete	Corrugated Steel
4"—15"	.010—.012	.018	.011—.015	.022—.026
15"—48"	.010—.012	.020	.011—.015	.022—.026

Height of Cover

Minimum Cover:
H-20 loads: 12" E-80 loads: 24"

Maximum Cover: Typically 50-60 feet but will vary depending on application and engineering design.

Notes:
1. Cover heights are measured from the top of the pipe.
2. Calculations based on load factor design per AASHTO procedures.
3. Assume soil density of 100 lbs./cu. ft.
4. Backfill compacted to 90% density per AASHTO T-99.
5. If a hydro-hammer is used for compaction, at least 48" of cover must be provided.

Applicable Standards

AASHTO M 294, Standard Specification for Corrugated Polyethylene Pipe

AASHTO MP6, Standard Specification for Corrugated Polyethylene Pipe, 1050 and 1200 mm Diameter (42" and 48")

ASTM F 667, Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings

ASTM D 2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Application

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

July 17, 2000

HIS Land Surveying, Inc.
P.O. Box 100
Providence Forge, Va. 23140
Attn: Mr. Dean E. Raynes

MC035

Re: Oak Tree Office Park & Airtight Self Storage (Plan No. SP-21-99)
Ironbound Road
Stormwater Management/BMP Facility

Dear Mr. Raynes:

The Environmental Division has reviewed a record drawing as submitted to our office on June 5th for the above referenced project. The record drawing dated July 10th 1999 provides as-built information for a stormwater management/BMP detention facility located in the northeast corner of the site and a portion of its associated onsite storm drainage system.

Based on our review of the drawing and a concurrent field observation, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility:

1. OK In accordance with Sheet 4, Note # 18 of the approved plan, construction certification for the BMP is required and was not provided.

2. Add the concrete emergency spillway and dam profile from Sheet 5 of the approved plan, annotated as necessary, to the record drawing. These details show important information relative to the facility.

3. Show the following additional information on the record drawing: low flow orifice size and trash rack type; location of the riser; riser size; riser crest elevation; emergency spillway dimensions and crest elevation; spot elevations along the top of dam (berm) perimeter at sufficient intervals; invert out, slope and length of the outlet barrel; and construction data for the primary inflow storm drain located southwest of the riser including size, length, slope and invert elevations. Also show spot elevations in the pond bottom to show if positive drainage to the riser exists.

4. Identify the type, location and invert elevation of the last access structure connected to the primary storm drain which flows into the BMP. The approved plan shows a MH-1 structure.

5. Note 3 on Sheet 5 of the approved plan states that after construction is complete, the basin will be cleaned out of sediment and the bottom will be leveled. Based on our field observation, standing water 6 to 12 inches deep was present in the bottom of the facility. Since this facility is intended to function as a dry detention basin, this is indicative of sediment or debris accumulations around the low flow (water quality) orifice. The orifice for this structure is a 4 inch size circular opening with a upstream cage-type trash rack. Sediment and debris must be removed and the low flow orifice unrestricted and fully operational prior to approval.

OK

6. The dewatering orifice was still present on the riser. It was our understanding that this feature was only provided to operate during the temporary sediment basin mode. Based on the approved pond hydraulics and routings (Mitchell Wilson Assoc. dated 5-4-98), the 4 inch low flow orifice, 30 inch diameter riser and 24 inch diameter outlet barrel are the only controls provided on the principal flow control structure. Therefore, it appears the dewatering orifice requires removal for formal conversion from a temporary sediment basin mode to permanent SWM/BMP mode.

OK

Need TO CHECK

7. The outlet barrel was exposed just downstream of the riser section and prior to the inside pond embankment toe. The outlet barrel should be protected with soil covering or berming to the greatest extent possible.

OK

8. There is a considerable amount of large construction debris present in the pond's bottom area. Debris observed included broken pipe sections, tree branches, large chunks of concrete and soil piles. All debris requires removal prior to final approval and surety release.

OK

9. Vegetation on bare soil areas present on the graded side slopes and embankment needs re-established. Slope erosion was evident between near the building located southwest of the riser.

OK

10. Some concern is forwarded pertaining to an outdoor, above-ground fuel storage tank located along north side of the building nearest to the BMP. Coordination with the owner is requested to relocate this feature, if temporary, or if permanent, provide for pollution prevention measures such as containment dikes, etc. around the feature to avoid accidental spills to the BMP.

OK

11. A professional seal and signature is required on the record drawing(s).

Please contact me at 757-253-6639 if you have any further comments or questions relative to record drawing or construction certification requirements for this project or facility.

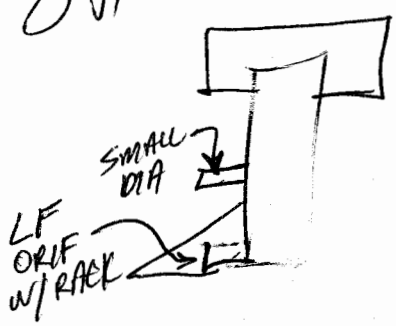
FINAL CONST INSP #2
FIELD INSPECTION
03/09/01 1:30pm
SJT

Sincerely,

Scott J. Thomas

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

G:\SWMProg\AsBuilts\SP-21-99.cert



WATERSHED	MC	MAINTENANCE PLAN	No	CTRL STRUC DESC	ACCMP
BMP ID NO	035	SITE AREA acre	5.674	CTRL STRUC SIZE inches	30
PLAN NO	SP-21-99	LAND USE	Gen Business	OTLT BARRL DESC	ACCMP
TAX PARCEL	(47-1)(1-26)	old BMP TYP	Dry Detention	OTLT BARRL SIZE inch	24
PIN NO	4710100026	JCC BMP CODE			
CONSTRUCTION DATE	8/1/1998	POINT VALUE	6	EMERG SPILLWAY	Yes
PROJECT NAME	Oak Tree Office Park			DESIGN HW ELEV	77.03
FACILITY LOCATION	3356 Ironbound Road			PERM POOL ELEV	No
CITY-STATE	Williamsburg, Va. 23188	SVC DRAIN AREA acres	3.11	2-YR OUTFLOW cfs	1.00
CURRENT OWNER	Jeanette Brady Descendents Trust			10-YR OUTFLOW cfs	13.00
OWNER ADDRESS	2501 Manion Drive			REC DRAWING	Yes
OWNER ADDRESS 2		SERVICE AREA DESCRI	3 Office & 3 Mini-Stor Bldgs		
CITY-STATE-ZIP CODE	Williamsburg, Va. 23185	IMPERV AREA acres	3	CONSTR CERTI	No
OWNER PHONE	(757) 253-9090	RECV STREAM	UT of Mill Creek		
MAINT AGREEMENT	Yes	EXT DET-WQ-CTRL	Yes	LAST INSP DATE	3/9/2001
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft		INTERNAL RATING	3
		CHAN PROT CTRL	No	MISC/COMMENTS	
		CHAN PROT VOL acre-ft		Five Forks Area. Small dia. dewatering orif left in place unopen.	
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	No		

Get Last BMP No

Return to Menu

MC035
MC011

OAK TREE OFFICE PARK

SP-23-98

JAMES CITY COUNTY ~~CODE COMPLIANCE~~ ENVIRONMENTAL DIVISION CHECKLIST

I. EROSION AND SEDIMENT CONTROL PLAN

✓ - ok

A. Site Plan

\- deficiency

NA - not applicable

✓ Vicinity Map - A small map locating the site in relation to the surrounding area. Include any landmarks which might assist in locating the site.

✓ Indicate North - The direction of north in relation to the site.

\- Limits of Clearing and Grading - Areas which are to be cleared and graded. Need to show limits of disturbance + ~~existing~~ label limits of clearing.

\- Limits of Cut and Fill Slopes - need to show full extent of grading See comment #4.

\- Areas and Amount of Disturbance (in acres or square feet).

✓ Existing Contours - The existing contours of the site at no more than 5-foot intervals.

\- Final Contours - Changes to the existing contours, including final drainage patterns at no more than 2 foot intervals. - need to label contours more often and show how final + existing contours tie back together. See Comment #4

✓ Existing and Proposed Spot Elevations - To supplement existing contour information. Proposed spot elevations may replace final contours in some instances.

\- Existing Vegetation - The existing tree lines, grassed areas, or unique vegetation. show tree line + areas to be cleared - See Comment #5

✓ Soils - The boundaries of different soil types.

\- Environmental Inventory - In accordance with Chesapeake Bay Ordinance, Sect. ~~19B~~ 23-10B. For wetlands, include documentation from approving agency.

\- Existing and Proposed Drainage Patterns - The dividing lines and the direction of flow for the different drainage areas. Include the size (acreage) of each drainage area. Need a drainage area map showing existing and proposed drainage. See comment #18.

NA 100 Year Floodplain Limits.

? Professional Seal - Signed upon approval of plan. Is applicant a III-A or III-B surveyor?

\- Critical Erosion Areas - Areas with potentially serious erosion problems. (See VESCH, Chapter 6 for criteria.) Note any steep, erodible portions on site.

✓ Site Development - Show all improvements such as buildings, parking lots, access roads, utility construction, etc.

\- Location of Practices - The locations of erosion and sediment controls, tree protection, and stormwater management practices used on the site. Use the standard symbols and abbreviations in Chapter 3 of the 1992 edition of the Virginia Erosion and Sediment Control Handbook. see comments ~~on~~ # 10-12 on Env. Div. Comment Sheet for detailed explanation.

\- Temporary Stockpile Areas - Staging and equipment storage areas.

\- Off-site Areas - Identify any off-site land-disturbing activities (e.g., borrow sites, waste areas, etc.). Show location of erosion controls. (Is there sufficient information to assure adequate protection and stabilization?)

\- Sediment Basin Design Data Sheet - Submitted along with cross-section through embankment for all basins. See comment #8

\- Detail Drawings - Any structural practices used that are not referenced to the E&S handbook or local handbooks should be explained and illustrated with detailed drawings. Also include standard detail along with site specific details required to construct measures such as sediment traps, outlet protection, etc. See comment #10

✓ Maintenance - A schedule of regular inspections and repair of erosion and sediment control structures should be set forth. (included in stnd E+S Notes)

NA Trench Dewatering - Details and specifications (per VESCH).

\- Standard County Erosion and Sediment Control Notes need updated notes dated 4/7/97 - See Comment # 13

NA Phasing Plan - (if required)

\- Construction Sequence - (if required) Generally supplied by contractor prior to preconstruction conference. Comment #14

B. Narrative Plan (if required)

✓ Project Description - Briefly describes the nature and purpose of the land-disturbing activity, and the areas (acres) to be disturbed.

✓ Existing Site Conditions - A description of the existing topography, vegetation, and drainage.

__-__ Calculations - Detailed calculations for design of temporary sediment basins and traps permanent diversion, channels, outfall protection, etc. Include calculations for pre- and post-development runoff.

__-__ Adjacent Areas - A description of neighboring areas such as streams, lakes, residential areas, roads, etc., which might be affected by the land disturbance.

__-__ Off-site Areas - Describe any off-site land-disturbing activities that will occur (including borrow sites, waste or surplus areas, etc.). Will any other areas be disturbed? May need to obtain easement + extend outfall - see detailed comments

__✓__ Soils - A brief description of the soils on the site giving such information as soil name, mapping unit, erodibility, permeability, depth, texture, and soil structure.

__NA__ Critical Areas - A description of areas on the site which have potentially serious erosion problems (e.g., steep slopes, channels, wet weather/underground springs, etc.).

__✓__ Erosion and Sediment Control Measures - A description of the methods which will be used to control erosion and sedimentation on the site. (Controls should meet the specifications in Chapter 3 of the VESCH.)

__✓__ Permanent Stabilization - A brief description, including specifications, of how the site will be stabilized after construction is completed.

__✓__ Stormwater Runoff Considerations - Describe the strategy to control stormwater runoff.

II. STORMWATER MANAGEMENT

A. STORMWATER TREATMENT SYSTEM – BMP

__-__ Drainage Area Map at a maximum scale of 1"=200' showing drainage area boundaries for pre- and post-development conditions and pre- and post-development time of concentration flow paths. For multiphased projects, the map must include all future phases for the project. See Comment #16

__NA__ Soil Map with site and drainage area outlined.

__-__ Receiving Channel and Pipe System Adequacy Determinations. All stormwater must be discharged to an adequate, well-defined receiving system. See Comment # 21

__-__ Worksheet for BMP Point System to determine need for and type of structural BMPs required as well as Natural Open Space BMP points.
See comment sheet for details - #16

__-__ Stormwater Detention Basin Design Checklist completed for each structure.
Attached

__-__ Conservation Easements required for all Natural Open Space Points claimed in BMP Worksheet.

__NA__ Infiltration Device Design, Detail and Specification. Must include results of a soil test to verify, a minimum infiltration rate of 0.27 inches per hour at the trench location to a depth of 5 feet below the bottom of the trench.

__NA__ Stormwater Management Facility Easements including a 20-foot wide access easement and a 15-foot wide maintenance easement from the 100-year storm elevation and include the dam and outlet structure.

B. STORMWATER CONVEYANCE SYSTEMS

__-__ Drainage Area Map to support the design of all conveyance systems; culverts, roadside ditches, storm drain systems, etc. Comment #18

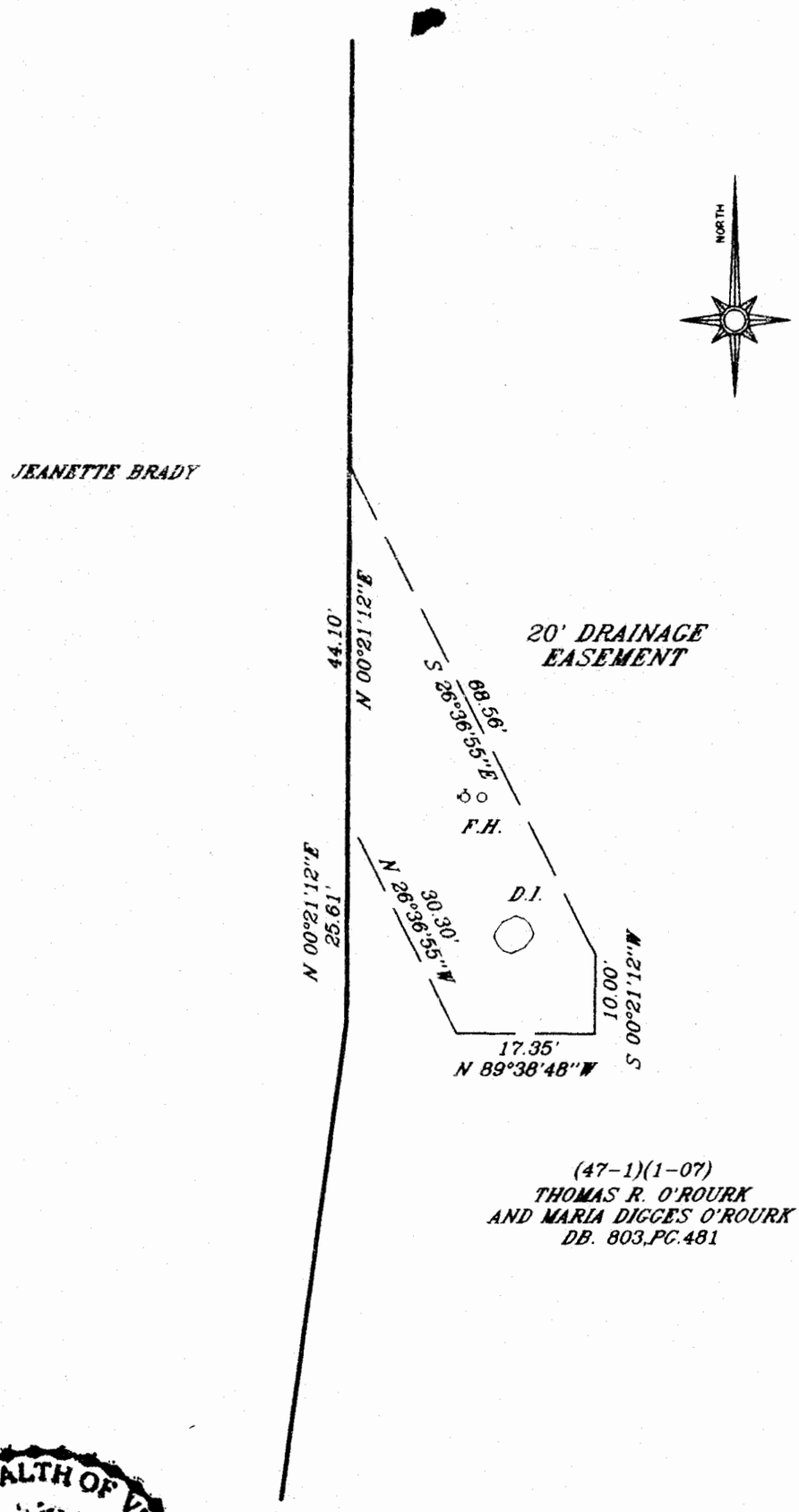
__-__ Culvert Calculations, inlet and outlet control, existing and proposed based on 10-year storm. If culvert is required @ entrance

__-__ Storm Sewer Calculations to include hydraulic grade line, inlet, and spread calculations for 10-year storm. Comment #18

__NA__ Open Ditch Calculations, lining determined based on 2-year peak velocity and capacity based on 10-year peak discharge, existing, and proposed.

__NA__ Slope Requirements, minimum longitundinal street slope requirement is 0.75% for grass-lined ditch, 0.5% for paved ditch, and 0.3% for closed (curb and gutter) section.

__-__ Outlet Protection required for all outfalls in accordance with Chapter 3, VESCH. Needed in the basin at end of pipe outfall
Comment #19.



COMMONWEALTH OF VIRGINIA
DEAN E. RAYNES
REG # NO.
1633
LAND SURVEYOR

HIS LAND SURVEYING INC.
P.O. BOX 100
PROVIDENCE FORGE, VIRGINIA 23140
(804)966-7017 FAX(804)966-7140

EASEMENT PLAT
SHOWING A
20' DRAINAGE EASEMENT
ACROSS
THOMAS R. O'ROURK JR. AND
MARIA DIGGES O'ROURK
JAMES CITY COUNTY VIRGINIA
SCALE:1"=20' DATE:4/9/98
J.N. 121.7

(47-1)(1-07)
THOMAS R. O'ROURK,JR. & MARIA DIGGES O'ROURK
DB.803,PG.481

S 00°21'12"W 277.27'

S 07°19'31"W 307.27'

NORTH

LOT 27

BARON WOODS
SUBDIVISION
PB.48,PG.69

LOT 28

S 84°34'15"E 248.84'

TOTAL AREA=5.674 AC.

LOT 29

(47-1)(1-24)
ELIZABETH N. VAIDEN
DB.608,PG.455

N 05°21'40"E 208.18'

LOT 30

DRAINAGE AREA 2
AREA= 3.4 ACRES

N 89°41'46"W 478.88'

(47-1)(1-25)
PHIL STANLEY ARMISTEAD
DB.127,PG.435

S 84°33'36"E 213.48'

DRAINAGE AREA 1
2.27 AC.

30 0 30 60 90
GRAPHIC SCALE - FEET

A=402.24' R=2839.79'

77.37'
N 01°50'39"E

COMMONWEALTH OF VIRGINIA
DEAN E. RAYNES
REG # NO.
1633
LAND SURVEYOR

IRONBOUND ROAD ROUTE 615

MC035

OAK TREE OFFICE PARK
AND AIRTIGHT SELF STORAGE
EXISTING CONDITIONS

PREPARED BY:
HIS LAND SURVEYING
P.O. BOX 100
PROVIDENCE FORGE , VA. 23140
(804)966-7017
FAX (804)966-7140

SCALE	1"=30'
DATE	2/24/98
JOB NO.	121.7
SHEET	2 OF 11