CERTIFICATE OF AUTHENTICITY

THIS IS TO CERTIFY THAT THE FOLLOWING ELECTRONIC RECORDS ARE TRUE AND ACCURATE REPRODUCTIONS OF THE ORIGINAL RECORDS OF JAMES CITY COUNTY GENERAL SERVICES DEPARTMENT- STORMWATER DIVISION; WERE SCANNED IN THE REGULAR COURSE OF BUSINESS PURSUANT TO GUIDELINES ESTABLISHED BY THE LIBRARY OF VIRGINIA AND ARCHIVES; AND HAVE BEEN VERIFIED IN THE CUSTODY OF THE INDIVIDUAL LISTED BELOW.

BMP NUMBER: **MC039**

DATE VERIFIED: **November 27, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

Date: March 30, 2012

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

From: Leah Hardenbergh

PO: 110426

Re: Files Approved for Scanning

General File ID or BMP ID:	**MC039**
PIN:	**4721500005A**
Owner Name (if known):	**LA FONTAINE**
Legal Property Description:	**CA LAFONTAINE CONDOMINIUMS**
Site Address:	**WET POND # 1-PARCEL 12**

(For internal use only):

Box # ~~3~~ 4

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

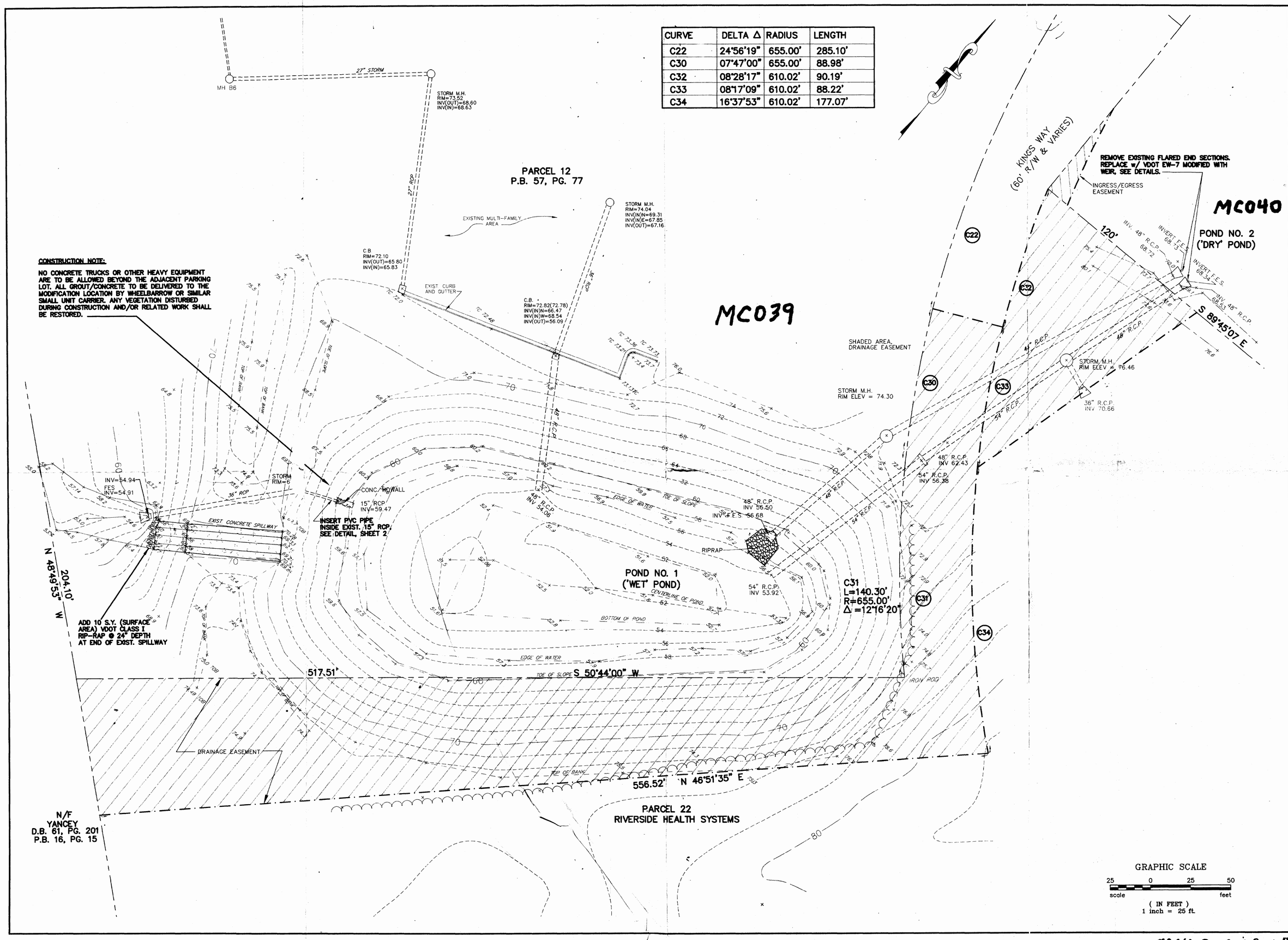
MC-039-MC-040

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

CURVE	DELTA Δ	RADIUS	LENGTH
C22	24°56'19"	655.00'	285.10'
C30	07°47'00"	655.00'	88.98'
C32	08°28'17"	610.02'	90.19'
C33	08°17'09"	610.02'	88.22'
C34	16°37'53"	610.02'	177.07'



COMMONWEALTH OF VIRGINIA
KENNETH E. RODMAN JR.
No. 023869
PROFESSIONAL ENGINEER
12/14/98

Langley and McDonald, P.C.
Engineers · Surveyors · Planners
Landscape Architects · Environmental Consultants
WILLIAMSBURG
VIRGINIA BEACH
5544 Greenwich Road, Suite 200
Virginia Beach, VA 23464
Tel. (757) 473-2000
Fax (757) 473-2030
Email: @langleymcd.com
201 Packets Court
Williamsburg, VA 23185
Tel. (757) 220-2830
Fax (757) 220-2839
Email: @langleymcd.com

REVISIONS:

12-14-98	RESPOND TO REVIEW COMMENTS	MAA

DRAWING STATUS
- Interoffice Review
- Client for Review
- For Approval/Bidding

COUNTY SUBMITTALS

10-07-98	1st Submittal
11-13-98	2nd Submittal
12-10-98	3rd Submittal
	Approved

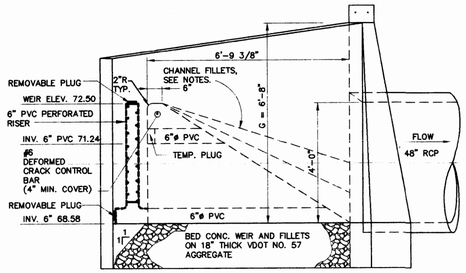
WILLIAMSBURG CROSSING SHOPPING CENTER DRAINAGE OUTFALL

POND NO. 1 - AS BUILT PLAN
POND NO. 1-MODIFICATIONS TO DRAINAGE OUTFALL
POND NO. 2 - WEIR DETAILS

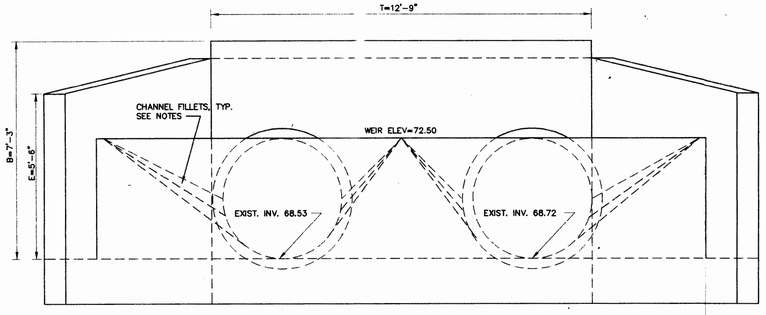
WILLIAMSBURG CROSSING, WILLIAMSBURG

Designed: WEH	Date: 10/07/98
Checked: WEH	Scale: 1"=25'
Drawn: CFR/CCC	File name: pond_asbuilt
Project Number: 1880079-000.28	Drawing Number: 30198A
Sheet Number C-1	SHEET 1 OF 2

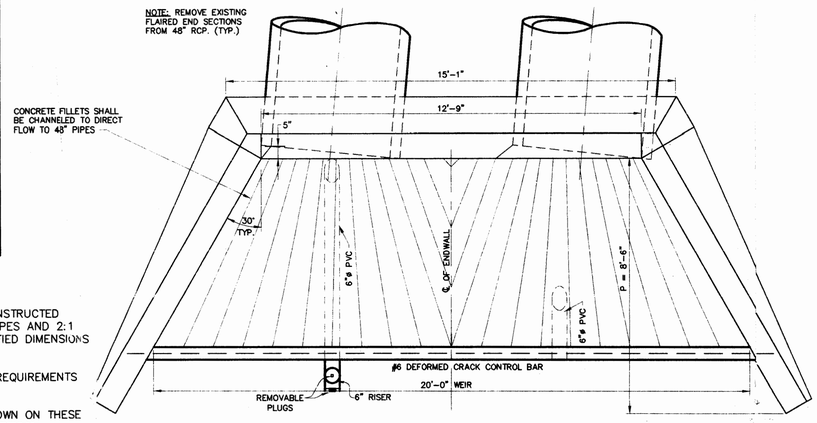
MC 040 POND 2 & POND 1 MC 039 SP-10-95



SIDE ELEVATION



DIMENSIONS FOR WEIR (*DENOTES REVISED DIMENSIONS)	
A	1'-6"
*B	7'-3"
C	4'-10 7/8"
D	4'-0"
*E	5'-6"
F	0'-7"
*G	6'-8"
H	0'-10"
I	2'-0 1/4"
*J	15'-1"
*K	13'-8 1/2"
L	9'-9 3/4"
M	1'-2"
N	0'-5 3/4"
O	0'-11 1/2"
P	8'-6"
R	1'-2 1/4"
*S	8'-4 1/2" (EXIST. PIPES)
*T	12'-9"

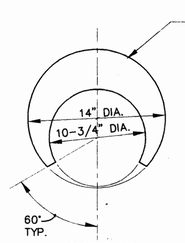


CONSTRUCT WEIR ON EXISTING 48" PIPES, POND NO. 2 OUTFALL

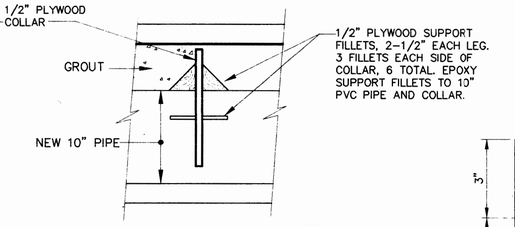
VDOT EW-7 ENDWALL MODIFIED w/ WEIR

ENDWALL/WEIR NOTES:

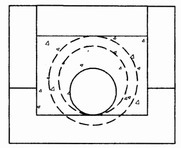
1. THE TWO 48 INCH PIPES ARE EXISTING. THE ENDWALL SHALL BE CONSTRUCTED AS A STANDARD VDOT EW-7, UTILIZING DIMENSIONS FOR 48 INCH PIPES AND 2:1 FILL SLOPES EXCEPT WHERE SPECIFICALLY MODIFIED. THE NON-MODIFIED DIMENSIONS ARE FROM THE 1993 VDOT STANDARDS BOOK.
2. THE ENDWALL CONSTRUCTION SHALL INCLUDE ALL STANDARD VDOT REQUIREMENTS INCLUDING CRACK CONTROL BARS.
3. WEIR SHALL BE CONSTRUCTED CONNECTING THE WING WALLS AS SHOWN ON THESE PLANS. THE ELEVATION AND LENGTH OF THE WEIR ARE CRITICAL; VERTICAL ELEVATION TOLERANCE IS 0.02ft.; PLAN TOLERANCE IS 0.04ft.
4. THE CONCRETE FILLETS SHALL BE CONSTRUCTED SO AS TO CHANNEL ONE-HALF OF THE FLOW OVER THE WEIR TO EACH 48 INCH PIPE. THE END OF THE FILLETS AGAINST THE WEIR SHALL BE FLAT. THE FILLETS SHALL SMOOTHLY TRANSITION TO CIRCULAR SECTIONS AS THEY APPROACH THE PIPES AND SHALL FIT THE BOTTOM ROUND SECTION OF THE PIPES AT THE ENDWALL.



COLLAR

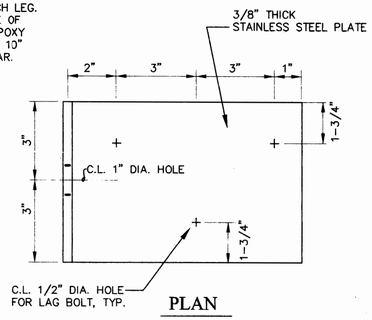


COLLAR DETAIL

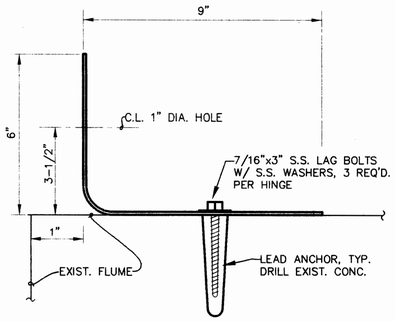


END ELEVATION

TRASH RACK OMITTED FOR CLARITY



PLAN



ELEVATION

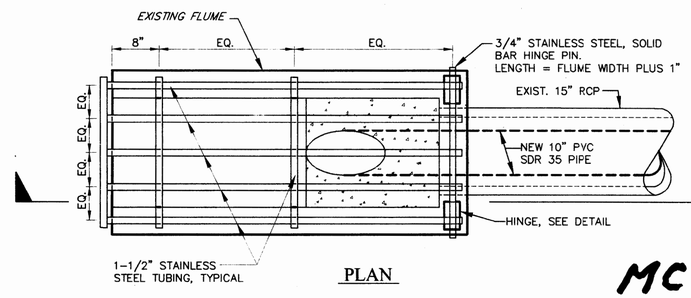
HINGE DETAIL

(TWO REQUIRED)

MODIFICATIONS TO POND No. 1 DRAINAGE OUTFALL:

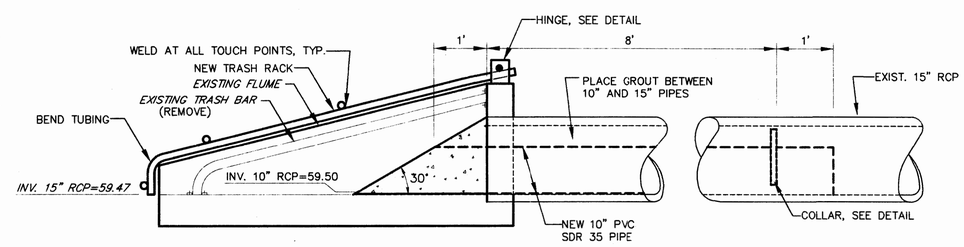
1. **PUMP POND No. 1 DOWN APPROXIMATELY 6 INCHES.**
2. **REMOVE EXISTING TRASH BAR.**
3. **CUT 10 INCH PVC SDR 35 AT 30 DEGREE MITER. CUT PIPE TO 10 FEET LENGTH FROM TOP OF MITER.**
4. **INSTALL PLYWOOD COLLAR 1 FOOT FROM END OF 10 INCH PIPE. EPOXY GLUE SUPPORT FILLETS TO PIPE AND COLLAR.**

   NOTE: THE COLLAR IS TO CONTAIN THE GROUT BETWEEN THE NEW 10 INCH PIPE AND THE EXISTING 15 INCH PIPE.
5. **SLIDE THE NEW 10 INCH PIPE INTO THE EXISTING 15 INCH PIPE AND PLACE GROUT BETWEEN THE PIPES. SHAPE THE GROUT AT THE PIPE INTAKE END TO MATCH THE 30 DEGREE PIPE MITER.**
6. **INSTALL THE NEW TRASH RACK. GRIND BURRS FROM ALL CUT OR DRILLED EDGES, INCLUDING THE HINGES.**



PLAN

MC039



SECTION

MODIFICATIONS TO POND 1 DRAINAGE OUTFALL

NOT TO SCALE

Langley and McDonald, P.C.
Engineers · Surveyors · Planners
Landscape Architects · Environmental Consultants
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Email: lm@langleymcdonald.com

COMMONWEALTH OF VIRGINIA
KENNETH E. BOSMAN JR.
No. 023862
PROFESSIONAL ENGINEER
12/18/98

REVISIONS:
12-28-98 RESPOND TO REVIEW COMMENTS. MAA
SHEET 2 ADDED

DRAWING STATUS
Interoffice Review
Client for Review
Pre Approval Building

COUNTY SUBMITTALS
10-07-98 1st Submittal
11-13-98 2nd Submittal
12-28-98 3rd Submittal
Approved

WILLIAMSBURG CROSSING SHOPPING CENTER
DRAINAGE OUTFALL
POND NO. 1 - AS BUILT PLAN
POND NO. 1-MODIFICATIONS TO DRAINAGE OUTFALL
POND NO. 2 - WEIR DETAILS
WILLIAMSBURG CROSSING, WILLIAMSBURG

Designed: WEH	Date: 10/07/98
Checked: WEH	Scale: AS SHOWN
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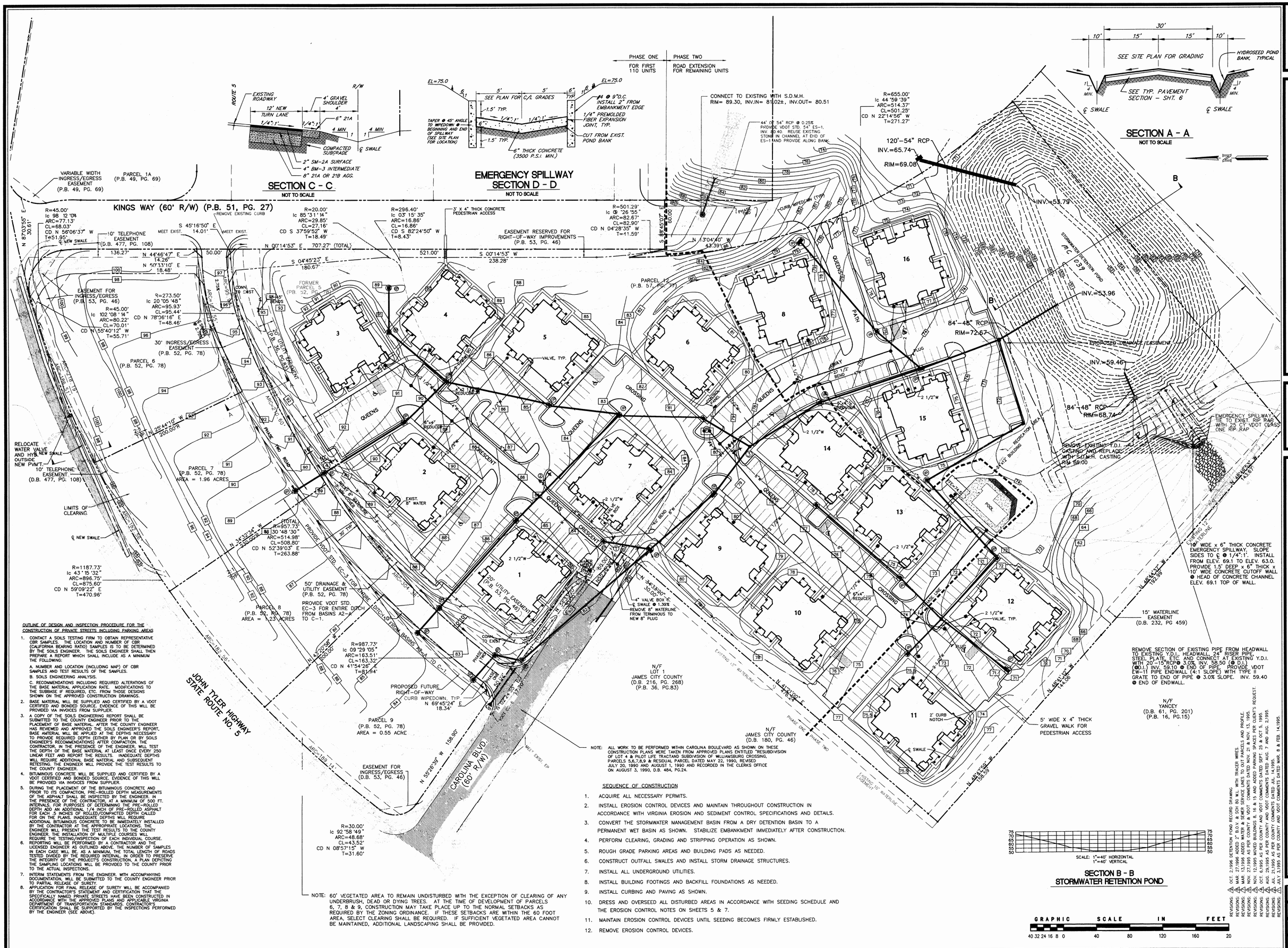
Project Number: 1880079-000.28	Drawing Number: 30198B
Sheet Number C-2 SHEET 2 OF 2	

MC 039 SP-10-95



OUTLINE OF DESIGN AND INSPECTION PROCEDURE FOR THE CONSTRUCTION OF PRIVATE STREETS INCLUDING PARKING AREAS

1. CONTACT A SOILS TESTING FIRM TO OBTAIN REPRESENTATIVE CBR SAMPLES. THE LOCATION AND NUMBER OF CBR (CALIFORNIA BEARING RATIO) SAMPLES IS TO BE DETERMINED BY THE SOILS ENGINEER. THE SOILS ENGINEER SHALL THEN PREPARE A REPORT WHICH SHALL INCLUDE AS A MINIMUM THE FOLLOWING:
   A. NUMBER AND LOCATION (INCLUDING MAP) OF CBR SAMPLES AND TEST RESULTS OF THE SAMPLES.
   B. SOILS ENGINEERING ANALYSIS.
   C. RECOMMENDATIONS INCLUDING REQUIRED ALTERATIONS OF THE BASE MATERIAL APPLICATION RATE. MODIFICATIONS TO THE SUBBASE IF REQUIRED, ETC. FROM THOSE DESIGNS SHOWN ON THE APPROVED CONSTRUCTION DRAWINGS.
2. BASE MATERIAL WILL BE SUPPLIED AND CERTIFIED BY A VDOT CERTIFIED AND BONDED SOURCE. EVIDENCE OF THIS WILL BE PROVIDED VIA INVOICES FROM SUPPLIER.
3. A COPY OF THE SOILS ENGINEERING REPORT SHALL BE SUBMITTED TO THE COUNTY ENGINEER PRIOR TO THE PLACEMENT OF BASE MATERIAL. AFTER THE COUNTY ENGINEER HAS REVIEWED AND APPROVED THE SOILS ENGINEER'S REPORT, BASE AMTERIAL WILL BE APPLIED AT THE DEPTHS NECESSARY TO PROVIDE REQUIRED DEPTH (EITHER BY PLAN OR BY SOILS ENGINEER'S RECOMMENDATIONS) AFTER COMPACTION. THE CONTRACTOR, IN THE PRESENCE OF THE ENGINEER, WILL TEST THE DEPTH OF THE BASE MATERIAL AT LEAST ONCE EVERY 250 LINEAR FEET AND REPORT THE RESULTS. INADEQUATE DEPTHS WILL REQUIRE ADDITIONAL BASE MATERIAL AND SUBSEQUENT RETESTING. THE ENGINEER WILL PROVIDE THE TEST RESULTS TO THE COUNTY ENGINEER.
4. BITUMINOUS CONCRETE WILL BE SUPPLIED AND CERTIFIED BY A VDOT CERTIFIED AND BONDED SOURCE. EVIDENCE OF THIS WILL BE PROVIDED VIA INVOICES FROM SUPPLIER.
5. DURING THE PLACEMENT OF THE BITUMINOUS CONCRETE AND PRIOR TO ITS COMPACTION, PRE-ROLLED DEPTH MEASUREMENTS OF THE ASPHALT SHALL BE INSPECTED BY THE ENGINEER. IN THE PRESENCE OF THE CONTRACTOR, AT A MINIMUM OF 500 FT. INTERVALS. FOR PURPOSES OF DETERMINING THE PRE-ROLLED DEPTH ADD AN ADDITIONAL 1/4 INCH OF PRE-ROLLED ASPHALT FOR EACH 3 INCHES OF ROLLED/COMPACTED DEPTH CALLED FOR ON THE PLANS. INADEQUATE DEPTHS WILL REQUIRE ADDITIONAL BITUMINOUS CONCRETE TO BE IMMEDIATELY INSTALLED BY THE CONTRACTOR AT THE APPROPRIATE LOCATIONS. THE ENGINEER WILL PRESENT THE TEST RESULTS TO THE COUNTY ENGINEER. THE INSTALLATION OF MULTIPLE COURSES WILL REQUIRE THE TESTING/INSPECTION OF EACH INDIVIDUAL COURSE.
6. REPORTING WILL BE PERFORMED BY A CONTRACTOR AND THE LICENSED ENGINEER AS OUTLINED ABOVE. THE NUMBER OF SAMPLES IN EACH CASE WILL BE, AS A MINIMUM, THE TOTAL LENGTH OF ROADS TESTED DIVIDED BY THE REQUIRED INTERVAL. IN ORDER TO PRESERVE THE INTEGRITY OF THE PROJECT'S CONSTRUCTION, A PLAN DEPICTING THE SAMPLING LOCATIONS WILL BE PROVIDED TO THE COUNTY PRIOR TO THE ACTUAL INSPECTIONS.
7. INTERIM STATEMENTS FROM THE ENGINEER, WITH ACCOMPANYING DOCUMENTATION, WILL BE SUBMITTED TO THE COUNTY ENGINEER PRIOR TO PARTIAL RELEASE OF SURETY.
8. APPLICATION FOR FINAL RELEASE OF SURETY WILL BE ACCOMPANIED BY THE CONTRACTOR'S STATEMENT AND CERTIFICATION THAT THE SPECIFICALLY NAMED PRIVATE STREETS HAVE BEEN CONSTRUCTED IN ACCORDANCE WITH THE APPROVED PLANS AND APPLICABLE VIRGINIA DEPARTMENT OF TRANSPORTATION STANDARDS. CONTRACTOR'S CERTIFICATION SHALL BE SUPPORTED BY THE INSPECTIONS PERFORMED BY THE ENGINEER (SEE ABOVE).

NOTE: ALL WORK TO BE PERFORMED WITHIN CAROLINA BOULEVARD AS SHOWN ON THESE CONSTRUCTION PLANS WERE TAKEN FROM APPROVED PLANS ENTITLED "RESUBDIVISION OF LOT 4 & PILOT LIFE TRACTAND SUBDIVISION OF WILLIAMSBURG CROSSING, PARCELS 5,6,7,8,9 & RESIDUAL PARCEL DATED MAY 22, 1990, REVISED JULY 20, 1990 AND AUGUST 1, 1990 AND RECORDED IN THE CLERKS OFFICE ON AUGUST 3, 1990, D.B. 484, PG.24.

SEQUENCE OF CONSTRUCTION

1. ACQUIRE ALL NECESSARY PERMITS.
2. INSTALL EROSION CONTROL DEVICES AND MAINTAIN THROUGHOUT CONSTRUCTION IN ACCORDANCE WITH VIRGINIA EROSION AND SEDIMENT CONTROL SPECIFICATIONS AND DETAILS.
3. CONVERT THE STORMWATER MANAGEMENT BASIN FROM A DRY DETENTION BASIN TO A PERMANENT WET BASIN AS SHOWN. STABILIZE EMBANKMENT IMMEDIATELY AFTER CONSTRUCTION.
4. PERFORM CLEARING, GRADING AND STRIPPING OPERATION AS SHOWN.
5. ROUGH GRADE PARKING AREAS AND BUILDING PADS AS NEEDED.
6. CONSTRUCT OUTFALL SWALES AND INSTALL STORM DRAINAGE STRUCTURES.
7. INSTALL ALL UNDERGROUND UTILITIES.
8. INSTALL BUILDING FOOTINGS AND BACKFILL FOUNDATIONS AS NEEDED.
9. INSTALL CURBING AND PAVING AS SHOWN.
10. DRESS AND OVERSEED ALL DISTURBED AREAS IN ACCORDANCE WITH SEEDING SCHEDULE AND THE EROSION CONTROL NOTES ON SHEETS 5 & 7.
11. MAINTAIN EROSION CONTROL DEVICES UNTIL SEEDING BECOMES FIRMLY ESTABLISHED.
12. REMOVE EROSION CONTROL DEVICES.

NOTE: 60' VEGETATED AREA TO REMAIN UNDISTURBED WITH THE EXCEPTION OF CLEARING OF ANY UNDERBRUSH, DEAD OR DYING TREES. AT THE TIME OF DEVELOPMENT OF PARCELS 6, 7, 8 & 9, CONSTRUCTION MAY TAKE PLACE UP TO THE NORMAL SETBACKS AS REQUIRED BY THE ZONING ORDINANCE. IF THESE SETBACKS ARE WITHIN THE 60 FOOT AREA, SELECT CLEARING SHALL BE REQUIRED. IF SUFFICIENT VEGETATED AREA CANNOT BE MAINTAINED, ADDITIONAL LANDSCAPING SHALL BE PROVIDED.

REVISIONS: OCT. 2,1996 DETENTION POND RECORD DRAWING.
REVISIONS: MAR. 14,1996 AS PER COUNTY & VDOT COMMENTS DATED MAR. 7 AND MAR. 11 WITH TRACER WIRES.
REVISIONS: MAR. 13,1996 ADDED WATER & SEWER SERVICE LINES TO LOT PARCELS AND PROFILE.
REVISIONS: NOV. 27,1995 AS PER COUNTY & VDOT COMMENTS DATED NOV. 21 & NOV. 13, 1995.
REVISIONS: NOV. 12,1995 MOVED BUILDINGS 8, 16 & 15 AND ADDED PARKING SPACES PER CLIENT'S REQUEST.
REVISIONS: OCT. 6,1995 AS PER COUNTY AND VDOT COMMENTS DATED SEPT. 25 & OCT. 5, 1995.
REVISIONS: AUG. 29,1995 AS PER COUNTY COMMENTS DATED AUG. 7 AND AUG. 2,1995.
REVISIONS: JUL. 21,1995 AS PER COUNTY COMMENTS DATED JUL. 14,1995.
REVISIONS: JULY 3,1995 AS PER COUNTY AND VDOT COMMENTS DATED MAR. 8 & FEB. 14,1995.

Langley and McDonald, P.C.

Engineers · Surveyors · Planners
Landscape Architects · Environmental Consultants

VIRGINIA BEACH — WILLIAMSBURG

DES.	WEH/KSM
DWN.	RCH/CFR/TDK
CHK.	KSM
DATE	10/02/96

SITE DEVELOPMENT PLAN
FOR A PORTION OF
WILLIAMSBURG CROSSING MULTI-FAMILY
JAMES CITY COUNTY, VIRGINIA

DETENTION POND RECORD DRAWING

PROJ.NO.	88079-MF
SCALE:	1"=40'
SHEET	1 OF 1
DWG. NO.	23906I

C:\88079\SITEPLAN\MASTER.dwg, 1" = 1', 04/01/96 at 08:58

EXISTING FOOD LION BUILDING

NOTE:
PROVIDE 16 ADDITIONAL GUARDPOSTS @ GAS METERS. COORDINATE IN THE FIELD WITH THE GAS COMPANY.

MATCHLINE SEE SHEET 5A

PROPOSED BUILDING ADDITION

FIN. FLR. ELEV.= 97.10

FIN. FLR. ELEV. = 95.10

FIN. FLR. ELEV. = 93.10

A= 0.14 Ac. C= 0.90

A= 0.10 Ac. C= 0.90

A= 0.29 C= 0.90

A= 0.51 Ac. C= 0.90

A= 0.68 Ac. C= 0.90

EXISTING PROPERTY LINE TO BE VACATED

DIVERSION DIKE

SILT FENCE

120'-30" RCP @ 0.30%

80'-30" RCP @ 0.30%

160'-30" RCP @ 0.30%

120'-30" RCP @ 0.28%

120'-24" RCP @ .77%

148'-24" RCP @ 0.50%

RAISE RIM TO NEW ELEV 95.83'

70' VEE SWALE @ 3.0%

70'x30' TEMP. CONSTRUCTION ENTRANCE

PROPOSED PROPERTY LINE (MATCHLINE)

SEE SHEET 5 FOR OFFSITE GRADING PLAN TO ROUTE 199

MATCHLINE SEE SHEET 5

PROPOSED GOLF COURSE

LIMIT OF CLEARING

PROPOSED GRADE AT PROPOSED WATER LINE

PROPOSED 8" WATER LINE

EXISTING GRADE AT PROPOSED WATER LINE

STA. 4+50 ANNUAL AIR RELEASE VALVE

2-22-95

DRAINAGE AREA MAP

GRADING, DRAINAGE, AND EROSION CONTROL PLAN

GRAPHIC SCALE IN FEET

25 20 15 10 5 0 25 50 75 100 125

COMMONWEALTH OF VIRGINIA
1-17-95
LARRY S. BARRY
No. 020490
PROFESSIONAL ENGINEER

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

DES.	RWE
DWN.	JAM
CHK.	KGM
DATE	9/28/94

SP-128-94

SITE DEVELOPMENT PLAN
OF A PORTION OF
WILLIAMSBURG CROSSING SHOPPING CENTER
James City County, Virginia
for
University Square Associates

REVISED 2-16-95 AS PER COUNTY COMMENTS DATED 2-13-95

REVISED 1/12/95: AS PER COUNTY AND VDOT COMMENTS DATED 12/15/94.

PROJ. NO.	88079-0479
SCALE:	1" = 25'
SHEET	2 OF 9
DWG. NO.	23817 H

MC039_LA_FONTAINE_DRY_POND_2 - 007

COUNTY OF JAMES CITY
FINAL SITE PLAN

API	DATE
Bldg Dir	
Health	
Hydro	
PW	
Public Wks	
Zoning	
JCSA	
Other	
Other	

FEB 1988
RECEIVED
PLANNING DEPARTMENT

Smith Demer Normann
Engineers - Planners - Surveyors - Landscape Architects
2101 Executive Drive, Tower Box 30
Hampton, Virginia 23666
804/826-4800 804/627-6900

NO.	BY	DATE	DESCRIPTION
REVISIONS			

WILLIAMSBURG CROSSING SHOPPING CENTER
JAMES CITY COUNTY, VIRGINIA

DRAINAGE AREAS

DRAWN BY: | CHECKED BY:
DATE: 4/1/88 | SCALE:

SHEET NO.:
OF
JOB NUMBER:

SP-11-88

SITE DEVELOPMENT PLANS
FOR
WILLIAMSBURG CROSSING SHOPPING CENTER

JAMES CITY COUNTY, VIRGINIA

AUGUST 10,1987
REVISED FEBRUARY 1, 1988

LAND USE SUMMARY TABLE

A. ZONING OF SITE: GENERAL BUSINESS DISTRICT, B-1

B. CALCULATION FOR PARKING REQUIREMENTS

USE CATEGORY	:	MERCANTILE
NUMBER OF SPACES REQUIRED	:	370
REQUIRED HANDICAPPED SPACE	:	6
NUMBER OF SPACES PROVIDED	:	421

C. OPEN SPACE DATA

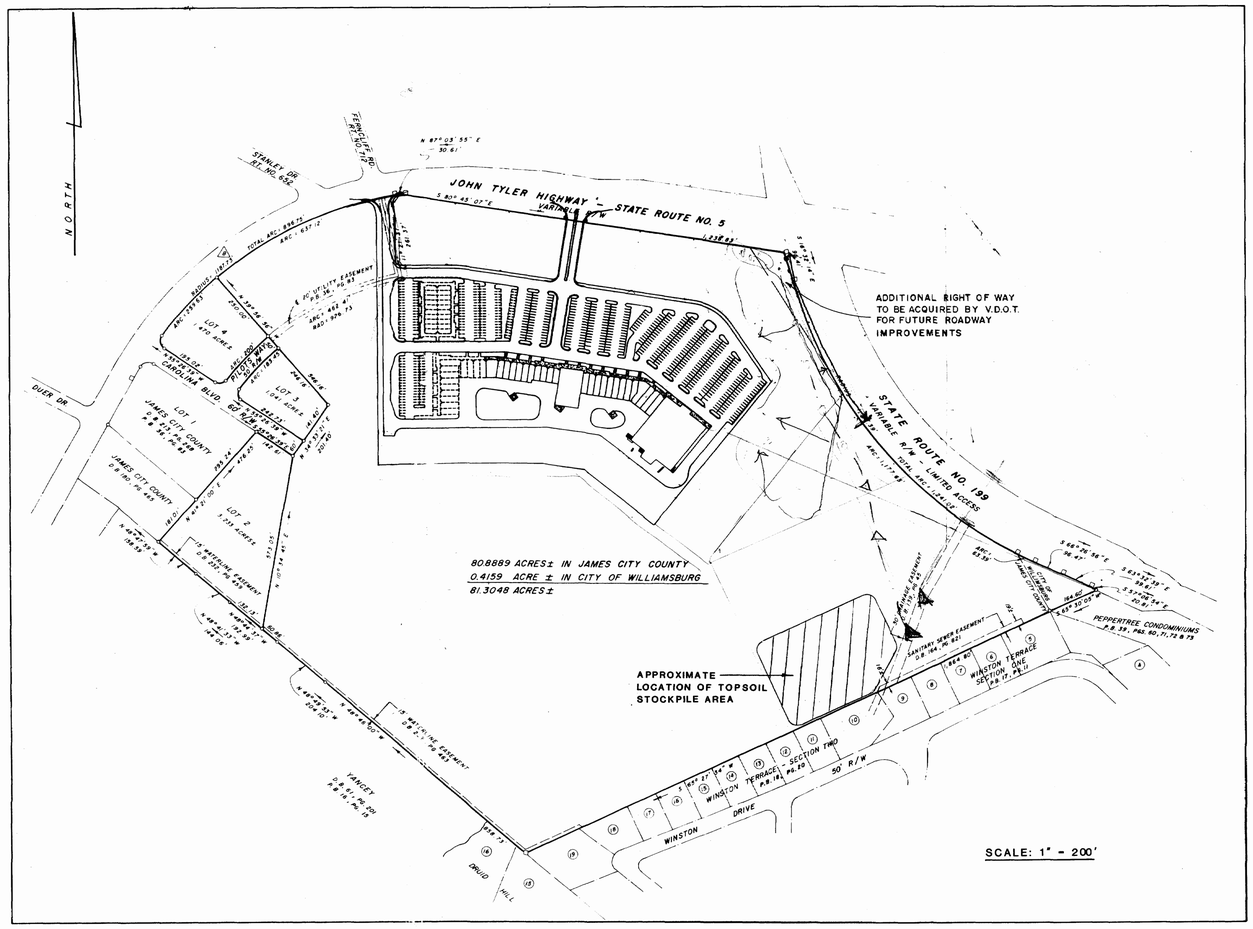
TOTAL SITE AREA	:	782,076 SF
TOTAL AMOUNT COVERED BY BUILDINGS	:	73,947 sf
PERCENT OF SITE COVERED BY BUILDINGS	:	9.5%
AMOUNT OF SITE COVERED BY OPEN SPACE	:	338,052 SF
PERCENT OF SITE COVERED BY OPEN SPACE	:	43.2%

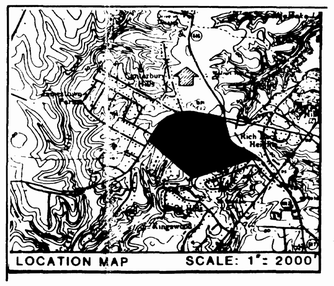
D. BUILDING DATA

TOTAL FLOOR AREA	:	73,947 sf
HEIGHT OF BUILDING	:	22 ft. max
NUMBER OF FLOORS	:	1
TYPE	:	MERCANTILE, TYPE 2C

LEGEND

PROPOSED	DESCRIPTION	EXISITNG
	WATER MAIN, TEE, VALVE & BEND	
	FIRE HYDRANT WITH VALVE	
	SANITARY SEWER WITH MANHOLE	
	SANITARY SEWER LATERAL WITH C.O.	
	STORM SEWER WITH STORM MANHOLE	
	DROP OR CURB INLET	
	BOUNDARY LINE	
	PROPERTY LINE	
	WOODS LINE	
	CURB	
	CURB AND GUTTER	
	CONCRETE	
	INLET PROTECTION	
—X—X—	SILT BARRIER	
—(X)—(X)—	SILT FENCE	
	PARKING LOT LIGHTS	
	WALL MOUNTED LIGHTS	
—(99)—	PROPOSED FINISH CONTOURS	
96	EXISTING GROUND CONTOURS	
\96.00	PROPOSED SPOT ELEVATIONS	
\96.00	REVISED SPOT ELEVATIONS	
(TOP) (TOE)	CUT OR FILL SLOPE	





SCHEDULE OF DRAWINGS

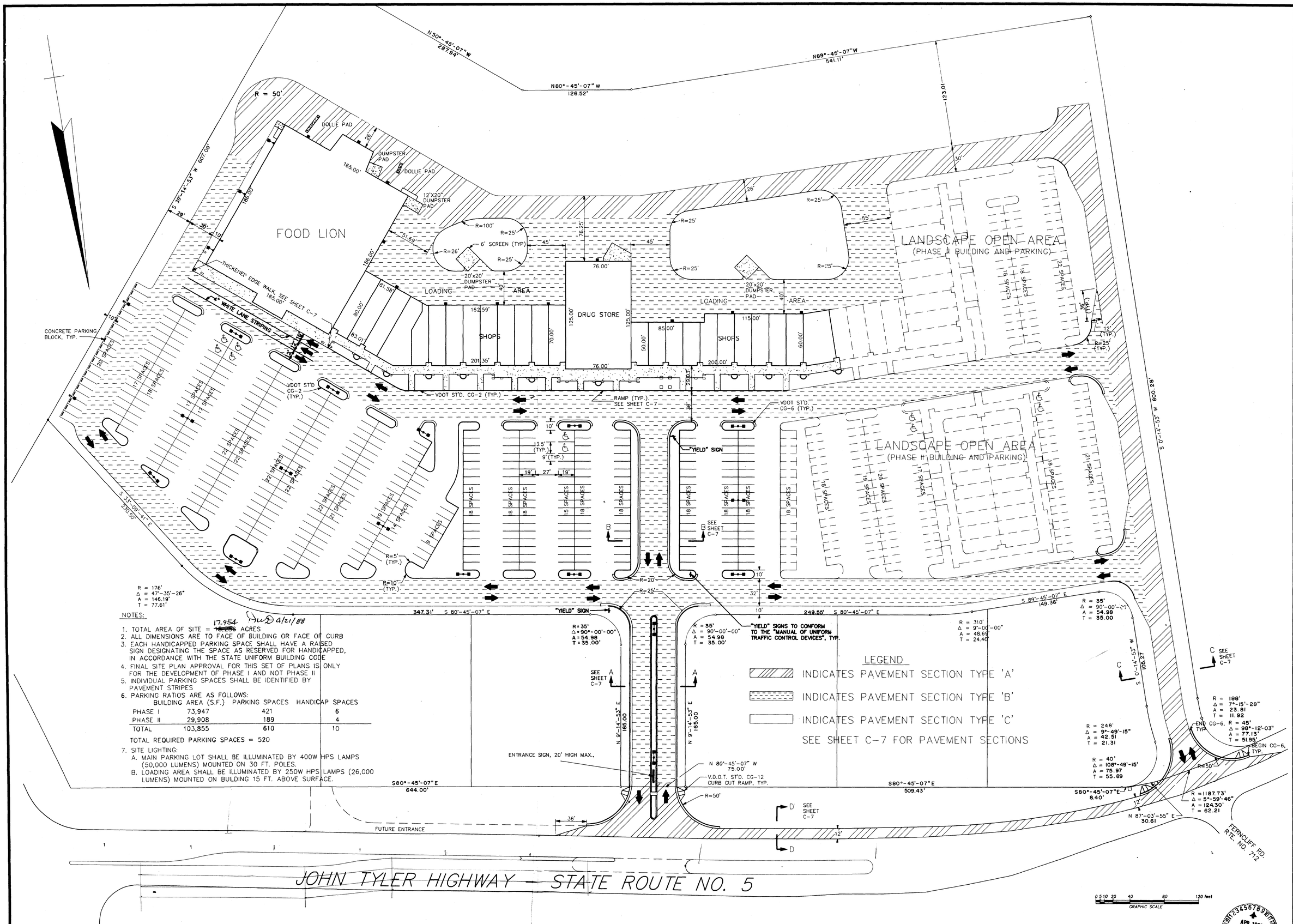
COVER SHEET
C-1 SITE LAYOUT AND PAVING PLAN
C-2 SITE GRADING AND EROSION CONTROL PLAN
C-3 SITE DRAINAGE AND UTILITY PLAN
C-4 SITE LANDSCAPE PLAN
C-5 OFF-SITE IMPROVEMENTS
C-6 DRAINAGE AND EROSION CONTROL DETAILS
C-7 SITE AND LANDSCAPE DETAILS
C-8 WATER MAIN PROFILES, DETECTOR CHECK DETAIL
C-9 SANITARY SEWER PROFILES

APR 1988
RECEIVED
PLANNING DEPARTMENT

Smith Demer Normann
Engineers - Planners - Surveyors - Landscape Architects
2101 Executive Drive, Tower Box 50
Hampton, Virginia 23666
804/826-4800 804/627-6900

COUNTY OF JAMES CITY
FINAL SITE PLAN
DATE
C.W./Peek 2-9-88
Hen/Peek 2-11-88
Fin/Peek 2-24-88
Hen/Peek 3-22-88
Dep/Peek 3-22-88
5/1/88
Hrg/Peek 3-22-88

87021.03



NOTES:

1. TOTAL AREA OF SITE = ~~18.256~~ 17.954 ACRES (HWD 4/21/88)
2. ALL DIMENSIONS ARE TO FACE OF BUILDING OR FACE OF CURB
3. EACH HANDICAPPED PARKING SPACE SHALL HAVE A RAISED SIGN DESIGNATING THE SPACE AS RESERVED FOR HANDICAPPED, IN ACCORDANCE WITH THE STATE UNIFORM BUILDING CODE
4. FINAL SITE PLAN APPROVAL FOR THIS SET OF PLANS IS ONLY FOR THE DEVELOPMENT OF PHASE I AND NOT PHASE II
5. INDIVIDUAL PARKING SPACES SHALL BE IDENTIFIED BY PAVEMENT STRIPES
6. PARKING RATIOS ARE AS FOLLOWS:

	BUILDING AREA (S.F.)	PARKING SPACES	HANDICAP SPACES
PHASE I	73,947	421	6
PHASE II	29,908	189	4
TOTAL	103,855	610	10

TOTAL REQUIRED PARKING SPACES = 520

7. SITE LIGHTING:
   A. MAIN PARKING LOT SHALL BE ILLUMINATED BY 400W HPS LAMPS (50,000 LUMENS) MOUNTED ON 30 FT. POLES.
   B. LOADING AREA SHALL BE ILLUMINATED BY 250W HPS LAMPS (26,000 LUMENS) MOUNTED ON BUILDING 15 FT. ABOVE SURFACE.

APR 1988 RECEIVED FLANNING DEPARTMENT

Smith Demer Normann
Engineers – Planners – Surveyors – Landscape Architects
2101 Executive Drive, Tower Box 50
Hampton, Virginia 23666
804/826-4800 804/627-6900

NO.	BY	DATE	DESCRIPTION
1	DWD	10-23-87	ADD NOTES, DIMENSIONS, LIGHTS, DIRECTIONAL ARROWS, H.C. RAMPS, "YIELD" SIGNS, DRIVE AISLES
2	DWD	11-25-87	ADD SITE LIGHTING NOTE NO. 7
3	DWD	2-1-88	REVISED LAYOUT-CHANGE RIGHT-OF-WAY
4	DWD	3/8/88	REVISED BOUNDRY PER J.C.C. PLAN CHECK
5	WHS	4/6/88	REVISED PROPERTY LINES

REVISIONS

WILLIAMSBURG CROSSING SHOPPING CENTER

JAMES CITY COUNTY, VIRGINIA

SITE LAYOUT AND PAVING PLAN

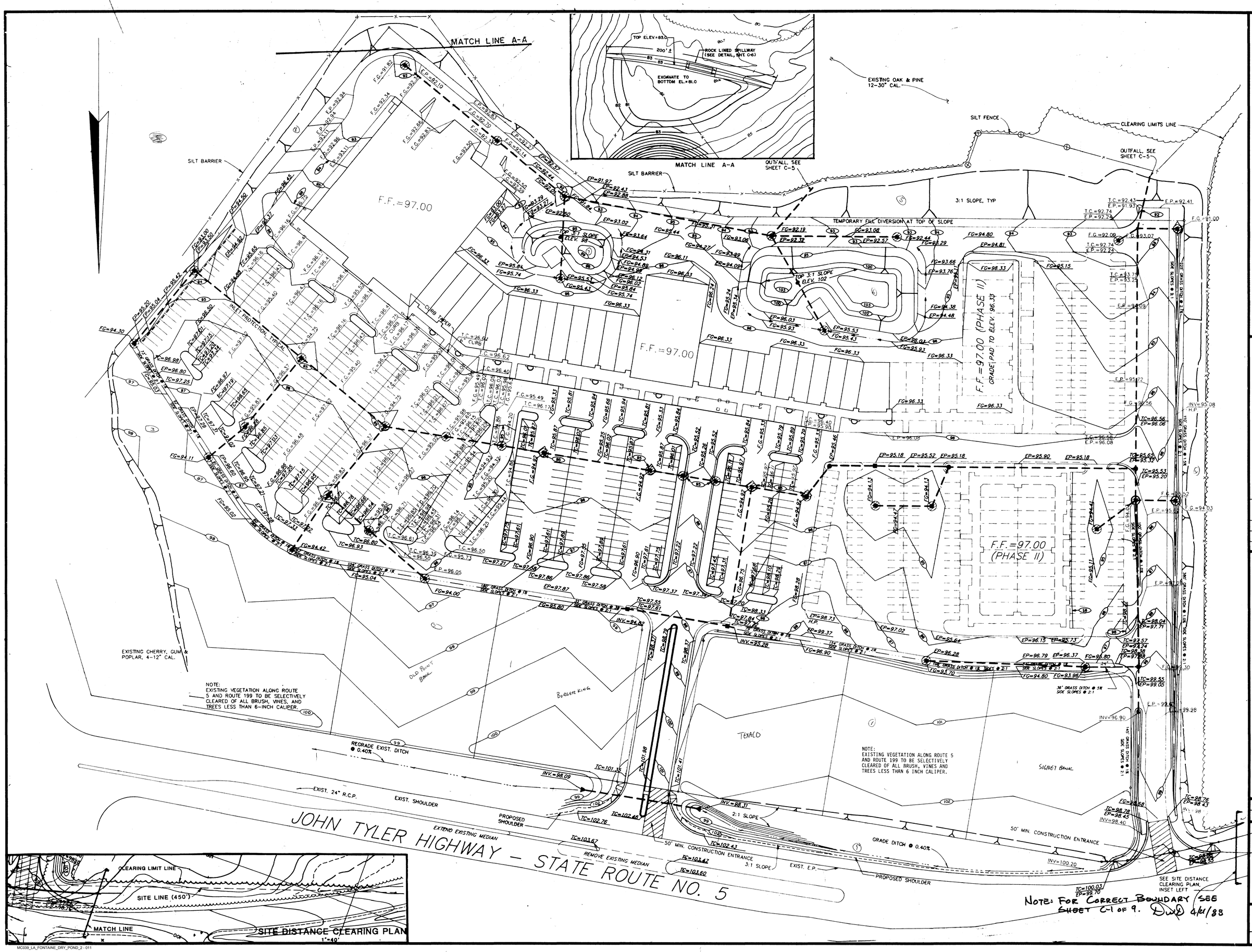
DRAWN BY: M.J.B.–C.A.D.D. | CHECKED BY: K.R.S.
DATE: 10/23/87 | SCALE: 1"=40'

PROFESSIONAL ENGINEER

SHEET NO.: C-1 OF 9

JOB NUMBER: 87021.03

MC039_LA_FONTAINE_DRY_POND_2 - 010



NOTE: FOR CORRECT BOUNDARY SEE SHEET C-1 OF 9. DWD 4/21/88

Smith Demer Normann
Engineers - Planners - Surveyors - Landscape Architects
2101 Executive Drive, Tower Box 50
Hampton, Virginia 23666
804/826-4800 804/627-5900

NO.	BY	DATE	DESCRIPTION
1	DWD	6-23-87	ADD DITCH AT NO. PL, ADD SITE DIST. INSET, MISC. NOTES & GRADES, MOVE PIPE AT ENTRANCE
2	DWD	2-1-88	REVISE GRADES DUE TO NEW LAYOUT
3	LSD	3/8/88	REVISED STORM

REVISIONS

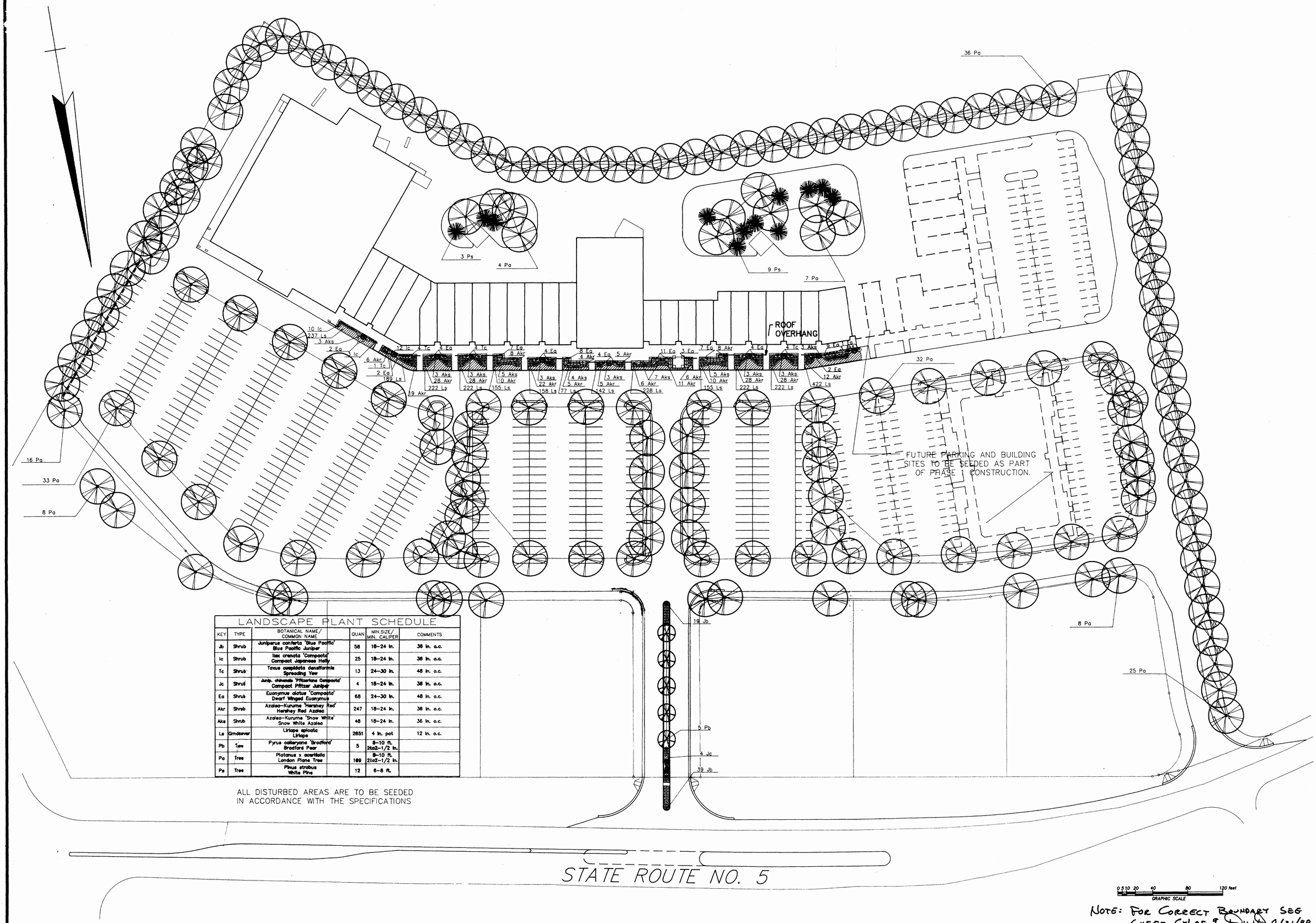
WILLIAMSBURG CROSSING SHOPPING CENTER
JAMES CITY COUNTY, VIRGINIA

SITE GRADING AND EROSION CONTROL PLAN

DRAWN BY: DWD
CHECKED BY: WRS
DATE: 8/10/87
SCALE: 1"=40'

SHEET NO.: C-2 OF 9
JOB NUMBER: 87021.03

MC039_LA_FONTAINE_DRY_POND_2 - 011



LANDSCAPE PLANT SCHEDULE

KEY	TYPE	BOTANICAL NAME/ COMMON NAME	QUAN	MIN.SIZE/ MIN. CALIPER	COMMENTS
Jb	Shrub	Juniperus conferta 'Blue Pacific' Blue Pacific Juniper	58	18–24 in.	36 in. o.c.
Ic	Shrub	Ilex crenata 'Compacta' Compact Japanese Holly	25	18–24 in.	36 in. o.c.
Tc	Shrub	Taxus cuspidata densiformis Spreading Yew	13	24–30 in.	48 in. o.c.
Jc	Shrub	Junip. chinensis 'Pfitzeriana Compacta' Compact Pfitzer Juniper	4	18–24 in.	36 in. o.c.
Eq	Shrub	Euonymus alatus 'Compacta' Dwarf Winged Euonymus	68	24–30 in.	48 in. o.c.
Akr	Shrub	Azalea–Kurume 'Hershey Red' Hershey Red Azalea	247	18–24 in.	36 in. o.c.
Aks	Shrub	Azalea–Kurume 'Snow White' Snow White Azalea	48	18–24 in.	36 in. o.c.
Ls	Grndcover	Liriope spicata Liriope	2651	4 in. pot	12 in. o.c.
Pb	Tree	Pyrus calleryana 'Bradford' Bradford Pear	5	8–10 ft. 2to2–1/2 in.	
Pa	Tree	Platanus x acerifolia London Plane Tree	189	8–10 ft. 2to2–1/2 in.	
Ps	Tree	Pinus strobus White Pine	12	6–8 ft.	

ALL DISTURBED AREAS ARE TO BE SEEDED IN ACCORDANCE WITH THE SPECIFICATIONS

NOTE: FOR CORRECT BOUNDARY SEE SHEET C-1 OF 9. DWD 4/21/88

Smith Demer Normann
Engineers – Planners – Surveyors – Landscape Architects
2101 Executive Drive, Tower Box 50
Hampton, Virginia 23666
804/826–4800 804/827–6900

NO.	BY	DATE	DESCRIPTION
1	SEP	10/23/87	ADD TREES, BUILDING OVERHANG
2	SEP	2/1/88	REVISED DUE TO LAYOUT CHANGE
3	DWD	3/18/88	REVISED BOUNDRY PER J.C.C. PLAN CHECK

REVISIONS

WILLIAMSBURG CROSSING SHOPPING CENTER

JAMES CITY COUNTY, VIRGINIA

SITE LANDSCAPE PLAN

DRAWN BY: MJB
CHECKED BY: WRS
DATE: 8/10/87
SCALE: 1"=40'

COMMONWEALTH OF VIRGINIA
Steven E. Pophal
No. 242
CERTIFIED LANDSCAPE ARCHITECT

SHEET NO.: C-4 OF 9

JOB NUMBER: 8702100

Smith Dewey Norman
Engineers - Planners - Surveyors - Landscape Architects
2101 Executive Drive, Tower Box 30
Hampton, Virginia 23666
804/826-4800 804/627-6900

REVISIONS	
1 DWG10/23/87 CHANGE MISC. GRADES, MOVE PIPE AT MAIN ENTRANCE, ADD WATERLINE STATIONS & DIMENSIONING	
2 DWD11/23/87 ADD J.C.S.A. REFERANCE TO DETECTOR CHECK	
3 SDN 2/1/88 REVISED STORM & SANITARY SEWER DUE TO ENTRANCE RELOCATION & ARCHITECTURAL REVISIONS	
4 DWD 3/8/88 REVISE SEWER.	
5 JSD 3/28/88 REVISE STORM, REVISE BOUNDARY PER J.C.C.	
NO. BY DATE	DESCRIPTION

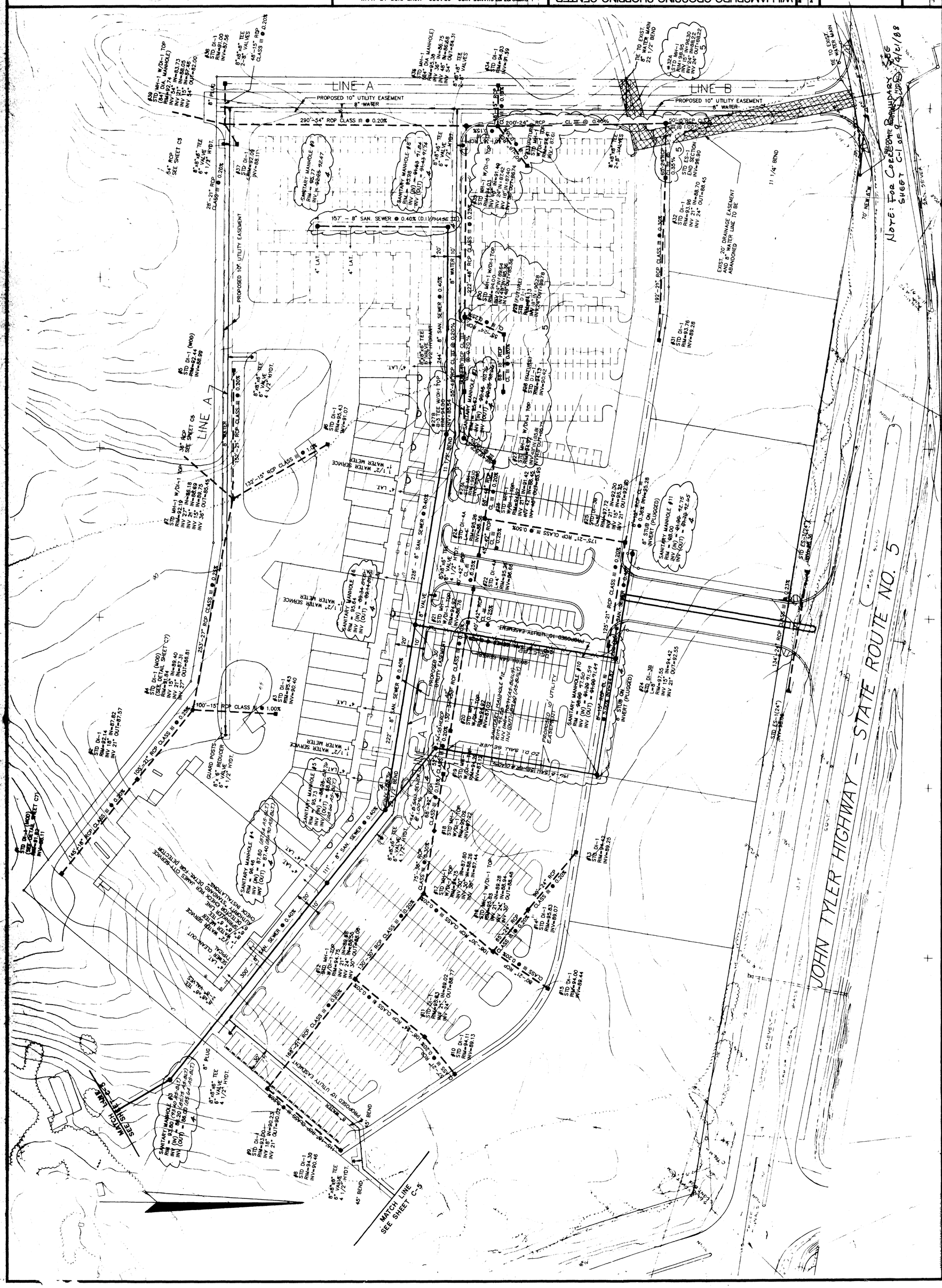
WILLIAMSBURG CROSSING SHOPPING CENTER

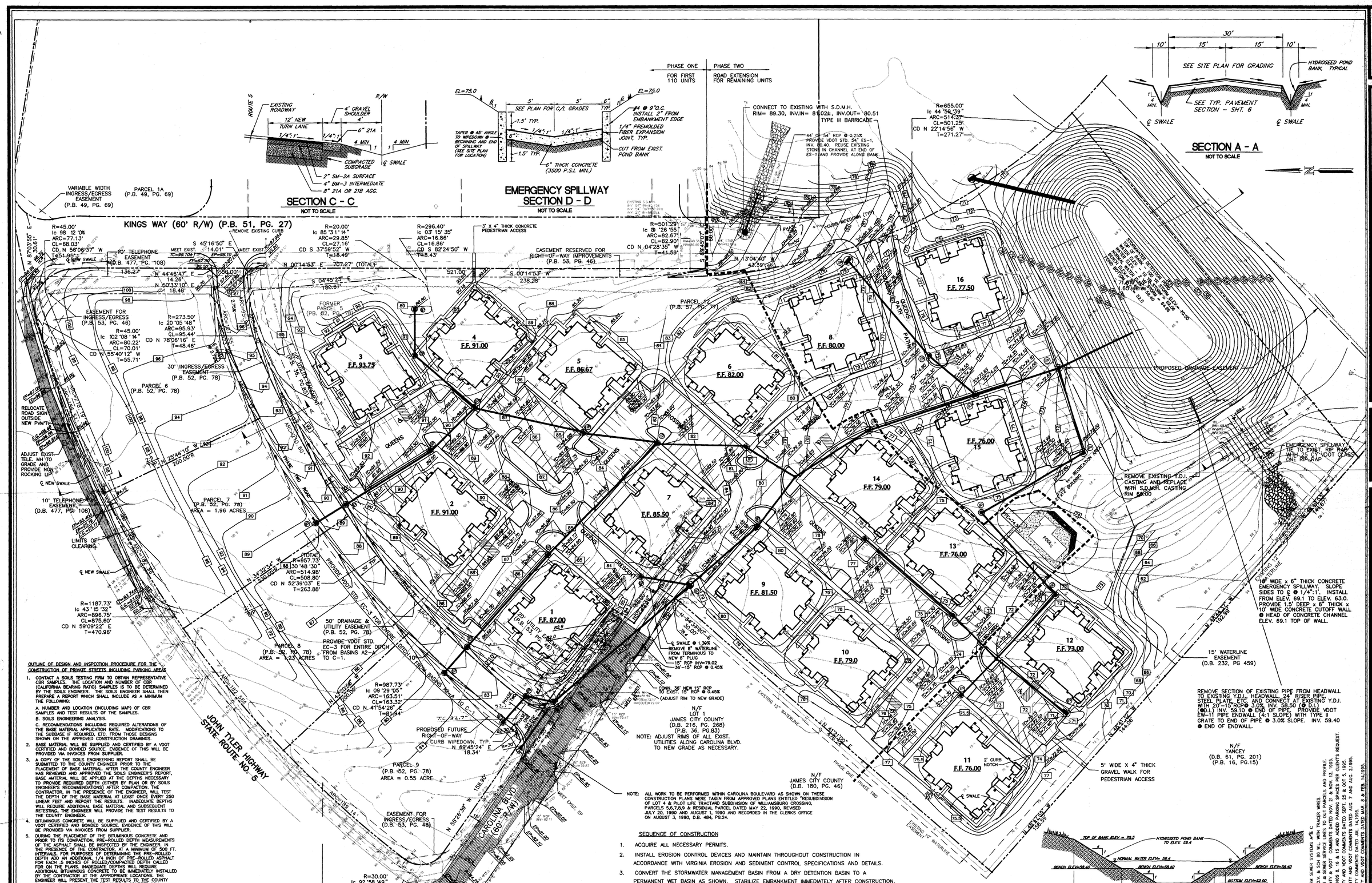
JAMES CITY COUNTY, VIRGINIA

SITE DRAINAGE AND UTILITY PLAN

DRAWN BY: MJB-CADD. DATE: 9/10/87
CHECKED BY: W.S.B. SCALE: 1"=40'

SHEET NO: C3 OF 9
JOB NUMBER: 87021.03





OUTLINE OF DESIGN AND INSPECTION PROCEDURE FOR THE CONSTRUCTION OF PRIVATE STREETS INCLUDING PARKING AREAS

1. CONTACT A SOILS TESTING FIRM TO OBTAIN REPRESENTATIVE CBR SAMPLES. THE LOCATION AND NUMBER OF CBR (CALIFORNIA BEARING RATIO) SAMPLES IS TO BE DETERMINED BY THE SOILS ENGINEER. THE SOILS ENGINEER SHALL THEN PREPARE A REPORT WHICH SHALL INCLUDE AS A MINIMUM THE FOLLOWING:
   A. NUMBER AND LOCATION (INCLUDING MAP) OF CBR SAMPLES AND TEST RESULTS OF THE SAMPLES.
   B. SOILS ENGINEERING ANALYSIS.
   C. RECOMMENDATIONS INCLUDING REQUIRED ALTERATIONS OF THE BASE MATERIAL APPLICATION RATE. MODIFICATIONS TO THE SUBBASE IF REQUIRED, ETC. FROM THOSE DESIGNS SHOWN ON THE APPROVED CONSTRUCTION DRAWINGS.
2. BASE MATERIAL WILL BE SUPPLIED AND CERTIFIED BY A VDOT CERTIFIED AND BONDED SOURCE. EVIDENCE OF THIS WILL BE PROVIDED VIA INVOICES FROM SUPPLIER.
3. A COPY OF THE SOILS ENGINEERING REPORT SHALL BE SUBMITTED TO THE COUNTY ENGINEER PRIOR TO THE PLACEMENT OF BASE MATERIAL. AFTER THE COUNTY ENGINEER HAS REVIEWED AND APPROVED THE SOILS ENGINEER'S REPORT, BASE AMTERIAL WILL BE APPLIED AT THE DEPTHS NECESSARY TO PROVIDE REQUIRED DEPTH (EITHER BY PLAN OR BY SOILS ENGINEER'S RECOMMENDATIONS) AFTER COMPACTION. THE CONTRACTOR, IN THE PRESENCE OF THE ENGINEER, WILL TEST THE DEPTH OF THE BASE MATERIAL AT LEAST ONCE EVERY 250 LINEAR FEET AND REPORT THE RESULTS. INADEQUATE DEPTHS WILL REQUIRE ADDITIONAL BASE MATERIAL AND SUBSEQUENT RETESTING. THE ENGINEER WILL PROVIDE THE TEST RESULTS TO THE COUNTY ENGINEER.
4. BITUMINOUS CONCRETE WILL BE SUPPLIED AND CERTIFIED BY A VDOT CERTIFIED AND BONDED SOURCE. EVIDENCE OF THIS WILL BE PROVIDED VIA INVOICES FROM SUPPLIER.
5. DURING THE PLACEMENT OF THE BITUMINOUS CONCRETE AND PRIOR TO ITS COMPACTION, PRE-ROLLED DEPTH MEASUREMENTS OF THE ASPHALT SHALL BE INSPECTED BY THE ENGINEER. IN THE PRESENCE OF THE CONTRACTOR, AT A MINIMUM OF 500 FT. INTERVALS. FOR PURPOSES OF DETERMINING THE PRE-ROLLED DEPTH ADD AN ADDITIONAL 1/4 INCH OF PRE-ROLLED ASPHALT FOR EACH .5 INCHES OF ROLLED/COMPACTED DEPTH CALLED FOR ON THE PLANS. INADEQUATE DEPTHS WILL REQUIRE ADDITIONAL BITUMINOUS CONCRETE TO BE IMMEDIATELY INSTALLED BY THE CONTRACTOR AT THE APPROPRIATE LOCATIONS. THE ENGINEER WILL PRESENT THE TEST RESULTS TO THE COUNTY ENGINEER. THE INSTALLATION OF MULTIPLE COURSES WILL REQUIRE THE TESTING/INSPECTION OF EACH INDIVIDUAL COURSE.
6. REPORTING WILL BE PERFORMED BY A CONTRACTOR AND THE LICENSED ENGINEER AS OUTLINED ABOVE. THE NUMBER OF SAMPLES IN EACH CASE WILL BE, AS A MINIMUM, THE TOTAL LENGTH OF ROADS TESTED DIVIDED BY THE REQUIRED INTERVAL. IN ORDER TO PRESERVE THE INTEGRITY OF THE PROJECT'S CONSTRUCTION, A PLAN DEPICTING THE SAMPLING LOCATIONS WILL BE PROVIDED TO THE COUNTY PRIOR TO THE ACTUAL INSPECTIONS.
7. INTERIM STATEMENTS FROM THE ENGINEER, WITH ACCOMPANYING DOCUMENTATION, WILL BE SUBMITTED TO THE COUNTY ENGINEER PRIOR TO PARTIAL RELEASE OF SURETY.
8. APPLICATION FOR FINAL RELEASE OF SURETY WILL BE ACCOMPANIED BY THE CONTRACTOR'S STATEMENT AND CERTIFICATION THAT THE SPECIFICALLY NAMED PRIVATE STREETS HAVE BEEN CONSTRUCTED IN ACCORDANCE WITH THE APPROVED PLANS AND APPLICABLE VIRGINIA DEPARTMENT OF TRANSPORTATION STANDARDS. CONTRACTOR'S CERTIFICATION SHALL BE SUPPORTED BY THE INSPECTIONS PERFORMED BY THE ENGINEER (SEE ABOVE).

NOTE: ALL WORK TO BE PERFORMED WITHIN CAROLINA BOULEVARD AS SHOWN ON THESE CONSTRUCTION PLANS WERE TAKEN FROM APPROVED PLANS ENTITLED "RESUBDIVISION OF LOT 4 & PILOT LIFE TRACTAND SUBDIVISION OF WILLIAMSBURG CROSSING, PARCELS 5,6,7,8,9 & RESIDUAL PARCEL DATED MAY 22, 1990, REVISED JULY 20, 1990 AND AUGUST 1, 1990 AND RECORDED IN THE CLERKS OFFICE ON AUGUST 3, 1990, D.B. 484, PG.24.

NOTE: 60' VEGETATED AREA TO REMAIN UNDISTURBED WITH THE EXCEPTION OF CLEARING OF ANY UNDERBRUSH, DEAD OR DYING TREES. AT THE TIME OF DEVELOPMENT OF PARCELS 6, 7, 8 & 9, CONSTRUCTION MAY TAKE PLACE UP TO THE NORMAL SETBACKS AS REQUIRED BY THE ZONING ORDINANCE. IF THESE SETBACKS ARE WITHIN THE 60 FOOT AREA, SELECT CLEARING SHALL BE REQUIRED. IF SUFFICIENT VEGETATED AREA CANNOT BE MAINTAINED, ADDITIONAL LANDSCAPING SHALL BE PROVIDED.

SEQUENCE OF CONSTRUCTION

1. ACQUIRE ALL NECESSARY PERMITS.
2. INSTALL EROSION CONTROL DEVICES AND MAINTAIN THROUGHOUT CONSTRUCTION IN ACCORDANCE WITH VIRGINIA EROSION AND SEDIMENT CONTROL SPECIFICATIONS AND DETAILS.
3. CONVERT THE STORMWATER MANAGEMENT BASIN FROM A DRY DETENTION BASIN TO A PERMANENT WET BASIN AS SHOWN. STABILIZE EMBANKMENT IMMEDIATELY AFTER CONSTRUCTION.
4. PERFORM CLEARING, GRADING AND STRIPPING OPERATION AS SHOWN.
5. ROUGH GRADE PARKING AREAS AND BUILDING PADS AS NEEDED.
6. CONSTRUCT OUTFALL SWALES AND INSTALL STORM DRAINAGE STRUCTURES.
7. INSTALL ALL UNDERGROUND UTILITIES.
8. INSTALL BUILDING FOOTINGS AND BACKFILL FOUNDATIONS AS NEEDED.
9. INSTALL CURBING AND PAVING AS SHOWN.
10. DRESS AND OVERSEED ALL DISTURBED AREAS IN ACCORDANCE WITH SEEDING SCHEDULE AND THE EROSION CONTROL NOTES ON SHEETS 5 & 7.
11. MAINTAIN EROSION CONTROL DEVICES UNTIL SEEDING BECOMES FIRMLY ESTABLISHED.
12. REMOVE EROSION CONTROL DEVICES.

REVISIONS: APR. 29,1996 REVISED STORM SEWER SYSTEMS A⊕ C
REVISIONS: MAR. 27,1996 ADDED 2" B.O.V. & 6CH 80 WLL WITH TRACER WIRES.
REVISIONS: NOV. 13,1995 AS PER COUNTY & VDOT COMMENTS DATED NOV. 21 & NOV. 13, 1995.
REVISIONS: NOV. 27,1995 AS PER COUNTY & VDOT COMMENTS DATED SEPT. 25 & OCT. 5, 1995.
REVISIONS: NOV. 12,1995 MOVED BUILDINGS 8, 16 & 15 AND ADDED PARKING SPACES PER CLIENT'S REQUEST.
REVISIONS: OCT. 6,1995 AS PER COUNTY AND VDOT COMMENTS DATED SEPT. 25 & OCT. 5, 1995.
REVISIONS: AUG. 29,1995 AS PER COUNTY AND VDOT COMMENTS DATED AUG. 7 AND AUG. 2,1995.
REVISIONS: JULY 31,1995 AS PER COUNTY AND VDOT COMMENTS DATED JULY 24, 1995.
REVISIONS: JULY 3,1995 AS PER COUNTY AND VDOT COMMENTS DATED MAR. 8 & FEB. 14,1995.

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

DES. WEH/KSM
DWN. RCH/CFR/TDK
CHK. WEH/KSM
DATE 1/31/95

SITE DEVELOPMENT PLAN
FOR A PORTION OF
WILLIAMSBURG CROSSING MULTI-FAMILY
JAMES CITY COUNTY, VIRGINIA
GRADING AND EROSION CONTROL

PROJ.NO. 88079-MF
SCALE: 1"=40'
SHEET 3 OF 8
DWG. NO. 23906.F

C:\88079\SITEPLAN\MASTER.dwg, 1" = 1' , 04/01/96 at 08:58
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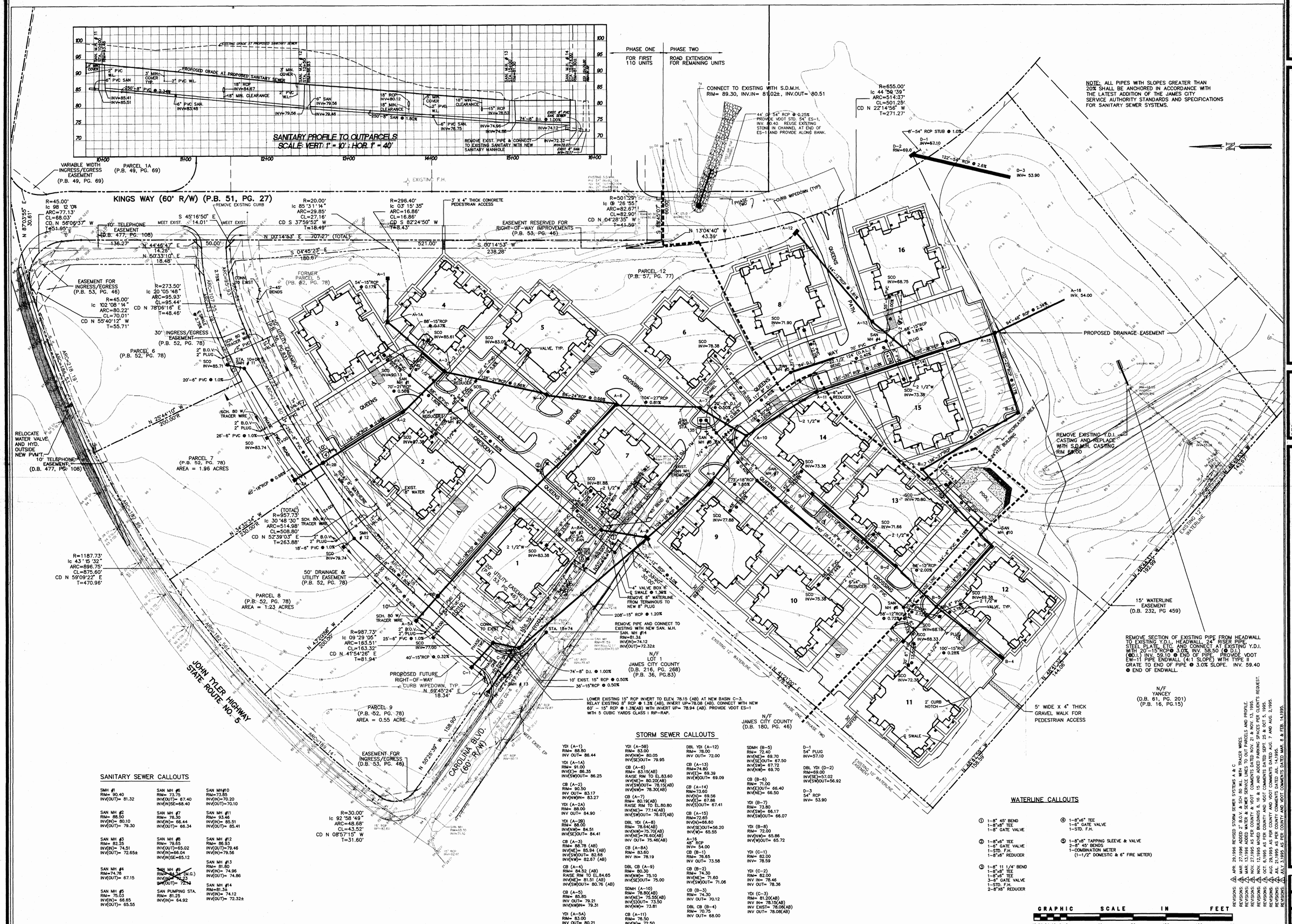


SANITARY SEWER CALLOUTS

SMH #1
RIM= 90.40
INV(OUT)= 81.32

SAN MH #2
RIM= 88.50
INV(IN)= 80.10
INV(OUT)= 79.30

SAN MH #3
RIM= 82.25
INV(IN)= 74.51
INV(OUT)= 72.65±

SAN MH #4
RIM=74.76
INV(OUT)= 67.15

SAN MH #5
RIM= 75.03
INV(IN)= 66.65
INV(OUT)= 65.55

SAN MH #6
RIM= 73.75
INV(OUT)= 67.40
INV(IN)SE=68.40

SAN MH #7
RIM= 78.30
INV(IN)= 66.44
INV(OUT)= 66.34

SAN MH #8
RIM= 79.65
INV(OUT)=65.02
INV(IN)=66.04
INV(IN)SE=65.12

SAN MH #9
RIM= 85.25 (N.G.)
INV(IN)= 76.23
INV(OUT)= 72.23

SAN PUMPING STA.
RIM= 81.25
INV(IN)= 64.92

SAN MH#10
RIM=73.85
INV(IN)=70.20
INV(OUT)=70.10

SAN MH #11
RIM= 93.46
INV(IN)= 85.51
INV(OUT)= 85.41

SAN MH #12
RIM= 86.93
INV(OUT)=79.46
INV(IN)=79.56

SAN MH #13
RIM= 81.80
INV(IN)= 74.96
INV(OUT)= 74.86

SAN MH #14
RIM=81.3±
INV(IN)= 74.12
INV(OUT)= 72.32±

STORM SEWER CALLOUTS

YDI (A-1)
RIM= 88.90
INV OUT= 86.44

YDI (A-1A)
RIM= 91.00
INV(E)= 86.35
INV(SW)OUT= 86.25

CB (A-2)
RIM= 90.50
INV OUT= 83.17
INV(NW)IN= 83.27

YDI (A-2A)
RIM= 88.00
INV OUT= 84.90

YDI (A-2B)
RIM= 88.00
INV(NW)= 84.51
INV(SE)OUT= 84.41

CB (A-3)
RIM= 88.78 (AB)
INV(NE)= 85.94 (AB)
INV(SW)OUT= 82.88
INV(NW)= 82.67 (AB)

CB (A-4)
RIM= 84.52 (AB)
RAISE RIM TO EL.84.65
INV(NE)= 81.51 (AB)
INV(SW)OUT= 80.78 (AB)

CB (A-5)
RIM= 85.85
INV OUT= 79.21
INV(NW)IN= 79.31

YDI (A-5A)
RIM= 83.00
INV OUT= 80.21

YDI (A-5B)
RIM= 83.00
INV(NW)= 80.05
INV(SE)OUT= 79.95

CB (A-6)
RIM= 83.15(AB)
RAISE RIM TO EL.83.60
INV(NE)= 80.20(AB)
INV(SW)OUT= 78.15(AB)
INV(NW)= 78.30(AB)

CB (A-7)
RIM= 80.19(AB)
RAISE RIM TO EL.80.80
INV(NE)= 77.14(AB)
INV(SW)OUT= 76.07(AB)

DBL YDI (A-8)
RIM= 78.84(AB)
INV(NW)=75.70(AB)
INV(NE)=76.60(AB)
INV OUT= 75.46(AB)

CB (A-8A)
RIM= 83.60
INV IN= 78.19

DBL CB (A-9)
RIM= 80.30
INV(NW)= 75.10
INV(SE)OUT= 75.00

SDMH (A-10)
RIM= 78.80(AB)
INV(NE)= 75.55(AB)
INV(S)OUT= 73.50
INV(NW)= 73.81

CB (A-11)
RIM= 76.50
INV(N)= 72.50
INV(S)OUT=70.90

DBL YDI (A-12)
RIM= 78.00
INV OUT= 72.00

CB (A-13)
RIM=74.80
INV(E)= 69.39
INV(W)OUT= 69.09

CB (A-14)
RIM=73.60
INV(N)= 69.56
INV(E)= 67.86
INV(S)OUT= 67.41

CB (A-15)
RIM=72.65
INV(N)=66.60
INV(SE)OUT=66.20
INV(W)= 65.55

A-16
48" RCP
INV= 54.00

CB (B-1)
RIM= 76.65
INV OUT= 73.58

CB (B-2)
RIM= 74.30
INV(NE)= 71.60
INV(S)OUT= 71.06

CB (B-3)
RIM= 74.30
INV OUT= 70.12

DBL CB (B-4)
RIM= 70.75
INV OUT= 68.00

SDMH (B-5)
RIM= 72.40
INV(NE)= 69.70
INV(SE)OUT= 67.50
INV(W)= 67.72
INV(NW)= 69.70

CB (B-6)
RIM= 71.00
INV(E)OUT= 66.40
INV(NE)= 66.50

YDI (B-7)
RIM= 73.80
INV(SW)= 66.17
INV(SW)OUT= 66.07

YDI (B-8)
RIM= 72.00
INV(NW)= 65.86
INV(W)OUT= 65.72

YDI (C-1)
RIM= 82.00
INV= 78.59

YDI (C-2)
RIM= 82.00
INV IN= 78.46
INV OUT= 78.36

YDI (C-3)
RIM= 81.20(AB)
INV IN= 78.15(AB)
INV EXIST= 78.08(AB)
INV OUT= 78.08(AB)

D-1
54" PLUG
INV=57.10

DBL YDI (D-2)
RIM=69.00
INV(SE)=57.02
INV(SW)OUT=56.92

D-3
54" RCP
INV= 53.90

WATERLINE CALLOUTS

① 1-8" 45° BEND
1-8"x6" TEE
1-8" GATE VALVE

② 1-8"x6" TEE
1-6" GATE VALVE
1-STD. F.H.
1-8"x6" REDUCER

③ 1-8" 11 1/4° BEND
1-8"x6" TEE
1-8"x6" TEE
3-6" GATE VALVE
1-STD. F.H.
2-8"X6" REDUCER

④ 1-8"x6" TEE
1-6" GATE VALVE
1-STD. F.H.

⑤ 1-8"x8" TAPPING SLEEVE & VALVE
2-8" 45° BENDS
1-COMBINATION METER
(1-1/2" DOMESTIC & 6" FIRE METER)

GRAPHIC SCALE IN FEET
40 32 24 16 8 0 40 80 120 160 20

REVISIONS: △ APR. 29,1996 REVISED STORM SEWER SYSTEMS A & C.
REVISIONS: △ MAR. 27,1996 ADDED 2" B.O.V. & SCH 80 W.L. WITH TRACER WIRES.
REVISIONS: △ MAR. 13,1996 ADDED WATER & SEWER SERVICE LINES TO OUT PARCELS AND PROFILE.
REVISIONS: △ NOV. 27,1995 AS PER COUNTY & VDOT COMMENTS DATED NOV. 21 & NOV. 13, 1995.
REVISIONS: △ NOV. 12,1995 AS PER COUNTY & VDOT COMMENTS DATED OCT. 26 & NOV. 1, 1995.
REVISIONS: △ OCT. 6,1995 AS PER COUNTY AND VDOT COMMENTS DATED SEPT. 25 & OCT. 5, 1995.
REVISIONS: △ AUG. 29,1995 AS PER COUNTY AND VDOT COMMENTS DATED AUG. 7 AND AUG. 2,1995.
REVISIONS: △ JUL. 21,1995 AS PER COUNTY COMMENTS DATED JUL. 14,1995.
REVISIONS: △ JULY 3,1995 AS PER COUNTY AND VDOT COMMENTS DATED MAR. 8 & FEB. 14,1995.

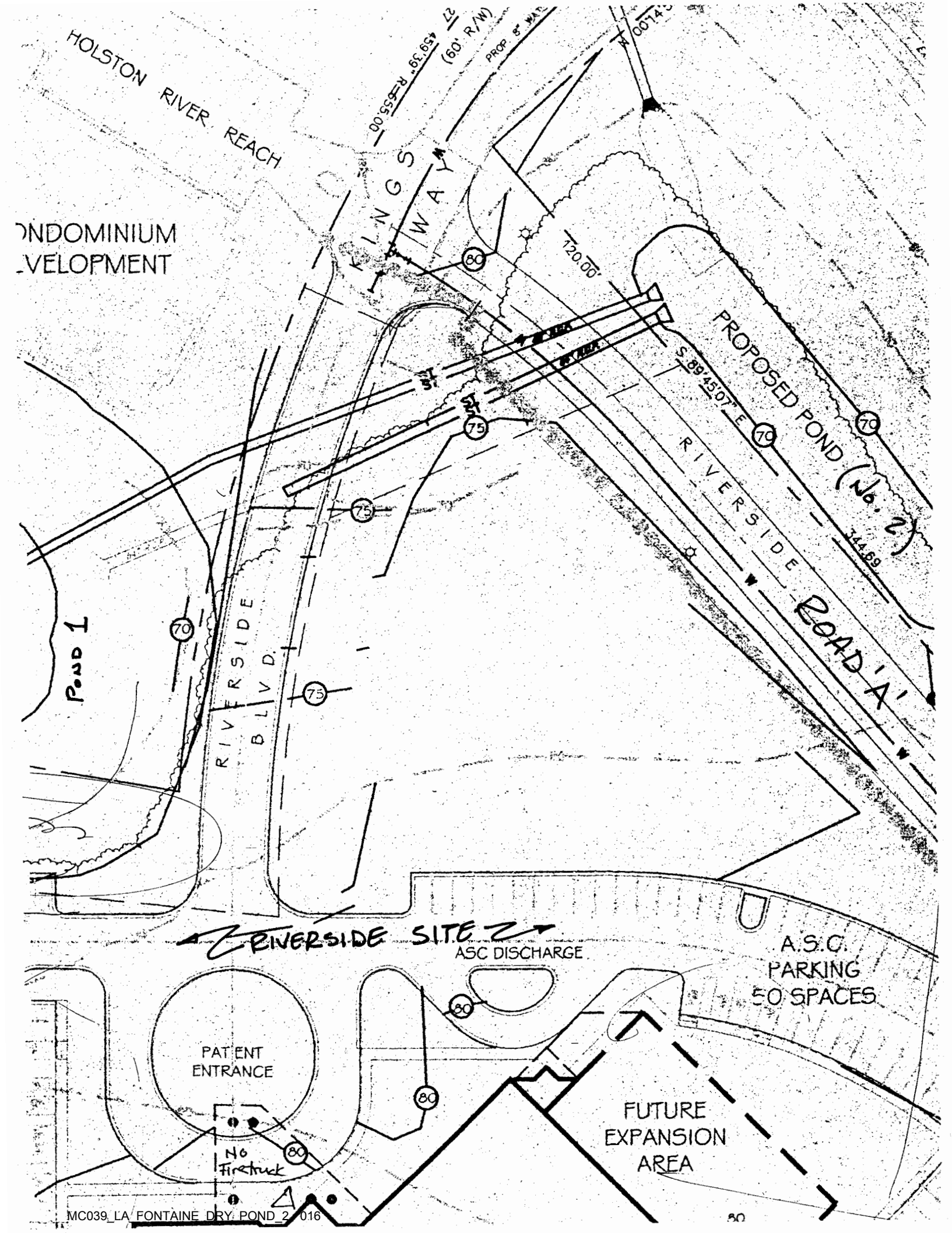
Langley and McDonald, P.C.
Engineers • Surveyors • Planners
Landscape Architects • Environmental Consultants
VIRGINIA BEACH WILLIAMSBURG

DES. WEH/KSM
DWN. RCH/CFR/TDK
CHK. WEH/KSM
DATE 1/31/95

SITE DEVELOPMENT PLAN
FOR A PORTION OF
WILLIAMSBURG CROSSING MULTI-FAMILY
JAMES CITY COUNTY, VIRGINIA

UTILITIES

PROJ.NO. 88079-MF
SCALE: 1"=40'
SHEET 4 OF 8
DWG. NO. 23906 E


HOLSTON RIVER REACH
ONDOMINIUM
VELOPMENT
(60' R/W)
PROP. 8" WATER
120.00'
80
75
70
PROPOSED POND (No. 2)
S 89°45'07" E
344.89
RIVERSIDE ROAD 'A'
RIVERSIDE BLVD.
POND 1
RIVERSIDE SITE
ASC DISCHARGE
A.S.C. PARKING 50 SPACES
PATIENT ENTRANCE
No Firetruck
FUTURE EXPANSION AREA

WILLIAMSBURG CROSSING
EXISTING POND #1

Williamsburg Crossing Multi-Family

Hydrograph and Ches Bay Calculations

No.	Area	Existing Cond *	Soil Type	Exist'g CN	% Imp	Area Imp Ac	Proposed Conditions Imp Area	~~Prev~~ PERV Area	Imp CN	Prev CN	Wt CN	Tc	Distance t to Pond	Tt 3.5 f/s	Total Time
1	0.8	Woods	B	60	0%	0	76% 0.56	0.24	98	60	86.6	0.1	1000	0.08	0.18
2	0.94	Developed	B	98	80%	0.752	70% 0.658	0.282	98	60	86.6	0.1	1100	0.09	0.19
3	1.3	Woods	B	60	0%	0	70% 0.91	0.39	98	60	86.6	0.1	1000	0.08	0.18
4	1.5	Woods	B	60	0%	0	70% 1.05	0.45	98	60	86.6	0.1	1050	0.08	0.18
5	0.84	Woods	C	73	0%	0	60% 0.504	0.336	98	73	88	0.1	800	0.06	0.16
6	0.34	Woods	C	73	0%	0	60% 0.204	0.136	98	73	88	0.1	900	0.07	0.17
7	1.1	Woods	C	73	0%	0	70% 0.77	0.33	98	73	90.5	0.1	800	0.06	0.16
8	0.53	Woods	C	73	0%	0	60% 0.318	0.212	98	73	88	0.1	1000	0.08	0.18
9	0.86	Woods	C	73	0%	0	60% 0.516	0.344	98	73	88	0.1	900	0.07	0.17
10	1.3	Woods	C	73	0%	0	60% 0.78	0.52	98	73	88	0.1	600	0.05	0.15
11	1.6	Woods	C	73	0%	0	60% 0.96	0.64	98	73	88	0.1	400	0.03	0.13
12	1.14	Woods	C	73	0%	0	60% 0.684	0.456	98	73	88	0.1	400	0.03	0.13
13	1.04	Woods	C	73	0%	0	60% 0.624	0.416	98	73	88	0.1	200	0.02	0.12
14	7.2	Woods	C	73	0%	0	60% 4.32	2.88	98	73	88	0.1	100	0.01	0.11
15	17	Developed	B	90	80%	13.6	80% - 13.6	3.4	98	60	90.4	0.1	1200	0.10	0.20
16	4.3	Developed	B	90	80%	3.44	80% - 3.44	0.86	98	60	90.4	0.1	800	0.06	0.16
17	0.21	Woods	C	73	0%	0	70% 0.147	0.063	98	73	90.5	0.1	300	0.02	0.12
18	5.3	Woods	B	60	0%	0	70% - 3.71	1.59	98	60	86.6	0.1	700	0.06	0.16
19	1.7	Woods	C	73	0%	0	70% - 1.19	0.51	98	73	90.5	0.1	200	0.02	0.12
20	3.4	Woods	B	60	0%	0	70% - 2.38	1.02	98	60	86.6	0.1	1100	0.09	0.19
21	0.87	Woods	C	73	0%	0	70% 0.609	0.261	98	73	90.5	0.1	0	0.00	0.10
TOTAL	53.27	Ac				17.792 Ac							37.934 Ac		

* Non-Grandfathered Areas

Phosphorous Load	5.37	#/yr	Phosphorous Load	5.37 #/yr
Developed Load	95.54304	#/yr	Developed Load	203.70558 #/yr
Undeveloped Area	35.478	Ac	Undeveloped Area	15.336 Ac
Load	0.12	#/yr	Load	0.12 #/yr
Load Undeveloped	4.25736	#/yr	Load Undeveloped	1.84032 #/yr
Total Load	99.8004	#/yr	Total Load	205.5459 #/yr

Required % Removal Req'd 48.55%

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 06-30-1995 12:42:13
Watershed file: --> A:WBURG1ER.MOP
Hydrograph file: --> A:WC-2-ER.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
EXIST. DEVELOPMENT CONDITIONS
REVISED JUNE 30, 1995

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
EXIST	15.20	73.0	0.75	0.00	3.50	1.18	I.21	.21

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.20 acres or 0.02375 sq.mi
Peak discharge = 11 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
EXIST	0.80	0.00	0.75	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 06-30-1995 12:42:13
Watershed file: --> A:WBURG1ER.MOP
Hydrograph file: --> A:WC-2-ER.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
EXIST. DEVELOPMENT CONDITIONS
REVISED JUNE 30, 1995

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
EXIST	11	12.7
Composite Watershed	11	12.7

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 06-30-1995 12:42:13
Watershed file: --> A:WBURG1ER.MOP
Hydrograph file: --> A:WC-2-ER.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
EXIST. DEVELOPMENT CONDITIONS
REVISED JUNE 30, 1995

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
EXIST	0	0	0	0	1	1	2	4	6
Total (cfs)	0	0	0	0	1	1	2	4	6

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
EXIST	9	10	11	10	7	5	4	3	2
Total (cfs)	9	10	11	10	7	5	4	3	2

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
EXIST	2	2	1	1	1	1	1	1	1
Total (cfs)	2	2	1	1	1	1	1	1	1

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
EXIST	1	1	1	0	0
Total (cfs)	1	1	1	0	0

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 06-30-1995 12:42:13
Watershed file: --> A:WBURG1ER.MOP
Hydrograph file: --> A:WC-10-ER.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
EXIST. DEVELOPMENT CONDITIONS
REVISED JUNE 30, 1995

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
EXIST	15.20	73.0	0.75	0.00	5.90	3.01	I.13 .13

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.20 acres or 0.02375 sq.mi
Peak discharge = 29 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
EXIST	0.80	0.00	0.75	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 06-30-1995 12:42:13
Watershed file: --> A:WBURG1ER.MOP
Hydrograph file: --> A:WC-10-ER.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
EXIST. DEVELOPMENT CONDITIONS
REVISED JUNE 30, 1995

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
EXIST	29	12.6
Composite Watershed	29	12.6

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 06-30-1995 12:42:13
Watershed file: --> A:WBURG1ER.MOP
Hydrograph file: --> A:WC-10-ER.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
EXIST. DEVELOPMENT CONDITIONS
REVISED JUNE 30, 1995

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
EXIST	1	1	1	2	3	4	7	13	20
Total (cfs)	1	1	1	2	3	4	7	13	20

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
EXIST	26	29	29	26	18	12	9	7	5
Total (cfs)	26	29	29	26	18	12	9	7	5

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
EXIST	5	4	3	3	2	2	2	2	2
Total (cfs)	5	4	3	3	2	2	2	2	2

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
EXIST	1	1	1	1	0
Total (cfs)	1	1	1	1	0

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 06-30-1995 12:42:13
Watershed file: --> A:WBURG1ER.MOP
Hydrograph file: --> A:WC-100ER.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
EXIST. DEVELOPMENT CONDITIONS
REVISED JUNE 30, 1995

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
EXIST	15.20	73.0	0.75	0.00	7.70	4.55	I.1 .10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.20 acres or 0.02375 sq.mi
Peak discharge = 46 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
EXIST	0.80	0.00	0.75	0.00	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 06-30-1995 12:42:13
Watershed file: --> A:WBURG1ER.MOP
Hydrograph file: --> A:WC-100ER.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
EXIST. DEVELOPMENT CONDITIONS
REVISED JUNE 30, 1995

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
EXIST	46	12.6
Composite Watershed	46	12.6

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 06-30-1995 12:42:13
Watershed file: --> A:WBURG1ER.MOP
Hydrograph file: --> A:WC-100ER.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
EXIST. DEVELOPMENT CONDITIONS
REVISED JUNE 30, 1995

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
EXIST	1	2	3	4	5	7	12	21	32
Total (cfs)	1	2	3	4	5	7	12	21	32

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
EXIST	41	46	44	40	27	19	13	10	8
Total (cfs)	41	46	44	40	27	19	13	10	8

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
EXIST	7	5	4	4	3	3	3	2	2
Total (cfs)	7	5	4	4	3	3	3	2	2

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
EXIST	2	2	2	1	0
Total (cfs)	2	2	2	1	0

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 06-30-1995 13:29:20
Watershed file: --> A:WBURG1-F.HOP
Hydrograph file: --> A:WC-2-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Area 1	0.80	87.0	0.10	0.10	3.50	2.18	I.09	.10
Area 2	0.94	87.0	0.10	0.10	3.50	2.18	I.09	.10
Area 3	1.30	87.0	0.10	0.10	3.50	2.18	I.09	.10
Area 4	1.50	87.0	0.10	0.10	3.50	2.18	I.09	.10
Area 5	0.84	88.0	0.10	0.10	3.50	2.27	I.08	.10
Area 6	0.34	88.0	0.10	0.10	3.50	2.27	I.08	.10
Area 7	1.10	91.0	0.10	0.10	3.50	2.54	I.06	.10
Area 8	0.53	88.0	0.10	0.10	3.50	2.27	I.08	.10
Area 9	0.86	88.0	0.10	0.10	3.50	2.27	I.08	.10
Area 10	1.30	88.0	0.10	0.10	3.50	2.27	I.08	.10
Area 11	1.60	88.0	0.10	0.00	3.50	2.27	I.08	.10
Area 12	1.14	88.0	0.10	0.00	3.50	2.27	I.08	.10
Area 13	1.04	88.0	0.10	0.00	3.50	2.27	I.08	.10
Area 14	7.20	88.0	0.10	0.00	3.50	2.27	I.08	.10
Area 15	17.00	90.0	0.10	0.10	3.50	2.45	I.06	.10
Area 16	4.30	90.0	0.10	0.10	3.50	2.45	I.06	.10
Area 17	0.21	91.0	0.10	0.00	3.50	2.54	I.06	.10
Area 18	5.30	87.0	0.10	0.10	3.50	2.18	I.09	.10
Area 19	1.70	91.0	0.10	0.00	3.50	2.54	I.06	.10
Area 20	3.40	87.0	0.10	0.10	3.50	2.18	I.09	.10
Area 21	0.87	91.0	0.10	0.00	3.50	2.54	I.06	.10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 53.27 acres or 0.08323 sq.mi
Peak discharge = 156 cfs

WARNING: Drainage areas of two or more subareas
differ by a factor of 5 or greater.

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 06-30-1995 13:29:20
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-2-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Area 1	0.10	0.08	0.10	0.10	No	Computed Ia/p < .1
Area 2	0.10	0.09	0.10	0.10	No	Computed Ia/p < .1
Area 3	0.10	0.08	0.10	0.10	No	Computed Ia/p < .1
Area 4	0.10	0.08	0.10	0.10	No	Computed Ia/p < .1
Area 5	0.10	0.06	0.10	0.10	No	Computed Ia/p < .1
Area 6	0.10	0.07	0.10	0.10	No	Computed Ia/p < .1
Area 7	0.10	0.06	0.10	0.10	No	Computed Ia/p < .1
Area 8	0.10	0.08	0.10	0.10	No	Computed Ia/p < .1
Area 9	0.10	0.07	0.10	0.10	No	Computed Ia/p < .1
Area 10	0.10	0.05	0.10	0.10	No	Computed Ia/p < .1
Area 11	0.10	0.03	0.10	0.00	No	Computed Ia/p < .1
Area 12	0.10	0.03	0.10	0.00	No	Computed Ia/p < .1
Area 13	0.10	0.02	0.10	0.00	No	Computed Ia/p < .1
Area 14	0.10	0.01	0.10	0.00	No	Computed Ia/p < .1
Area 15	0.10	0.10	**	**	No	Computed Ia/p < .1
Area 16	0.10	0.06	0.10	0.10	No	Computed Ia/p < .1
Area 17	0.10	0.02	0.10	0.00	No	Computed Ia/p < .1
Area 18	0.10	0.06	0.10	0.10	No	Computed Ia/p < .1
Area 19	0.10	0.02	0.10	0.00	No	Computed Ia/p < .1
Area 20	0.10	0.09	0.10	0.10	No	Computed Ia/p < .1
Area 21	0.10	0.00	**	**	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 06-30-1995 13:29:20
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-2-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Area 1	2	12.2
Area 2	3	12.2
Area 3	4	12.2
Area 4	4	12.2
Area 5	3	12.2
Area 6	1	12.1
Area 7	4	12.2
Area 8	2	12.2
Area 9	3	12.2
Area 10	4	12.2
Area 11	6	12.1
Area 12	4	12.1
Area 13	4	12.1
Area 14	26	12.1
Area 15	55	12.2
Area 16	14	12.2
Area 17	1	12.0
Area 18	15	12.2
Area 19	7	12.1
Area 20	10	12.2
Area 21	3	12.1
Composite Watershed	156	12.2

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-10-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Area 1	0.80	87.0	0.10	0.10	5.90	4.42	I.05	.10
Area 2	0.94	87.0	0.10	0.10	5.90	4.42	I.05	.10
Area 3	1.30	87.0	0.10	0.10	5.90	4.42	I.05	.10
Area 4	1.50	87.0	0.10	0.10	5.90	4.42	I.05	.10
Area 5	0.84	88.0	0.10	0.10	5.90	4.53	I.05	.10
Area 6	0.34	88.0	0.10	0.10	5.90	4.53	I.05	.10
Area 7	1.10	91.0	0.10	0.10	5.90	4.86	I.03	.10
Area 8	0.53	88.0	0.10	0.10	5.90	4.53	I.05	.10
Area 9	0.86	88.0	0.10	0.10	5.90	4.53	I.05	.10
Area 10	1.30	88.0	0.10	0.10	5.90	4.53	I.05	.10
Area 11	1.60	88.0	0.10	0.00	5.90	4.53	I.05	.10
Area 12	1.14	88.0	0.10	0.00	5.90	4.53	I.05	.10
Area 13	1.04	88.0	0.10	0.00	5.90	4.53	I.05	.10
Area 14	7.20	88.0	0.10	0.00	5.90	4.53	I.05	.10
Area 15	17.00	90.0	0.10	0.10	5.90	4.75	I.04	.10
Area 16	4.30	90.0	0.10	0.10	5.90	4.75	I.04	.10
Area 17	0.21	91.0	0.10	0.00	5.90	4.86	I.03	.10
Area 18	5.30	87.0	0.10	0.10	5.90	4.42	I.05	.10
Area 19	1.70	91.0	0.10	0.00	5.90	4.86	I.03	.10
Area 20	3.40	87.0	0.10	0.10	5.90	4.42	I.05	.10
Area 21	0.87	91.0	0.10	0.00	5.90	4.86	I.03	.10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 53.27 acres or 0.08323 sq.mi
Peak discharge = 304 cfs

WARNING: Drainage areas of two or more subareas
differ by a factor of 5 or greater.

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-10-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Area 1	0.10	0.08	0.10	0.10	No	Computed Ia/p < .1
Area 2	0.10	0.09	0.10	0.10	No	Computed Ia/p < .1
Area 3	0.10	0.08	0.10	0.10	No	Computed Ia/p < .1
Area 4	0.10	0.08	0.10	0.10	No	Computed Ia/p < .1
Area 5	0.10	0.06	0.10	0.10	No	Computed Ia/p < .1
Area 6	0.10	0.07	0.10	0.10	No	Computed Ia/p < .1
Area 7	0.10	0.06	0.10	0.10	No	Computed Ia/p < .1
Area 8	0.10	0.08	0.10	0.10	No	Computed Ia/p < .1
Area 9	0.10	0.07	0.10	0.10	No	Computed Ia/p < .1
Area 10	0.10	0.05	0.10	0.10	No	Computed Ia/p < .1
Area 11	0.10	0.03	0.10	0.00	No	Computed Ia/p < .1
Area 12	0.10	0.03	0.10	0.00	No	Computed Ia/p < .1
Area 13	0.10	0.02	0.10	0.00	No	Computed Ia/p < .1
Area 14	0.10	0.01	0.10	0.00	No	Computed Ia/p < .1
Area 15	0.10	0.10	**	**	No	Computed Ia/p < .1
Area 16	0.10	0.06	0.10	0.10	No	Computed Ia/p < .1
Area 17	0.10	0.02	0.10	0.00	No	Computed Ia/p < .1
Area 18	0.10	0.06	0.10	0.10	No	Computed Ia/p < .1
Area 19	0.10	0.02	0.10	0.00	No	Computed Ia/p < .1
Area 20	0.10	0.09	0.10	0.10	No	Computed Ia/p < .1
Area 21	0.10	0.00	**	**	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-10-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Area 1	5	12.2
Area 2	5	12.2
Area 3	8	12.2
Area 4	9	12.2
Area 5	5	12.2
Area 6	2	12.2
Area 7	7	12.2
Area 8	3	12.2
Area 9	5	12.2
Area 10	8	12.2
Area 11	11	12.1
Area 12	8	12.1
Area 13	7	12.1
Area 14	51	12.1
Area 15	107	12.2
Area 16	27	12.2
Area 17	2	12.1
Area 18	31	12.2
Area 19	13	12.1
Area 20	20	12.2
Area 21	7	12.1
Composite Watershed	304	12.2

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-10-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Area 1	0	0	0	1	1	3	5	4	2
Area 2	0	0	0	1	2	3	5	5	2
Area 3	0	0	0	1	2	5	8	6	3
Area 4	0	0	0	1	3	5	9	7	4
Area 5	0	0	0	1	2	3	5	4	2
Area 6	0	0	0	0	1	1	2	2	1
Area 7	0	0	0	1	2	4	7	6	3
Area 8	0	0	0	1	1	2	3	3	1
Area 9	0	0	0	1	2	3	5	4	2
Area 10	0	0	0	1	2	5	8	6	3
Area 11	0	0	1	4	7	11	7	2	2
Area 12	0	0	0	3	5	8	5	2	1
Area 13	0	0	0	2	5	7	5	2	1
Area 14	1	2	3	17	33	51	32	11	7
Area 15	3	4	5	17	34	66	107	88	48
Area 16	1	1	1	4	9	17	27	22	12
Area 17	0	0	0	1	1	2	1	0	0
Area 18	1	1	2	5	10	19	31	26	14
Area 19	0	0	1	4	8	13	8	3	2
Area 20	0	1	1	3	6	12	20	16	9
Area 21	0	0	0	2	4	7	4	1	1
Total (cfs)	6	9	14	71	140	247	304	220	120

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-10-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

Composite Hydrograph Summary (cfs)

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Area 1	1	1	1	1	0	0	0	0	0
Area 2	1	1	1	1	0	0	0	0	0
Area 3	2	1	1	1	1	1	1	0	0
Area 4	2	2	1	1	1	1	1	1	0
Area 5	1	1	1	1	0	0	0	0	0
Area 6	1	0	0	0	0	0	0	0	0
Area 7	2	1	1	1	1	1	0	0	0
Area 8	1	1	0	0	0	0	0	0	0
Area 9	1	1	1	1	0	0	0	0	0
Area 10	2	1	1	1	1	1	1	0	0
Area 11	1	1	1	1	1	1	1	1	0
Area 12	1	1	1	1	1	0	0	0	0
Area 13	1	1	1	1	0	0	0	0	0
Area 14	6	5	4	4	3	3	3	2	2
Area 15	28	20	15	12	9	8	7	6	6
Area 16	7	5	4	3	2	2	2	2	1
Area 17	0	0	0	0	0	0	0	0	0
Area 18	8	6	4	4	3	2	2	2	2
Area 19	2	1	1	1	1	1	1	1	1
Area 20	5	4	3	2	2	2	1	1	1
Area 21	1	1	1	1	0	0	0	0	0
Total (cfs)	74	55	43	38	26	23	20	16	13

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-10-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

Composite Hydrograph Summary (cfs)

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Area 1	0	0	0	0	0	0	0	0	0
Area 2	0	0	0	0	0	0	0	0	0
Area 3	0	0	0	0	0	0	0	0	0
Area 4	0	0	0	0	0	0	0	0	0
Area 5	0	0	0	0	0	0	0	0	0
Area 6	0	0	0	0	0	0	0	0	0
Area 7	0	0	0	0	0	0	0	0	0
Area 8	0	0	0	0	0	0	0	0	0
Area 9	0	0	0	0	0	0	0	0	0
Area 10	0	0	0	0	0	0	0	0	0
Area 11	0	0	0	0	0	0	0	0	0
Area 12	0	0	0	0	0	0	0	0	0
Area 13	0	0	0	0	0	0	0	0	0
Area 14	2	2	2	1	1	1	1	1	1
Area 15	5	5	4	4	3	3	3	3	2
Area 16	1	1	1	1	1	1	1	1	1
Area 17	0	0	0	0	0	0	0	0	0
Area 18	2	1	1	1	1	1	1	1	1
Area 19	0	0	0	0	0	0	0	0	0
Area 20	1	1	1	1	1	1	0	0	0
Area 21	0	0	0	0	0	0	0	0	0
Total (cfs)	11	10	9	8	7	7	6	6	5

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-10-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

Composite Hydrograph Summary (cfs)

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Area 1	0	0	0	0	0
Area 2	0	0	0	0	0
Area 3	0	0	0	0	0
Area 4	0	0	0	0	0
Area 5	0	0	0	0	0
Area 6	0	0	0	0	0
Area 7	0	0	0	0	0
Area 8	0	0	0	0	0
Area 9	0	0	0	0	0
Area 10	0	0	0	0	0
Area 11	0	0	0	0	0
Area 12	0	0	0	0	0
Area 13	0	0	0	0	0
Area 14	1	1	1	1	0
Area 15	2	2	2	2	0
Area 16	1	1	0	0	0
Area 17	0	0	0	0	0
Area 18	1	1	0	0	0
Area 19	0	0	0	0	0
Area 20	0	0	0	0	0
Area 21	0	0	0	0	0
Total (cfs)	5	5	3	3	0

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-100-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
Area 1	0.80	87.0	0.10	0.10	7.70	6.16	I.04	.10
Area 2	0.94	87.0	0.10	0.10	7.70	6.16	I.04	.10
Area 3	1.30	87.0	0.10	0.10	7.70	6.16	I.04	.10
Area 4	1.50	87.0	0.10	0.10	7.70	6.16	I.04	.10
Area 5	0.84	88.0	0.10	0.10	7.70	6.28	I.04	.10
Area 6	0.34	88.0	0.10	0.10	7.70	6.28	I.04	.10
Area 7	1.10	91.0	0.10	0.10	7.70	6.63	I.03	.10
Area 8	0.53	88.0	0.10	0.10	7.70	6.28	I.04	.10
Area 9	0.86	88.0	0.10	0.10	7.70	6.28	I.04	.10
Area 10	1.30	88.0	0.10	0.10	7.70	6.28	I.04	.10
Area 11	1.60	88.0	0.10	0.00	7.70	6.28	I.04	.10
Area 12	1.14	88.0	0.10	0.00	7.70	6.28	I.04	.10
Area 13	1.04	88.0	0.10	0.00	7.70	6.28	I.04	.10
Area 14	7.20	88.0	0.10	0.00	7.70	6.28	I.04	.10
Area 15	17.00	90.0	0.10	0.10	7.70	6.51	I.03	.10
Area 16	4.30	90.0	0.10	0.10	7.70	6.51	I.03	.10
Area 17	0.21	91.0	0.10	0.00	7.70	6.63	I.03	.10
Area 18	5.30	87.0	0.10	0.10	7.70	6.16	I.04	.10
Area 19	1.70	91.0	0.10	0.00	7.70	6.63	I.03	.10
Area 20	3.40	87.0	0.10	0.10	7.70	6.16	I.04	.10
Area 21	0.87	91.0	0.10	0.00	7.70	6.63	I.03	.10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 53.27 acres or 0.08323 sq.mi
Peak discharge = 419 cfs

WARNING: Drainage areas of two or more subareas differ by a factor of 5 or greater.

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-100-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Area 1	0.10	0.08	0.10	0.10	No	Computed Ia/p < .1
Area 2	0.10	0.09	0.10	0.10	No	Computed Ia/p < .1
Area 3	0.10	0.08	0.10	0.10	No	Computed Ia/p < .1
Area 4	0.10	0.08	0.10	0.10	No	Computed Ia/p < .1
Area 5	0.10	0.06	0.10	0.10	No	Computed Ia/p < .1
Area 6	0.10	0.07	0.10	0.10	No	Computed Ia/p < .1
Area 7	0.10	0.06	0.10	0.10	No	Computed Ia/p < .1
Area 8	0.10	0.08	0.10	0.10	No	Computed Ia/p < .1
Area 9	0.10	0.07	0.10	0.10	No	Computed Ia/p < .1
Area 10	0.10	0.05	0.10	0.10	No	Computed Ia/p < .1
Area 11	0.10	0.03	0.10	0.00	No	Computed Ia/p < .1
Area 12	0.10	0.03	0.10	0.00	No	Computed Ia/p < .1
Area 13	0.10	0.02	0.10	0.00	No	Computed Ia/p < .1
Area 14	0.10	0.01	0.10	0.00	No	Computed Ia/p < .1
Area 15	0.10	0.10	**	**	No	Computed Ia/p < .1
Area 16	0.10	0.06	0.10	0.10	No	Computed Ia/p < .1
Area 17	0.10	0.02	0.10	0.00	No	Computed Ia/p < .1
Area 18	0.10	0.06	0.10	0.10	No	Computed Ia/p < .1
Area 19	0.10	0.02	0.10	0.00	No	Computed Ia/p < .1
Area 20	0.10	0.09	0.10	0.10	No	Computed Ia/p < .1
Area 21	0.10	0.00	**	**	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-100-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Area 1	7	12.2
Area 2	8	12.2
Area 3	11	12.2
Area 4	12	12.2
Area 5	7	12.2
Area 6	3	12.2
Area 7	10	12.2
Area 8	4	12.2
Area 9	7	12.2
Area 10	11	12.2
Area 11	16	12.1
Area 12	11	12.1
Area 13	10	12.1
Area 14	71	12.1
Area 15	146	12.2
Area 16	37	12.2
Area 17	2	12.1
Area 18	43	12.2
Area 19	18	12.1
Area 20	28	12.2
Area 21	9	12.1
Composite Watershed	419	12.2

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-100-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Area 1	0	0	0	1	2	4	7	5	3
Area 2	0	0	0	1	2	5	8	6	3
Area 3	0	0	1	2	3	7	11	9	5
Area 4	0	0	1	2	4	8	12	10	5
Area 5	0	0	0	1	2	4	7	6	3
Area 6	0	0	0	0	1	2	3	2	1
Area 7	0	0	0	2	3	6	10	8	4
Area 8	0	0	0	1	1	3	4	4	2
Area 9	0	0	0	1	2	4	7	6	3
Area 10	0	0	1	2	3	7	11	9	5
Area 11	0	1	1	5	10	16	10	3	2
Area 12	0	0	1	4	7	11	7	2	2
Area 13	0	0	1	3	7	10	6	2	2
Area 14	2	2	4	24	46	71	44	15	10
Area 15	4	5	7	23	46	90	146	121	65
Area 16	1	1	2	6	12	23	37	31	17
Area 17	0	0	0	1	1	2	1	0	0
Area 18	1	1	2	7	14	27	43	36	19
Area 19	0	1	1	6	11	18	11	4	3
Area 20	1	1	1	4	9	17	28	23	12
Area 21	0	0	0	3	6	9	6	2	1
Total (cfs)	9	12	23	99	192	344	419	304	167

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-100-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

Composite Hydrograph Summary (cfs)

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Area 1	2	1	1	1	1	0	0	0	0
Area 2	2	1	1	1	1	1	1	0	0
Area 3	3	2	2	1	1	1	1	1	1
Area 4	3	2	2	1	1	1	1	1	1
Area 5	2	1	1	1	1	1	0	0	0
Area 6	1	1	0	0	0	0	0	0	0
Area 7	3	2	1	1	1	1	1	1	1
Area 8	1	1	1	1	0	0	0	0	0
Area 9	2	1	1	1	1	1	0	0	0
Area 10	3	2	2	1	1	1	1	1	1
Area 11	2	2	1	1	1	1	1	1	1
Area 12	1	1	1	1	1	1	1	1	0
Area 13	1	1	1	1	1	1	1	0	0
Area 14	9	7	6	5	5	4	4	3	3
Area 15	39	27	21	17	13	11	10	9	8
Area 16	10	7	5	4	3	3	2	2	2
Area 17	0	0	0	0	0	0	0	0	0
Area 18	11	8	6	5	4	3	3	3	2
Area 19	2	2	2	1	1	1	1	1	1
Area 20	7	5	4	3	2	2	2	2	1
Area 21	1	1	1	1	1	1	0	0	0
Total (cfs)	105	75	60	48	40	35	30	26	22

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-100-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

Composite Hydrograph Summary (cfs)

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Area 1	0	0	0	0	0	0	0	0	0
Area 2	0	0	0	0	0	0	0	0	0
Area 3	1	0	0	0	0	0	0	0	0
Area 4	1	1	0	0	0	0	0	0	0
Area 5	0	0	0	0	0	0	0	0	0
Area 6	0	0	0	0	0	0	0	0	0
Area 7	0	0	0	0	0	0	0	0	0
Area 8	0	0	0	0	0	0	0	0	0
Area 9	0	0	0	0	0	0	0	0	0
Area 10	1	0	0	0	0	0	0	0	0
Area 11	1	1	1	0	0	0	0	0	0
Area 12	0	0	0	0	0	0	0	0	0
Area 13	0	0	0	0	0	0	0	0	0
Area 14	3	2	2	2	2	2	1	1	1
Area 15	7	6	6	5	5	4	4	3	3
Area 16	2	2	1	1	1	1	1	1	1
Area 17	0	0	0	0	0	0	0	0	0
Area 18	2	2	2	2	1	1	1	1	1
Area 19	1	1	1	1	0	0	0	0	0
Area 20	1	1	1	1	1	1	1	1	1
Area 21	0	0	0	0	0	0	0	0	0
Total (cfs)	20	16	14	12	10	9	8	7	7

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-30-1995 16:20:25
Watershed file: --> A:WBURG1-F.MOP
Hydrograph file: --> A:WC-100-F.HYD

WILLIAMSBURG CROSSING MULTI FAMILY
FUTURE DEVELOPMENT CONDITIONS
88-079

Composite Hydrograph Summary (cfs)

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Area 1	0	0	0	0	0
Area 2	0	0	0	0	0
Area 3	0	0	0	0	0
Area 4	0	0	0	0	0
Area 5	0	0	0	0	0
Area 6	0	0	0	0	0
Area 7	0	0	0	0	0
Area 8	0	0	0	0	0
Area 9	0	0	0	0	0
Area 10	0	0	0	0	0
Area 11	0	0	0	0	0
Area 12	0	0	0	0	0
Area 13	0	0	0	0	0
Area 14	1	1	1	1	0
Area 15	3	3	2	2	0
Area 16	1	1	1	1	0
Area 17	0	0	0	0	0
Area 18	1	1	1	1	0
Area 19	0	0	0	0	0
Area 20	1	1	0	0	0
Area 21	0	0	0	0	0
Total (cfs)	7	7	5	5	0

POND-2 Version: 5.17
S/N:

WILLIAMSBURG CROSSING MULTI FAMILY
PROPOSED POND
88-079
REVISED JUNE 30, 1995

CALCULATED 06-30-1995 12:48:02
DISK FILE: a:WBURG2-F.VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
52.00	10,397.00	0.24	0.00	0.00	0.00
57.00	22,519.00	0.52	1.11	1.84	1.84
57.01	25,807.00	0.59	1.66	0.01	1.85
58.00	28,550.00	0.66	1.87	0.62	2.47
59.40	*I*	0.75	2.11	0.98	3.45
68.00	64,145.00	1.47	3.11	10.37	12.84
72.00	99,992.00	2.30	5.61	7.48	20.31

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

$$IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

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

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Outlet Structure File: WBURG3-F.STR

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

****
WILLIAMSBURG CROSSING MULTI FAMILY
PROPOSED POND
REVISED JUNE 30, 1995

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
59.40	0.0	2
59.90	0.9	2
60.40	2.9	2
60.90	5.0	2
61.40	6.6	2
61.90	7.9	2
62.40	9.1	2
62.90	10.0	2
63.40	10.9	2
63.90	11.8	2
64.40	12.5	2
64.90	13.3	2
65.40	14.0	2
65.90	14.6	2
66.40	15.3	2
66.90	15.9	2
67.40	16.5	2
67.90	17.0	2
68.40	17.6	2
68.90	18.1	2
69.40	23.6	2 +4
69.90	40.6	2 +4
70.40	64.1	2 +4
70.90	92.5	2 +4
71.40	125.2	2 +4
71.90	161.6	2 +4
72.00	0.0	

Outlet Structure File: WBURG3-F.STR

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

```
**********************************
WILLIAMSBURG CROSSING MULTI FAMILY
          PROPOSED POND
       REVISED JUNE 30, 1995

**********************************
```

Outlet Structure File: a:WBURG3-F.STR
Planimeter Input File: a:WBURG2-F.VOL
Rating Table Output File: a:WBURG3-F.PND

Min. Elev.(ft) = 59.4 Max. Elev.(ft) = 72 Incr.(ft) = .5

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

```
*********************************************
              SYSTEM CONNECTIVITY
*********************************************
```

Structure	No.	Q Table		Q Table
CULVERT-CR	2		->	2
WEIR-VR	4	+ 2	->	1

Outflow rating table summary was stored in file:
a:WBURG3-F.PND

Outlet Structure File: WBURG3-F.STR

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

****
WILLIAMSBURG CROSSING MULTI FAMILY
PROPOSED POND
REVISED JUNE 30, 1995

****

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

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	59.4
E2 elev.(ft)?	72
Diam. (ft)?	1.25
Inv. el.(ft)?	59.4
Slope (ft/ft)?	0.03
T1 ratio?	
T2 ratio?	
K Coeff.?	0.0098
M Coeff.?	2.0
c Coeff.?	0.0398
Y Coeff.?	0.67
Form 1 or 2?	1
Slope factor?	

Outlet Structure File: WBURG3-F.STR

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

****
WILLIAMSBURG CROSSING MULTI FAMILY
PROPOSED POND
REVISED JUNE 30, 1995

****

>>>>>> Structure No. 4 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	69.1
E2 elev.(ft)?	72
Weir coefficient?	3.0
Weir elev.(ft)?	69.10
Length (ft)?	10
Contracted/Suppressed (C/S)?	S

Outlet Structure File: WBURG3-F.STR

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

****
WILLIAMSBURG CROSSING MULTI FAMILY
PROPOSED POND
REVISED JUNE 30, 1995

****

Outflow Rating Table for Structure #2
CULVERT-CR Circular Culvert (With Inlet Control)

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

Elevation (ft)	Q (cfs)	Computation Messages		
59.40	0.0	No headwater		
59.90	0.9	Equ.1: HW =.5	dc=.361	Ac=.294
60.40	2.9	Equ.1: HW =1.0	dc=.68	Ac=.682
60.90	5.0	Transition: HW =1.5		
61.40	6.6	Submerged: HW =2.0		
61.90	7.9	Submerged: HW =2.5		
62.40	9.1	Submerged: HW =3.0		
62.90	10.0	Submerged: HW =3.5		
63.40	10.9	Submerged: HW =4.0		
63.90	11.8	Submerged: HW =4.5		
64.40	12.5	Submerged: HW =5.0		
64.90	13.3	Submerged: HW =5.5		
65.40	14.0	Submerged: HW =6.0		
65.90	14.6	Submerged: HW =6.5		
66.40	15.3	Submerged: HW =7.0		
66.90	15.9	Submerged: HW =7.5		
67.40	16.5	Submerged: HW =8.0		
67.90	17.0	Submerged: HW =8.5		
68.40	17.6	Submerged: HW =9.0		
68.90	18.1	Submerged: HW =9.5		
69.40	18.6	Submerged: HW =10.0		
69.90	19.1	Submerged: HW =10.5		
70.40	19.6	Submerged: HW =11.0		
70.90	20.1	Submerged: HW =11.5		
71.40	20.6	Submerged: HW =12.0		
71.90	21.0	Submerged: HW =12.5		
72.00	0.0	E = or > E2=72		

Used Unsubmerged Equ. Form (1) for elev. less than 60.85 ft
Used Submerged Equation for elevations greater than 61.03 ft
HW=Headwater (ft) dc=Critical depth (ft) Ac=Area (sq.ft) at dc

Transition flows interpolated from the following values:
E1=60.85 ft; Q1=4.8 cfs; Dc=.89 ft; E2=61.03 ft; Q2=5.49 cfs

Outlet Structure File: WBURG3-F.STR

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

****
WILLIAMSBURG CROSSING MULTI FAMILY
PROPOSED POND
REVISED JUNE 30, 1995

****

Outflow Rating Table for Structure #4
WEIR-VR Weir - Vertical Rectangular

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

Elevation (ft)	Q (cfs)	Computation Messages
59.40	0.0	E < Inv.El.= 69.1
59.90	0.0	E < Inv.El.= 69.1
60.40	0.0	E < Inv.El.= 69.1
60.90	0.0	E < Inv.El.= 69.1
61.40	0.0	E < Inv.El.= 69.1
61.90	0.0	E < Inv.El.= 69.1
62.40	0.0	E < Inv.El.= 69.1
62.90	0.0	E < Inv.El.= 69.1
63.40	0.0	E < Inv.El.= 69.1
63.90	0.0	E < Inv.El.= 69.1
64.40	0.0	E < Inv.El.= 69.1
64.90	0.0	E < Inv.El.= 69.1
65.40	0.0	E < Inv.El.= 69.1
65.90	0.0	E < Inv.El.= 69.1
66.40	0.0	E < Inv.El.= 69.1
66.90	0.0	E < Inv.El.= 69.1
67.40	0.0	E < Inv.El.= 69.1
67.90	0.0	E < Inv.El.= 69.1
68.40	0.0	E < Inv.El.= 69.1
68.90	0.0	E < Inv.El.= 69.1
69.40	4.9	H =.3
69.90	21.5	H =.8
70.40	44.5	H =1.3
70.90	72.4	H =1.8
71.40	104.6	H =2.3
71.90	140.6	H =2.8
72.00	0.0	E = or > E2=72

C = 3 L (ft) = 10
H (ft) = Table elev. - Invert elev. (69.1 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: WBURG3-F.STR

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

****
WILLIAMSBURG CROSSING MULTI FAMILY
PROPOSED POND
REVISED JUNE 30, 1995

****

Outflow Rating Table 1
Table 1 = 2 + 4

Elevation (ft)	Q (cfs)	Contributing Structures
59.40	0.0	2
59.90	0.9	2
60.40	2.9	2
60.90	5.0	2
61.40	6.6	2
61.90	7.9	2
62.40	9.1	2
62.90	10.0	2
63.40	10.9	2
63.90	11.8	2
64.40	12.5	2
64.90	13.3	2
65.40	14.0	2
65.90	14.6	2
66.40	15.3	2
66.90	15.9	2
67.40	16.5	2
67.90	17.0	2
68.40	17.6	2
68.90	18.1	2
69.40	23.6	2 +4
69.90	40.6	2 +4
70.40	64.1	2 +4
70.90	92.5	2 +4
71.40	125.2	2 +4
71.90	161.6	2 +4
72.00	0.0	-

EXECUTED: 06-30-1995 12:53:45 Return Freq: 2 years

```
*************************************
*                                   *
*  WILLIAMSBURG CROSSING MULTI FAMILY *
*        PROPOSED CONDITIONS        *
*              88-079               *
*        REVISED JUNE 30, 1995      *
*                                   *
*************************************
```

Inflow Hydrograph: a:WC-2-F .HYD
Rating Table file: a:WBURG3-F.PND

----INITIAL CONDITIONS----
Elevation = 59.40 ft
Outflow = 0.00 cfs
Storage = 3.45 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
59.40	0.0	3.451	835.1	835.1
59.90	0.9	3.835	928.0	928.9
60.40	2.9	4.237	1025.3	1028.2
60.90	5.0	4.657	1127.0	1132.0
61.40	6.6	5.096	1233.1	1239.7
61.90	7.9	5.554	1344.0	1351.9
62.40	9.1	6.031	1459.5	1468.6
62.90	10.0	6.528	1579.9	1589.9
63.40	10.9	7.046	1705.2	1716.1
63.90	11.8	7.585	1835.5	1847.3
64.40	12.5	8.144	1971.0	1983.5
64.90	13.3	8.726	2111.6	2124.9
65.40	14.0	9.329	2257.6	2271.6
65.90	14.6	9.955	2409.0	2423.6
66.40	15.3	10.603	2565.9	2581.2
66.90	15.9	11.275	2728.5	2744.4
67.40	16.5	11.970	2896.7	2913.2
67.90	17.0	12.689	3070.8	3087.8
68.40	17.6	13.440	3252.4	3270.0
68.90	18.1	14.237	3445.3	3463.4
69.40	23.6	15.082	3649.8	3673.4
69.90	40.6	15.977	3866.4	3907.0
70.40	64.1	16.923	4095.4	4159.5
70.90	92.5	17.922	4337.1	4429.6
71.40	125.2	18.975	4591.9	4717.1
71.90	161.6	20.083	4860.1	5021.7

Time increment (t) = 0.100 hrs.

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

Pond File: a:WBURG3-F.PND
Inflow Hydrograph: a:WC-2-F .HYD
Outflow Hydrograph: a:WC2R-O .HYD

Starting Pond W.S. Elevation = 59.40 ft

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

Peak Inflow = 156.00 cfs
Peak Outflow = 13.23 cfs
Peak Elevation = 64.86 ft

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

Initial Storage = 3.45 ac-ft
Peak Storage From Storm = 5.23 ac-ft

Total Storage in Pond = 8.68 ac-ft

Warning: Inflow hydrograph truncated on left side.

EXECUTED: 06-30-1995 12:54:10 Return Freq: 10 years

```
*************************************
*                                   *
* WILLIAMSBURG CROSSING MULTI FAMILY *
*        PROPOSED CONDITIONS        *
*              88-079               *
*        REVISED JUNE 30, 1995      *
*                                   *
*************************************
```

Inflow Hydrograph: a:WC-10-F .HYD
Rating Table file: a:WBURG3-F.PND

----INITIAL CONDITIONS----
Elevation = 59.40 ft
Outflow = 0.00 cfs
Storage = 3.45 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
59.40	0.0	3.451	835.1	835.1
59.90	0.9	3.835	928.0	928.9
60.40	2.9	4.237	1025.3	1028.2
60.90	5.0	4.657	1127.0	1132.0
61.40	6.6	5.096	1233.1	1239.7
61.90	7.9	5.554	1344.0	1351.9
62.40	9.1	6.031	1459.5	1468.6
62.90	10.0	6.528	1579.9	1589.9
63.40	10.9	7.046	1705.2	1716.1
63.90	11.8	7.585	1835.5	1847.3
64.40	12.5	8.144	1971.0	1983.5
64.90	13.3	8.726	2111.6	2124.9
65.40	14.0	9.329	2257.6	2271.6
65.90	14.6	9.955	2409.0	2423.6
66.40	15.3	10.603	2565.9	2581.2
66.90	15.9	11.275	2728.5	2744.4
67.40	16.5	11.970	2896.7	2913.2
67.90	17.0	12.689	3070.8	3087.8
68.40	17.6	13.440	3252.4	3270.0
68.90	18.1	14.237	3445.3	3463.4
69.40	23.6	15.082	3649.8	3673.4
69.90	40.6	15.977	3866.4	3907.0
70.40	64.1	16.923	4095.4	4159.5
70.90	92.5	17.922	4337.1	4429.6
71.40	125.2	18.975	4591.9	4717.1
71.90	161.6	20.083	4860.1	5021.7

Time increment (t) = 0.100 hrs.

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

Pond File: a:WBURG3-F.PND
Inflow Hydrograph: a:WC-10-F .HYD
Outflow Hydrograph: a:WC10R-O .HYD

Starting Pond W.S. Elevation = 59.40 ft

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

Peak Inflow	=	304.00 cfs
Peak Outflow	=	19.89 cfs
Peak Elevation	=	69.06 ft

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

Initial Storage	=	3.45 ac-ft
Peak Storage From Storm	=	11.06 ac-ft
Total Storage in Pond	=	14.51 ac-ft

Warning: Inflow hydrograph truncated on left side.

```
*************************************
*                                   *
*  WILLIAMSBURG CROSSING MULTI FAMILY *
*        PROPOSED CONDITIONS        *
*              88-079               *
*        REVISED JUNE 30, 1995      *
*                                   *
*************************************
```

Inflow Hydrograph: a:WC-100-F.HYD
Rating Table file: a:WBURG3-F.PND

----INITIAL CONDITIONS----
Elevation = 59.40 ft
Outflow = 0.00 cfs
Storage = 3.45 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
59.40	0.0	3.451	835.1	835.1
59.90	0.9	3.835	928.0	928.9
60.40	2.9	4.237	1025.3	1028.2
60.90	5.0	4.657	1127.0	1132.0
61.40	6.6	5.096	1233.1	1239.7
61.90	7.9	5.554	1344.0	1351.9
62.40	9.1	6.031	1459.5	1468.6
62.90	10.0	6.528	1579.9	1589.9
63.40	10.9	7.046	1705.2	1716.1
63.90	11.8	7.585	1835.5	1847.3
64.40	12.5	8.144	1971.0	1983.5
64.90	13.3	8.726	2111.6	2124.9
65.40	14.0	9.329	2257.6	2271.6
65.90	14.6	9.955	2409.0	2423.6
66.40	15.3	10.603	2565.9	2581.2
66.90	15.9	11.275	2728.5	2744.4
67.40	16.5	11.970	2896.7	2913.2
67.90	17.0	12.689	3070.8	3087.8
68.40	17.6	13.440	3252.4	3270.0
68.90	18.1	14.237	3445.3	3463.4
69.40	23.6	15.082	3649.8	3673.4
69.90	40.6	15.977	3866.4	3907.0
70.40	64.1	16.923	4095.4	4159.5
70.90	92.5	17.922	4337.1	4429.6
71.40	125.2	18.975	4591.9	4717.1
71.90	161.6	20.083	4860.1	5021.7

Time increment (t) = 0.100 hrs.

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

Pond File: a:WBURG3-F.PND
Inflow Hydrograph: a:WC-100-F.HYD
Outflow Hydrograph: a:WC100R-O.HYD

Starting Pond W.S. Elevation = 59.40 ft

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

Peak Inflow = 419.00 cfs
Peak Outflow = 69.82 cfs
Peak Elevation = 70.50 ft

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

Initial Storage = 3.45 ac-ft
Peak Storage From Storm = 13.67 ac-ft

Total Storage in Pond = 17.12 ac-ft

Warning: Inflow hydrograph truncated on left side.

ORIGINAL POND #1

DESIGN CALCULATIONS
FOR
DETENTION/SEDIMENT BASIN
AND
RIPRAP PROTECTION

UNIVERSITY SQUARE SHOPPING CENTER
JAMES CITY COUNTY, VIRGINIA
AUGUST 10, 1987

Smith Demer Normann
Engineers & Planners

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SUMMARY OF CALCULATIONS

1. DETENTION BASIN

The Rational Method was used to derive watershed characteristics and peak flows for the University Square Development. The pre- and post-development drainage areas are different because the project covers portions of several subcatchments. Both peak hydrographs and critical storm durations were determined using the "SMALL POND" computer program, developed in conjunction with the Virginia Stormwater Management Course. The critical storm duration of 65 minutes is the one requiring the maximum volume of detention.

A detention basin was then designed to hold the post development 2 year peak flow to the pre-development level. 10 year and 100 year storms were also routed, with and without sediment storage. The sediment storage was assumed to be 40 C.Y. per acre of drainage basin. A condition of storage reduction by sediment along with a post-development storm is overly conservative since the basin will be cleaned out prior to final site development.

The storage-indication routing method was used to determine post-development flow rates. Results are shown on sheets 16 through 30.

2. RIPRAP DESIGN

Methods from the VDOT Highway Drainage MAnual and the Virginia Erosion and Sediment Control Manual were used to design riprap channel linings and aprons for pipe and channel outlets. The results are shown on sheets 40 through 44.

Smith Demer Normann
Engineers & Planners

DESIGN ANALYSIS

☐ BUDGET
☐ PRELIMINARY
☒ FINAL
☐ OTHER _____

PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DRAINAGE	SPEC. DIVISION: DETENTION BASIN
DEPARTMENT: CIVIL	COMPUTED BY: Jan DATE: 8/4/87	JOB NO: 87021.00
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 1 OF: 44

NOTE: SEE CHARTS, p 36-38.

15.2 21.5 7.8

TOTAL SITE AREA = 89.3 ACRES, C = 0.45

PHASE I DEVELOPMENT, SHOPPING CENTER

inc Phase II + outparcels — A = 21.5 Ac INCL. 6 AC. OUT PARCELS
C = 0.85

D.A. TO DETENTION BASIN, EXISTING (1380'x480') = 15.2 Ac

PORTION OF SHOPPING CTR WITHIN
EXISTING AREA = 710 x 480 = 7.8 Ac.

EXISTING COND., SUBCATCHMENT TO DET. BASIN.

A = 15.2 Ac.

80% WOODED, 20% FIELDS

WT. C = (0.8)(0.25) + (0.2)(0.7) = 0.34

OVERLAND FLOW - L = 200'
102.9' → 101', [CROPLAND n = 0.30]
S = 0.0095 ft/ft
Δt_c = 18 MIN.

CHAN. FLOW L = 1180'
101' → 57', Δh = 44', Δt_c = 6.5 min. (3.02 ft/s)

ADD 210' TO CHAN LENGTH FOR ADDL. AREA.

TOTAL ADJUSTED CHAN LENGTH = 1390' *, V = 3 ft/s.
Adj. t_c = 38.7 min. (+ 1.2 min)

* ~~ASSUME THAT TOTAL 21.5 Ac. SHOP. CTR. ALSO DRAINS TO DETENTION BASIN.~~ (PRE AND POST)

t_{c_1}	+ t_{c_2}	= Total t_c	i	R.I., yrs.	
28	6.5	34.5	2.5	2	FIRST CUT
24	"	30.5	3.5	10	
21	"	27.5	5.4	100	
31	"	37.5	2.3	2	
26	"	32.5	3.3	10	
22	"	28.5	5.2	100	

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DESIGN ANALYSIS

☐ BUDGET
☐ PRELIMINARY
☒ FINAL
☐ OTHER _____

PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DRAINAGE	SPEC. DIVISION: DETENTION BASIN
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/4/87	JOB NO: 87021.00
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 2 OF: 44

FUTURE CONDITIONS

FUTURE AREA = 15.2 + 21.5 − 7.8 = 28.9 Ac.

(INCLUDES ALL OF PHASE 1)

$$C = \frac{(21.5)(0.85) + (15.2^{7.4} - 7.8)(0.25)}{28.9} = \boxed{0.70}$$

TIME OF CONC.

OVERLAND FLOW : 100' @ 0.01 ft/ft, t_{c_1} = 3 MIN (2 YR), 2.5 MIN (10 YR), 2 MIN (100 YR) ($n = 0.02$)

PIPE FLOW : 400' + 1110' = 1510 L.F. @ 0.005 ft/ft, $\Delta t_{c_2} = 17.5 \times 0.2 = 3.5$ MIN

CHAN FLOW : 480' + 420' = 900 L.F., 95' → 57', $\Delta h = 38'$, $\Delta t_{c_3} = 5$ MIN.

t_{c_1}	$t_{c_2} + t_{c_3}$	TOTAL tc	i	R.I.
4	8.5	12.5	4.3	2
4	"	"	5.5	10
4	"	"	7.8	100
3	"	11.5	4.5	2
2.5	"	10.5	6.0	10
2	"	10.0	8.3	100

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PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DRAINAGE	SPEC. DIVISION: DETENTION BASIN
DEPARTMENT: CIVIL	COMPUTED BY: JMM DATE: 8/4/87	JOB NO: 87021.00
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 3 OF: 44

PRE-DEVELOPMENT FLOW, CHANNEL DRAINAGE ONLY

R.I.	A	C	i	Q_p, cfs.
2	15.2	0.34	2.3	11.9
10	"	"	3.3	17.1
100	"	"	5.2	26.8

POST DEVELOPMENT FLOW, TOTAL AREA

R.I.	A	C	i	Q_p
2	28.9	0.70	4.5	91.0
10	"	"	6.0	121.4
100	"	"	8.3	167.9

ASSUMPTION: HOLD 2 YR TO 11.9 cfs
CONTAIN 10 YR W/O EM. SPILLWAY
RELEASE EXCESS ON 100 YR.

PRE-DEV CA = (0.34)(15.2) = 5.2 AC
EQUIVALENT TO (0.18)(28.9) ← USE FOR SNL-POND. SO THAT AREAS ARE EQUAL.

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PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DRAINAGE	SPEC. DIVISION: DETENTION BASIN
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/4/87	JOB NO: 87021.00
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 4 OF: 44

Post Dev

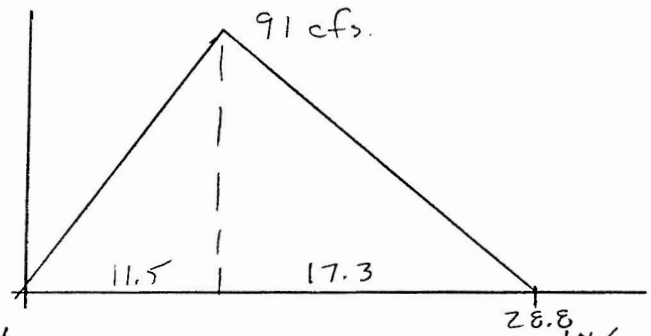
PEAK STORMS

$CA = (28.9)(0.7) = 20.23$

2 YR

$t_c = 11.5$ min, $i = 4.5$ IN/HR

$Q_p = 91.0$ cfs.

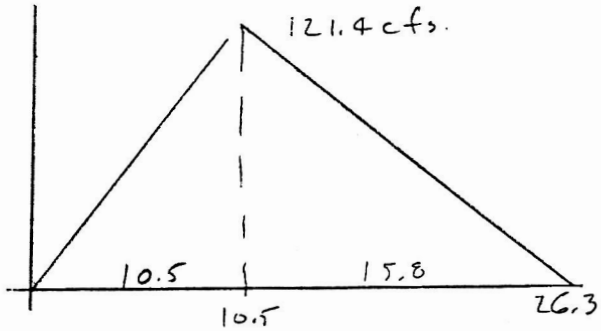


TIME	Q
0	0
5	39.6
10	91 * (ADJ)
15	~~43.6~~ 72.6
20	46.3
25	20.0
30	0

10 YR

$t_c = 10.5$ min, $i = 6.0$ IN/HR

$Q_p = 121.4$ cfs

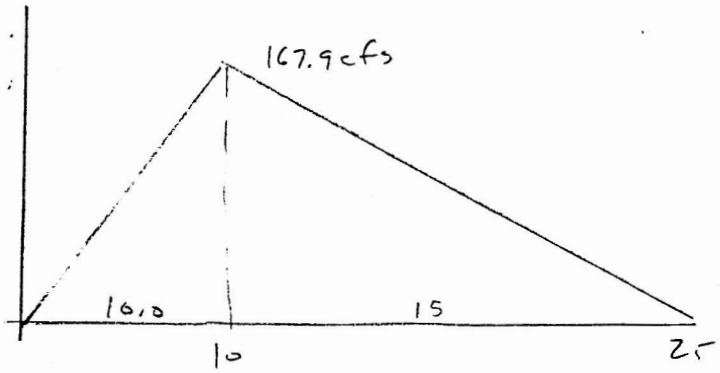


TIME	Q
0	0
5	57.8
10	121.4 * ADJ.
15	86.8
20	48.4
25	10.0
30	0

100 YR

$t_c = 10.0$ min, $i = 8.3$ IN/HR

$Q_p = 167.9$ cfs



TIME	Q
0	0
5	84.0
10	167.9
15	112.0
20	55.4
25	0
30	0

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DESIGN ANALYSIS

☐ BUDGET
☐ PRELIMINARY
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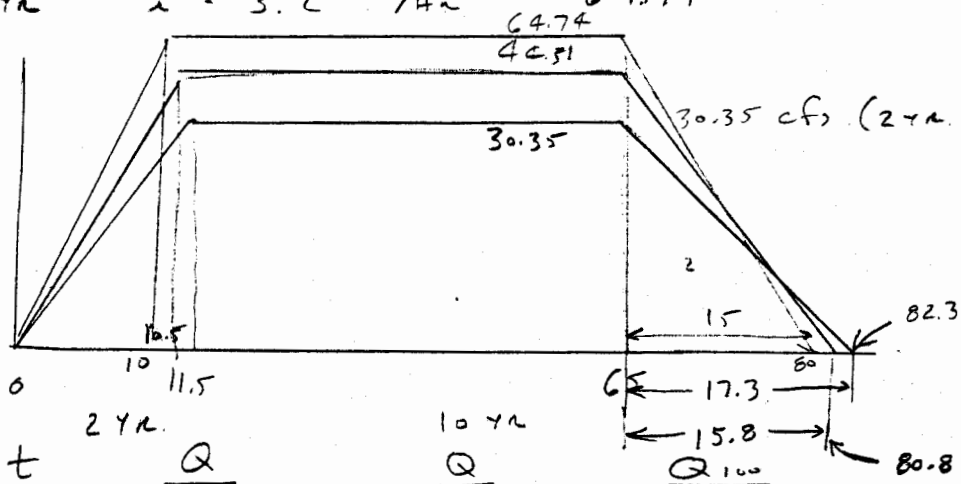
☐ OTHER

PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DRAINAGE	SPEC. DIVISION: DETENTION BASIN.
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/4/87	JOB NO: 87021.00
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 5 OF: 44

USE 65 MIN STORM DURATIONS ← STORMS W/ GREATEST STORAGE.

			$Q=(0.7)(28.9)\,i$ (20.23)	t_c
2 YR	i = 1.5	IN/HR	30.35 cfs	11.5
10 YR	i = 2.2	IN/HR	44.51 "	10.5
100 YR	i = 3.2	IN/HR	64.74 "	10.0



t	Q (2 YR.)	Q (10 YR)	Q_{100}
0	0	0	0
5	13.2	21.2	32.35
10	26.4	42.4	64.7
15	30.35	44.5	64.7
20			
25			
30			
35			
40			
45			
50			
55			
60			
65	30.35	44.5	64.7
70	21.6	30.4	43.3
75	12.8	16.3	21.4
80	4.0	2.3	0
85	0	0	0
90	0	0	0
95	0	0	0
100	0	0	0

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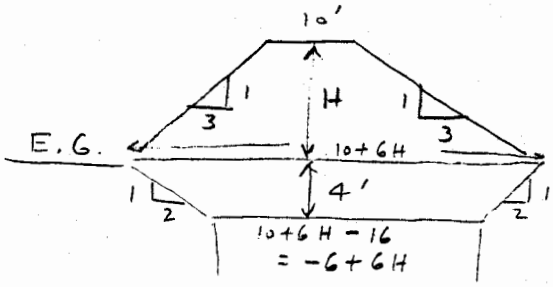
DESIGN ANALYSIS

☐ BUDGET
☐ PRELIMINARY
☒ FINAL
☐ OTHER _____

PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DETENTION BASIN	SPEC. DIVISION: VOLUME OF FILL
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/5/87	JOB NO: 87021.00
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 6 OF: 44

EST. VOL OF FILL FOR CLOSURE

EST 4' OVER DREDGE



$A_1 = 10H + 3H^2$

$A_2 = 4(-6+6H) + 2(4)^2$
$= -24 + 24H + 32$
$= 8 + 24H$

SECTION	H	A_1	A_2	CUT ΔVol	TOTA	L	Δ VOL
1	0	0	0		0		
				3800		50'	8000
2	6'	168	152		320		
				9752		46'	24,495
3	11'	473	272		745		
				9960		30'	30,975
4	16'	928	392		1320		
				8988		21'	32,099
5	19'	1273	464		1737		
				6848		16'	24,456
6	16'	928	392		1320		
				17,596		53'	54,723
7	11'	473	272		745		
				14,416		68'	36,210
8	6'	168	152		320		
				1,976		26'	4,160
9	0'	0	0		0		
				73,336 C.F.			215,108 C.F.

2,716 C.Y. UNSUIT.
SPILLWAY 519 C.Y.
3,235 TOTAL CUT

= 7,967 C.Y. FILL

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DESIGN ANALYSIS

☐ BUDGET
☐ PRELIMINARY
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☐ OTHER _____

PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DETENTION BASIN	SPEC. DIVISION: STAGE VS VOLUME
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/5/87	JOB NO: 87021.00
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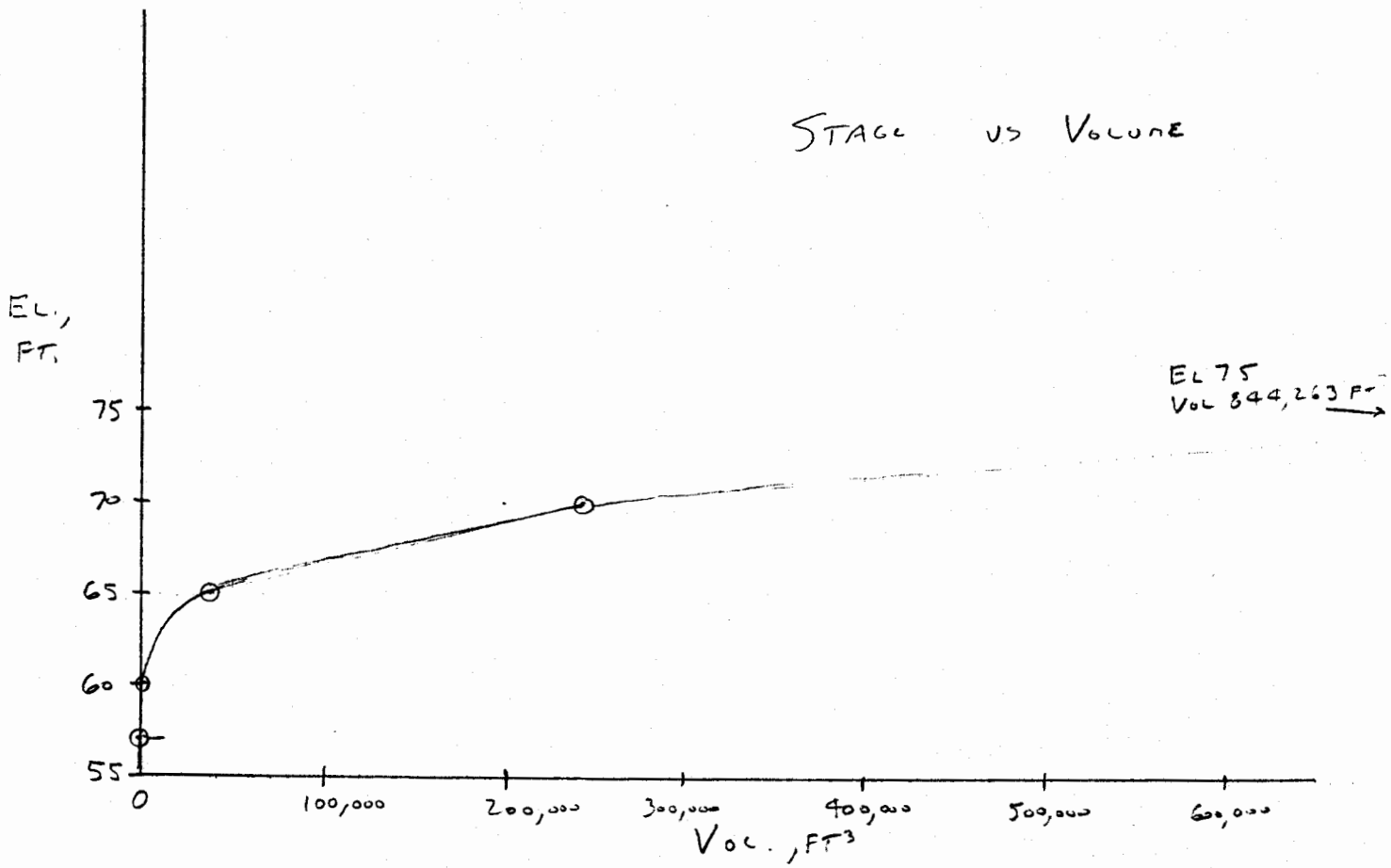
EL.	AREA, IN²	AREA, FT²	Δh	Δ VOL, FT³	TOT VOL FT³
57		0.			0.
			3	2,256.	2256.
60	2.82 /3 = 0.94	1,504.			
			5	37,480.	39,736.
65	25.29 /3 = 8.43	13,488.			
			5	203,750.	243,486
70	127.52/3 = 42.51	68,012.			
			5	600.777.	844,263
75	323.06/3 = 107.69	172,299.			



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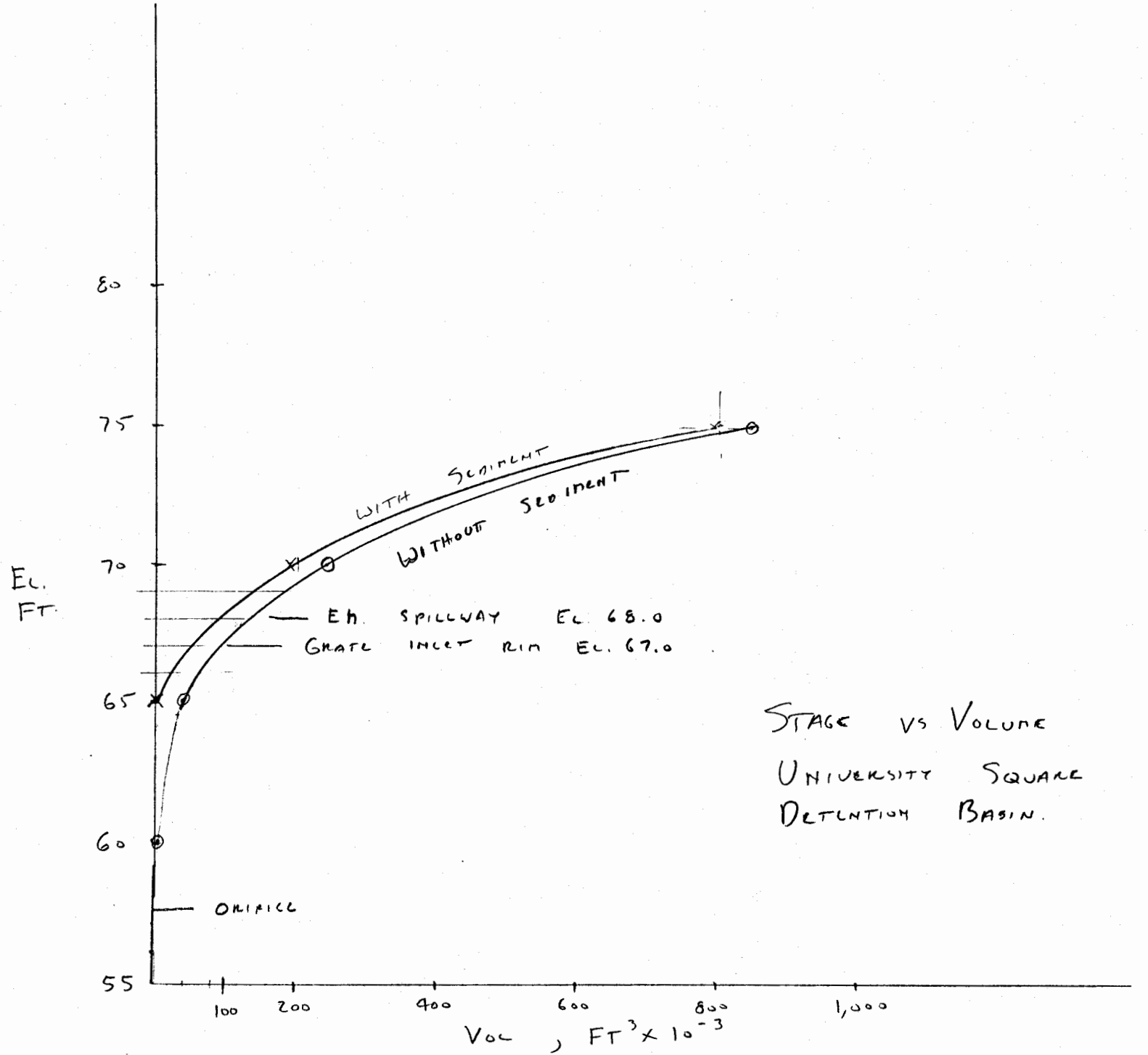
DESIGN ☐ BUDGET ☐ PRELIMINARY
ANALYSIS ☒ FINAL ☐ OTHER _____

PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DETENTION BASIN	SPEC. DIVISION: STAGE VS VOLUME	
DEPARTMENT: CIVIL	COMPUTED BY: JHM DATE: 8/5/87	JOB NO: 87021.00	
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 8 OF: 44	



STAGE VS VOLUME
UNIVERSITY SQUARE
DETENTION BASIN.

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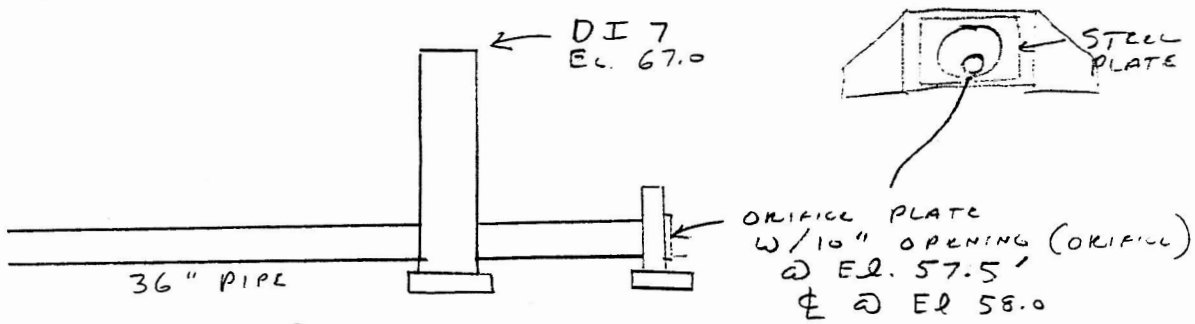
DESIGN ANALYSIS

☐ BUDGET
☐ PRELIMINARY
☒ FINAL
☐ OTHER

PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DETENTION BASIN	SPEC. DIVISION: STAGE VS Q
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/5/87	JOB NO: 87021.00
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 9 OF: 44

OUTFLOW – OUTFLOW STRUCTURE



W.S. EL.	HEAD (ABOVE EL. 57)	DISCHARGE Q 12" (ORIFICE) (57.5)	Q (DI 7) (67.0)	Q EMERGENCY SPILLWAY (68)	ΣQ
57.0	0	(0) 0	(0) 0	(0) 0	0
60.0	3	(2.0) 5.53	(0) 0	(0) 0	5.53
65.0	8	(7.0) 10.34	(0) 0	(0) 0	10.34
67.0	10	(9.0) 11.73	(0) 0	(0) 0	11.73
68.0	11	(10.0) 12.36	(1.0) 24.17	(0) 0	36.53
69.0	12	(11.0) 12.96	(2.0) 51.18	(1) 58.5	69.99
70.0	13	(12.0) 13.54	(3.0) 62.68	(2) 185.5	261.72
75.0	18	(17.0) 16.12	(8.0) 102.36	(7) 1789.	1907.5

ORIFICE:

$Q = C a \sqrt{2gH}$ (H ABOVE ℄ OF ORIFICE)

$= 0.62\ a \sqrt{2gH} = (0.62)(0.55)\sqrt{(64.4)\ H}$

$a = \frac{\pi (10/12)^2}{4} = 0.55\ FT^2$ $= 2.74\sqrt{H}$

$Q_{36} = C E W_{68}$

→ ADJUST TO GET 12 cfs @ 10'

$12 = 0.62\ a \sqrt{2g \cdot 10}$

$a = 0.76\ FT^2$

$d = 0.98\ FT = 11.8''$ – USE 12"

$Q = (0.62)(0.785)\sqrt{2gH} = \underline{\underline{3.91\sqrt{H}}}$

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DESIGN ANALYSIS

☐ BUDGET
☐ PRELIMINARY
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☐ OTHER

PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DETENTION BASIN	SPEC. DIVISION: STAGE VS Q
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/6/87	JOB NO: 87021.00
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 10 OF: 44

D.I. 7 (EL. 67.0)

TOTAL AREA = $3' \times 3' = 9'^2$

AREA OF BARS = $7 \times \frac{2''}{12} \times 3' = 3.5'^2$

PERIMETER = $4 \times 3' - 14\left(\frac{2}{12}\right)' = 9.67' \leftarrow L$

CLEAR AREA = $9 - 3.5 = 5.5\ FT^2$

BROAD CRESTED WEIR $Q = CLH^{3/2} = 2.5\ L\ H^{3/2}$

$= 2.5(9.67)\ H^{3/2}$

$= 24.17\ H^{3/2}$

H	Q_{WEIR}	$Q_{ORIFICE}$
0	0	0
0.5	8.55	25.59
1	24.17	36.19
1.5	44.40	44.32
2	68.36	51.18
3	125.59	62.68
4	193.36	72.38
8		

↑ WEIR

← EQUAL

↓ ORIFICE

ORIFICE - $Q = 0.82\ a\sqrt{2gH}$

$= 0.82(5.5)\sqrt{64.4\ H}$

$= 36.19\sqrt{H}$

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DESIGN ANALYSIS

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PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DETENTION BASIN	SPEC. DIVISION: STAGE VS Q
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/6/87	JOB NO: 87021.00
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EMERGENCY SPILLWAY

USE TABLE 1.26C IN E & S HANDBOOK
SHOULD BE CONSERVATIVE FOR PROPOSED CHANNEL

STAGE	Q	L AVG	C
0.5	17.5	26.5	1.87
1.0	58.5	28.0	2.09
2.0	185.5	31.0	2.12
2.4	250.5	32.2	2.09

$Q = CLH^{3/2}$ USE $L =$ AVG WIDTH $= \frac{25 + 25 + 6d}{2}$

$C = \frac{Q}{LH^{3/2}}$

USE C = 2.1 TO EST HIGHER STAGES

3.0	371.0	34.0
7.0	1789.0	46.0

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PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DETENTION BASIN	SPEC. DIVISION: STAGE VS Q
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/6/87	JOB NO: 87021.00
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CAPACITY OF 3' PIPE

$$h_L = \left(\frac{29 n^2 L}{R^{1.33}} + h_e + h_o + h_{misc} \right) \frac{Q^2}{2gA^2}$$

$$h_L = \left[\frac{(29)(.013)^2(95)}{(0.75)^{1.33}} + 0.5 + 1.0 + 0.5 \right] \frac{Q^2}{2gA^2}$$

$$h_L = 2.68 \frac{Q^2}{(64.4)(49.96)} = 0.000833\, Q^2$$

$$Q^2 = 1200.5\, h_L$$

$$Q = 34.6\, h_L^{1/2}$$

ASSUME WATER SURF AT OUTLET = 3'

∴ TAILWATER EL. = 55 + 3 = 58'

HW EL.	h_L	$Q_{36"}$	CARRY ORIFICE + DI 7?	$Q_{30"}$	?
57'	0	0	Y	0	Y
58'	0	0	Y	0	Y
60'	2'	48.93	Y	32.89	Y
65	7'	91.54	Y	61.5	Y
67	9'	103.8	Y	69.8	Y
68	10'	109.4	Y	73.6	Y
69	11'	114.8	Y	77.1	Y
70	12'	119.9	Y	80.6	Y
75	17'	142.7	Y	95.9	N

∴ 3' PIPE IS NOT A BOTTLENECK TO FLOW OVER RANGE OF INTEREST.

30" WORKS, UNLESS TAILWATER RISES –
BETTER TO USE 3' –

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PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DETENTION BASIN	SPEC. DIVISION: STAGE VS Q
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/6/87	JOB NO: 87021.00
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 13 OF: 44

CHECK 30" PIPE

$$h_L = \left[\frac{29 n^2 L}{R^{1.33}} + 2.0\right] \frac{Q^2}{2g A^2}$$

$R = 0.625'$

$A = 4.91 \text{ FT}^2$

$$h_L = \left[\frac{(29)(.013)^2(95)}{(.625)^{1.33}} + 2.0\right] \frac{Q^2}{(64)(4.91)^2}$$

$$h_L = 0.00185\ Q^2$$

$$Q = 23.26\ h_L^{1/2}$$

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PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DETENTION BASIN	SPEC. DIVISION: Q VS VOLUME
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/6/87	JOB NO: 87021.00
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 14 OF: 44

USE FOR ROUTING
REVISED FLOW VS VOLUME 53,000 C.Y.

W.S. EL.	Q	VOL W/O SED		VOL. W/SEDIMENT
57	0	0		0
60	5.53	2,256.	(-50%)	1,128
65	10.34	39,736.	(-50%)	19,868
67	11.73	90,000.	(-53,000 C.Y.)	37,000
68	36.53	130,000.	"	77,000
69	69.99	180,000.	"	127,000
70	261.72	243,486	"	190,486
75	1907.5	844,263	"	791,263

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PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: SEDIMENT BASIN	SPEC. DIVISION: SEDIMENT BASIN
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/6/87	JOB NO: 87021.00
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VA E&S CONTROL HANDBOOK

REQD VOL FOR SEDIMENT STORAGE =

$67\ YD^3/AC = (67)(28.9)$

$= 1{,}936\ YD^3$

$= \boxed{52{,}280\ FT^3} \rightarrow$ EL. 65.5

CLEAN BASIN WITH VOL IS REDUCED TO $27\ YD^3/AC. = (27)(28.9)$

$= 780\ YD^3$

$= 21{,}068\ FT^3$

VOL SEDIMENT ACCUMULATED. $= (67-27)(28.9)$

$= 1156\ YD^3$

$= 31{,}212\ FT^3 \rightarrow$ EL 64.5

STORAGE - INDICATION ROUTING

UNIVERSITY SQUARE - 2 YR CRIT STORM - 12 IN ORIFICE PLATE - NO SEDIMENT

Q (CFS)	STORAGE(CU.FT.)
0	0
5.53	2256
10.34	39736
11.73	90000
36.53	130000
69.99	180000
261.72	243486 70
1907.5	844263 75

Q (CFS)	S/T+Q/2
0	0
5.53	10.285
10.34	137.6233
11.73	305.865
36.53	451.5984
69.99	634.995
261.72	942.48
1907.5	3767.96

T (MIN.)	INFLOW (CFS)	OUTFLOW (CFS)
0.00	0.00	0.00
5.00	13.20	3.50
10.00	26.40	6.00
15.00	30.40	6.80
20.00	30.40	7.70
25.00	30.40	8.60
30.00	30.40	9.40
35.00	30.40	10.20
40.00	30.40	10.50
45.00	30.40	10.60
50.00	30.40	10.80
55.00	30.40	11.00
60.00	30.40	11.10
65.00	30.40	11.30
70.00	21.60	11.40
75.00	12.80	11.50
80.00	4.00	11.40
85.00	0.00	11.40
90.00	0.00	11.30
95.00	0.00	11.20
100.00	0.00	11.10
105.00	0.00	11.00
110.00	0.00	10.90
115.00	0.00	10.80
120.00	0.00	10.70
125.00	0.00	10.60
130.00	0.00	10.50
135.00	0.00	10.40
140.00	0.00	10.40

145.00	0.00	10.00
150.00	0.00	9.70
155.00	0.00	9.30
160.00	0.00	8.90
165.00	0.00	8.60
170.00	0.00	8.30
175.00	0.00	8.00
180.00	0.00	7.70
185.00	0.00	7.40
190.00	0.00	7.10
195.00	0.00	6.80
200.00	0.00	6.60
205.00	0.00	6.30
210.00	0.00	6.10
215.00	0.00	5.90
220.00	0.00	5.60
225.00	0.00	4.00
230.00	0.00	1.90
235.00	0.00	0.90
240.00	0.00	0.40
245.00	0.00	0.20
250.00	0.00	0.10

STORAGE-INDICATION ROUTING FOR:

UNIVERSITY SQUARE - 2 YR CRIT STORM - 12 IN ORIFICE PLATE - NO SEDIMENT

VOLUME STORED = 80203.5 (CU.FT.)

STORAGE - INDICATION ROUTING

UNIVERSITY SQUARE - 10 YR CRIT STORM - 12 IN ORIFICE PLATE - NO SEDIMENT

Q (CFS)	STORAGE(CU.FT.)
0	0
5.53	2256
10.34	39736
11.73	90000
36.53	130000
69.99	180000
261.72	243486
1907.5	844263

Q (CFS)	S/T+Q/2
0	0
5.53	10.285
10.34	137.6233
11.73	305.865
36.53	451.5984
69.99	634.995
261.72	942.48
1907.5	3767.96

T (MIN.)	INFLOW (CFS)	OUTFLOW (CFS)
0.00	0.00	0.00
5.00	21.20	5.50
10.00	42.40	6.50
15.00	44.50	7.90
20.00	44.50	9.30
25.00	44.50	10.40
30.00	44.50	10.70
35.00	44.50	11.00
40.00	44.50	11.20
45.00	44.50	11.50
50.00	44.50	13.00
55.00	44.50	18.30
60.00	44.50	22.80
65.00	44.50	26.50
70.00	30.40	28.40
75.00	16.30	27.50
80.00	2.30	24.40
85.00	0.00	20.40
90.00	0.00	17.00
95.00	0.00	14.10
100.00	0.00	11.70
105.00	0.00	11.60
110.00	0.00	11.50
115.00	0.00	11.40
120.00	0.00	11.30
125.00	0.00	11.30
130.00	0.00	11.20
135.00	0.00	11.10
140.00	0.00	11.00

145.00	0.00	10.90
150.00	0.00	10.80
155.00	0.00	10.70
160.00	0.00	10.60
165.00	0.00	10.50
170.00	0.00	10.40
175.00	0.00	10.40
180.00	0.00	10.00
185.00	0.00	9.60
190.00	0.00	9.30
195.00	0.00	8.90
200.00	0.00	8.60
205.00	0.00	8.30
210.00	0.00	8.00
215.00	0.00	7.70
220.00	0.00	7.40
225.00	0.00	7.10
230.00	0.00	6.80
235.00	0.00	6.60
240.00	0.00	6.30
245.00	0.00	6.10
250.00	0.00	5.80

STORAGE-INDICATION ROUTING FOR:

UNIVERSITY SQUARE - 10 YR CRIT STORM - 12 IN ORIFICE PLATE - NO SEDIMENT

VOLUME STORED = 117,120.4 (CU.FT.)

STORAGE - INDICATION ROUTING

UNIVERSITY SQUARE - 100 YR CRIT STORM- 12 IN ORIFICE PLATE - NO SEDIMENT

Q (CFS)	STORAGE(CU.FT.)
0	0
5.53	2256
10.34	39736
11.73	90000
36.53	130000
69.99	180000
261.72	243486
1907.5	844263

Q (CFS)	S/T+Q/2
0	0
5.53	10.285
10.34	137.6233
11.73	305.865
36.53	451.5984
69.99	634.995
261.72	942.48
1907.5	3767.96

T (MIN.)	INFLOW (CFS)	OUTFLOW (CFS)
0.00	0.00	0.00
5.00	32.40	5.80
10.00	64.70	7.40
15.00	64.70	9.50
20.00	64.70	10.60
25.00	64.70	11.10
30.00	64.70	11.50
35.00	64.70	16.20
40.00	64.70	24.50
45.00	64.70	31.30
50.00	64.70	37.00
55.00	64.70	42.10
60.00	64.70	46.20
65.00	64.70	49.60
70.00	43.30	50.40
75.00	21.40	47.10
80.00	0.00	40.50
85.00	0.00	33.30
90.00	0.00	27.60
95.00	0.00	22.90
100.00	0.00	19.00
105.00	0.00	15.80
110.00	0.00	13.10
115.00	0.00	11.70
120.00	0.00	11.60
125.00	0.00	11.50
130.00	0.00	11.40
135.00	0.00	11.30
140.00	0.00	11.20

145.00	0.00	11.10
150.00	0.00	11.00
155.00	0.00	10.90
160.00	0.00	10.80
165.00	0.00	10.80
170.00	0.00	10.70
175.00	0.00	10.60
180.00	0.00	10.50
185.00	0.00	10.40
190.00	0.00	10.30
195.00	0.00	9.90
200.00	0.00	9.50
205.00	0.00	9.10
210.00	0.00	8.80
215.00	0.00	8.50
220.00	0.00	8.10
225.00	0.00	7.80
230.00	0.00	7.50
235.00	0.00	7.20
240.00	0.00	7.00
245.00	0.00	6.70
250.00	0.00	6.50

STORAGE-INDICATION ROUTING FOR:

UNIVERSITY SQUARE - 100 YR CRIT STORM- 12 IN ORIFICE PLATE - NO SEDIMENT

VOLUME STORED = 151777 (CU.FT.)

STORAGE - INDICATION ROUTING

UNIVERSITY SQUARE - 2 YR CRIT STORM - 12 IN ORIFICE PLATE - WITH SEDIMENT

Q (CFS)	STORAGE(CU.FT.)
0	0
5.53	1128
10.34	19868
11.73	37000
36.53	77000
69.99	127000
261.72	191206
1907.5	791983

Q (CFS)	S/T+Q/2
0	0
5.53	6.525
10.34	71.39667
11.73	129.1983
36.53	274.9317
69.99	458.3284
261.72	768.2133
1907.5	3593.693

T (MIN.)	INFLOW (CFS)	OUTFLOW (CFS)
0.00	0.00	0.00
5.00	13.20	5.50
10.00	26.40	6.60
15.00	30.40	8.20
20.00	30.40	9.80
25.00	30.40	10.70
30.00	30.40	11.10
35.00	30.40	11.60
40.00	30.40	14.10
45.00	30.40	16.80
50.00	30.40	19.10
55.00	30.40	21.00
60.00	30.40	22.60
65.00	30.40	23.90
70.00	21.60	24.30
75.00	12.80	23.10
80.00	4.00	20.60
85.00	0.00	17.40
90.00	0.00	14.50
95.00	0.00	12.00
100.00	0.00	11.50
105.00	0.00	11.20
110.00	0.00	10.90
115.00	0.00	10.70
120.00	0.00	10.40
125.00	0.00	9.80
130.00	0.00	9.10
135.00	0.00	8.40
140.00	0.00	7.80

145.00	0.00	7.20
150.00	0.00	6.70
155.00	0.00	6.20
160.00	0.00	5.70
165.00	0.00	2.80
170.00	0.00	0.40
175.00	0.00	0.10
180.00	0.00	0.00
185.00	0.00	0.00
190.00	0.00	0.00
195.00	0.00	0.00
200.00	0.00	0.00
205.00	0.00	0.00
210.00	0.00	0.00
215.00	0.00	0.00
220.00	0.00	0.00
225.00	0.00	0.00
230.00	0.00	0.00
235.00	0.00	0.00
240.00	0.00	0.00
245.00	0.00	0.00
250.00	0.00	0.00

STORAGE-INDICATION ROUTING FOR:

UNIVERSITY SQUARE - 2 YR CRIT STORM - 12 IN ORIFICE PLATE - WITH SEDIMENT

VOLUME STORED = 57656.8 (CU.FT.)

STORAGE - INDICATION ROUTING

UNIVERSITY SQUARE - 10 YR CRIT STORM - 12 IN ORIFICE PLATE - WITH SEDIMENT

Q (CFS)	STORAGE(CU.FT.)
0	0
5.53	1128
10.34	19868
11.73	37000
36.53	77000
69.99	127000
261.72	190486
1907.5	791263

Q (CFS)	S/T+Q/2
0	0
5.53	6.525
10.34	71.39667
11.73	129.1983
36.53	274.9317
69.99	458.3284
261.72	765.8133
1907.5	3591.293

T (MIN.)	INFLOW (CFS)	OUTFLOW (CFS)
0.00	0.00	0.00
5.00	21.20	5.80
10.00	42.40	7.80
15.00	44.50	10.40
20.00	44.50	11.20
25.00	44.50	13.50
30.00	44.50	18.80
35.00	44.50	23.20
40.00	44.50	26.80
45.00	44.50	29.80
50.00	44.50	32.30
55.00	44.50	34.40
60.00	44.50	36.10
65.00	44.50	37.60
70.00	30.40	37.60
75.00	16.30	35.10
80.00	2.30	30.70
85.00	0.00	25.70
90.00	0.00	21.30
95.00	0.00	17.70
100.00	0.00	14.70
105.00	0.00	12.20
110.00	0.00	11.50
115.00	0.00	11.20
120.00	0.00	11.00
125.00	0.00	10.70
130.00	0.00	10.40
135.00	0.00	9.90
140.00	0.00	9.10

145.00	0.00	8.40
150.00	0.00	7.80
155.00	0.00	7.20
160.00	0.00	6.70
165.00	0.00	6.20
170.00	0.00	5.70
175.00	0.00	3.10
180.00	0.00	0.50
185.00	0.00	0.10
190.00	0.00	0.00
195.00	0.00	0.00
200.00	0.00	0.00
205.00	0.00	0.00
210.00	0.00	0.00
215.00	0.00	0.00
220.00	0.00	0.00
225.00	0.00	0.00
230.00	0.00	0.00
235.00	0.00	0.00
240.00	0.00	0.00
245.00	0.00	0.00
250.00	0.00	0.00

STORAGE-INDICATION ROUTING FOR:

UNIVERSITY SQUARE - 10 YR CRIT STORM - 12 IN ORIFICE PLATE - WITH SEDIMENT

VOLUME STORED = 79642.71 (CU.FT.)

STORAGE - INDICATION ROUTING

UNIVERSITY SQUARE - 100 YR CRIT STORM- 12 IN ORIFICE PLATE - WITH SEDIMENT

Q (CFS)	STORAGE(CU.FT.)
0	0
5.53	1128
10.34	19868
11.73	37000
36.53	77000
69.99	127000
261.72	190486
1907.5	791263

Q (CFS)	S/T+Q/2
0	0
5.53	6.525
10.34	71.39667
11.73	129.1983
36.53	274.9317
69.99	458.3284
261.72	765.8133
1907.5	3591.293

T (MIN.)	INFLOW (CFS)	OUTFLOW (CFS)
0.00	0.00	0.00
5.00	32.40	6.20
10.00	64.70	9.40
15.00	64.70	11.40
20.00	64.70	18.20
25.00	64.70	26.10
30.00	64.70	32.70
35.00	64.70	38.20
40.00	64.70	43.10
45.00	64.70	47.00
50.00	64.70	50.20
55.00	64.70	52.90
60.00	64.70	55.00
65.00	64.70	56.80
70.00	43.30	56.30
75.00	21.40	51.90
80.00	0.00	44.40
85.00	0.00	36.30
90.00	0.00	30.10
95.00	0.00	25.00
100.00	0.00	20.80
105.00	0.00	17.20
110.00	0.00	14.30
115.00	0.00	11.90
120.00	0.00	11.50
125.00	0.00	11.20
130.00	0.00	10.90
135.00	0.00	10.70
140.00	0.00	10.40

145.00	0.00	9.80
150.00	0.00	9.00
155.00	0.00	8.40
160.00	0.00	7.70
165.00	0.00	7.20
170.00	0.00	6.60
175.00	0.00	6.10
180.00	0.00	5.70
185.00	0.00	2.50
190.00	0.00	0.40
195.00	0.00	0.10
200.00	0.00	0.00
205.00	0.00	0.00
210.00	0.00	0.00
215.00	0.00	0.00
220.00	0.00	0.00
225.00	0.00	0.00
230.00	0.00	0.00
235.00	0.00	0.00
240.00	0.00	0.00
245.00	0.00	0.00
250.00	0.00	0.00

STORAGE-INDICATION ROUTING FOR:

UNIVERSITY SQUARE - 100 YR CRIT STORM- 12 IN ORIFICE PLATE - WITH SEDIMENT

VOLUME STORED = 108470.6 (CU.FT.)

STORAGE - INDICATION ROUTING

UNIVERSITY SQUARE - 2 YR TC STORM - 12 IN ORIFICE PLATE - NO SEDIMENT

Q (CFS)	STORAGE(CU.FT.)
0	0
5.53	2256
10.34	39736
11.73	90000
36.53	130000
69.99	180000
261.72	243486
1907.5	844263

Q (CFS)	S/T+Q/2
0	0
5.53	10.285
10.34	137.6233
11.73	305.865
36.53	451.5984
69.99	634.995
261.72	942.48
1907.5	3767.96

T (MIN.)	INFLOW (CFS)	OUTFLOW (CFS)
0.00	0.00	0.00
5.00	39.60	5.90
10.00	91.00	8.10
15.00	72.60	10.50
20.00	46.30	10.90
25.00	20.00	11.10
30.00	0.00	11.00
35.00	0.00	11.00
40.00	0.00	10.90
45.00	0.00	10.80
50.00	0.00	10.70
55.00	0.00	10.60
60.00	0.00	10.50
65.00	0.00	10.40
70.00	0.00	10.30
75.00	0.00	9.90
80.00	0.00	9.60
85.00	0.00	9.20
90.00	0.00	8.90
95.00	0.00	8.50
100.00	0.00	8.20

STORAGE-INDICATION ROUTING FOR:

UNIVERSITY SQUARE - 2 YR TC STORM - 12 IN ORIFICE PLATE - NO SEDIMENT

VOLUME STORED = 66925.6 (CU.FT.)

STORAGE - INDICATION ROUTING

UNIVERSITY SQUARE - 10 YR TC STORM - 12 IN ORIFICE PLATE - NO SEDIMENT

Q (CFS)	STORAGE(CU.FT.)
0	0
5.53	2256
10.34	39736
11.73	90000
36.53	130000
69.99	180000
261.72	243486
1907.5	844263

Q (CFS)	S/T+Q/2
0	0
5.53	10.285
10.34	137.6233
11.73	305.865
36.53	451.5984
69.99	634.995
261.72	942.48
1907.5	3767.96

T (MIN.)	INFLOW (CFS)	OUTFLOW (CFS)
0.00	0.00	0.00
5.00	57.80	6.20
10.00	121.40	9.40
15.00	86.80	10.90
20.00	48.40	11.40
25.00	10.00	11.50
30.00	0.00	11.50
35.00	0.00	11.40
40.00	0.00	11.30
45.00	0.00	11.20
50.00	0.00	11.10
55.00	0.00	11.00
60.00	0.00	10.90
65.00	0.00	10.80
70.00	0.00	10.70
75.00	0.00	10.60
80.00	0.00	10.60
85.00	0.00	10.50
90.00	0.00	10.40
95.00	0.00	10.20
100.00	0.00	9.80

STORAGE-INDICATION ROUTING FOR:

UNIVERSITY SQUARE - 10 YR TC STORM - 12 IN ORIFICE PLATE - NO SEDIMENT

VOLUME STORED = 82947.1 (CU.FT.)

STORAGE - INDICATION ROUTING

UNIVERSITY SQUARE - 100 YR TC STORM- 12 IN ORIFICE PLATE - NO SEDIMENT

Q (CFS)	STORAGE(CU.FT.)	
0	0	
5.53	2256	60
10.34	39736	65
11.73	90000	67
36.53	130000	68
69.99	180000	69
261.72	243486	70
1907.5	844263	75

Q (CFS)	S/T+Q/2
0	0
5.53	10.285
10.34	137.6233
11.73	305.865
36.53	451.5984
69.99	634.995
261.72	942.48
1907.5	3767.96

T (MIN.)	INFLOW (CFS)	OUTFLOW (CFS)
0.00	0.00	0.00
5.00	84.00	6.70
10.00	167.90	10.50
15.00	112.00	11.60
20.00	55.40	21.40
25.00	0.00	22.50
30.00	0.00	18.70
35.00	0.00	15.50
40.00	0.00	12.80
45.00	0.00	11.70
50.00	0.00	11.60
55.00	0.00	11.50
60.00	0.00	11.40
65.00	0.00	11.30
70.00	0.00	11.20
75.00	0.00	11.10
80.00	0.00	11.00
85.00	0.00	10.90
90.00	0.00	10.80
95.00	0.00	10.70
100.00	0.00	10.70

STORAGE-INDICATION ROUTING FOR:

UNIVERSITY SQUARE - 100 YR TC STORM- 12 IN ORIFICE PLATE - NO SEDIMENT

VOLUME STORED = 110707.6 (CU.FT.)

DETERMINE CRITICAL STORM DURATION - PEAK VOLUME

DESIGN DATA

DRAINAGE AREA(acres)? 89.3

PRE-DEVELOPMENT DATA:

TIME OF CONC.(min.)? 38.7

RUNOFF COEF.? .34

POST-DEVELOPMENT DATA:

TIME OF CONC.(min.)?

RUNOFF COEF.?

PLEASE ANSWER IN CAPITAL LETTERS

IS DESIGN DATA O.K.?(Y/N)
? N

DESIGN DATA

DRAINAGE AREA(acres)? 28.9

PRE-DEVELOPMENT DATA:

TIME OF CONC.(min.)? 38.7

RUNOFF COEF.? .18

POST-DEVELOPMENT DATA:

TIME OF CONC.(min.)? 11.5

RUNOFF COEF.? .7

PLEASE ANSWER IN CAPITAL LETTERS

IS DESIGN DATA O.K.?(Y/N)
? Y

RAINFALL INTENSITY IS MODELED AS:

I = A / (B + T)

WHERE T IS STORM DURATION AND A&B ARE RAINFALL COEFFICIENTS.

CONSTANTS (A&B) CAN BE ENTERED DIRECTLY (CHOICE D),OR CALCULATED
USING POINTS SELECTED FROM AN
INTENSITY/DURATION/FREQUENCY CURVE.

YOUR CHOICE ?(D OR C)
? D

RAINFALL COEF. (A)? 130.3

RAINFALL COEF. (B)? 18.5

DO YOU WISH THE ALLOWABLE PEAK DISCHARGE
TO BE BASED ON THE PRE-DEVELOPMENT
FLOW RATE CALCULATED USING THE
RATIONAL EQUATION? (Y/N)? Y

ALLOW. PEAK DISCHARGE (cfs)= 11.85

CRITICAL STORM DURATION (min.)= 64.87 — 2YR CRITICAL STORM

VOLUME = 99322.84 (cu. ft.)

NOW SIZE A 'BASIN' TO PROVIDE THE
REQUIRED VOLUME AND SELECT AN OUTLET
DEVICE (ORIFICE) THAT WILL JUST PASS THE
ALLOWABLE PEAK DISCHARGE WHEN THE BASIN
IS FULL.

HIT RETURN TO CONTINUE?

SMALL POND PROGRAM MENU

1. IMPOUNDMENT SIZE DETERMINATION
2. OUTLET DEVICE OR CULVERT
   SIZING ACCOUNTING FOR STORAGE
3. STORAGE INDICATION ROUTING METHOD
4. EXPLANATION OF CHOICES
5. END PROGRAM

Choose an option

and hit RETURN? 1

DESIGN DATA

DRAINAGE AREA(acres)? 28.9

PRE-DEVELOPMENT DATA:

TIME OF CONC.(min.)? 33.7

RUNOFF COEF.? .18

POST-DEVELOPMENT DATA:

TIME OF CONC.(min.)? 10.5

RUNOFF COEF.? .7

PLEASE ANSWER IN CAPITAL LETTERS

IS DESIGN DATA O.K.?(Y/N)
? Y

RAINFALL INTENSITY IS MODELED AS:

I = A / (B + T)

WHERE T IS STORM DURATION AND A&B ARE RAINFALL COEFFICIENTS.

CONSTANTS (A&B) CAN BE ENTERED DIRECTLY (CHOICE D),OR CALCULATED
USING POINTS SELECTED FROM AN
INTENSITY/DURATION/FREQUENCY CURVE.

YOUR CHOICE ?(D OR C)
? D

RAINFALL COEF. (A)? 189.2

RAINFALL COEF. (B)? 22.1

DO YOU WISH THE ALLOWABLE PEAK DISCHARGE
TO BE BASED ON THE PRE-DEVELOPMENT
FLOW RATE CALCULATED USING THE
RATIONAL EQUATION? (Y/N)? Y

ALLOW. PEAK DISCHARGE (cfs)= 17.64

CRITICAL STORM DURATION (min.)= 69.84 10 YR STORM

VOLUME = 135715.70 (cu. ft.)

NOW SIZE A 'BASIN' TO PROVIDE THE
REQUIRED VOLUME AND SELECT AN OUTLET

DEVICE (ORIFICE) THAT WILL JUST PASS THE
ALLOWABLE PEAK DISCHARGE WHEN THE BASIN
IS FULL.

HIT RETURN TO CONTINUE?

SMALL POND PROGRAM MENU

1. IMPOUNDMENT SIZE DETERMINATION

2. OUTLET DEVICE OR CULVERT
   SIZING ACCOUNTING FOR STORAGE

3. STORAGE INDICATION ROUTING METHOD

4. EXPLANATION OF CHOICES

5. END PROGRAM

Choose an option

and hit RETURN? 1

DESIGN DATA

DRAINAGE AREA(acres)? 28.9

PRE-DEVELOPMENT DATA:

TIME OF CONC.(min.)? 29.7

RUNOFF COEF.? .18

POST-DEVELOPMENT DATA:

TIME OF CONC.(min.)? 10.

RUNOFF COEF.? .7

PLEASE ANSWER IN CAPITAL LETTERS

IS DESIGN DATA O.K.?(Y/N)
? D
IS DESIGN DATA O.K.?(Y/N)
? 289.7
IS DESIGN DATA O.K.?(Y/N)
? Y4.8

RAINFALL INTENSITY IS MODELED AS:

I = A / (B + T)

WHERE T IS STORM DURATION AND A&B ARE RAINFALL COEFFICIENTS.

CONSTANTS (A&B) CAN BE ENTERED DIRECTLY (CHOICE D),OR CALCULATED
USING POINTS SELECTED FROM AN
INTENSITY/DURATION/FREQUENCY CURVE.

YOUR CHOICE ?(D OR C)
? D

RAINFALL COEF. (A)? 289.7

RAINFALL COEF. (B)? 24.8

DO YOU WISH THE ALLOWABLE PEAK DISCHARGE
TO BE BASED ON THE PRE-DEVELOPMENT
FLOW RATE CALCULATED USING THE
RATIONAL EQUATION? (Y/N)? Y

ALLOW. PEAK DISCHARGE (cfs)= 27.65

CRITICAL STORM DURATION (min.)= 72.43 100 YR STORM.

VOLUME = 198460.90 (cu. ft.)

NOW SIZE A 'BASIN' TO PROVIDE THE
REQUIRED VOLUME AND SELECT AN OUTLET
DEVICE (ORIFICE) THAT WILL JUST PASS THE
ALLOWABLE PEAK DISCHARGE WHEN THE BASIN
IS FULL.

HIT RETURN TO CONTINUE?
SMALL POND PROGRAM MENU

1. IMPOUNDMENT SIZE DETERMINATION

2. OUTLET DEVICE OR CULVERT
SIZING ACCOUNTING FOR STORAGE

3. STORAGE INDICATION ROUTING METHOD

4. EXPLANATION OF CHOICES

5. END PROGRAM

Choose an option

and hit RETURN? 5

Ok
SYSTEM

Fig. 1.5.1.5

RICHMOND, VA.

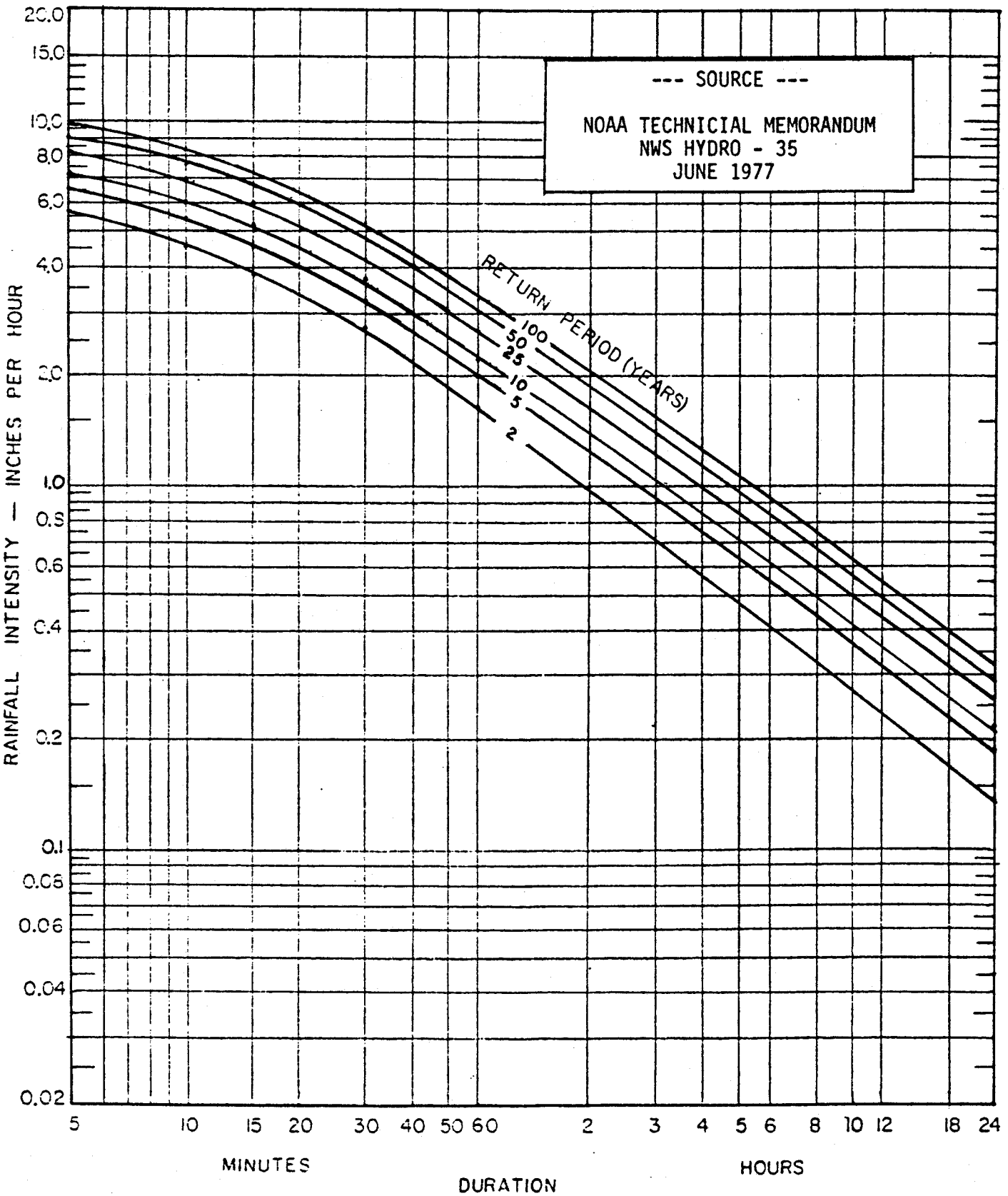
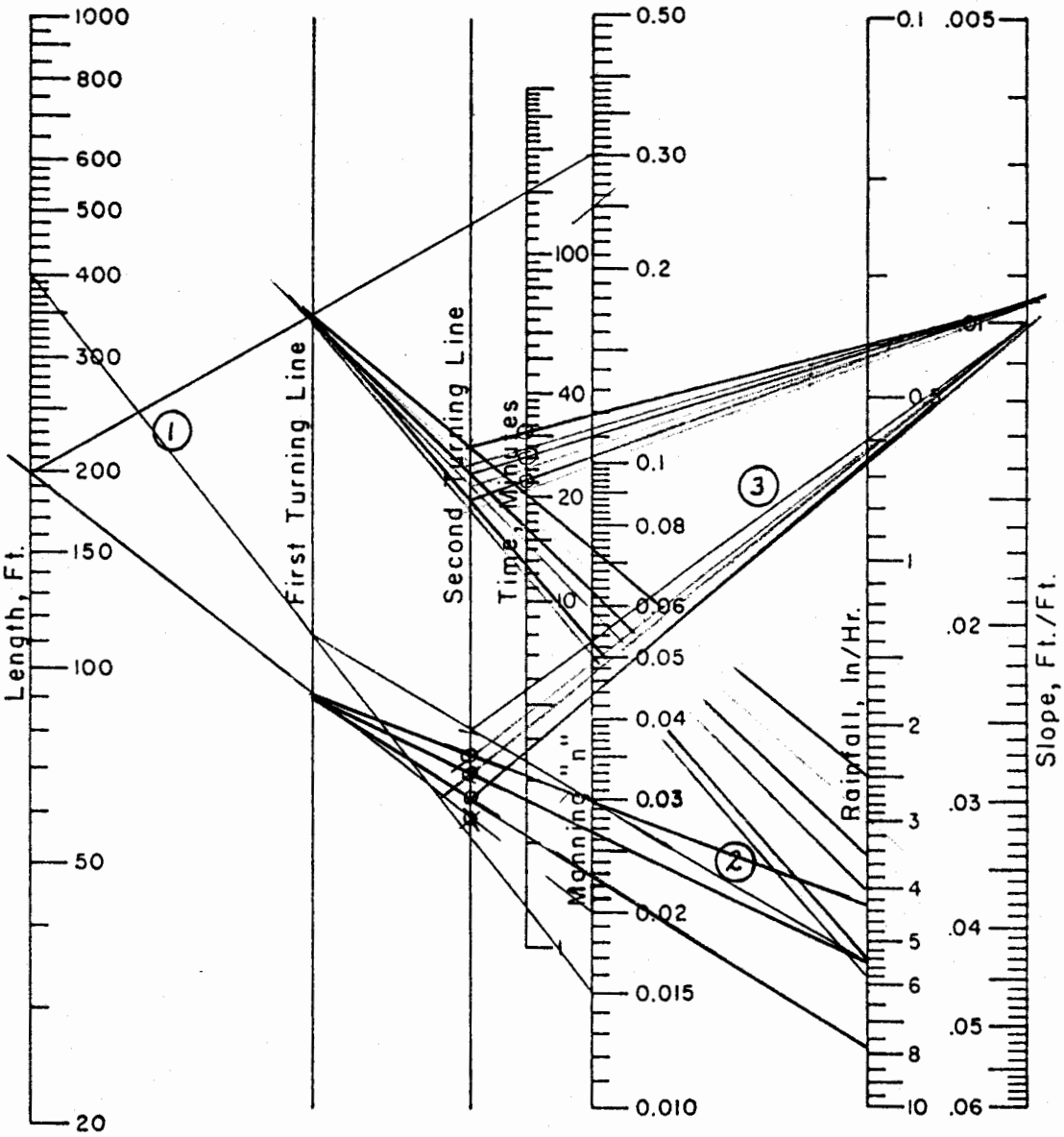


Fig. 1.5.1.1A

Equation solved by nomograph:

$$t_c\,(min) = .93\,\frac{L^{0.6}n^{0.6}}{i^{0.4}S_o^{0.3}}$$



The initially assumed value of i and the nomograph value of t must be checked against the applicable intensity-duration-frequency curve by trial and error.

Example:

L = 400 ft.
n = 0.015
i = 5.5 in./hr.
S_o = 0.01
t = 5.5 min.

ONE INCH is 25.4mm
ONE FOOT is 0.3048m

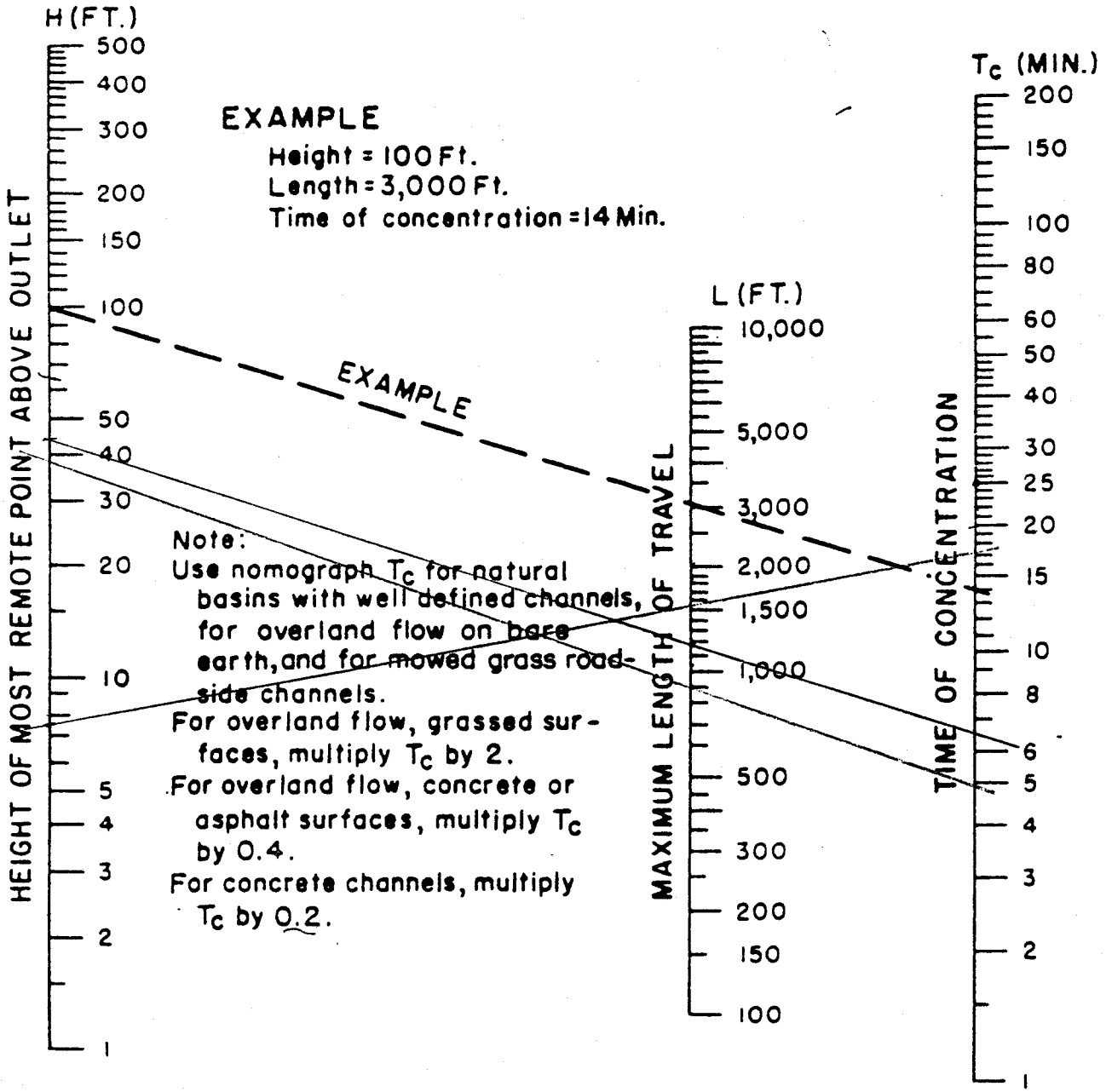
Nomograph for determining time of concentration for overland flow, Kinematic Wave Formulation. *(After Ragan.)*

(Rev. 3/83)

MC039_LA_FONTAINE_DRY_POND_2 - 099

Fig. 1.5.1.2

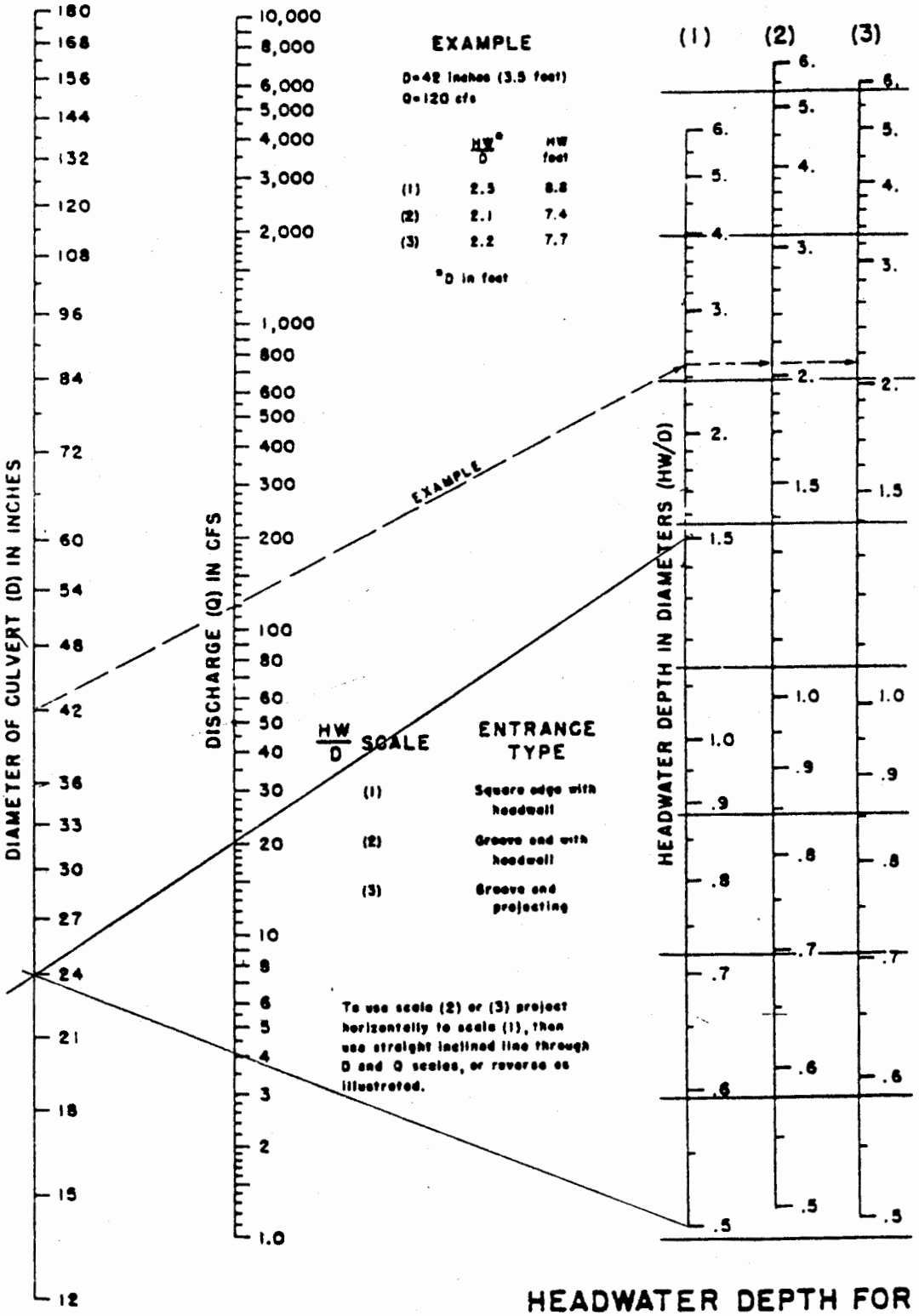
TCC



Based on study by P. Z. Kirpich,
Civil Engineering, Vol. 10, No. 6, June 1940, p. 362

TIME OF CONCENTRATION OF SMALL DRAINAGE BASINS

CHART 2



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2 & 3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

22 (5-22)

Smith Demer Normann
Engineers & Planners

DESIGN ANALYSIS

☐ BUDGET
☐ PRELIMINARY
☒ FINAL
☐ OTHER _____

PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DRAINAGE	SPEC. DIVISION: RIPRAP OUTFALL CHANNEL
DEPARTMENT: CIVIL	COMPUTED BY: JMM DATE: 8/10/87	JOB NO: 87021.00
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 40 OF: 44

$Q = 93$ cfs

$S_o = 9/110 = 0.082$ FT/FT

$D = 54'' = 4.5'$

$A = 15.90$ FT^2

$V = 9$ F/S - CHT. DEPTH AT OUTLET

$M = \rho Q V = \left(\frac{62.4}{32.2}\right)(91)(9.0) = 1587\#$

CLASS I RIPRAP, $d_{50} = 1.1'$

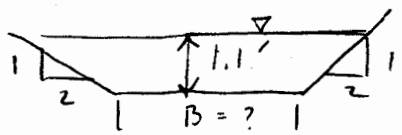
$d_{max} = 1.1$ FT

(FIG 7, VDHMT DRAIN MANUAL, RIPRAP DESIGN)

$n = 0.0395\, d_{50}^{1/6} = 0.040$

$$Q = \frac{1.49}{0.04} A R^{2/3} (.082)^{1/2} = 10.67\, A R^{2/3}$$

$$A R^{2/3} = \frac{Q}{10.67} = \frac{93}{10.67} = 8.72$$



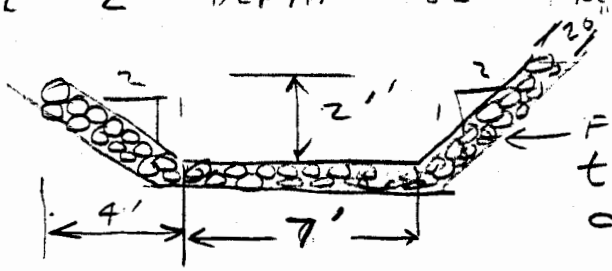
$A = Bd + 2(d^2) = 1.1B + 2.42$

$P = B + 4.47d = B + 4.92$

B	A	P	R	$AR^{2/3}$
6'	9.02	10.92	0.826	7.94 < 8.72
7'	10.12	11.92	.849	9.07 — OK

USE 7' CHAN W/ CLASS I RIPRAP.

USE 2' DEPTH FOR FREEBOARD.



FILTER FABRIC, TRUVIRA 1127 OR EQUAL

$t = 20''$

$d_{50} = 1.1$ (CLASS I RIPRAP.)

Smith Demer Normann
Engineers & Planners

DESIGN ANALYSIS

☐ BUDGET
☐ PRELIMINARY
☒ FINAL
☐ OTHER _____

PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DRAINAGE	SPEC. DIVISION: RIP RAP APRONS
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/10/87	JOB NO: 87021.00
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 41 OF: 42

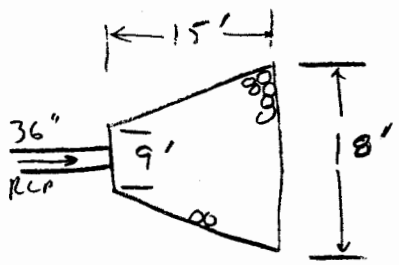
OUTLET PAD, 36" PIPE FROM MAIN SITE

VA E&S CONTROL MANUAL, p. III-135, MIN TAILWATER

$Q = 32$ cfs
$D = d = 36''$

$d_{50} = 0.5' \pm$ — USE 6" RIPRAP, THICKNESS = 12"

$L_a = 15'$ ±
$W = 3 + 15 = 18'$
$W' = 3(3) = 9'$



Smith Demer Normann
Engineers & Planners

DESIGN ANALYSIS

☐ BUDGET
☐ PRELIMINARY
☒ FINAL
☐ OTHER

PROJECT NAME: UNIVERSITY SQUARE	PROJECT PART: DRAINAGE	SPEC. DIVISION: RIPRAP APRON
DEPARTMENT: CIVIL	COMPUTED BY: [illegible] DATE: 8/10/87	JOB NO: 87021.00
SHEET NO: OF:	CHECKED BY: DATE:	SHEET NO: 42 OF: 44

OUTFLOW FROM DAM - RIPRAP IN D.S. CHANNEL, DETENTION BASIN

DIA = 3'

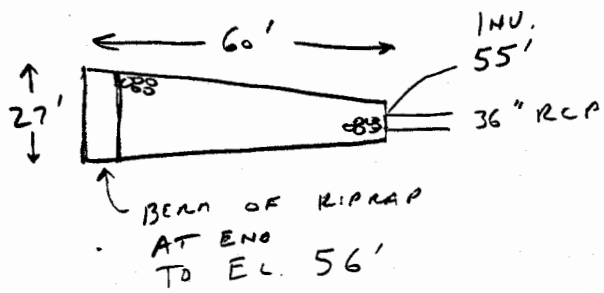
Q = 121. cfs - 100 YR OUTFLOW

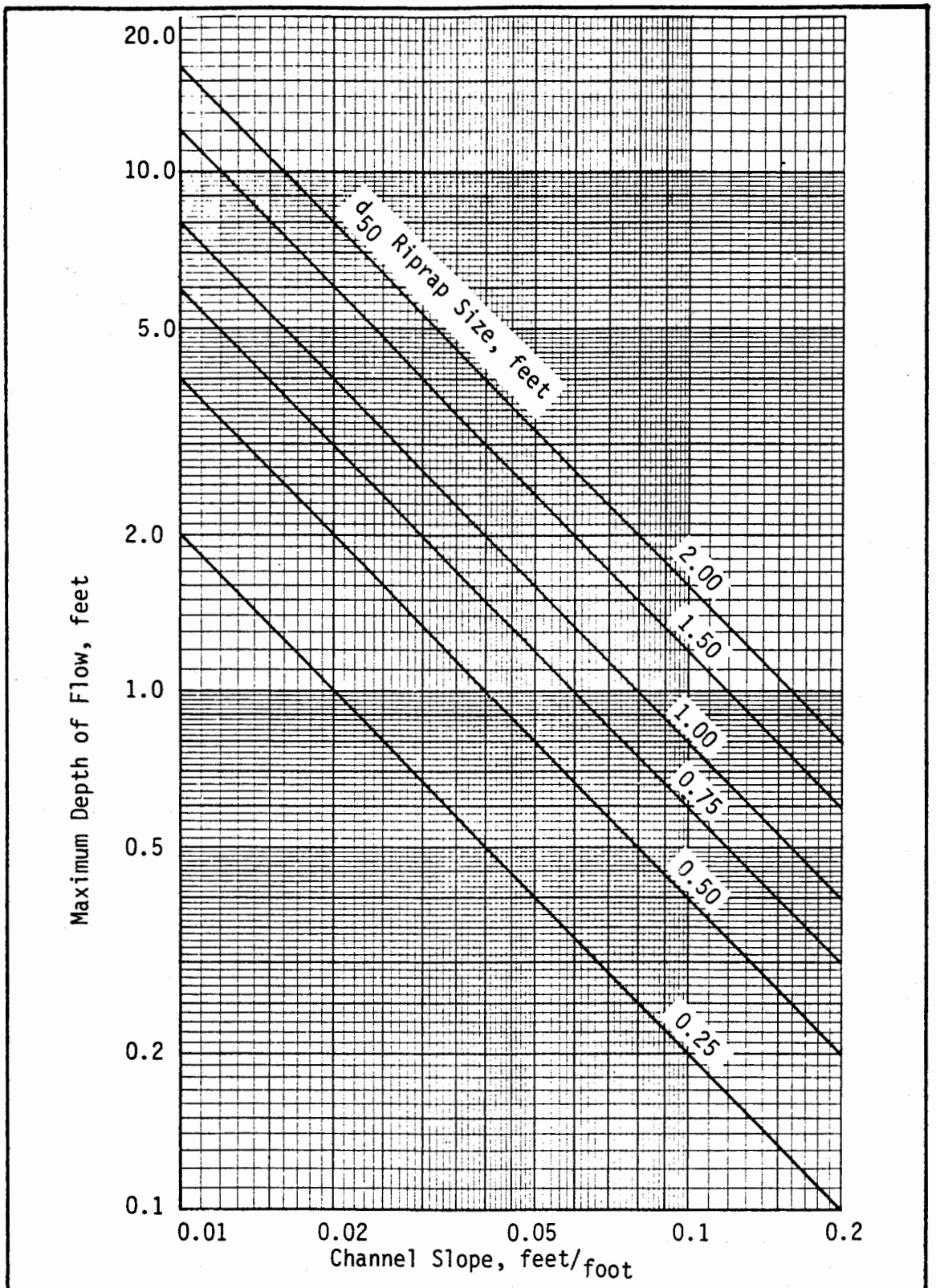
USE PLATE 1.36 d, p III-136, VA. E&S CONTROL MANUAL, MAX. TAILWATER

d_{50} = 0.9', USE CLASS I RIPRAP, d_{50} = 1.1'

L_a = 72' - USE 60' WITH A LIP AT D.S. END

$W = D_o + 0.4 L_a = 3 + (0.4)(60) = 27'$

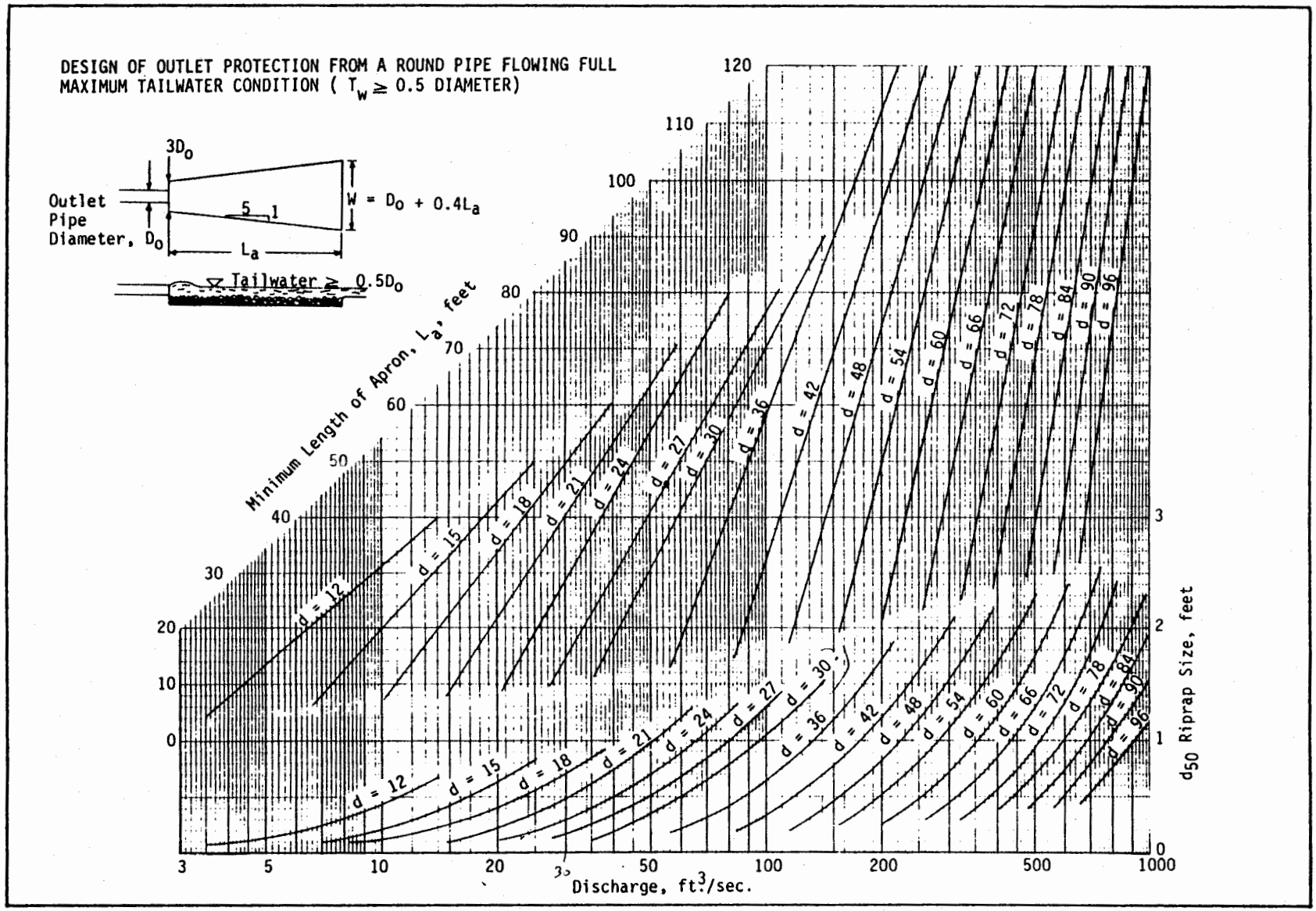




MAXIMUM DEPTH OF FLOW FOR RIPRAP LINED CHANNELS

Source: VDH&T Drainage Manual

Plate 1.37b

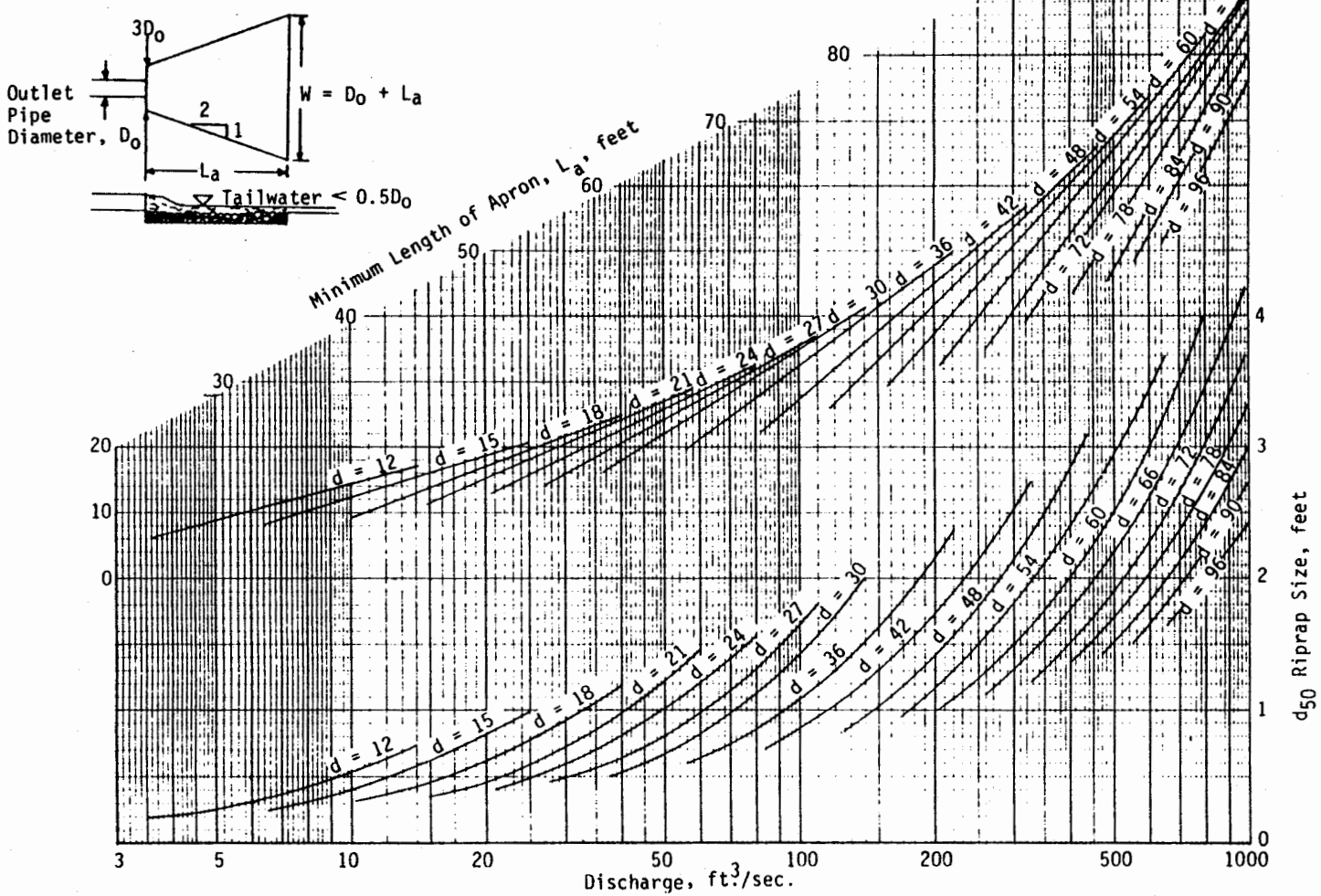


Source: USDA-SCS

Plate 1.36d

43/44

DESIGN OF OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL
MINIMUM TAILWATER CONDITION (T_w < 0.5 DIAMETER)



Source: USDA-SCS

Plate 1.36c

44/44

PROJ. NO.: 87021.00
DESIGNED BY: wlo
CHECKED BY:

PROJ. NAME: UNIVERSITY SQUARE
LOCATION: JAMES CITY COUNTY
DATE: 8/8/87
Q = CiA 10 YEAR STORM

Smith Demer Normann
Engineers & Planners
2101 Executive Drive, Tower Box 50
Hampton, Virginia 23666
Telephone 804-826-4800 Norfolk 804-627-6900

STORM SEWER DESIGN COMPUTATIONS

FROM POINT	TO POINT	AREA DRAIN "A"	RUN-OFF COEF	C A		INLET TIME	RAIN FALL	RUNOFF "Q" C.F.S.		INVERT ELEV.		LENGTH OF PIPE	SLOPE OF PIPE	DIA. OF PIPE	VEL. OF PIPE	CAPA-CITY	FLOW TIME IN PIPE	REMARKS
		ACRES	C	INCRE-MENT	ACCUM-ULATED	MIN-UTES	INCHES	INCRE-MENT	ACCUM-ULATED	UPPER END	LOWER END	FT.	FT./FT.	INCHES	FT./SEC	C.F.S.	MIN-UTES	
1	2	0.74	0.9	0.67	0.67	5.0 / 5.0	7.1 / 7.1	4.76	4.76	90.97	90.88	35	0.0025	18"	3.3	5.25	0.2	FUTURE FLOW. PRESENT FLOW = 0.74 × 0.4 × 7.1 = 2.10 c.f.s.
2	3	0.20	0.9	0.18	0.85	5.0 / 5.2	7.1 / 7.06	1.28	6.00	90.63	90.41	110	0.0020	21"	3.3	7.07	0.6	
3	5	0.39	0.9	0.35	1.20	5.0 / 5.8	7.1 / 6.94	2.49	8.33	90.16	89.77	130	0.0030	21"	4.1	8.65	0.5	
4	5	0.40	0.9	0.36	0.36	5.0 / 5.0	7.1 / 7.1	2.56	2.56	90.59	90.31	110	0.0025	15"	2.9	3.24		
5	9	0.55	0.9	0.50	2.06	5.0 / 6.3	7.1 / 6.84	3.55	14.09	89.23	88.91	130	0.0025	27"	3.2	15.50	0.7	
6	8A	1.18	0.9	1.06	1.06	5.0 / 5.0	7.1 / 7.1	7.53	7.53	90.07	89.85	89	0.0025	21"	3.7	7.90	0.4	FUTURE FLOW. PRESENT FLOW = 1.18 × 0.4 × 7.1 = 3.35 c.f.s.
8A	8	0.15	0.9	0.14	1.20	5.0 / 5.4	7.1 / 6.95	0.99	8.34	89.60	89.47	65	0.0020	24"	3.6	10.11	0.3	
7	8	1.47	0.9	1.32	1.32	5.0 / 5.0	7.1 / 7.1	9.37	9.37	90.28	89.96	90	0.0035	21"	3.9	9.35	0.4	FUTURE FLOW. PRESENT FLOW = 1.47 × 0.4 × 7.1 = 4.17 c.f.s.
8	9	0.34	0.9	0.31	2.83	5.0 / 5.7	7.1 / 6.96	2.20	19.70	89.23	88.96	108	0.0025	30"	4.7	20.50	0.3	
9	10	0.43	0.9	0.39	5.28	5.0 / 7.0	7.1 / 6.70	2.77	35.38	88.41	88.18	78	0.0030	36"	5.9	36.48	0.2	
10	11	0.27	0.9	0.24	5.52	5.0 / 7.2	7.1 / 6.66	1.70	36.76	88.18	87.77	68	0.0030	36"	5.2	36.48	0.2	
11	12	0.46	0.9	0.41	5.93	5.0 / 7.4	7.1 / 6.62	2.91	39.26	86.97	86.58	48	0.0020	34 × 53	5.4	47.72	0.2	
12	13	0.34	0.9	0.31	6.24	5.0 / 7.6	7.1 / 6.58	2.20	41.06	86.58	86.82	30	0.0020	42"	5.3	44.99	0.1	
13	14	0.30	0.9	0.27	6.51	5.0 / 7.7	7.1 / 6.56	1.92	42.71	86.82	86.68	70	0.0020	42"	5.3	44.99	0.2	
14	18	0.30	0.9	0.27	6.78	5.0 / 7.9	7.1 / 6.52	1.92	44.21	86.68	86.59	45	0.0020	42"	5.3	44.99	0.1	
15	16	0.34	0.9	0.31	0.31	5.0 / 5.0	7.1 / 7.1	2.20	2.20	93.97	93.83	70	0.0020	15"	2.6	2.89	0.4	
16	17	0.34	0.9	0.31	0.62	5.0 / 5.4	7.1 / 7.02	2.20	4.35	93.58	93.50	38	0.0020	18"	3.0	4.70	0.2	
17	18	1.07	0.9	0.96	1.58	5.0 / 5.6	7.1 / 6.98	6.82	11.02	90.10	89.67	172	0.0025	24"	4.1	11.30		FUTURE FLOW. PRESENT FLOW = 1.07 × 0.4 × 7.1 = 3.04 c.f.s.
18	19	0.42	0.9	0.38	8.74	5.0 / 8.0	7.1 / 6.50	2.70	56.81	86.59	86.46	66	0.0020	48"	5.8	64.22	0.2	
19	20	0.63	0.9	0.57	9.31	5.0 / 8.2	7.1 / 6.45	4.05	60.05	86.46	86.20	130	0.0020	48"	5.8	64.22	0.4	
20	22	0.63	0.9	0.57	9.88	5.0 / 8.6	7.1 / 6.35	4.05	62.74	86.20	86.05	74	0.0020	48"	5.8	64.22	0.2	
21	22	1.06	0.9	0.95	0.95	5.0 / 5.0	7.1 / 7.1	6.75	6.75	90.32	89.95	184	0.0020	21"	3.4	7.06		FUTURE FLOW. PRESENT FLOW = 1.06 × 0.4 × 7.1 = 3.01 c.f.s.
22	23	0.52	0.9	0.47	11.30	5.0 / 8.8	7.1 / 6.30	3.34	71.19	86.05	85.89	65	0.0025	48"	6.5	71.80	0.2	
23	24	0.66	0.9	0.59	11.89	5.0 / 9.0	7.1 / 6.25	4.19	74.31	85.39	85.20	130	0.0015	54"	5.4	76.18	0.4	

ORIGINAL SHOPPING CENTER - STORM DRAIN CALCS

SHEET ___ OF ___

PROJ. NO.: 87021.00
DESIGNED BY: [illegible]
CHECKED BY:

PROJ. NAME: UNIVERSITY SQUARE
LOCATION: JAMES CITY COUNTY
DATE:

Smith Demer Normann
Engineers & Planners
2101 Executive Drive, Tower Box 50
Hampton, Virginia 23666
Telephone 804-826-4800 Norfolk 804-627-6900

STORM SEWER DESIGN COMPUTATIONS

FROM POINT	TO POINT	AREA DRAIN "A"	RUN-OFF COEF	C A		INLET TIME	RAIN FALL	RUNOFF "Q" C.F.S.		INVERT ELEV.		LENGTH OF PIPE	SLOPE OF PIPE	DIA. OF PIPE	VEL. OF PIPE	CAPA-CITY	FLOW TIME IN PIPE	REMARKS
		ACRES	C	INCRE-MENT	ACCUM-ULATED	MIN-UTES	INCHES	INCRE-MENT	ACCUM-ULATED	UPPER END	LOWER END	FT.	FT./FT.	INCHES	FT./SEC	C.F.S.	MIN-UTES	
24	26	0.67	0.9	0.60	12.49	5.0 / 9.4	7.1 / 6.15	4.26	76.81	85.20	85.10	65	0.0015	54"	4.8	76.18	0.2	
25	26	1.06	0.9	0.95	0.95	5.0 / 5.0	7.1 / 7.1	6.75	6.75	90.36	89.95	205	0.0020	21"	3.4	7.07		FUTURE FLOW. PRESENT FLOW = 1.06 x 0.4 x 2.1 = 3.01
26	28	0.54	0.9	0.49	13.93	5.0 / 9.6	7.1 / 6.10	3.48	84.97	85.10	84.98	60	0.0020	54"	6.3	82.97	0.2	
27	28	0.60	0.9	0.54	0.54	5.0 / 5.0	7.1 / 7.1	3.83	3.83	91.80	91.62	44	0.0040	15"	3.8	4.09		
28	30	0.43	0.9	0.39	14.86	5.0 / 9.8	7.1 / 6.05	2.97	89.90	84.98	84.16	329	0.0025	54"	7.0	98.31	0.3	
29	30	0.27	0.9	0.24	0.24	5.0 / 5.0	7.1 / 7.1	1.70	1.70	87.58	87.34	40	0.0059	15"	3.5	4.58		
30	OUT	0.38	0.9	0.34	15.44	5.0 / 10.1	7.1 / 5.98	2.41	92.33	82.00			0.0125	54"	13.3	219.9		
31	32	0.76	0.9	0.68	0.68	5.0 / 5.0	7.1 / 7.1	4.83	4.83	88.00	87.65	140	0.0025	18"	3.4	5.25	0.7	
32	33	0.58	0.9	0.52	1.20	5.0 / 5.7	7.1 / 6.96	3.69	8.35	87.40	87.04	120	0.0030	21"	4.1	8.65	0.5	
33	36	0.73	0.9	0.66	1.86	5.0 / 6.2	7.1 / 6.86	4.69	12.76	86.79	85.95	240	0.0035	24"	4.9	13.37	0.8	
34	35	0.50	0.9	0.45	0.45	5.0 / 5.0	7.1 / 7.1	3.2	3.2	88.80	87.90	180	0.0050	15"	4.0	4.58	0.7	
35	36	0.55	0.9	0.5	0.95	5.0 / 5.7	7.1 / 6.9	3.55	6.56	86.90	86.45	90	0.0050	18"	4.7	242		
37	36	1.24	0.9	1.12														FUTURE ROOF DRAINAGE
		0.54	0.9	0.49	1.61	5.0 / 5.0	7.1 / 7.1	3.48	11.43	87.03	86.22	274	0.0030	24"	4.2	12.98		
36	OUT	0.56	0.9	0.50	4.92	5.0 / 8.1	7.1 / 6.5	3.55	31.98	85.45			0.0136	36"	10.4	78.24		

SHEET ___ OF ___

STORM SEWER COMPUTATION SHEET

Form Rev. 1/3/88

SMITH DEMER NORMANN
Engineers, Planners, Surveyors
and Landscape Architects
2101 Executive Drive
Hampton, Virginia

Calculated By: JSD
Checked By:
N: 0.013
Storm Frequency: 10 YR

Job No. 87021.06
Project: WILLIAMSBURG CROSSING
PHASE I REV.
Sheet 1 of 2
REV 3/8/88

Rainfall Constants a=201.0 b= 23.9

FROM POINT	TO POINT	AREA Ac.	RUNOFF COEF.	CxA	ACCUM. CxA	INLET TIME Min.	Tc Min.	INCR. INTEN. in/hr	SYSTEM INTEN. in/hr	Q INCR. cfs	Q SYS. cfs	PIPE SIZE in.	FRICT. SLOPE ft/ft	DESIGN SLOPE ft/ft	CAP. FULL cfs	DESIGN VEL. ft/sec	LENGTH ft.	TIME min.	INVERT IN	INVERT OUT
8	9	0.49	0.9	0.44	0.44	5	5.0	6.96	6.96	3.07	3.07	18	0.0009	0.002	4.70	2.89	115	0.66	90.46	90.23
9	12	0.43	0.9	0.39	0.83	5	5.8	6.96	6.77	2.69	5.60	21	0.0013	0.002	7.09	3.27	168	0.86	90.02	89.68
10	11	1.09	0.9	0.98	0.98	5	5.0	6.96	6.96	6.82	6.82	21	0.0019	0.002	7.09	3.39	57	0.28	89.13	89.02
11	12	0.32	0.9	0.29	1.27	5	5.3	6.96	6.88	2.00	8.74	24	0.0015	0.002	10.12	3.66	108	0.49	82.77	82.55
					2.10		6.7													
12	17	0.54	0.9	0.49	2.59	5	6.7	6.96	6.57	3.38	16.99	30	0.0017	0.002	18.34	4.30	130	0.50	88.06	87.80
13	14	1.38	0.9	1.24	1.24	5	5.0	6.96	6.96	8.64	8.64	24	0.0015	0.002	10.12	3.62	90	0.41	89.25	89.07
14	16	0.15	0.9	0.14	1.38	5	5.5	6.96	6.84	0.94	9.41	24	0.0017	0.002	10.12	3.67	65	0.29	89.07	88.94
15	16	1	0.9	0.90	0.90	5	5.0	6.96	6.96	6.26	6.26	21	0.0016	0.002	7.09	3.33	80	0.40	89.44	89.28
					2.28		5.8													
16	17	0.3	0.9	0.27	2.55	5	5.8	6.96	6.77	1.88	17.26	30	0.0018	0.002	18.34	4.26	108	0.42	88.48	88.26
					5.14		7.2													
17	18	0.42	0.9	0.38	5.52	5	7.2	6.96	6.46	2.63	35.66	36	0.0029	0.003	36.53	5.95	75	0.21	87.44	87.22
18	19	0.27	0.9	0.24	5.76	5	7.4	6.96	6.42	1.69	37.00	42	0.0014	0.0015	38.97	4.65	68	0.24	87.22	87.12
19	20	0.49	0.9	0.44	6.20	5	7.7	6.96	6.36	3.07	39.45	42	0.0015	0.002	44.99	5.32	52	0.16	87.12	87.02
20	21	0.62	0.9	0.56	6.76	5	7.9	6.96	6.32	3.88	42.73	42	0.0018	0.002	44.99	5.38	130	0.40	87.02	86.76
21	22	0.61	0.9	0.55	7.31	5	8.3	6.96	6.24	3.82	45.62	42	0.0021	0.0025	50.30	5.98	40	0.11	86.76	86.66
22	23	0.17	0.9	0.15	7.46	5	8.4	6.96	6.22	1.06	46.44	42	0.0021	0.0025	50.30	6.00	40	0.11	86.66	86.56
23	26	0.17	0.9	0.15	7.62	5	8.5	6.96	6.20	1.06	47.24	42	0.0022	0.0025	50.30	6.02	45	0.12	86.56	86.45
24	25	0.89	0.9	0.80	0.80	5	5.0	6.96	6.96	5.57	5.57	21	0.0012	0.002	7.09	3.31	125	0.63	92.55	92.30
25	26	0.9	0.9	0.81	1.61	5	5.7	6.96	6.79	5.63	10.94	21	0.0048	0.005	11.20	5.37	175	0.54	92.30	91.43
					9.23		8.6													
26	27	0.43	0.9	0.39	9.62	5	8.6	6.96	6.18	2.69	59.48	48	0.0017	0.002	64.24	5.88	68	0.19	85.95	85.81
27	27a	0.46	0.9	0.41	10.03	5	8.8	6.96	6.15	2.88	61.66	48	0.0018	0.002	64.24	5.86	48	0.14	85.81	85.71
27a	27b	0	0.9	0.00	10.03	5	8.9	6.96	6.13	0.00	61.47	48	0.0018	0.002	64.24	5.84	55	0.16	85.65	85.54
27b	30	0.52	0.9	0.47	10.50	5	9.0	6.96	6.11	3.25	64.14	48	0.0020	0.002	64.24	5.88	90	0.25	85.54	85.36
*28	29	0.52	0.9	0.47	0.47	5	5.0	6.96	6.96	3.25	3.27	18	0.0010	0.002	4.70	2.90	68	0.39	90.42	90.28
*29	30	0.95	0.9	0.86	1.33	5	5.4	6.96	6.86	5.95	9.09	24	0.0016	0.002	10.12	3.65	55	0.25	89.78	89.67
					10.50															
30	36	0.95	0.9	0.86	11.36	5	9.3	6.96	6.05	5.95	68.75	48	0.0023	0.0025	71.82	6.54	222	0.57	85.36	84.81
31	32	1.34	0.9	1.21	1.21	5	5.0	6.96	6.96	8.39	8.42	21	0.0028	0.003	8.68	4.13	192	0.77	89.28	88.70
32	32a	0.74	0.9	0.67	1.88	5	5.8	6.96	6.77	4.63	12.70	24	0.0031	0.0035	13.38	4.89	65	0.22	88.45	88.22
32a	35	0.12	0.9	0.11	1.98	5	6.0	6.96	6.72	0.75	13.34	24	0.0035	0.004	14.31	5.21	200	0.64	88.22	87.42

*33	35	0.9	0.9	0.81	0.81	5	5.0	6.96	6.96	5.63	5.63	18	0.0029	0.0035	6.21	4.02	60	0.25	87.61	87.40
34	35	0.37	0.9	0.33	0.33	5	5.0	6.96	6.96	2.32	2.30	15	0.0013	0.002	2.89	2.63	48	0.30	91.59	91.49
					2.31		6.6													
35	36	1.13	0.9	1.02	3.33	5	6.6	6.96	6.59	7.07	21.93	36	0.0011	0.002	29.83	4.67	40	0.14	87.99	87.91
					14.70		9.9													
36	39	0	0.9	0.00	14.70	5	9.9	6.96	5.95	0.00	87.42	54	0.0020	0.002	87.94	6.33	290	0.76	84.31	83.73
37	39	1.1	0.9	0.99	0.99	5	5.0	6.96	6.96	6.89	6.89	21	0.0019	0.002	7.09	3.38	28	0.14	88.11	88.05
38	39	0.18	0.9	0.16	0.16	5	5.0	6.96	6.96	1.13	1.13	15	0.0003	0.002	2.89	2.23	48	0.36	87.56	87.46
					15.85		10.7													
39	OUT	0	0.9	0.00	15.85	5	10.7	6.96	5.81	0.00	92.08	54	0.0022	0.0025	98.32	7.10	50	0.12	82.00	81.88
1	2	0.61	0.9	0.55	0.55	5	5.0	6.96	6.96	3.82	3.82	18	0.0013	0.002	4.70	2.98	145	0.81	88.11	87.82
2	4	0.57	0.9	0.51	1.06	5	5.8	6.96	6.77	3.57	7.19	21	0.0021	0.0025	7.92	3.77	105	0.46	87.57	87.31
1																				
3	4	0.21	0.9	0.19	0.19	5	5.0	6.96	6.96	1.31	1.31	15	0.0004	0.01	6.46	4.24	100	0.39	90.40	89.40
					1.25		6.3													
4	7	1.09	0.9	0.98	2.23	5	6.3	6.96	6.66	6.82	14.85	27	0.0023	0.0025	15.49	4.46	253	0.94	86.81	86.18
5	7	0.88	0.9	0.79	0.79	5	5.0	6.96	6.96	5.51	5.51	21	0.0012	0.002	7.09	3.27	152	0.77	88.99	88.69
6	7	0.5	0.9	0.45	0.45	5	5.0	6.96	6.96	3.13	3.13	15	0.0023	0.01	6.46	5.23	132	0.42	91.07	89.75
					3.47		7.2													
7	OUT	0.67	0.9	0.60	4.07	5	7.2	6.96	6.46	4.19	26.32	36	0.0016	0.002	29.83	4.83	120	0.41	85.45	85.21

*Future Storm Sewer

STORM SEWER COMPUTATION SHEET

Form Rev. 1/3/88

SMITH DEMER NORMANN
Engineers, Planners, Surveyors
and Landscape Architects
2101 Executive Drive
Hampton, Virginia

Calculated By: JSD
Checked By:
N: 0.013
Storm Frequency: 10 YR

Job No. 87021.06
Project: WILLIAMSBURG CROSSING
PHASE I REV.
Sheet 1 of 2
REV 3/8/88

Rainfall Constants a=201.0 b= 23.9

FROM POINT	TO POINT	AREA Ac.	RUNOFF COEF.	CxA	ACCUM. CxA	INLET TIME Min.	Tc Min.	INCR. INTEN. in/hr	SYSTEM INTEN. in/hr	Q INCR. cfs	Q SYS. cfs	PIPE SIZE in.	FRICT. SLOPE ft/ft	DESIGN SLOPE ft/ft	CAP. FULL cfs	DESIGN VEL. ft/sec	LENGTH ft.	TIME min.	INVERT IN	INVERT OUT
8	9	0.49	0.9	0.44	0.44	5	5.0	6.96	6.96	3.07	3.07	18	0.0009	0.002	4.70	2.89	115	0.66	90.46	90.23
9	12	0.43	0.9	0.39	0.83	5	5.8	6.96	6.77	2.69	5.60	21	0.0013	0.002	7.09	3.27	168	0.86	90.02	89.68
10	11	1.09	0.9	0.98	0.98	5	5.0	6.96	6.96	6.82	6.82	21	0.0019	0.002	7.09	3.39	57	0.28	89.13	89.02
11	12	0.32	0.9	0.29	1.27	5	5.3	6.96	6.88	2.00	8.74	24	0.0015	0.002	10.12	3.66	108	0.49	82.77	82.55
					2.10		6.7													
12	17	0.54	0.9	0.49	2.59	5	6.7	6.96	6.57	3.38	16.99	30	0.0017	0.002	18.34	4.30	130	0.50	88.06	87.80
13	14	1.38	0.9	1.24	1.24	5	5.0	6.96	6.96	8.64	8.64	24	0.0015	0.002	10.12	3.62	90	0.41	89.25	89.07
14	16	0.15	0.9	0.14	1.38	5	5.5	6.96	6.84	0.94	9.41	24	0.0017	0.002	10.12	3.67	65	0.29	89.07	88.94
15	16	1	0.9	0.90	0.90	5	5.0	6.96	6.96	6.26	6.26	21	0.0016	0.002	7.09	3.33	80	0.40	89.44	89.28
					2.28		5.8													
16	17	0.3	0.9	0.27	2.55	5	5.8	6.96	6.77	1.88	17.26	30	0.0018	0.002	18.34	4.26	108	0.42	88.48	88.26
					5.14		7.2													
17	18	0.42	0.9	0.38	5.52	5	7.2	6.96	6.46	2.63	35.66	36	0.0029	0.003	36.53	5.95	75	0.21	87.44	87.22
18	19	0.27	0.9	0.24	5.76	5	7.4	6.96	6.42	1.69	37.00	42	0.0014	0.0015	38.97	4.65	68	0.24	87.22	87.12
19	20	0.49	0.9	0.44	6.20	5	7.7	6.96	6.36	3.07	39.45	42	0.0015	0.002	44.99	5.32	52	0.16	87.12	87.02
20	21	0.62	0.9	0.56	6.76	5	7.9	6.96	6.32	3.88	42.73	42	0.0018	0.002	44.99	5.38	130	0.40	87.02	86.76
21	22	0.61	0.9	0.55	7.31	5	8.3	6.96	6.24	3.82	45.62	42	0.0021	0.0025	50.30	5.98	40	0.11	86.76	86.66
22	23	0.17	0.9	0.15	7.46	5	8.4	6.96	6.22	1.06	46.44	42	0.0021	0.0025	50.30	6.00	40	0.11	86.66	86.56
23	26	0.17	0.9	0.15	7.62	5	8.5	6.96	6.20	1.06	47.24	42	0.0022	0.0025	50.30	6.02	45	0.12	86.56	86.45
24	25	0.89	0.9	0.80	0.80	5	5.0	6.96	6.96	5.57	5.57	21	0.0012	0.002	7.09	3.31	125	0.63	92.55	92.30
25	26	0.9	0.9	0.81	1.61	5	5.7	6.96	6.79	5.63	10.94	21	0.0048	0.005	11.20	5.37	175	0.54	92.30	91.43
					9.23		8.6													
26	27	0.43	0.9	0.39	9.62	5	8.6	6.96	6.18	2.69	59.48	48	0.0017	0.002	64.24	5.88	68	0.19	85.95	85.81
27	27a	0.46	0.9	0.41	10.03	5	8.8	6.96	6.15	2.88	61.66	48	0.0018	0.002	64.24	5.86	48	0.14	85.81	85.71
27a	27b	0	0.9	0.00	10.03	5	8.9	6.96	6.13	0.00	61.47	48	0.0018	0.002	64.24	5.84	55	0.16	85.65	85.54
27b	30	0.52	0.9	0.47	10.50	5	9.0	6.96	6.11	3.25	64.14	48	0.0020	0.002	64.24	5.88	90	0.25	85.54	85.36
*28	29	0.52	0.9	0.47	0.47	5	5.0	6.96	6.96	3.25	3.27	18	0.0010	0.002	4.70	2.90	68	0.39	90.42	90.28
*29	30	0.95	0.9	0.86	1.33	5	5.4	6.96	6.86	5.95	9.09	24	0.0016	0.002	10.12	3.65	55	0.25	89.78	89.67
					10.50															
30	36	0.95	0.9	0.86	11.36	5	9.3	6.96	6.05	5.95	68.75	48	0.0023	0.0025	71.82	6.54	222	0.57	85.36	84.81
31	32	1.34	0.9	1.21	1.21	5	5.0	6.96	6.96	8.39	8.42	21	0.0028	0.003	8.68	4.13	192	0.77	89.28	88.70
32	32a	0.74	0.9	0.67	1.88	5	5.8	6.96	6.77	4.63	12.70	24	0.0031	0.0035	13.38	4.89	65	0.22	88.45	88.22
32a	35	0.12	0.9	0.11	1.98	5	6.0	6.96	6.72	0.75	13.34	24	0.0035	0.004	14.31	5.21	200	0.64	88.22	87.42

*33	35	0.9	0.9	0.81	0.81	5	5.0	6.96	6.96	5.63	5.63	18	0.0029	0.0035	6.21	4.02	60	0.25	87.61	87.40
34	35	0.37	0.9	0.33	0.33	5	5.0	6.96	6.96	2.32	2.30	15	0.0013	0.002	2.89	2.63	48	0.30	91.59	91.49
					2.31		6.6													
35	36	1.13	0.9	1.02	3.33	5	6.6	6.96	6.59	7.07	21.93	36	0.0011	0.002	29.83	4.67	40	0.14	87.99	87.91
					14.70		9.9													
36	39	0	0.9	0.00	14.70	5	9.9	6.96	5.95	0.00	87.42	54	0.0020	0.002	87.94	6.33	290	0.76	84.31	83.73
37	39	1.1	0.9	0.99	0.99	5	5.0	6.96	6.96	6.89	6.89	21	0.0019	0.002	7.09	3.38	28	0.14	88.11	88.05
38	39	0.18	0.9	0.16	0.16	5	5.0	6.96	6.96	1.13	1.13	15	0.0003	0.002	2.89	2.23	48	0.36	87.56	87.46
					15.85		10.7													
39	OUT	0	0.9	0.00	15.85	5	10.7	6.96	5.81	0.00	92.08	54	0.0022	0.0025	98.32	7.10	50	0.12	82.00	81.88
1	2	0.61	0.9	0.55	0.55	5	5.0	6.96	6.96	3.82	3.82	18	0.0013	0.002	4.70	2.98	145	0.81	88.11	87.82
2	4	0.57	0.9	0.51	1.06	5	5.8	6.96	6.77	3.57	7.19	21	0.0021	0.0025	7.92	3.77	105	0.46	87.57	87.31
1																				
3	4	0.21	0.9	0.19	0.19	5	5.0	6.96	6.96	1.31	1.31	15	0.0004	0.01	6.46	4.24	100	0.39	90.40	89.40
					1.25		6.3													
4	7	1.09	0.9	0.98	2.23	5	6.3	6.96	6.66	6.82	14.85	27	0.0023	0.0025	15.49	4.46	253	0.94	86.81	86.18
5	7	0.88	0.9	0.79	0.79	5	5.0	6.96	6.96	5.51	5.51	21	0.0012	0.002	7.09	3.27	152	0.77	88.99	88.69
6	7	0.5	0.9	0.45	0.45	5	5.0	6.96	6.96	3.13	3.13	15	0.0023	0.01	6.46	5.23	132	0.42	91.07	89.75
					3.47		7.2													
7	OUT	0.67	0.9	0.60	4.07	5	7.2	6.96	6.46	4.19	26.32	36	0.0016	0.002	29.83	4.83	120	0.41	85.45	85.21

*Future Storm Sewer

PROJECT Food Lion Expansion @ Williamsburg Crossing
JOB NO. 88079-042 (51)
DATE 12/15/97 SHEET 1 OF
DESIGN FORMULA AC1=Q FREQ. 10

INCRE / ACCUM

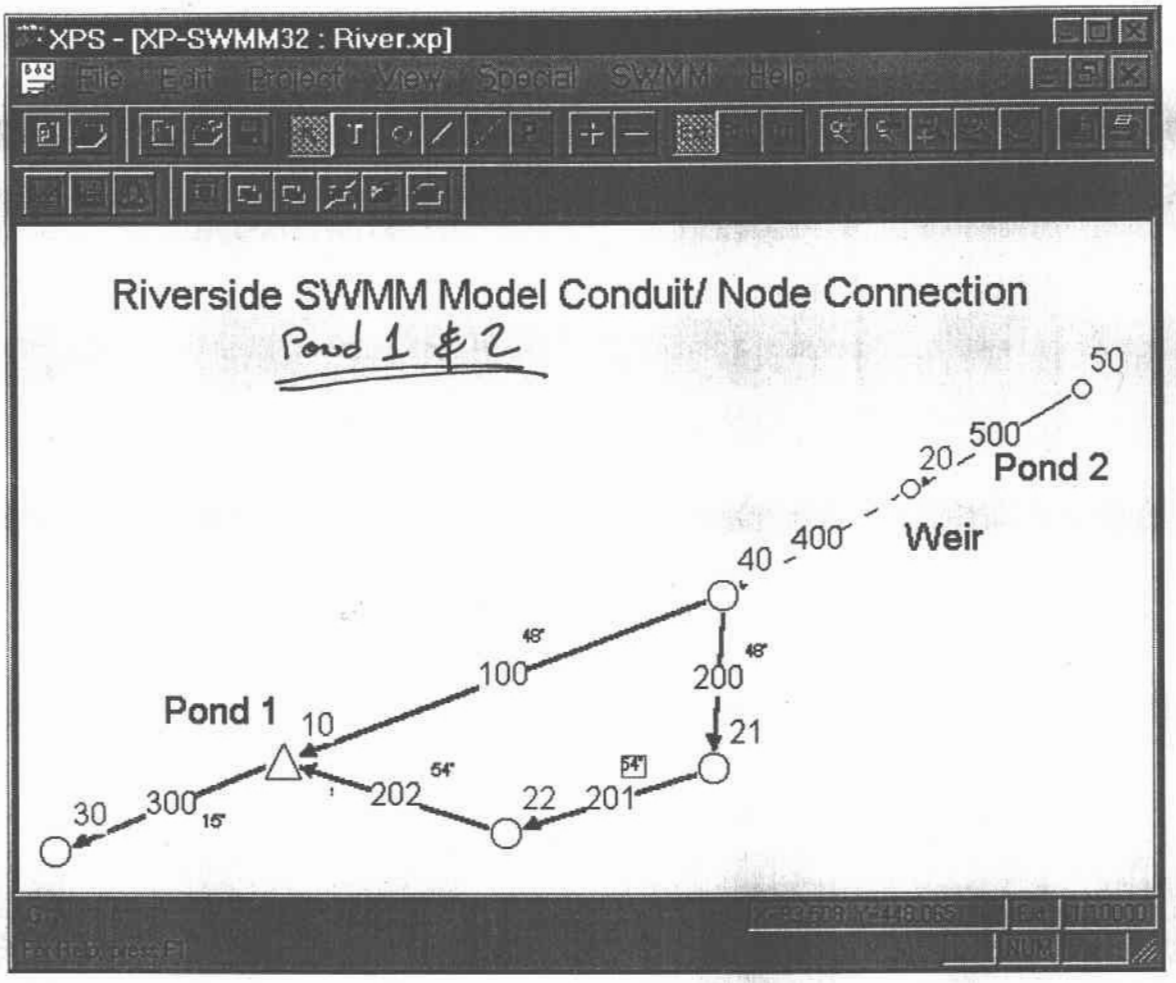
STORM SEWER DESIGN COMPUTATIONS

$i = \frac{a}{b+t}$ a = 201 b = 23.9

COMPUTED BY WEH CHECKED BY

LANGLEY AND McDONALD
ENGINEERS·PLANNERS·SURVEYORS
VIRGINIA BEACH, VIRGINIA

LOCATION STREET	LOCATION POINT	AREA ACRES "A"	RUNOFF COEF. "C"	"A" x "C" INCRE.	"A" x "C" ACCUM.	INLET TIME MIN.	RAIN INTEN. INCH	RUNOFF Q CFS	PIPE (DITCH) SIZE	CAPACITY CFS	VELO. FT./SEC.	LENGTH FEET	SLOPE FT/FT	FALL FT.	INVERT ELEV. UP	INVERT ELEV. DOWN	TIME IN ~~REMARKS~~ PIPE
OUT PARCELS	F.L. 10	2.35	0.8		1.88	6.5	6.61	12.4	24"	16.0	5.8	2' stub	0.0050	0.01			
F.L. 10	F.L. 12	0.22	0.8	0.18	2.06	5.0 / 6.5	6.95 / 6.61	1.25 / 13.6	24"	16.0	5.8	156	0.0050	0.78			0.45
F.L. 12	FL 14	1.34	0.8	1.07	3.13	5.0 / 6.95	6.95 / 6.51	7.43 / 20.4	24"	20.8	7.2	120	0.0080	0.96			0.28
FL 14	FL 16	0.95	0.8	0.76	3.89	5.0 / 7.23	6.95 / 6.46	5.28 / 25.1	30"	26.8	6.0	118	0.0040	0.47			0.33
FL 16	FL 20	0.44	0.8	0.35	4.24	5.0 / 7.56	6.95 / 6.39	2.43 / 27.1	30"	28.2	6.4	248	0.0045	1.12			0.65
FL 18	FL 20	0.20	0.8	0.16		5.0	6.95	1.11	12"	1.80	2.5	40	0.0025	0.10			0.27
FL 20	FL 22	0.17	0.8	0.14	4.54	5.0 / 8.21	6.95 / 6.26	0.97 / 28.4	30"	29.8	6.6	200	0.0050	1.00			0.51
FL 22	FL 24	—	—	—	4.54	8.72	6.16	28.0	30"	74.0	8.0	300	0.0300	9.00			0.62
FL 24	FL 26	—	—	—	4.54	9.34	6.05	27.4	36"	29.0	4.5	24	0.0018	0.04			0.09
		5.7ac															

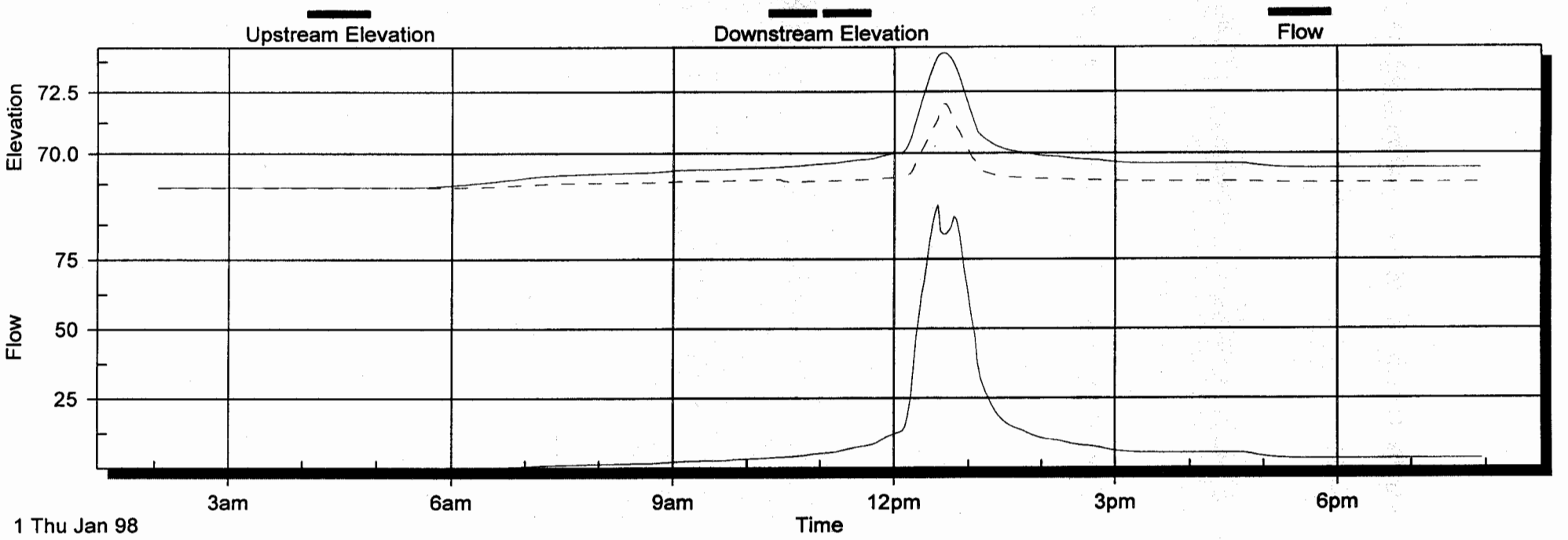


ORIGINAL DESIGN

-Revised later to use 12" pipe release - dec. from 15" Ø

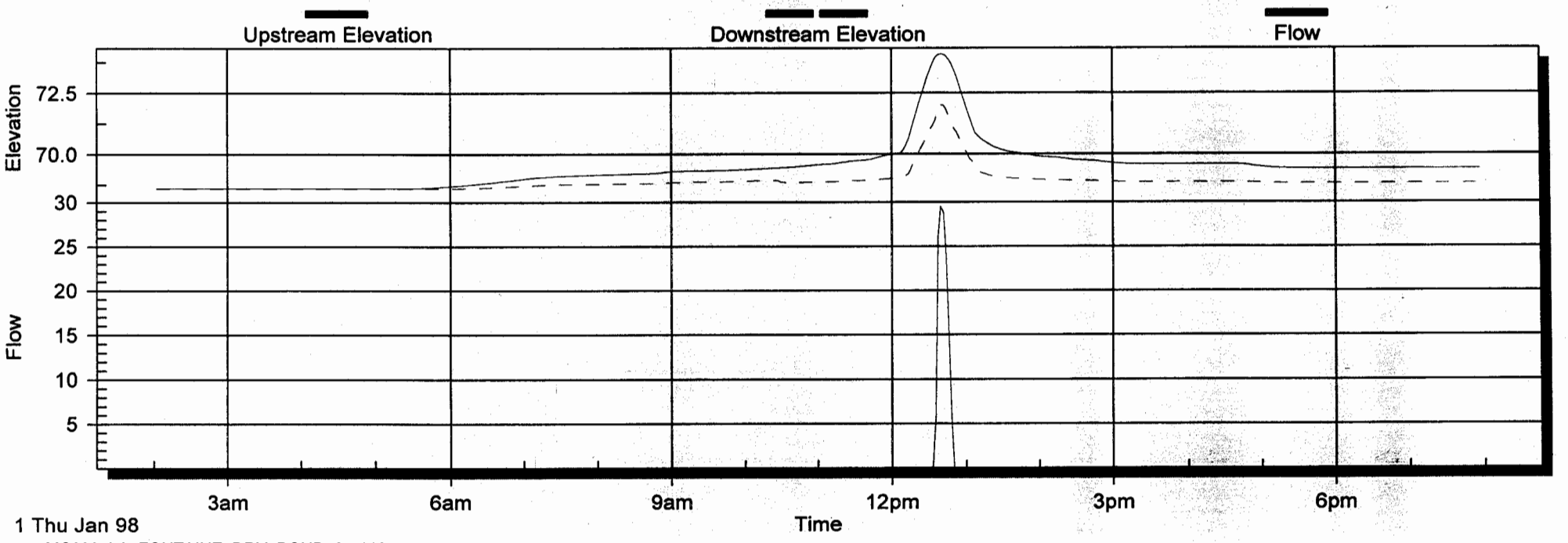
Diversion ORF # 1 from 20 to 40

[Max Flow = 94.33][Max Velocity = 13.50]



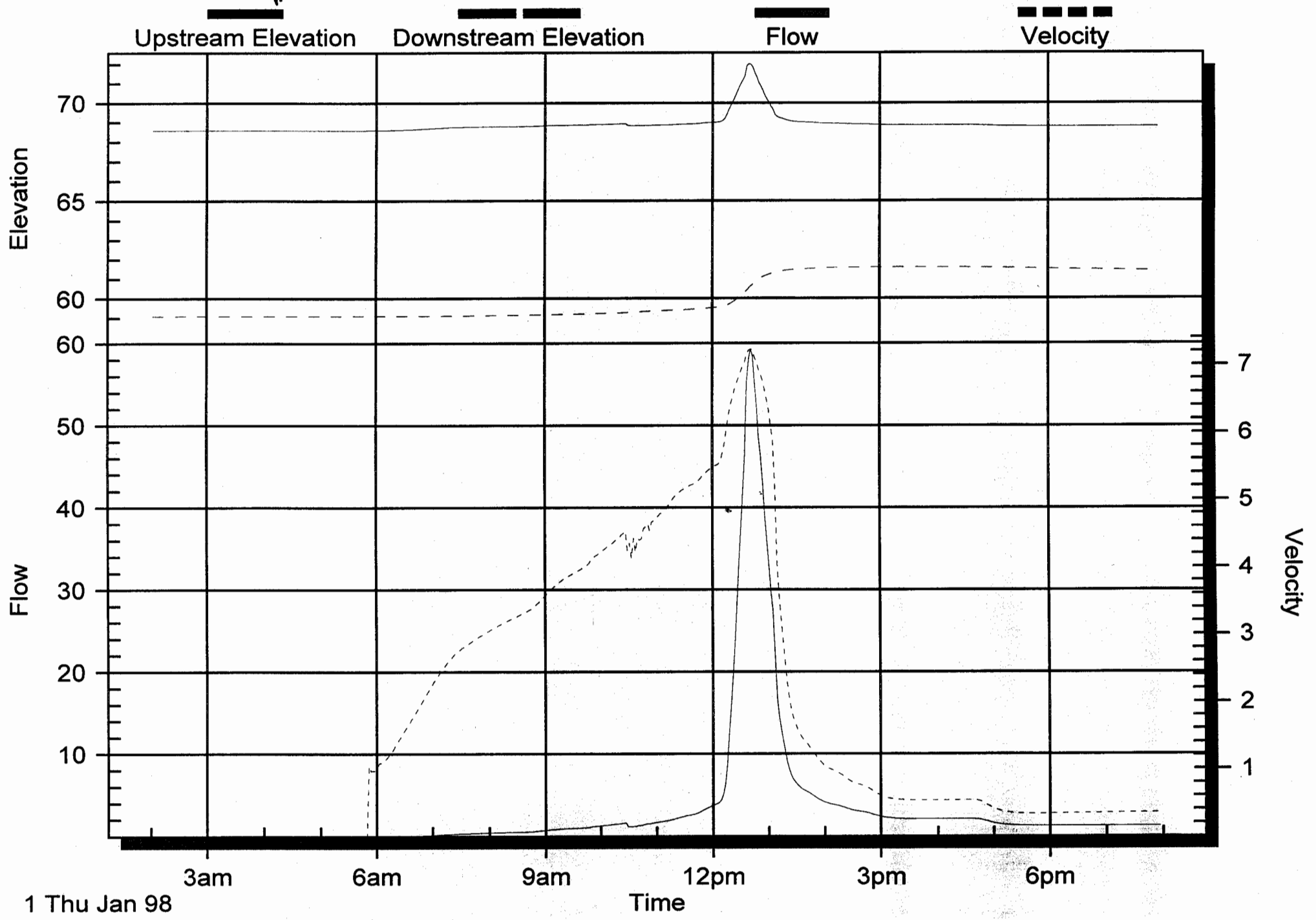
Diversion WEIR # 1 from 20 to 40

[Max Flow = 29.51][Max Velocity = 0.00]



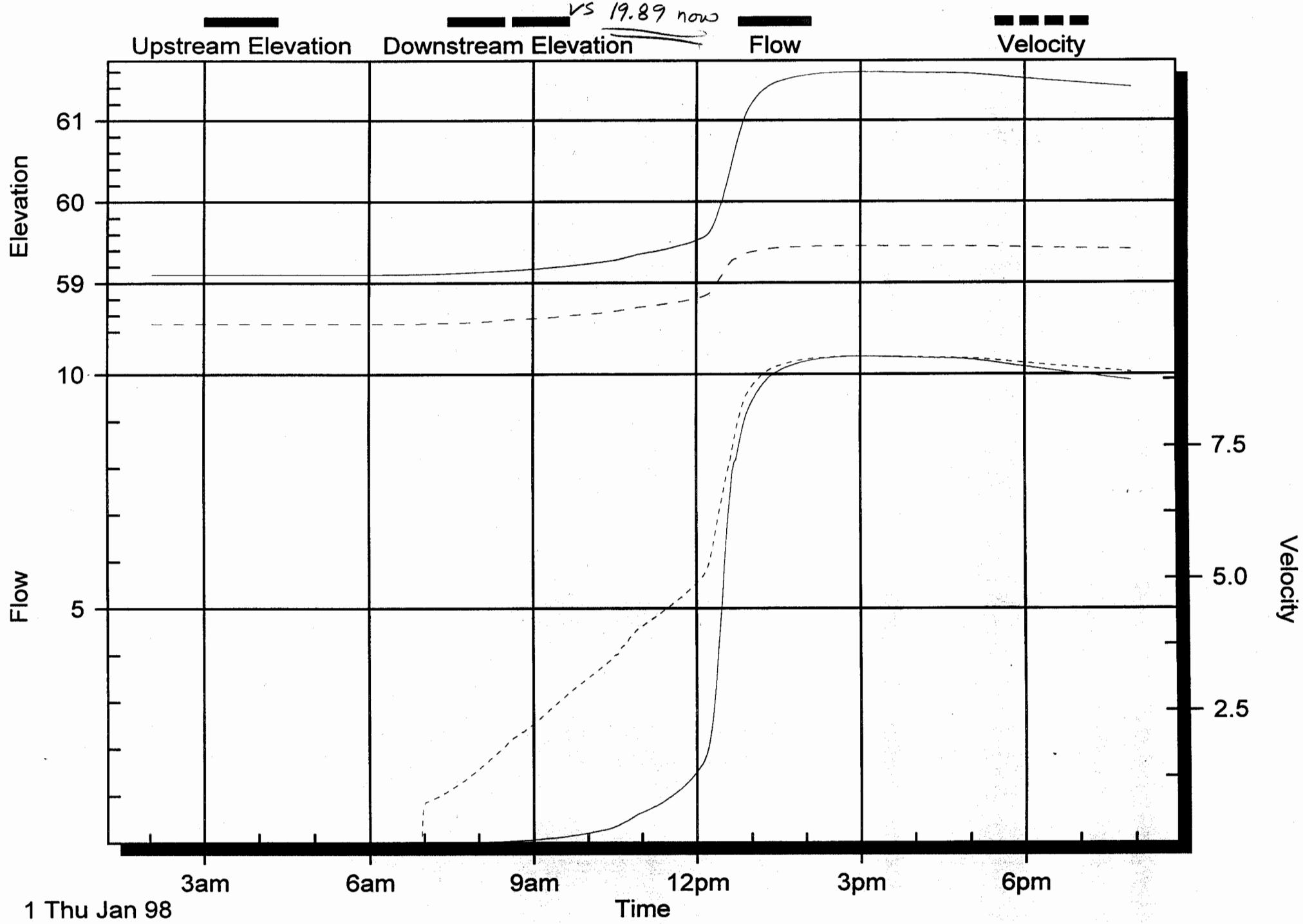
Conduit 100 from 40 to 10

[Max Flow = 59.30][Max Velocity = 7.23]



Conduit 300 from 10 to 30

[Max Flow = 10.38][Max Velocity = 9.19]



```
Input File :          C:\XPS\River.XP
Current Directory:    C:\PROGRA~1\XPS\XP-SWM~1
Executable Name:      C:\Program Files\XPS\XP-SWMM32\XPSWMM32.EXE
Read      0 line(s) and found    0 items(s) from your cfg file.
          *==============================================*
          |                   XP - SWMM                  |
          |           Storm Water Management Model       |
          |                  Version 5.10a               |
          |==============================================|
          |                Developed by                  |
          |==============================================|
          |           XP Software Inc. and Pty. Ltd.     |
          |                                              |
          |              Based on the U.S. EPA           |
          |   Storm Water Management Model Version 4.40  |
          |                                              |
          |            Originally Developed by           |
          |             Metcalf & Eddy, Inc.             |
          |            University of Florida             |
          |          Camp Dresser & McKee Inc.           |
          |              September 1970                  |
          |                                              |
          |            EPA-SWMM is maintained by         |
          |            Oregon State University           |
          |            Camp Dresser & McKee Inc.         |
          |==============================================|
          |   XP Software         August 7, 1997         |
          |       Data File Version --->     7.1          |
          |==============================================|
          |     If problems occur in running this model  |
          |     please contact XP Software - Australia   |
          |                 or XP Software - U.S.A.      |
          |     Phone +61-6 253-1844  in Australia       |
          |     Fax # +61-6 253-1847  in Australia       |
          |     Phone (813)-886-7724  in U.S.A.          |
          |     Fax # (813)-885-4198  in U.S.A.          |
          *==============================================*


*==========================================================*
|       Input and Output file names by SWMM Layer          |
*==========================================================*

Input File  to Layer #     1 C:\XPS\INTER.INT
Output File to Layer #     1 C:\XPS\INTER.INT

*==========================================================*
```

```
|   Special command line arguments in XP-SWMM. This section |
|   now includes program defaults. $Keywords are the program|
|   defaults.  Other Keywords are from the SWMMCOM.CFG file.|
|   or the command line or any cfg file on the command line.|
|   Examples include these in the file xpswm.bat under the  |
|   section :solve or in the windows version XPSWMM32 in the|
|   file solve.bat                                          |
|                                                           |
|   Note: the cfg file should be in the subdirectory swmxp  |
|         or defined by the set variable in the xpswm.bat   |
|         file.  Some examples of the command lines possible|
|         are shown below:                                  |
|                                                           |
|   swmmd swmmcom.cfg                                       |
|   swmmd my.cfg                                            |
|   swmmd nokeys nconv5 perv extranwq                       |
*===========================================================*
```

$powerstation	0.0000	0	2
$perv	0.0000	0	4
$oldegg	0.0000	0	7
$as	0.0000	0	11
$noflat	0.0000	0	21
$oldomega	0.0000	0	24
$oldvol	0.0000	1	28
$implicit	0.0000	1	29
$oldhot	0.0000	1	31
$oldscs	0.0000	0	33
$flood	0.0000	1	40
$nokeys	0.0000	0	42
$pzero	0.0000	0	55
$oldvol2	0.0000	2	59
$storage_97	0.0000	1	62
$oldhot1	0.0000	0	63
$pumpwt	0.0000	1	70
$ecloss	0.0000	1	77
$exout	0.0000	0	97
$neweir	0.0000	1	153
$ncmid	0.0000	0	164
$h_ellipse	0.0000	1	270
$v_ellipse	0.0000	1	271
$arch	0.0000	2	272
$fast_pump	0.0000	1	288
$new_nl_97	0.0000	2	290
$best97	0.0000	1	294
$newbound	0.0000	1	295

```
*==============================================================*
| Parameter Values on the Tapes Common Block.These are the |
| values read from the data file and dynamically allocated |
| by the model for this simulation.                        |
*==============================================================*

 Number of Subcatchments in the Runoff Block (NW)....      0
 Number of Channel/Pipes in the Runoff Block (NG)....      0
 Runoff Water quality constituents (NRQ)............       0
 Runoff Land Uses per Subcatchment (NLU)............       0
 Number of Elements in the Transport Block (NET).....      0
 Number of Storage Junctions in Transport (NTSE).....      0
 Number of Input Hydrographs in Transport (NTH......       0
 Number of Elements in the Extran Block (NEE)........      9
 Number of Groundwater Subcatchments in Runoff (NGW).      0
 Number of Interface locations for all Blocks (NIE)..      9
 Number of Pumps in Extran (NEP)....................       0
 Number of Orifices in Extran (NEO).................       1
 Number of Tide Gates/Free Outfalls in Extran (NTG)..      1
 Number of Extran Weirs (NEW).......................       1
 Number of scs hydrograph points....................    2197
 Number of Extran printout locations (NPO)..........       0
 Number of Tide elements in Extran (NTE)............       1
 Number of Natural channels (NNC)...................       0
 Number of Storage junctions in Extran (NVSE)........      1
 Number of Time history data points in Extran(NTVAL).      0
 Number of Variable storage elements in Extran (NVST)     14
 Number of Input Hydrographs in Extran (NEH)........       0
 Number of Particle sizes in Transport Block (NPS)...      0
 Number of User defined conduits (NHW)..............       9
 Number of Connecting conduits in Extran (NECC)......     20
 Number of Upstream elements in Transport (NTCC).....     10
 Number of Storage/treatment plants (NSTU)..........       0
 Number of Values for R1 lines in Transport (NR1)....      0
 Number of Nodes to be allowed for (NNOD)...........       9
 Number of Plugs in a Storage Treatment Unit........       1


#######################################################
#    Entry made to the EXTRAN Layer(Block) of SWMM    #
#    Last Updated August,1997 by XP Software          #

    Riverside Two Pond Analysis
    Proposed Conditions 10 Year Storm


*==============================================================*
```

```
|          EXTRAN TABLES IN THE OUTPUT FILE                  |
|  These are the more important tables in the output file.   |
|  You can use your editor to find the table numbers,        |
|  for example: search for Table E20 to check continuity.    |
|  This output file can be imported into a Word Processor    |
|  and printed on US letter or A4 paper using portrait       |
|  mode, courier font, a size of 8 pt. and margins of 0.75   |
|                                                            |
| Table E1  - Basic Conduit Data                             |
| Table E2  - Conduit Factor Data                            |
| Table E3  - Junction Data                                  |
| Table E4  - Conduit Connectivity Data                      |
| Table E5  - Junction Time Step Limitation Summary          |
| Table E5a - Conduit Explicit Condition Summary             |
| Table E6  - Final Model Condition                          |
| Table E7  - Extran Iteration Summary                       |
| Table E8  - Junction Time Step Limitation Summary          |
| Table E9  - Junction  Summary  Statistics                  |
| Table E10 - Conduit   Summary  Statistics                  |
| Table E11 - Area assumptions used in the analysis          |
| Table E12 - Mean conduit information                       |
| Table E13 - Channel losses(H) and culvert info             |
| Table E14 - Natural Channel Overbank Flow Information      |
| Table E15 - Spreadsheet Info List                          |
| Table E16 - New Conduit Output Section                     |
| Table E17 - Pump Operation                                 |
| Table E18 - Junction Continuity Error                      |
| Table E19 - Junction Inflow Sources                        |
| Table E20 - Junction Flooding and Volume List              |
| Table E21 - Extran continuity balance at simulation end    |
| Table E22 - Model Judgement Section                        |
*============================================================*

Time Control from Extran Job Control
Year.........      98 Month.......      1
Day..........       1 Hour........      2
Minute.......       0 Second......      0


Control information for simulation
----------------------------------

Integration cycles................      6480
Length of integration step is......    10.00 seconds
Simulation length.................     18.00 hours
Do not create equiv. pipes(NEQUAL).        0
Use U.S. customary units for I/O...        0
```

```
Printing starts in cycle..........      2880
Intermediate printout intervals of.       90 cycles
Intermediate printout intervals of.    15.00 minutes
Summary printout intervals of......       90 cycles
Summary printout time interval of..    15.00 minutes
Hot start file parameter (REDO)....        0
Initial time......................      2.00 hours

Iteration variables: SURTOL........    0.0010
                     SURJUN........    0.0060 mm or inch
                     QREF..........    1.0000
    Minimum depth (m or ft)........    0.0033
    Underrelaxation parameter......    0.6500
    Time weighting parameter.......    0.6500
    Default Expansion/Contraction K    0.0000
    Default Entrance/Exit K........    0.0000
Default surface area of junctions..     13.00 square feet.
NJSW input hydrograph junctions....     0
     or user defined hydrographs...
```

==========
| Table E1 - Conduit Data |
==========

Inp Num	Conduit Name	Length (ft)	Conduit Class	Area (ft^2)	Manning Coef.	Max Width (ft)	Depth (ft)	Trapezoid Side Slopes	
1	201	108.00	Circular	15.90	0.01300	4.50	4.50		
2	202	110.00	Circular	15.90	0.01300	4.50	4.50		
3	300	20.00	Circular	1.23	0.01300	1.25	1.25		
4	200	84.00	Circular	12.57	0.01300	4.00	4.00		
5	100	304.00	Circular	12.57	0.01300	4.00	4.00		
6	500	200.00	Trapezoid	486.64	0.03000	30.00	7.90	4.00	4.00

Total length of all conduits .... 826.0000 feet

==========
| Table E2 - Conduit Factor Data |
==========

Conduit Name	Number of Barrels	Entrance Loss Coef	Exit Loss Coef	Exp/Contc Coefficnt	Time Weighting Parameter	Low Flow Roughness Factor	Depth at Which n Changes	Flow Routing
201	1.0000	2.9000	2.9000	2.9000	0.6500	1.0000	0.0000	Standard - Dynamic Wave
202	1.0000	2.9000	2.9000	2.9000	0.6500	1.0000	0.0000	Standard - Dynamic

```
Wave
300             1.0000    1.0000    0.0000    1.0000    0.6500    1.0000    0.0000 Standard - Dynamic
Wave
200             1.0000    2.9000    2.9000    2.9000    0.6500    1.0000    0.0000 Standard - Dynamic
Wave
100             1.0000    2.9000    2.9000    2.9000    0.6500    1.0000    0.0000 Standard - Dynamic
Wave

 *=====================================================*
 | If there are messages about (sqrt(g*d)*dt/dx), or|
 | the sqrt(wave celerity)*time step/conduit length |
 | in the output file all it means is that the      |
 | program will lower the internal time step to     |
 | satisfy this condition (explicit condition).     |
 | You control the actual internal time step by     |
 | using the minimum courant time step factor in the|
 | Extran job control.  The message put in words    |
 | states that the smallest conduit with the fastest|
 | velocity will control the time step selection.   |
 | You have further control by using the modify     |
 | conduit option in the Extran Job Control.        |
 *=====================================================*

 ===> Warning ! (sqrt(wave celerity)*time step/conduit length)
                in conduit 201        is     1.11 at full depth.
 ===> Warning ! (sqrt(wave celerity)*time step/conduit length)
                in conduit 202        is     1.09 at full depth.
 ===> Warning ! (sqrt(wave celerity)*time step/conduit length)
                in conduit 300        is     3.17 at full depth.
 ===> Warning ! (sqrt(wave celerity)*time step/conduit length)
                in conduit 200        is     1.35 at full depth.

 *===================*
 |  Conduit Volume  |
 *===================*

 Full pipe or full open conduit volume
 Input full depth volume............    1.0570E+05 cubic feet


 *=====================================================*
 |           Table E3 - Junction Data                  |
 *=====================================================*

 Inp  Junction    Ground    Crown   Invert    Qinst  Initial        X        Y
 Num  Name         Elev.     Elev.   Elev.      cfs Depth-ft   Coord.   Coord. Type of Manhole
 ---  --------   -------   -------  ------  ------- --------  -------  ------- ---------------
```

1	10	75.00	63.6	59.1	0.000	0.000	79.8	425.	Flooded Ponding
2	21	75.00	66.0	59.4	0.000	0.000	118.	431.	Flooded Ponding
3	22	75.00	63.8	59.2	0.000	0.000	97.1	422.	No Ponding
4	30	70.00	59.8	58.5	0.000	0.000	50.7	411.	No Ponding
5	40	76.00	72.6	68.6	0.000	0.000	124.	448.	Flooded Ponding
6	20	80.00	76.5	68.6	0.000	0.000	100.	448.	Flooded Ponding
7	50	80.00	78.9	68.6	0.000	0.000	0.000	0.000	Flooded Ponding

```
*=====================================================*
| The junction surface elevation was over the top of  |
| the following open channels.  The following changes |
| have been made to the surface elevation.            |
*=====================================================*
```

The ground elevation of junction 50
has been changed to 78.900 m or ft from 80.000
The ground elevation of junction 20
has been changed to 76.500 m or ft from 80.000
The ground elevation of junction 50
has been changed to 78.900 m or ft from 78.900
The ground elevation of junction 20
has been changed to 76.500 m or ft from 76.500

```
*=====================================================*
|           Table E4 - Conduit Connectivity           |
*=====================================================*
```

Input Number	Conduit Name	Upstream Node	Downstream Node	Upstream Elevation	Downstream Elevation	
1	201	21	22	59.400	59.300	No Design
2	202	22	10	59.200	59.150	No Design
3	300	10	30	59.100	58.500	No Design
4	200	40	21	68.600	62.000	No Design
5	100	40	10	68.600	59.100	No Design
6	500	50	20	71.000	68.600	No Design

```
*==========================================*
|          Storage Junction Data           |
*==========================================*
```

STORAGE JUNCTION NUMBER OR NAME	JUNCTION TYPE	MAXIMUM OR CONSTANT SURFACE AREA (FT2)	PEAK OR CONSTANT VOLUME (CUBIC FEET)	CROWN ELEVATION (FT)

```
10        Stage/Area        7.3717E+05        4.4063E+06  75.00

*==================================*
|   Variable storage data for node |10
*==================================*
```

Data Point	Depth ft	Area ft^2	Volume ft^3
1	0.0000	1.5033E+05	0.0000
2	0.1667	1.5590E+05	2.5519E+04
3	0.3333	1.6148E+05	5.1967E+04
4	0.5000	1.6705E+05	7.9345E+04
5	0.6667	1.7289E+05	1.0767E+05
6	0.8333	1.7873E+05	1.3697E+05
7	1.000	1.8456E+05	1.6725E+05
8	1.167	1.9066E+05	1.9852E+05
9	1.333	1.9676E+05	2.3080E+05
10	1.500	2.0286E+05	2.6410E+05
11	1.667	2.0923E+05	2.9845E+05
12	1.833	2.1561E+05	3.3385E+05
13	2.000	2.2198E+05	3.7031E+05
14	2.333	2.3556E+05	4.4657E+05
15	2.667	2.4913E+05	5.2735E+05
16	3.000	2.6271E+05	6.1266E+05
17	3.333	2.7745E+05	7.0269E+05
18	3.667	2.9219E+05	7.9763E+05
19	4.000	3.0692E+05	8.9748E+05
20	4.333	3.2287E+05	1.0024E+06
21	4.667	3.3881E+05	1.1127E+06
22	5.000	3.5475E+05	1.2283E+06
23	5.333	3.7196E+05	1.3494E+06
24	5.667	3.8917E+05	1.4763E+06
25	6.000	4.0637E+05	1.6089E+06
26	6.333	4.2487E+05	1.7474E+06
27	6.667	4.4337E+05	1.8921E+06
28	7.000	4.6187E+05	2.0430E+06
29	7.333	4.8172E+05	2.2003E+06
30	7.667	5.0156E+05	2.3641E+06
31	8.000	5.2141E+05	2.5346E+06
32	8.333	5.4276E+05	2.7120E+06
33	8.667	5.6410E+05	2.8965E+06
34	9.000	5.8545E+05	3.0881E+06
35	9.333	6.0929E+05	3.2872E+06
36	9.667	6.3313E+05	3.4943E+06
37	10.00	6.5697E+05	3.7093E+06
38	10.33	6.8370E+05	3.9327E+06
39	10.67	7.1043E+05	4.1651E+06

```
        40      11.00         7.3717E+05     4.4063E+06


 *==========================================*
 |             Orifice Data                 |
 *==========================================*

      From         To                 Area     Depth      Discharge   Height Above
  Junction    Junction      Type     (ft2)     (ft)     Coefficient  Junction (ft)
  --------    --------      ----     -----     -----    -----------  -------------
20        40         Circ Side      7.07      3.00          1.000          0.000

 ====> EQUIVALENT PIPE INFORMATION FOR ORIFICE       1
       CONDUIT NAME........................... ORF #  1
       Upstream node...........................20
       Downstream node.........................40
       PIPE DIAMETER.......................        3.00
       PIPE LENGTH.........................      300.00
       MANNINGS ROUGHNESS..................      0.0088
       INVERT ELEVATION AT UPSTREAM END.....     68.6000
       INVERT ELEVATION AT DOWNSTREAM END...     68.5900


 *==========================================*
 |                Weir Data                 |
 *==========================================*

      From        To      Link                  Crest      Weir        Weir     Discharge
Weir
   Junction  Junction    Number      Type  Height(ft)   Top(ft)  Length(ft)   Coefficient
Power
   --------  --------    ------      ----  ----------   -------  ----------   -----------   ----------
-
 20        40        WEIR # 1          1        4.90      7.40       22.00        3.0000
1.5000


 *==================================================*
 |          FREE OUTFALL DATA (DATA GROUP I1)       |
 |         BOUNDARY CONDITION ON DATA GROUP J1      |
 *==================================================*

 Outfall at Junction....30         has boundary condition number...         1


 *==================================================*
 |        INTERNAL CONNECTIVITY INFORMATION         |
```

```
*==================================================*

    CONDUIT       JUNCTION     JUNCTION
    -------       --------     --------
    ORF #  1      20           40
    WEIR # 1      20           40
    FREE # 1      30           BOUNDARY

*=====================================================*
|        Boundary Condition Information               |
|                 Data Groups J1-J4                   |
*=====================================================*


BC NUMBER..         1 has no control water surface.


###########################################
# Header information from interface file: #
###########################################

Title from first computational layer:
Riverside Two Pond Analysis
Proposed Conditions 10 year Storm

Title from immediately preceding computational layer
Riverside Two Pond Analysis
Proposed Conditions 10 year Storm

Name of preceding layer:................Runoff Layer
Initial Julian date (IDATEZ)......................   98001
Initial time of day in seconds (TZERO)............  7200.0
No. Transfered input locations....................       4
No. Transfered pollutants.........................       0
Size of total catchment area (acres)..............   53.40

##################################################
# Element numbers of interface inlet locations: #
##################################################
50

##################################################
# Element numbers of interface inlet locations: #
##################################################
21
```

```
 ##################################################
 # Element numbers of interface inlet locations: #
 ##################################################
 22

 ##################################################
 # Element numbers of interface inlet locations: #
 ##################################################
 10

 Conversion factor to cfs for flow units
 on interface file.  Multiply by:     1.00000

######## Important Information ########
Start date/time of interface file was..   98001 7200.0000 hours
Start date/time of the simulation was..   98001 7200.0000 hours
                                Same date/time found in interface file and model

 *=====================================================*
 |              XP Note Field Summary                  |
 *=====================================================*



 *==================================*
 |   Conduit Convergence Criteria   |
 *==================================*

   Conduit       Full   Conduit   Conduit       Full   Conduit
      Name       Flow     Slope      Name       Flow     Slope
---------- --------- --------- --------- --------- ---------
 201          60.      9.26E-04 202          42.      4.55E-04
 300          11.      3.00E-02 200         4.03E+02  7.86E-02
 100         2.54E+02  3.12E-02 500         7.84E+03  1.20E-02
 ORF #  1     98.      3.33E-05

 *==================================*
 |    Initial Model Condition       |
 | Initial Time =      2.00 hours   |
 *==================================*

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.00 /    59.10 21        /   0.00 /    59.40 22        /   0.00 /    59.20
30        /   0.00 /    58.50 40        /   0.00 /    68.59 20        /   0.00 /    68.60
50        /   0.00 /    68.60
```

```
   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201        /       0.00 202       /       0.00 300       /       0.00
200        /       0.00 100       /       0.00 500       /       0.00
ORF #  1  /        0.00 WEIR # 1  /       0.00 FREE # 1  /       0.00

   Conduit/   Velocity
201        /       0.00 202       /       0.00 300       /       0.00
200        /       0.00 100       /       0.00 500       /       0.00
ORF #  1  /        0.00

   Conduit/ Cross Sectional Area
201        /       0.00 202       /       0.00 300       /       0.00
200        /       0.00 100       /       0.00 500       /       0.00
ORF #  1  /        0.00

   Conduit/ Hydraulic Radius
201        /       0.00 202       /       0.00 300       /       0.00
200        /       0.00 100       /       0.00 500       /       0.00
ORF #  1  /        0.00

   Conduit/ Upstream/ Downstream Elevation
201        /    59.20/    59.20202       /    59.10/    59.10300       /    58.50/    58.50
201        /    59.20/    59.20202       /    59.10/    59.10300       /    58.50/    58.50
200        /    59.40/    59.40100       /    59.10/    59.10500       /    68.60/    68.60
201        /    59.20/    59.20202       /    59.10/    59.10300       /    58.50/    58.50
200        /    59.40/    59.40100       /    59.10/    59.10500       /    68.60/    68.60
ORF #  1  /    68.59/    68.59

 ===> System inflows (file) at     2.25 hours (  Junction / Inflow, cfs)

 50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00

 ===> System inflows (file) at     2.50 hours (  Junction / Inflow, cfs)

 50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00

 ===> System inflows (file) at     2.75 hours (  Junction / Inflow, cfs)

 50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00

 ===> System inflows (file) at     3.00 hours (  Junction / Inflow, cfs)

 50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00

 ===> System inflows (file) at     3.25 hours (  Junction / Inflow, cfs)

 50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00
```

```
===> System inflows (file) at     3.50 hours (  Junction / Inflow, cfs)
50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00
===> System inflows (file) at     3.75 hours (  Junction / Inflow, cfs)
50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00
===> System inflows (file) at     4.00 hours (  Junction / Inflow, cfs)
50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00
===> System inflows (file) at     4.25 hours (  Junction / Inflow, cfs)
50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00
===> System inflows (file) at     4.50 hours (  Junction / Inflow, cfs)
50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00
===> System inflows (file) at     4.75 hours (  Junction / Inflow, cfs)
50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00
===> System inflows (file) at     5.00 hours (  Junction / Inflow, cfs)
50        / 8.12E-05 21        / 0.00E+00 22        / 1.06E-05 10        / 6.67E-06
===> System inflows (file) at     5.25 hours (  Junction / Inflow, cfs)
50        / 3.30E-02 21        / 0.00E+00 22        / 7.13E-04 10        / 7.13E-03
===> System inflows (file) at     5.50 hours (  Junction / Inflow, cfs)
50        / 1.32E-01 21        / 0.00E+00 22        / 1.65E-03 10        / 4.83E-02
===> System inflows (file) at     5.75 hours (  Junction / Inflow, cfs)
50        / 2.43E-01 21        / 0.00E+00 22        / 2.53E-03 10        / 1.11E-01
===> System inflows (file) at     6.00 hours (  Junction / Inflow, cfs)
50        / 3.50E-01 21        / 0.00E+00 22        / 3.37E-03 10        / 1.78E-01
===> System inflows (file) at     6.25 hours (  Junction / Inflow, cfs)
```

```
50        / 4.51E-01 21        / 0.00E+00 22        / 4.15E-03 10        / 2.43E-01
===> System inflows (file) at     6.50 hours (  Junction / Inflow, cfs)
50        / 5.46E-01 21        / 0.00E+00 22        / 4.90E-03 10        / 3.05E-01
===> System inflows (file) at     6.75 hours (  Junction / Inflow, cfs)
50        / 7.03E-01 21        / 0.00E+00 22        / 6.95E-03 10        / 3.76E-01
===> System inflows (file) at     7.00 hours (  Junction / Inflow, cfs)
50        / 9.05E-01 21        / 0.00E+00 22        / 8.10E-03 10        / 4.96E-01
===> System inflows (file) at     7.25 hours (  Junction / Inflow, cfs)
50        / 1.04E+00 21        / 0.00E+00 22        / 9.05E-03 10        / 5.97E-01
===> System inflows (file) at     7.50 hours (  Junction / Inflow, cfs)
50        / 1.16E+00 21        / 0.00E+00 22        / 9.95E-03 10        / 6.79E-01
===> System inflows (file) at     7.75 hours (  Junction / Inflow, cfs)
50        / 1.27E+00 21        / 3.69E-04 22        / 1.08E-02 10        / 7.51E-01
===> System inflows (file) at     8.00 hours (  Junction / Inflow, cfs)
50        / 1.37E+00 21        / 5.91E-03 22        / 1.16E-02 10        / 8.18E-01
===> System inflows (file) at     8.25 hours (  Junction / Inflow, cfs)
50        / 1.46E+00 21        / 1.34E-02 22        / 1.23E-02 10        / 8.81E-01
===> System inflows (file) at     8.50 hours (  Junction / Inflow, cfs)
50        / 1.55E+00 21        / 2.09E-02 22        / 1.30E-02 10        / 9.39E-01
===> System inflows (file) at     8.75 hours (  Junction / Inflow, cfs)
50        / 1.89E+00 21        / 3.66E-02 22        / 1.87E-02 10        / 1.05E+00
===> System inflows (file) at     9.00 hours (  Junction / Inflow, cfs)
50        / 2.37E+00 21        / 5.28E-02 22        / 2.04E-02 10        / 1.33E+00
===> System inflows (file) at     9.25 hours (  Junction / Inflow, cfs)
```

```
 50        / 2.50E+00 21        / 6.26E-02 22        / 2.01E-02 10        / 1.50E+00

 ===> System inflows (file) at     9.50 hours (  Junction / Inflow, cfs)

 50        / 2.53E+00 21        / 7.20E-02 22        / 2.09E-02 10        / 1.56E+00

 ===> System inflows (file) at     9.75 hours (  Junction / Inflow, cfs)

 50        / 2.85E+00 21        / 9.53E-02 22        / 2.63E-02 10        / 1.65E+00

 ===> System inflows (file) at    10.00 hours (  Junction / Inflow, cfs)

 50        / 3.30E+00 21        / 1.15E-01 22        / 2.79E-02 10        / 1.92E+00

 Cycle  2880      Time   10 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.13 /    59.23 21        /   2.54 /    61.94 22        /   1.20 /    60.40
30        /   0.11 /    58.61 40        /   0.31 /    68.90 20        /   0.77 /    69.37
50        /   2.50 /    71.10

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       1.88 202       /       1.81 300       /       0.20 200       /       1.80
100       /       1.25 500       /       3.27*ORF #  1  /       3.07 WEIR # 1  /       0.00
FREE # 1  /       0.20

 ===> System inflows (file) at    10.25 hours (  Junction / Inflow, cfs)

 50        / 3.66E+00 21        / 1.41E-01 22        / 3.23E-02 10        / 2.14E+00

 Cycle  2970      Time   10 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.15 /    59.25 21        /   2.67 /    62.07 22        /   1.31 /    60.51
30        /   0.13 /    58.63 40        /   0.32 /    68.91 20        /   0.80 /    69.40
50        /   2.50 /    71.10

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.04 202       /       1.98 300       /       0.25 200       /       1.94
100       /       1.42 500       /       3.60*ORF #  1  /       3.38 WEIR # 1  /       0.00
FREE # 1  /       0.25

 ===> System inflows (file) at    10.50 hours (  Junction / Inflow, cfs)

 50        / 4.04E+00 21        / 1.63E-01 22        / 3.38E-02 10        / 2.40E+00
```

```
 Cycle  3060      Time   10 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.18 /    59.28 21        /   2.98 /    62.38 22        /   1.65 /    60.85
30        /   0.15 /    58.65 40        /   0.25 /    68.84 20        /   0.84 /    69.44
50        /   2.51 /    71.11

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       0.00 202       /       3.67 300       /       0.34 200       /       2.50
100       /       1.09 500       /       4.02*ORF #  1  /       3.71 WEIR # 1  /       0.00
FREE # 1  /       0.34

 ===> System inflows (file) at    10.75 hours (  Junction / Inflow, cfs)

 50        / 4.68E+00 21        / 2.13E-01 22        / 4.38E-02 10        / 2.66E+00

 Cycle  3150      Time   10 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.22 /    59.32 21        /   3.14 /    62.54 22        /   1.77 /    60.97
30        /   0.18 /    58.68 40        /   0.26 /    68.85 20        /   0.89 /    69.49
50        /   2.52 /    71.12

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       0.00 202       /       3.38 300       /       0.48 200       /       3.44
100       /       1.35 500       /       4.57*ORF #  1  /       4.22 WEIR # 1  /       0.00
FREE # 1  /       0.50

 ===> System inflows (file) at    11.00 hours (  Junction / Inflow, cfs)

 50        / 5.49E+00 21        / 2.52E-01 22        / 4.64E-02 10        / 3.17E+00

 Cycle  3240      Time   11 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.26 /    59.36 21        /   3.14 /    62.54 22        /   1.92 /    61.12
30        /   0.20 /    58.70 40        /   0.27 /    68.86 20        /   0.96 /    69.56
50        /   2.53 /    71.13

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       3.62 202       /       3.56 300       /       0.65 200       /       3.40*
100       /       1.66 500       /       5.44*ORF #  1  /       5.08 WEIR # 1  /       0.00
FREE # 1  /       0.65

 ===> System inflows (file) at    11.25 hours (  Junction / Inflow, cfs)

 50        / 6.57E+00 21        / 3.42E-01 22        / 6.32E-02 10        / 3.64E+00
```

```
 Cycle  3330      Time   11 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.29 /    59.39 21        /   3.21 /    62.61 22        /   2.07 /    61.27
30        /   0.22 /    58.72 40        /   0.28 /    68.87 20        /   1.01 /    69.61
50        /   2.54 /    71.14

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       4.14 202       /       4.03 300       /       0.78 200       /       3.83*
100       /       1.95 500       /       6.39*ORF #  1  /       5.82 WEIR # 1  /       0.00
FREE # 1  /       0.78

 ===> System inflows (file) at    11.50 hours (  Junction / Inflow, cfs)

 50        / 7.91E+00 21        / 4.09E-01 22        / 6.72E-02 10        / 4.51E+00

 Cycle  3420      Time   11 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.32 /    59.42 21        /   3.36 /    62.76 22        /   2.30 /    61.50
30        /   0.25 /    58.75 40        /   0.32 /    68.91 20        /   1.11 /    69.71
50        /   2.56 /    71.16

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       5.33 202       /       5.15 300       /       0.96 200       /       4.91*
100       /       2.38 500       /       7.84*ORF #  1  /       7.33 WEIR # 1  /       0.00
FREE # 1  /       0.96

 ===> System inflows (file) at    11.75 hours (  Junction / Inflow, cfs)

 50        / 1.01E+01 21        / 6.15E-01 22        / 1.04E-01 10        / 5.38E+00

 Cycle  3510      Time   11 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.37 /    59.47 21        /   3.50 /    62.90 22        /   2.52 /    61.72
30        /   0.27 /    58.77 40        /   0.35 /    68.94 20        /   1.20 /    69.80
50        /   2.58 /    71.18

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       6.25 202       /       6.16 300       /       1.18 200       /       5.81*
100       /       2.85 500       /       9.82*ORF #  1  /       8.73 WEIR # 1  /       0.00
FREE # 1  /       1.18

 ===> System inflows (file) at    12.00 hours (  Junction / Inflow, cfs)
```

```
 50        / 1.30E+01 21        / 7.63E-01 22        / 1.12E-01 10        / 7.21E+00

 Cycle  3600      Time   12 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.42 /    59.52 21        /   3.83 /    63.23 22        /   2.91 /    62.11
30        /   0.31 /    58.81 40        /   0.41 /    69.00 20        /   1.38 /    69.98
50        /   2.62 /    71.22

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       8.90 202       /       8.82 300       /       1.50 200       /       8.33*
100       /       3.73 500       /      12.92*ORF #  1  /      12.11 WEIR # 1  /       0.00
FREE # 1  /       1.50

 ===> System inflows (file) at    12.25 hours (  Junction / Inflow, cfs)

 50        / 5.24E+01 21        / 5.25E+00 22        / 8.85E-01 10        / 1.59E+01

 Cycle  3690      Time   12 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.53 /    59.63 21        /   5.51 /    64.91 22        /   4.35 /    63.55
30        /   0.38 /    58.88 40        /   0.77 /    69.36 20        /   2.31 /    70.91
50        /   2.88 /    71.48

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /      28.28 202       /      26.84 300       /       2.23 200       /      24.28
100       /       8.26 500       /      48.77*ORF #  1  /      34.32 WEIR # 1  /       0.00
FREE # 1  /       2.23

 ===> System inflows (file) at    12.50 hours (  Junction / Inflow, cfs)

 50        / 1.13E+02 21        / 9.12E+00 22        / 1.05E+00 10        / 5.16E+01

 Cycle  3780      Time   12 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   1.00 /    60.10 21        /   8.84*/    68.24 22        /   6.84*/    66.04
30        /   0.64 /    59.14 40        /   2.35 /    70.94 20        /   4.76 /    73.36
50        /   4.76 /    73.36

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /      56.88 202       /      57.69 300       /       5.76 200       /      47.83
100       /      36.51 500       /     100.44 ORF #  1  /      85.91 WEIR # 1  /       0.00
FREE # 1  /       5.76

 ===> System inflows (file) at    12.75 hours (  Junction / Inflow, cfs)
```

```
 50        / 8.89E+01 21        / 4.85E+00 22        / 2.93E-01 10        / 6.46E+01

 Cycle  3870      Time   12 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   1.67 /    60.77 21        /   9.70*/    69.10 22        /   8.01*/    67.21
30        /   0.81 /    59.31 40        /   3.06 /    71.65 20        /   5.32 /    73.92
50        /   5.32 /    73.92

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /      54.49 202       /      54.78 300       /       8.35 200       /      49.53
100       /      56.34 500       /      96.71 ORF #  1  /      85.88 WEIR # 1  /      18.42
FREE # 1  /       8.35

 ===> System inflows (file) at    13.00 hours (  Junction / Inflow, cfs)

 50        / 3.65E+01 21        / 2.29E+00 22        / 2.06E-01 10        / 3.74E+01

 Cycle  3960      Time   13 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.11 /    61.21 21        /   8.81*/    68.21 22        /   8.05*/    67.25
30        /   0.88 /    59.38 40        /   1.51 /    70.10 20        /   3.32 /    71.92
50        /   3.32 /    71.92

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /      31.21 202       /      31.51 300       /       9.40 200       /      28.97
100       /      34.57 500       /      47.95 ORF #  1  /      61.67 WEIR # 1  /       0.00
FREE # 1  /       9.40

 ===> System inflows (file) at    13.25 hours (  Junction / Inflow, cfs)

 50        / 2.24E+01 21        / 1.42E+00 22        / 1.16E-01 10        / 2.15E+01

 Cycle  4050      Time   13 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.29 /    61.39 21        /   8.43*/    67.83 22        /   8.28*/    67.48
30        /   0.91 /    59.41 40        /   0.60 /    69.19 20        /   1.93 /    70.53
50        /   2.71 /    71.31

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /      15.96 202       /      16.08 300       /       9.85 200       /      14.55
100       /      12.16*500       /      23.23*ORF #  1  /      26.30 WEIR # 1  /       0.00
FREE # 1  /       9.85
```

```
 ===> System inflows (file) at    13.50 hours (  Junction / Inflow, cfs)

 50        / 1.46E+01 21        / 1.10E+00 22        / 1.06E-01 10        / 1.30E+01

 Cycle  4140      Time   13 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.38 /    61.48 21        /   8.48*/    67.88 22        /   8.50*/    67.70
30        /   0.93 /    59.43 40        /   0.45 /    69.04 20        /   1.56 /    70.16
50        /   2.64 /    71.24

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /      11.17 202       /      11.33 300       /      10.07 200       /      10.11*
100       /       6.38*500       /      14.77*ORF #  1  /      16.37 WEIR # 1  /       0.00
FREE # 1  /      10.07

 ===> System inflows (file) at    13.75 hours (  Junction / Inflow, cfs)

 50        / 1.20E+01 21        / 8.86E-01 22        / 8.02E-02 10        / 9.26E+00

 Cycle  4230      Time   13 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.43 /    61.53 21        /   8.54*/    67.94 22        /   8.63*/    67.83
30        /   0.94 /    59.44 40        /   0.40 /    68.99 20        /   1.42 /    70.02
50        /   2.61 /    71.21

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       9.05 202       /       9.08 300       /      10.19 200       /       8.14*
100       /       5.13*500       /      12.20*ORF #  1  /      13.21 WEIR # 1  /       0.00
FREE # 1  /      10.19

 ===> System inflows (file) at    14.00 hours (  Junction / Inflow, cfs)

 50        / 9.97E+00 21        / 7.95E-01 22        / 7.74E-02 10        / 7.16E+00

 Cycle  4320      Time   14 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.46 /    61.56 21        /   8.59*/    67.99 22        /   8.71*/    67.91
30        /   0.94 /    59.44 40        /   0.36 /    68.95 20        /   1.30 /    69.90
50        /   2.59 /    71.19

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       7.33 202       /       7.38 300       /      10.27 200       /       6.53*
100       /       4.12*500       /      10.03*ORF #  1  /      10.61 WEIR # 1  /       0.00
FREE # 1  /      10.27
```

```
 ===> System inflows (file) at    14.25 hours (  Junction / Inflow, cfs)

 50        / 8.84E+00 21        / 6.76E-01 22        / 6.20E-02 10        / 6.15E+00

 Cycle  4410      Time   14 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.48 /    61.58 21        /   8.63*/    68.03 22        /   8.77*/    67.97
30        /   0.95 /    59.45 40        /   0.35 /    68.94 20        /   1.24 /    69.84
50        /   2.58 /    71.18

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       6.54 202       /       6.59 300       /      10.32 200       /       5.87*
100       /       3.70*500       /       8.98*ORF #  1  /       9.53 WEIR # 1  /       0.00
FREE # 1  /      10.32

 ===> System inflows (file) at    14.50 hours (  Junction / Inflow, cfs)

 50        / 7.69E+00 21        / 6.21E-01 22        / 6.03E-02 10        / 5.25E+00

 Cycle  4500      Time   14 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.49 /    61.59 21        /   8.65*/    68.05 22        /   8.81*/    68.01
30        /   0.95 /    59.45 40        /   0.32 /    68.91 20        /   1.16 /    69.76
50        /   2.56 /    71.16

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       5.65 202       /       5.69 300       /      10.36 200       /       5.00*
100       /       3.15*500       /       7.73*ORF #  1  /       8.13 WEIR # 1  /       0.00
FREE # 1  /      10.36

 ===> System inflows (file) at    14.75 hours (  Junction / Inflow, cfs)

 50        / 6.70E+00 21        / 5.04E-01 22        / 4.49E-02 10        / 4.68E+00

 Cycle  4590      Time   14 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.50 /    61.60 21        /   8.66*/    68.06 22        /   8.83*/    68.03
30        /   0.95 /    59.45 40        /   0.31 /    68.90 20        /   1.11 /    69.71
50        /   2.55 /    71.15

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       5.04 202       /       5.08 300       /      10.38 200       /       4.55*
100       /       2.87*500       /       6.85*ORF #  1  /       7.38 WEIR # 1  /       0.00
```

```
FREE # 1  /      10.38

 ===> System inflows (file) at    15.00 hours (  Junction / Inflow, cfs)

 50        / 5.57E+00 21        / 4.48E-01 22        / 4.32E-02 10        / 3.88E+00

 Cycle  4680      Time   15 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.50 /    61.60 21        /   8.66*/    68.06 22        /   8.83*/    68.03
30        /   0.95 /    59.45 40        /   0.28 /    68.87 20        /   1.03 /    69.63
50        /   2.53 /    71.13

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       4.16 202       /       4.19 300       /      10.38 200       /       3.74*
100       /       2.36*500       /       5.61*ORF #  1  /       6.07 WEIR # 1  /       0.00
FREE # 1  /      10.38

 ===> System inflows (file) at    15.25 hours (  Junction / Inflow, cfs)

 50        / 5.37E+00 21        / 4.43E-01 22        / 4.32E-02 10        / 3.50E+00

 Cycle  4770      Time   15 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.50 /    61.60 21        /   8.65*/    68.05 22        /   8.83*/    68.03
30        /   0.95 /    59.45 40        /   0.27 /    68.86 20        /   0.99 /    69.59
50        /   2.53 /    71.13

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       3.82 202       /       3.85 300       /      10.38 200       /       3.38*
100       /       2.13*500       /       5.38*ORF #  1  /       5.50 WEIR # 1  /       0.00
FREE # 1  /      10.38

 ===> System inflows (file) at    15.50 hours (  Junction / Inflow, cfs)

 50        / 5.34E+00 21        / 4.44E-01 22        / 4.32E-02 10        / 3.40E+00

 Cycle  4860      Time   15 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.49 /    61.59 21        /   8.64*/    68.04 22        /   8.82*/    68.02
30        /   0.95 /    59.45 40        /   0.26 /    68.85 20        /   0.98 /    69.58
50        /   2.53 /    71.13

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       3.74 202       /       3.77 300       /      10.37 200       /       3.29*
```

```
100        /       2.08*500       /       5.35*ORF #  1  /       5.37 WEIR # 1  /       0.00
FREE # 1  /      10.37

 ===> System inflows (file) at    15.75 hours (  Junction / Inflow, cfs)

 50        / 5.34E+00 21        / 4.45E-01 22        / 4.32E-02 10        / 3.36E+00

 Cycle  4950      Time   15 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.49 /    61.59 21        /   8.63*/    68.03 22        /   8.81*/    68.01
30        /   0.95 /    59.45 40        /   0.26 /    68.85 20        /   0.98 /    69.58
50        /   2.53 /    71.13

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       3.75 202       /       3.79 300       /      10.37 200       /       3.28*
100       /       2.07*500       /       5.34*ORF #  1  /       5.35 WEIR # 1  /       0.00
FREE # 1  /      10.37

 ===> System inflows (file) at    16.00 hours (  Junction / Inflow, cfs)

 50        / 5.35E+00 21        / 4.46E-01 22        / 4.32E-02 10        / 3.36E+00

 Cycle  5040      Time   16 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.49 /    61.59 21        /   8.62*/    68.02 22        /   8.80*/    68.00
30        /   0.95 /    59.45 40        /   0.26 /    68.85 20        /   0.98 /    69.58
50        /   2.53 /    71.13

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       3.75 202       /       3.79 300       /      10.36 200       /       3.28*
100       /       2.07*500       /       5.35*ORF #  1  /       5.35 WEIR # 1  /       0.00
FREE # 1  /      10.36

 ===> System inflows (file) at    16.25 hours (  Junction / Inflow, cfs)

 50        / 5.35E+00 21        / 4.46E-01 22        / 4.33E-02 10        / 3.36E+00

 Cycle  5130      Time   16 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.49 /    61.59 21        /   8.61*/    68.01 22        /   8.79*/    67.99
30        /   0.95 /    59.45 40        /   0.26 /    68.85 20        /   0.98 /    69.58
50        /   2.53 /    71.13

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
```

```
201        /       3.74 202        /       3.78 300        /      10.35 200        /       3.28*
100        /       2.07*500        /       5.35*ORF #  1  /       5.35 WEIR # 1  /       0.00
FREE # 1  /      10.35

 ===> System inflows (file) at    16.50 hours (  Junction / Inflow, cfs)

 50        / 5.35E+00 21        / 4.47E-01 22        / 4.33E-02 10        / 3.36E+00

 Cycle  5220      Time   16 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.48 /    61.58 21        /   8.60*/    68.00 22        /   8.78*/    67.98
30        /   0.95 /    59.45 40        /   0.26 /    68.85 20        /   0.98 /    69.58
50        /   2.53 /    71.13

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201        /       3.73 202        /       3.76 300        /      10.34 200        /       3.28*
100        /       2.07*500        /       5.35*ORF #  1  /       5.35 WEIR # 1  /       0.00
FREE # 1  /      10.34

 ===> System inflows (file) at    16.75 hours (  Junction / Inflow, cfs)

 50        / 4.56E+00 21        / 3.32E-01 22        / 2.78E-02 10        / 3.20E+00

 Cycle  5310      Time   16 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.48 /    61.58 21        /   8.59*/    67.99 22        /   8.77*/    67.97
30        /   0.95 /    59.45 40        /   0.26 /    68.85 20        /   0.96 /    69.56
50        /   2.52 /    71.12

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201        /       3.52 202        /       3.54 300        /      10.33 200        /       3.18*
100        /       2.01*500        /       4.72*ORF #  1  /       5.17 WEIR # 1  /       0.00
FREE # 1  /      10.33

 ===> System inflows (file) at    17.00 hours (  Junction / Inflow, cfs)

 50        / 3.45E+00 21        / 2.75E-01 22        / 2.60E-02 10        / 2.51E+00

 Cycle  5400      Time   17 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.47 /    61.57 21        /   8.56*/    67.96 22        /   8.75*/    67.95
30        /   0.95 /    59.45 40        /   0.23 /    68.82 20        /   0.87 /    69.47
50        /   2.50 /    71.10
```

```
   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201        /       2.79 202        /       2.80 300        /      10.31 200        /       2.50*
100        /       1.58*500        /       3.50*ORF #  1  /       4.04 WEIR # 1  /       0.00
FREE # 1  /       10.31

 ===> System inflows (file) at    17.25 hours (  Junction / Inflow, cfs)

 50        / 3.25E+00 21        / 2.70E-01 22        / 2.60E-02 10        / 2.16E+00

 Cycle  5490      Time   17 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.46 /    61.56 21        /   8.52*/    67.92 22        /   8.71*/    67.91
30        /   0.94 /    59.44 40        /   0.22 /    68.81 20        /   0.82 /    69.42
50        /   2.50 /    71.10

   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201        /       2.42 202        /       2.43 300        /      10.28 200        /       2.13*
100        /       1.34*500        /       3.26*ORF #  1  /       3.45 WEIR # 1  /       0.00
FREE # 1  /       10.28

 ===> System inflows (file) at    17.50 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.70E-01 22        / 2.60E-02 10        / 2.06E+00

 Cycle  5580      Time   17 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.45 /    61.55 21        /   8.47*/    67.87 22        /   8.66*/    67.86
30        /   0.94 /    59.44 40        /   0.21 /    68.80 20        /   0.80 /    69.40
50        /   2.49 /    71.09

   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201        /       2.30 202        /       2.31 300        /      10.24 200        /       2.01*
100        /       1.27*500        /       3.22*ORF #  1  /       3.27 WEIR # 1  /       0.00
FREE # 1  /       10.24

 ===> System inflows (file) at    17.75 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.70E-01 22        / 2.60E-02 10        / 2.03E+00

 Cycle  5670      Time   17 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.43 /    61.53 21        /   8.42*/    67.82 22        /   8.61*/    67.81
30        /   0.94 /    59.44 40        /   0.21 /    68.80 20        /   0.80 /    69.40
50        /   2.49 /    71.09
```

```
   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.27 202       /       2.28 300       /      10.20 200       /       1.98*
100       /       1.25*500       /       3.22*ORF #  1  /       3.23 WEIR # 1  /       0.00
FREE # 1  /      10.20

 ===> System inflows (file) at    18.00 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.70E-01 22        / 2.60E-02 10        / 2.02E+00

 Cycle  5760      Time   18 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.42 /    61.52 21        /   8.38*/    67.78 22        /   8.57*/    67.77
30        /   0.93 /    59.43 40        /   0.21 /    68.80 20        /   0.80 /    69.40
50        /   2.49 /    71.09

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.23 202       /       2.28 300       /      10.16 200       /       1.98*
100       /       1.25*500       /       3.22*ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1  /      10.16

 ===> System inflows (file) at    18.25 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.70E-01 22        / 2.60E-02 10        / 2.02E+00

 Cycle  5850      Time   18 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.40 /    61.50 21        /   8.33*/    67.73 22        /   8.52*/    67.72
30        /   0.93 /    59.43 40        /   0.21 /    68.80 20        /   0.80 /    69.40
50        /   2.49 /    71.09

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.26 202       /       2.26 300       /      10.12 200       /       1.97*
100       /       1.25*500       /       3.22*ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1  /      10.12

 ===> System inflows (file) at    18.50 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.71E-01 22        / 2.60E-02 10        / 2.02E+00

 Cycle  5940      Time   18 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   2.39 /    61.49 21        /   8.29*/    67.69 22        /   8.48*/    67.68
30        /   0.93 /    59.43 40        /   0.21 /    68.80 20        /   0.80 /    69.40
```

```
50          /   2.49 /    71.09

   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201        /       2.25 202       /       2.28 300       /      10.08 200       /       1.97*
100        /       1.25*500       /       3.22*ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1  /       10.08

 ===> System inflows (file) at    18.75 hours (  Junction / Inflow, cfs)

 50         / 3.22E+00 21        / 2.71E-01 22        / 2.60E-02 10        / 2.02E+00

 Cycle  6030      Time   18 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   2.37 /    61.47 21        /   8.24*/    67.64 22        /   8.44*/    67.64
30         /   0.93 /    59.43 40        /   0.21 /    68.80 20        /   0.80 /    69.40
50         /   2.49 /    71.09

   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201        /       2.24 202       /       2.27 300       /      10.05 200       /       1.98*
100        /       1.25*500       /       3.22*ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1  /       10.05

 ===> System inflows (file) at    19.00 hours (  Junction / Inflow, cfs)

 50         / 3.22E+00 21        / 2.71E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6120      Time   19 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   2.36 /    61.46 21        /   8.20*/    67.60 22        /   8.40*/    67.60
30         /   0.92 /    59.42 40        /   0.21 /    68.80 20        /   0.80 /    69.40
50         /   2.49 /    71.09

   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201        /       2.26 202       /       2.27 300       /      10.01 200       /       1.98*
100        /       1.25*500       /       3.22*ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1  /       10.01

 ===> System inflows (file) at    19.25 hours (  Junction / Inflow, cfs)

 50         / 3.22E+00 21        / 2.72E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6210      Time   19 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   2.35 /    61.45 21        /   8.16*/    67.56 22        /   8.35*/    67.55
```

```
30          /   0.92 /    59.42 40        /   0.21 /    68.80 20        /   0.80 /    69.40
50          /   2.49 /    71.09

   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201         /       2.26 202       /       2.27 300       /       9.97 200       /       1.98*
100         /       1.25*500       /       3.22*ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1    /       9.97

 ===> System inflows (file) at    19.50 hours (  Junction / Inflow, cfs)

 50         / 3.22E+00 21        / 2.72E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6300      Time   19 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10          /   2.33 /    61.43 21        /   8.12*/    67.52 22        /   8.31*/    67.51
30          /   0.92 /    59.42 40        /   0.21 /    68.80 20        /   0.80 /    69.40
50          /   2.49 /    71.09

   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201         /       2.25 202       /       2.30 300       /       9.94 200       /       1.98*
100         /       1.25*500       /       3.22*ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1    /       9.94

 ===> System inflows (file) at    19.75 hours (  Junction / Inflow, cfs)

 50         / 3.23E+00 21        / 2.72E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6390      Time   19 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10          /   2.32 /    61.42 21        /   8.08*/    67.48 22        /   8.27*/    67.47
30          /   0.91 /    59.41 40        /   0.21 /    68.80 20        /   0.80 /    69.40
50          /   2.49 /    71.09

   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201         /       2.24 202       /       2.28 300       /       9.90 200       /       1.98*
100         /       1.25*500       /       3.23*ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1    /       9.90

 ===> System inflows (file) at    20.00 hours (  Junction / Inflow, cfs)

 50         / 3.23E+00 21        / 2.72E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6480      Time   20 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
```

```
10        /   2.31 /    61.41 21        /   8.03*/    67.43 22        /   8.23*/    67.43
30        /   0.91 /    59.41 40        /   0.21 /    68.80 20        /   0.80 /    69.40
50        /   2.49 /    71.09

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.26 202       /       2.28 300       /       9.87 200       /       1.98*
100       /       1.25*500       /       3.23*ORF #  1  /       3.23 WEIR # 1  /       0.00
FREE # 1  /       9.87


 *=====================================================*
 | Table E5 - Junction Time Limitation Summary         |
 |              (0.10 or 0.25)* Depth * Area           |
 | Time step = ------------------------------          |
 |                  Sum of Flow                        |
 *=====================================================*
 |  The time this junction was the limiting junction |
 |                is listed in the third column.       |
 *=====================================================*

Junction     Time(.10)  Time(.25)  Time(sec)
--------     ---------  ---------  ---------
 10            100.00    100.00   11050.0
 21             12.19     30.47       0.0
 22              6.66     16.64   34280.0
 30            100.00    100.00       0.0
 40             21.70     54.26       0.0
 20              7.88     19.71   18350.0
 50              9.36     23.41    1120.0
The junction requiring the smallest time step was...22


 *==============================================================*
 |       Table E5a - Conduit Explicit Condition Summary         |
 |       Courant   =         Conduit Length                     |
 |       Time step = --------------------------------           |
 |                      Velocity + sqrt(g*depth)                |
 |                                                              |
 |                  Conduit Implicit Condition Summary          |
 |       Courant   =         Conduit Length                     |
 |       Time step = --------------------------------           |
 |                              Velocity                        |
 *==============================================================*
 |  The 3rd column is the Explicit time step times the          |
 |      minimum courant time step factor                        |
 |                                                              |
 |  Minimum Conduit Time Step in seconds in the 4th column      |
```

```
|  in the list. Maximum possible is 10 * maximum time step |
|                                                          |
|  The 5th column is the maximum change at any time step   |
|  during the simulation. The 6th column is the wobble     |
|  value which is an indicator of the flow stability.      |
|                                                          |
|  You should use this section to find those conduits that |
|  are slowing your model down.  Use modify conduits to    |
|  alter the length of the slow conduits to make your      |
|  simulation faster, or change the conduit name to        |
|  "CHME?????" where ????? are any characters, this will   |
|  lengthen the conduit based on the model time step,      |
|  not the value listed in modify conduits.                |
*==========================================================*
```

Conduit	Time(exp)	Expl*Cmin	Time(imp)	Time(min)	Max Qchange	Wobble
201	4.96	9.92	26.80	400.3	22.853	12.933
202	5.25	10.51	21.21	0.0	-1.145	2.681
300	1.10	2.20	2.18	679.7	0.025	0.452
200	4.22	8.44	13.92	0.0	-0.563	0.137
100	17.16	34.31	42.03	0.0	0.459	0.145
500	18.74	37.49	100.00	0.0	-1.782	0.013
ORF # 1	11.26	22.52	22.06	0.0	-0.514	0.713

The conduit with the smallest time step limitation was..300
The conduit with the largest wobble was.....201
The conduit with the largest flow change in any
consecutive time step.....201

```
*=====================================================*
|  Table E6. Final Model Condition                    |
|            This table is used for steady state      |
|            flow comparison and is the information|
|            saved to the hot-restart file.           |
|            Final Time =    20.003 hours            |
*=====================================================*
```

```
Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10       /  2.31 /    61.4121       /  8.03*/    67.4322       /  8.23*/    67.43
30       /  0.91 /    59.4140       /  0.21 /    68.8020       /  0.80 /    69.40
50       /  2.49 /    71.09

  Conduit/       Flow   ===> "*" Conduit uses the normal flow option.
201      /       2.26 202      /       2.28 300      /       9.87
200      /       1.98*100      /       1.25*500      /       3.23*
ORF #  1 /       3.23 WEIR # 1 /       0.00 FREE # 1 /       9.87
201      /       0.14 202      /       0.18 300      /       8.89
```

```
200        /       0.34 100       /       0.36 500       /       0.24
ORF #  1  /       3.48

   Conduit/ Cross Sectional Area
201        /      15.98 202       /      12.39 300       /       1.11
200        /       5.80 100       /       3.51 500       /      13.48
ORF #  1  /       0.93

   Conduit/ Cross Sectional Area
201        /    1726.36 202       /    1362.74 300       /      22.21
200        /     487.26 100       /    1067.80 500       /    2696.09
ORF #  1  /     278.18

   Conduit/ Hydraulic Radius
201        /       1.13 202       /       1.13 300       /       0.34
200        /       0.52 100       /       0.56 500       /       0.38
ORF #  1  /       0.31

   Conduit/ Upstream/ Downstream Elevation
201        /    67.43/    67.43202       /    67.43/    61.41300       /    61.41/    59.41
201        /    67.43/    67.43202       /    67.43/    61.41300       /    61.41/    59.41
200        /    68.80/    67.43100       /    68.80/    61.41500       /    71.09/    69.40
201        /    67.43/    67.43202       /    67.43/    61.41300       /    61.41/    59.41
200        /    68.80/    67.43100       /    68.80/    61.41500       /    71.09/    69.40
ORF #  1  /    69.40/    68.80
```

```
*==========================================================*
|          Table E7 -  Extran Iteration Summary            |
*==========================================================*

Total number of time steps simulated............      6480
Total number of passes in the simulation........     20255
Total number of time steps during simulation....     15206
Ratio of actual # of time steps / NTCYC.........     2.347
Average number of iterations per time step......     1.332
Average  time step size(seconds)................     4.261
Smallest time step size(seconds)................     2.500
Largest  time step size(seconds)................    10.000
Average minimum Conduit Courant time step (sec).     5.890
Average minimum implicit time step (sec)........     2.622
Average minimum junction time step (sec)........     2.622
Average Courant Factor Tf.......................     2.622
Number of times omega reduced...................       409

*==========================================================*
```

```
|     Table E8 - Junction Time Step Limitation Summary    |
*==========================================================*
|   Not Convr = Number of times this junction did not      |
|               converge during the simulation.            |
|   Avg Convr = Average junction iterations.               |
|   Conv err  = Mean convergence error.                    |
|   Omega Cng = Change of omega during iterations          |
|   Max Itern = Maximum number of iterations               |
*==========================================================*
```

Junction	Not Convr	Avg Convr	Total Itt	Omega Cng	Max Itern	Ittrn >10	Ittrn >25	Ittrn >40
10	0	1.67	25370	98	25	154	1	0
21	6	2.50	38007	188	47	214	31	13
22	23	2.72	41370	93	51	197	51	27
30	0	1.13	17212	0	11	6	0	0
40	0	1.29	19665	26	11	10	0	0
20	1	1.25	19006	0	51	1	1	1
50	0	1.23	18775	4	31	4	1	0

```
Total number of iterations for all junctions..    179405
Minimum number of possible iterations........     106442
Efficiency of the simulation.................       1.69
                                                 Excellent Efficiency

*==========================================================*
| Extran Efficiency is an indicator of the efficiency of   |
| the simulation.  Ideal efficiency is one iteration per   |
| time step.  Altering the underrelaxation parameter,      |
| lowering the time step, increasing the flow and head     |
| tolerance are good ways of improving the efficiency,     |
| another is lowering the internal time step. The lower the|
| efficiency generally the faster your model will run.     |
| If your efficiency is less than 1.5 then you may try     |
| increasing your time step so that your overall simulation|
| is faster.  Ideal efficiency would be around 2.0         |
|                                                          |
| Good Efficiency      < 1.5           mean iterations     |
| Excellent Efficiency < 2.5 and > 1.5 mean iterations     |
| Good      Efficiency < 4.0 and > 2.5 mean iterations     |
| Fair      Efficiency < 7.5 and > 4.0 mean iterations     |
| Poor Efficiency      > 7.5           mean iterations     |
*==========================================================*


*=========================================================*
|        Table E9 - JUNCTION SUMMARY STATISTICS           |
| The Maximum area is only the area of the node, it       |
| does not include the area of the surrounding conduits|
```

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Meters of Surcharge at Max Elevation	Freeboard of node meters	Maximum Junction Area ft^2
10	75.00	75.00	61.60	15	0	0.00	13.40	2.423E+05
21	75.00	66.00	69.27	12	41	3.27	5.73	1.300E+01
22	75.00	63.80	68.04	15	1	4.24	6.96	1.300E+01
30	70.00	59.75	59.45	15	0	0.00	10.55	1.300E+01
40	76.00	72.60	72.02	12	39	0.00	3.98	1.300E+01
20	76.50	76.50	74.09	12	39	0.00	2.41	1.300E+01
50	78.90	78.90	74.09	12	40	0.00	4.81	1.300E+01

Table E10 - CONDUIT SUMMARY STATISTICS

Note: The peak flow may be less than the design flow and the conduit may still surcharge because of the downstream boundary conditions.

Name Conduit Dwnstrm Name	Design Flow (cfs)	Design Velocity (ft/s)	Conduit Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Ends Upstream (ft)	(ft)
201	60.	3.76	54.00	6.45E+01	12	36	4.03	12	36	1.08	69.27	68.04
202	42.	2.64	54.00	6.52E+01	12	36	5.19	12	36	1.55	68.04	61.60
300	11.	9.12	15.00	1.04E+01	15	0	9.19	15	0	0.93	61.60	59.45
200	4.03E+02	32.04	48.00	5.54E+01	12	38	6.03	10	36	0.14	72.02	69.27
100	2.54E+02	20.21	48.00	5.93E+01	12	42	7.23	12	41	0.23	72.02	61.60
500	7.84E+03	16.11	94.80	1.18E+02	12	35	1.05	12	18	0.02	74.09	74.09
ORF # 1	98.	0.80	36.00	9.43E+01	12	34	13.60	12	34	0.96	74.09	72.02
WEIR # 1	Undefnd	Undefnd	Undefnd	3.01E+01	12	39						
FREE # 1	Undefnd	Undefnd	Undefnd	1.04E+01	15	0						

Table E11. Area assumptions used in the analysis
Subcritical and Critical flow assumptions from Subroutine Head. See Figure 17-1 in the manual for further information.

Conduit Name	Length of Dry Flow(min)	Length of Sub-Critical Flow(min)	Length of Upstream Critical Flow(min)	Length of Downstream Critical Flow(min)	Maximum Hydraulic Radius-m	Maximum X-Sect Area(ft^2)	Maximum Vel*D (ft^2/s)
201	0.00	792.00	0.00	288.00	1.333	16.278	0.181E+02
202	0.00	428.00	0.00	652.00	1.151	12.782	0.233E+02
300	0.00	298.83	0.00	781.17	0.355	1.131	0.115E+02
200	232.00	573.50	0.00	274.50	1.119	11.974	0.196E+02
100	232.00	848.00	0.00	0.00	1.065	8.209	0.177E+02
500	202.67	877.33	0.00	0.00	3.003	200.315	0.254E+01
ORF # 1	202.67	877.33	0.00	0.00	0.823	7.244	0.408E+02

==========
| Table E12. Mean Conduit Flow Information |
==========

Conduit Name	Mean Flow (cfs)	Total Flow (ft^3)	Mean Percent Change	Low Flow Weightng	Mean Froude Number	Mean Hydraulic Radius	Mean Cross Area	Mean Conduit Roughness
201	4.75	3.077E+05	0.509	1.00	8.883E-02	0.969	12.7	1.878E-04
202	4.75	3.077E+05	7.392E-02	1.00	0.157	0.912	9.57	1.878E-04
300	4.35	2.819E+05	3.323E-03	0.882	1.44	0.262	0.816	1.745E-05
200	4.22	2.737E+05	3.638E-02	0.908	0.628	0.458	4.57	1.770E-05
100	3.21	2.083E+05	2.421E-02	0.908	0.646	0.474	2.92	1.770E-05
500	7.47	4.841E+05	6.921E-02	0.920	0.138	0.526	23.0	4.111E-05
ORF # 1	7.16	4.638E+05	4.606E-02	0.920	1.28	0.360	1.45	1.210E-05
WEIR # 1	0.277	1.798E+04						
FREE # 1	4.35	2.819E+05						

==========
| Table E13. Channel losses(H), headwater depth (HW), tailwater |
| depth (TW), critical and normal depth (Yc and Yn). |
| Use this section for culvert comparisons |
==========

Conduit Name	Maximum Flow	Head Loss	Friction Loss	Critical Depth	Normal Depth	HW Elevat	TW Elevat	
201	62.073	2.102	0.106	2.289	3.869	69.271	67.061	Max Flow
202	62.469	5.231	0.179	2.297	4.500	67.061	61.447	Max Flow
300	10.385	1.434	0.540	1.189	0.952	61.599	59.452	Max Flow
200	54.685	2.753	0.116	2.222	0.994	72.008	69.271	Max Flow
100	58.979	9.219	1.171	2.311	1.310	72.008	60.573	Max Flow
ORF # 1	94.326	0.000	2.568	2.866	3.000	73.938	71.381	Max Flow

==========

| CULVERT ANALYSIS CLASSIFICATION, and the time the culvert was in a particular classification during the simulation. The time is in minutes. Extran used the Dynamic Wave Equation for all conduit analysis but classifies the culvert flow condition based on the HW and TW depths. |

Conduit Name	Critical D Outlet Control	Mild Slope TW Control Outlet Control	Steep Slope TW Insignf Entrance Control	Slug Flow Outlet/ Entrance Control	Mild Slope TW > D Outlet Control	Mild Slope TW <= D Outlet Control	Outlet Control	Inlet Control
201	17.000	600.667	0.000	0.000	462.333	0.000	0.000	0.000
202	232.333	402.333	0.000	0.000	0.000	0.000	445.333	0.000
300	0.000	0.000	629.000	0.000	0.000	0.000	428.333	22.667
200	0.000	0.000	1057.333	0.000	0.000	0.000	0.000	22.667
100	0.000	0.000	1080.000	0.000	0.000	0.000	0.000	0.000
500	0.000	876.000	204.000	0.000	0.000	0.000	0.000	0.000
ORF # 1	802.333	45.333	204.000	0.000	5.667	0.000	22.667	0.000

| Kinematic Wave Approximations Time in Minutes for Each Condition |

Conduit Name	Length of Normal Flow	Slope Criteria	Super-Critical	Roll Waves
201	0.00	369.83	0.00	0.00
202	0.00	0.00	0.00	0.00
300	0.00	0.00	781.17	0.00
200	487.67	573.00	381.83	0.00
100	422.17	506.67	414.00	0.00
500	823.17	868.50	0.00	0.00
ORF # 1	0.00	0.00	611.33	0.00

Table E15 - SPREADSHEET INFO LIST
Conduit Flow and Junction Depth Information for use in spreadsheets. The maximum values in this table are the true maximum values because they sample every time step. The values in the review results may only be the maximum of a subset of all the time steps in the run. Note: These flows are only the flows in a single barrel.

Conduit Name	Maximum Flow	Total Flow	Maximum Velocity	##	Junction Name	Invert Elevation	Maximum Elevation
201	64.47006	307731.9	4.030078	##	10	59.10000	61.59877
202	65.16788	307709.5	5.186459	##	21	59.40000	69.27409
300	10.38483	281939.8	9.185605	##	22	59.20000	68.03622
200	55.35956	273693.7	6.032737	##	30	58.50000	59.45219
100	59.31119	208258.3	7.232785	##	40	68.59000	72.02061
500	117.6774	484125.9	1.049451	##	20	68.60000	74.09232
ORF # 1	94.33682	463814.6	13.59961	##	50	68.60000	74.09114
WEIR # 1	30.08216	17980.28	0.0000000	##			
FREE # 1	10.38483	281928.4	0.0000000	##			

```
#######################################################
# Table E16. New Conduit Information Section          #
#            Conduit Invert (IE) Elevation and Conduit #
#            Maximum Water Surface (WS) Elevations    #
#######################################################
```

Conduit Name	Upstream Node	Downstream Node	IE Up	IE Dn	WS Up	WS Dn	Conduit Type
201	21	22	59.40	59.30	69.27	68.04	Circular
202	22	10	59.20	59.15	68.04	61.60	Circular
300	10	30	59.10	58.50	61.60	59.45	Circular
200	40	21	68.60	62.00	72.02	69.27	Circular
100	40	10	68.60	59.10	72.02	61.60	Circular
500	50	20	71.00	68.60	74.09	74.09	Trapezoid
ORF # 1	20	40	68.60	68.59	74.09	72.02	Circ Orif

```
*==============================================================================*
|    Table E18 - Junction Continuity Error.   Division by Volume added 11/96   |
|                                                                              |
|  Continuity Error = Net Flow + Beginning Volume - Ending Volume              |
|                     ---------------------------------------------------      |
|                     Total Flow + (Beginning Volume + Ending Volume)/2        |
|                                                                              |
|  Net Flow   = Node Inflow - Node Outflow                                     |
|  Total Flow = absolute (Inflow + Outflow                                     |
|  Intermediate column is a judgement on the node continuity error.            |
|                                                                              |
|  Excellent  < 1 percent    Great  1 to  2 percent  Good  2 to  5 percent     |
|  Fair  5 to 10  percent    Poor  10 to 25 percent  Bad  25 to 50 percent     |
|  Terrible > 50  percent                                                      |
*==============================================================================*
```

Junction Continuity % Error in Remaining Beginning Net Flow

Name	Error	Node Contn	Volume	Volume	Thru Node
10	9.413E+04	7.120	4.427E+05	0.000	5.368E+05
21	630.	0.102	1.601E+03	0.000	2.231E+03
22	2.684E+03	0.433	1.758E+03	0.000	4.442E+03
30	-15.5	0.003	23.7	0.000	8.21
40	1.27	0.000	145.	0.000	-146.
20	758.	0.078	1.508E+03	0.000	2.266E+03
50	-1.257E+03	0.130	1.413E+03	0.000	-156.

The total continuity error was 96933. cubic feet
The remaining total volume was 4.49167E+05 cubic feet
Your mean node continuity error was Excellent
Your worst node continuity error was Fair

Table E19 - Junction Inflow Sources
Units are either ft^3 or m^3
depending on the units in your model.

Junction Name	Constant Inflow to Node	User Inflow Inflow to Node	Interface Inflow to Node	Outflow from Node
10	0.000	0.000	3.027E+05	2.612E-23
21	0.000	0.000	3.408E+04	2.943E-21
22	0.000	0.000	3.925E+03	0.000
30	0.000	0.000	0.000	2.819E+05
40	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000
50	0.000	0.000	4.839E+05	9.962E-23

Table E20 - Junction Flooding and Volume List
Units are either ft^3 or m^3
depending on the units in your model.

Junction Name	Surcharged Time (min)	Flooded Time(min)	Out of System Flooded Volume	Maximum Volume	Stored in System Ponding Allowed Flood Pond Volume
10	0.000	0.000	0.000	4.867E+05	0.000
21	462.	0.000	0.000	128.	0.000
22	464.	0.000	0.000	115.	0.000
30	0.000	0.000	0.000	12.4	0.000

```
40                0.000       0.000       0.000    44.6           0.000
20                0.000       0.000       0.000    71.4           0.000
50                0.000       0.000       0.000    71.4           0.000

*==================================*
| Simulation Specific Information  |
*==================================*
Number of Input Conduits..........        6 Number of Simulated Conduits......        9
Number of Natural Channels........        0 Number of Junctions...............        7
Number of Storage Junctions.......        1 Number of Weirs...................        1
Number of Orifices................        1 Number of Pumps...................        0
Number of Free Outfalls...........        1 Number of Tide Gate Outfalls......        0


*==========================================================*
| Average % Change in Junction or Conduit is defined as:   |
| Conduit  % Change ==> 100.0 ( Q(n+1) - Q(n) ) / Qfull    |
| Junction % Change ==> 100.0 ( Y(n+1) - Y(n) ) / Yfull    |
*==========================================================*

The Conduit with the largest average change was..201        with     0.509 percent
The Junction with the largest average change was.21         with     0.247 percent
The Conduit with the largest sinuosity was.......201        with    12.933


*=====================================================================*
| Table E21. Extran continuity balance at the end of the simulation |
|            Junction Inflow, Outflow or Street Flooding             |
| Error = Inflow  + Initial Volume - Outflow - Final   Volume        |
*=====================================================================*

   Inflow          Inflow       Average
   Junction    Volume,ft^3   Inflow, cfs
   --------   ------------  -------------
 10             3.0271E+05    4.6715E+00
 21             3.4085E+04    5.2600E-01
 22             3.9263E+03    6.0591E-02
 50             4.8400E+05    7.4691E+00

   Outflow      Outflow          Average
   Junction  Volume,ft^3    Outflow, cfs
   --------  ------------   ------------
 30             2.8193E+05    4.3507E+00

*=========================================================*
| Initial system volume        =     3.7158E+00 Cu Ft |
| Total system inflow volume   =     8.2472E+05 Cu Ft |
```

```
| Inflow + Initial volume      =     8.2472E+05 Cu Ft |
|=========================================================|
| Total system outflow         =     2.8193E+05 Cu ft |
| Volume left in system        =     4.4857E+05 Cu ft |
| Outflow + Final Volume       =     7.3050E+05 Cu ft |
*=========================================================*

*==================================================*
| Total Model Continuity Error                     |
| Error in Continuity, Percent =       11.42518 |
| Error in Continuity, ft^3    =      94226.230 |
| + Error means a continuity loss, - a gain        |
*==================================================*

#####################################################
# Table E22. Numerical Model judgement section    #
#####################################################

Your overall error was                          11.4252 percent
Worst nodal error was in node 10         with    7.1205 percent
Of the total inflow this loss was               11.4137 percent
Your overall continuity error was                 Poor
                                                 Excellent Efficiency
Efficiency of the simulation                      1.69
Most Number of Non Convergences at one Node      23.
Total Number Non Convergences at all Nodes       30.
Total Number of Nodes with Non Convergences       3.

===> Extended Transport model simulation ended normally.
 ===> SWMM Simulation ended normally.
===> Your input file was named  : C:\XPS\River.DAT
===> Your output file was named : C:\XPS\Riverext.out

*==============================================================*
|             SWMM Simulation Date and Time Summary            |
*==============================================================*
| Starting Date... April      29, 1998  Time...   19:51:38:82  |
|   Ending Date... April      29, 1998  Time...   19:52:45:61  |
|  Elapsed Time...    1.11317 minutes or     66.79000 seconds  |
*==============================================================*
```

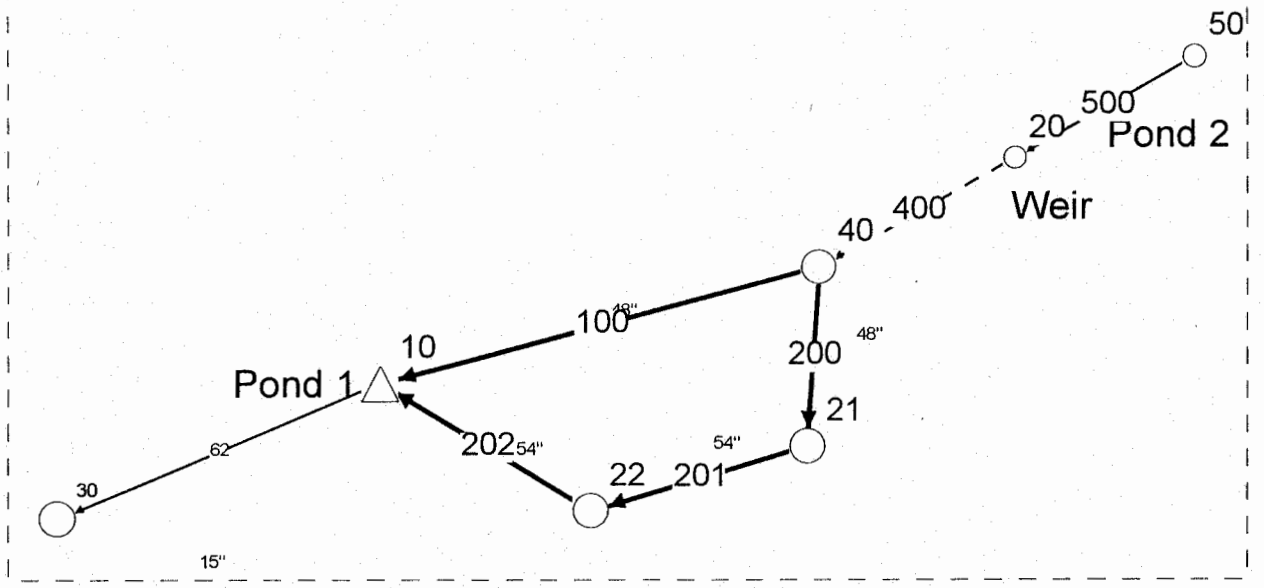
Project Name: Riverside - Off-site Drainage
Project No.: 188079
Date:11/13/98

POND No. 1

SUMMARY OF RESULTS FROM SWMM

	EXIST. CONDITION 20 ft - 15 inch pipe	SCENARIO #1 10 ft - 12 inch pipe inside exist. 15 inch pipe	SCENARIO #2 10ft - 10 inch pipe inside exist. 15 inch pipe
2 YEAR STORM ELEV. (FT)	64.01	64.21	64.48
10 YEAR STORM ELEV. (FT)	66.92	67.19	67.62
100 YEAR STORM ELEV. (FT)	70.74	71.14	71.58

Riverside SWMM Model Conduit/ Node Connection



EXISTING CONDITION
2 YEAR STORM (P=3.36 inch)

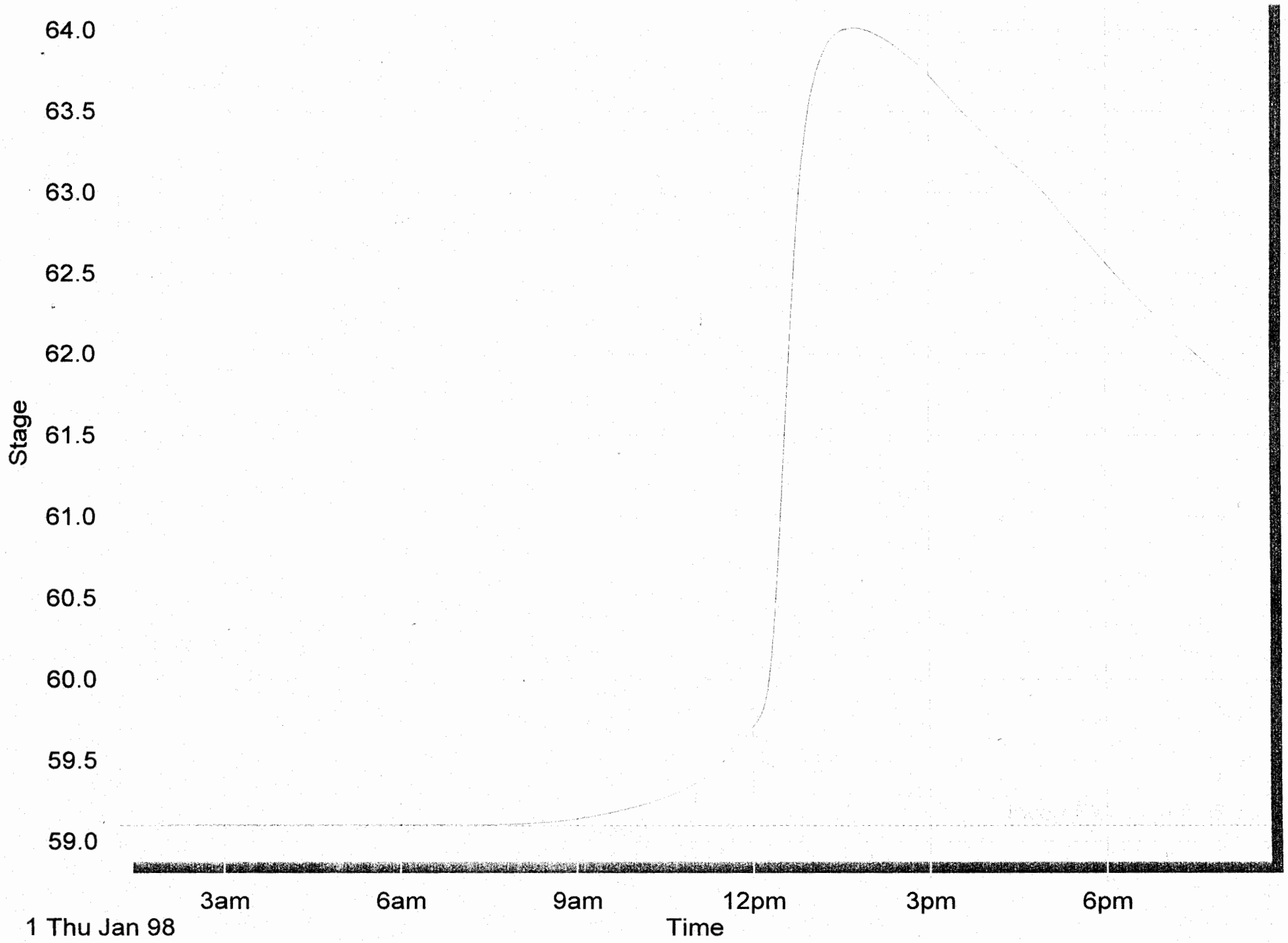
==========
| Table E9 - JUNCTION SUMMARY STATISTICS |
| The Maximum area is only the area of the node, it |
| does not include the area of the surrounding conduits |
==========

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Meters of Surcharge at Max Elevation	Freeboard of node meters	Maximum Junction Area ft^2
10	75.00	75.00	64.01	13	44	0.00	10.99	4.903E+04
21	75.00	66.00	64.97	12	43	0.00	10.03	1.300E+01
22	75.00	63.80	64.03	13	43	0.23	10.97	1.300E+01
40	76.00	72.60	69.53	12	33	0.00	6.47	1.300E+01
20	80.00	76.50	72.37	12	39	0.00	7.63	1.300E+01
50	80.00	76.60	72.58	12	39	0.00	7.42	1.300E+01
30	70.00	59.75	59.75	13	7	0.00	10.25	1.300E+01

==========
| Table E10 - CONDUIT SUMMARY STATISTICS |
| Note: The peak flow may be less than the design flow |
| and the conduit may still surcharge because of the |
| downstream boundary conditions. |
==========

Name Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Conduit Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Ends Upstream (ft)	Dwnstrm (ft)
201	60.	3.76	54.00	3.29E+01	12	37	2.11	12	33	0.55	64.97	64.03
202	42.	2.64	54.00	3.30E+01	12	34	2.97	12	27	0.79	64.03	64.01
200	4.03E+02	32.04	48.00	2.89E+01	12	38	6.05	12	11	0.07	69.53	64.97
100	2.54E+02	20.21	48.00	2.95E+01	12	35	6.37	12	24	0.12	69.53	64.01
500	85.	1.74	94.80	5.94E+01	12	36	2.95	12	26	0.70	72.58	72.37
62	11.	9.12	15.00	1.23E+01	13	44	9.95	13	44	1.10	64.01	59.75
ORF # 1	98.	0.80	36.00	5.83E+01	12	37	12.29	12	40	0.59	72.37	69.53
WEIR # 1	Undefnd	Undefnd	Undefnd	0.00E+00	0	0						
FREE # 1	Undefnd	Undefnd	Undefnd	1.23E+01	13	44						

Node - 10


64.0
63.5
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6am
9am
12pm
3pm
6pm
1 Thu Jan 98
Time

EXISTING CONDITION
10 YEAR STORM (P=5.04 inch)

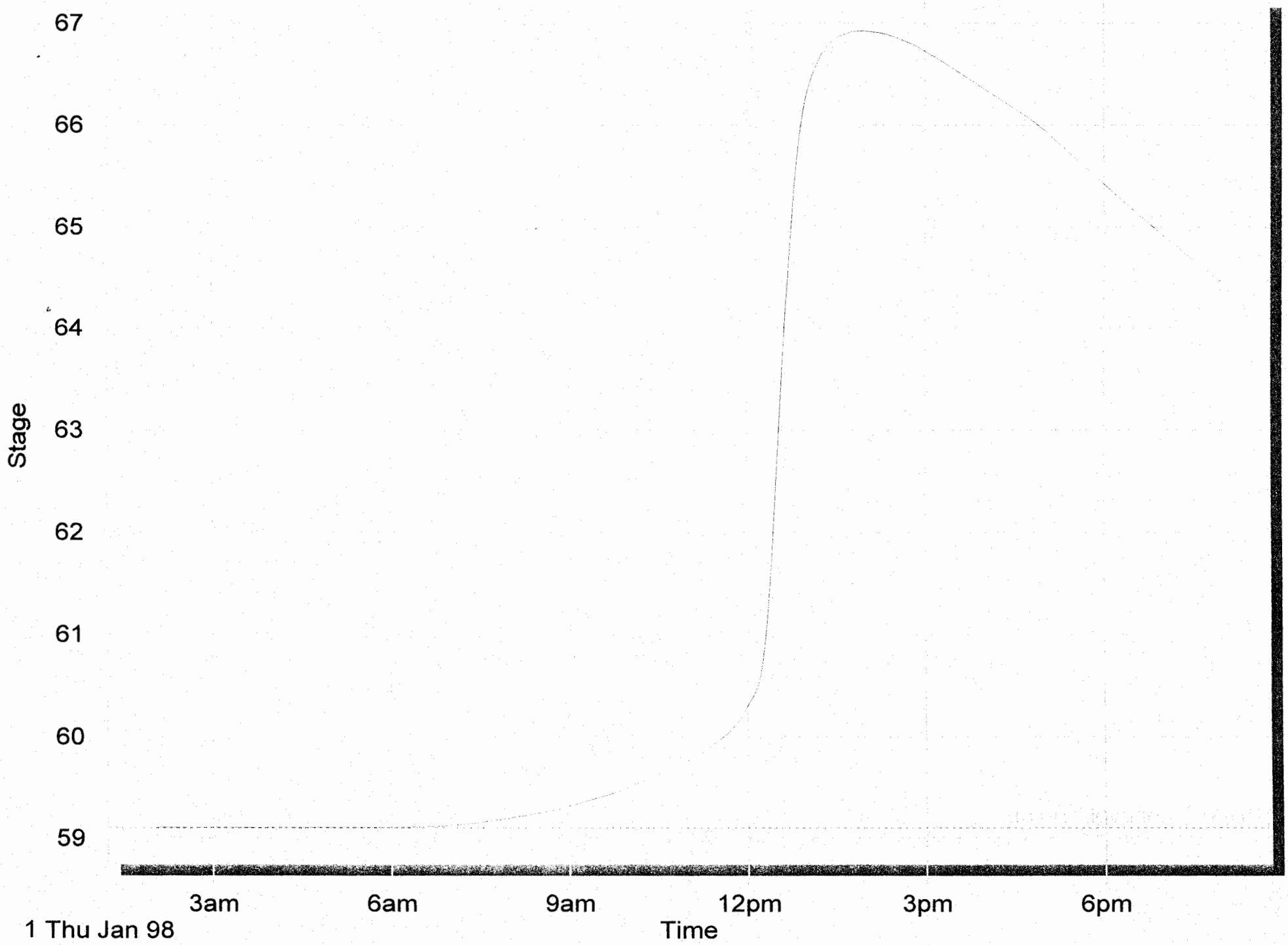
==========
| Table E9 - JUNCTION SUMMARY STATISTICS |
| The Maximum area is only the area of the node, it |
| does not include the area of the surrounding conduits|
==========

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Meters of Surcharge at Max Elevation	Freeboard of node meters	Maximum Junction Area ft^2
10	75.00	75.00	66.92	13	55	0.00	8.08	6.008E+04
21	75.00	66.00	67.66	12	42	1.66	7.34	1.300E+01
22	75.00	63.80	66.95	13	51	3.15	8.05	1.300E+01
40	76.00	72.60	70.46	12	39	0.00	5.54	1.300E+01
20	80.00	76.50	73.88	12	26	0.00	6.12	1.300E+01
50	80.00	76.60	74.06	12	26	0.00	5.94	1.300E+01
30	70.00	59.75	59.75	12	36	0.00	10.25	1.300E+01

==========
| Table E10 - CONDUIT SUMMARY STATISTICS |
| Note: The peak flow may be less than the design flow |
| and the conduit may still surcharge because of the |
| downstream boundary conditions. |
==========

Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Conduit Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Ends Upstream (ft)	Dwnstrm (ft)
201	60.	3.76	54.00	5.22E+01	12	34	3.27	12	34	0.87	67.66	66.95
202	42.	2.64	54.00	5.29E+01	12	35	3.63	12	27	1.26	66.95	66.92
200	4.03E+02	32.04	48.00	4.49E+01	12	37	8.12	6	5	0.11	70.46	67.66
100	2.54E+02	20.21	48.00	5.43E+01	12	36	6.53	12	27	0.21	70.46	66.92
500	85.	1.74	94.80	9.97E+01	12	36	2.98	12	17	1.17	74.06	73.88
62	11.	9.12	15.00	1.61E+01	13	55	12.90	13	55	1.44	66.92	59.75
ORF # 1	98.	0.80	36.00	8.93E+01	12	38	15.20	12	26	0.91	73.88	70.46
WEIR # 1	Undefnd	Undefnd	Undefnd	1.16E+01	12	27						
FREE # 1	Undefnd	Undefnd	Undefnd	1.61E+01	13	55						

Node - 10


67
66
65
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62
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Stage
3am
6am
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12pm
3pm
6pm
1 Thu Jan 98
Time

EXISTING CONDITION
100 YEAR STORM (P=7.68 inch)

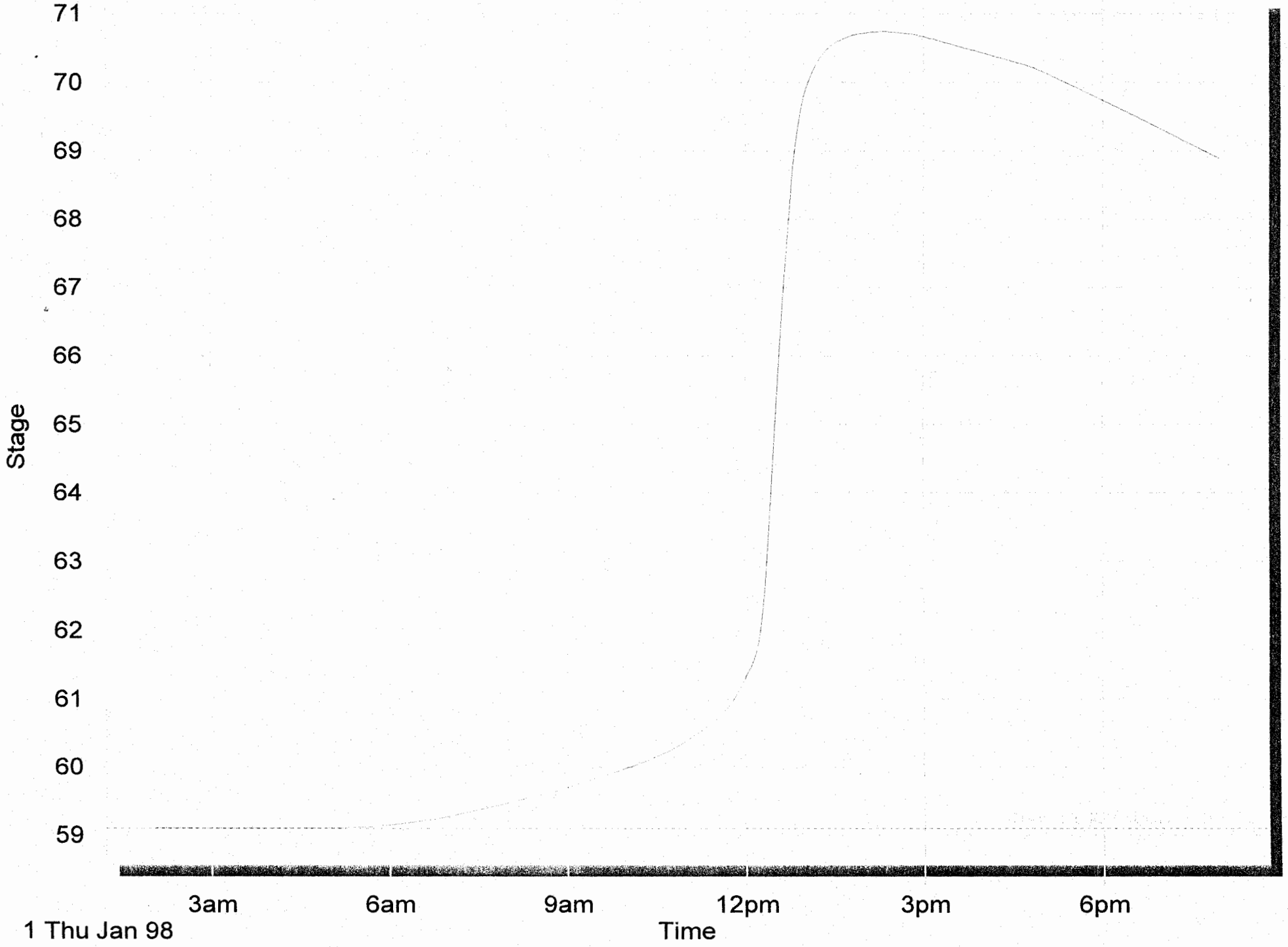
==========
| Table E9 - JUNCTION SUMMARY STATISTICS |
| The Maximum area is only the area of the node, it |
| does not include the area of the surrounding conduits |
==========

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Meters of Surcharge at Max Elevation	Freeboard of node meters	Maximum Junction Area ft^2
10	75.00	75.00	70.74	14	18	0.00	4.26	8.052E+04
21	75.00	66.00	72.97	12	45	6.97	2.03	1.300E+01
22	75.00	63.80	71.37	12	45	7.57	3.63	1.300E+01
40	76.00	72.60	76.01	12	38	3.41	0.00	5.041E+03
20	80.00	76.50	79.06	12	38	2.56	0.94	1.300E+01
50	80.00	76.60	79.40	12	38	2.80	0.60	1.300E+01
30	70.00	59.75	59.75	12	25	0.00	10.25	1.300E+01

==========
| Table E10 - CONDUIT SUMMARY STATISTICS |
| Note: The peak flow may be less than the design flow |
| and the conduit may still surcharge because of the |
| downstream boundary conditions. |
==========

Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Conduit Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Ends Upstream (ft)	Dwnstrm (ft)
201	60.	3.76	54.00	8.09E+01	12	35	5.04	12	35	1.35	72.97	71.37
202	42.	2.64	54.00	8.26E+01	12	35	5.16	12	35	1.97	71.37	70.74
200	4.03E+02	32.04	48.00	6.86E+01	12	35	5.91	11	0	0.17	76.00	72.97
100	2.54E+02	20.21	48.00	9.10E+01	12	35	7.21	12	35	0.36	76.00	70.74
500	85.	1.74	94.80	1.63E+02	12	37	3.72	12	30	1.91	79.40	79.06
62	11.	9.12	15.00	2.02E+01	14	18	15.96	14	18	1.80	70.74	59.75
ORF # 1	98.	0.80	36.00	1.12E+02	12	21	17.59	12	20	1.14	79.06	76.00
WEIR # 1	Undefnd	Undefnd	Undefnd	1.63E+02	12	36						
FREE # 1	Undefnd	Undefnd	Undefnd	2.02E+01	14	18						

Node - 10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Stage
3am
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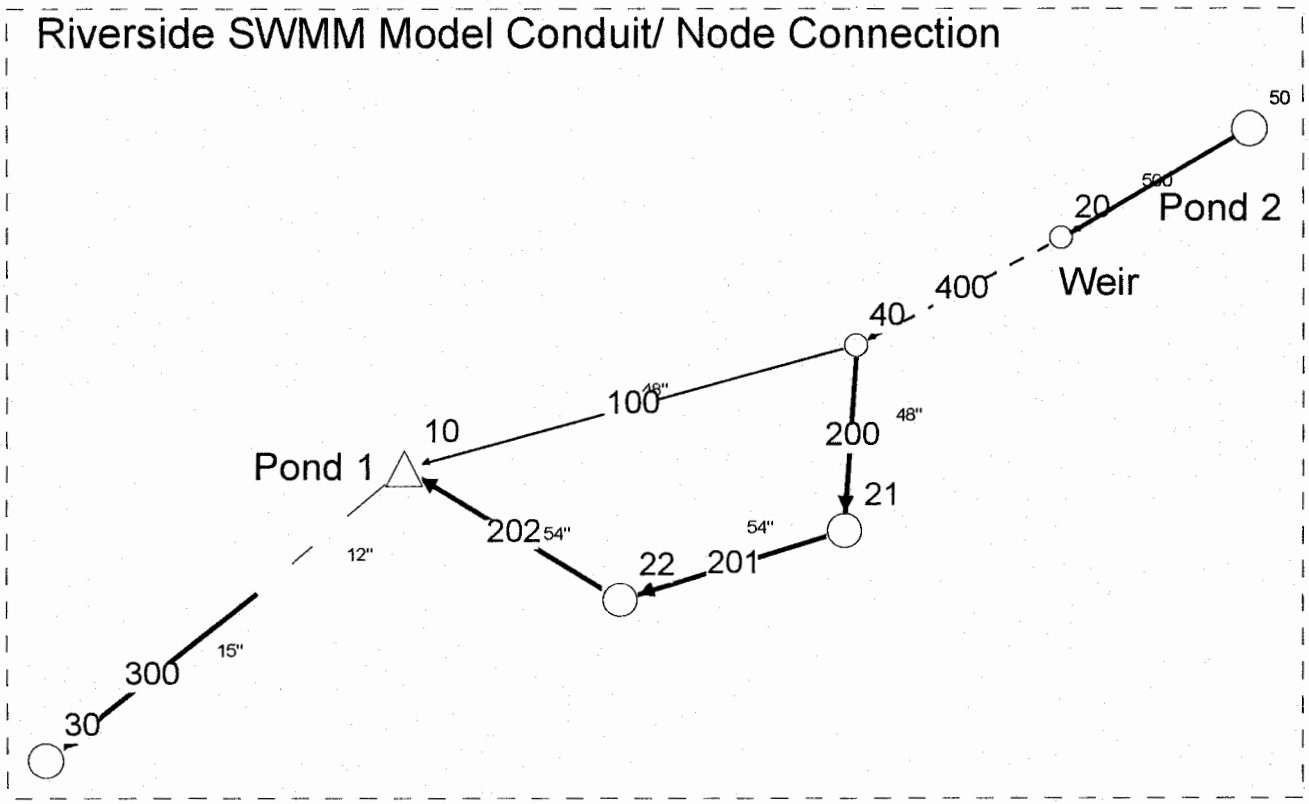
12pm
3pm
6pm
1 Thu Jan 98
Time


Riverside SWMM Model Conduit/ Node Connection
50
500
20
Pond 2
400
Weir
40
100
48"
10
200
48"
Pond 1
21
202
54"
54"
12"
22
201
15"
300
30

12-15 PIPE
2 YEAR STORM (P=3.36 inch)

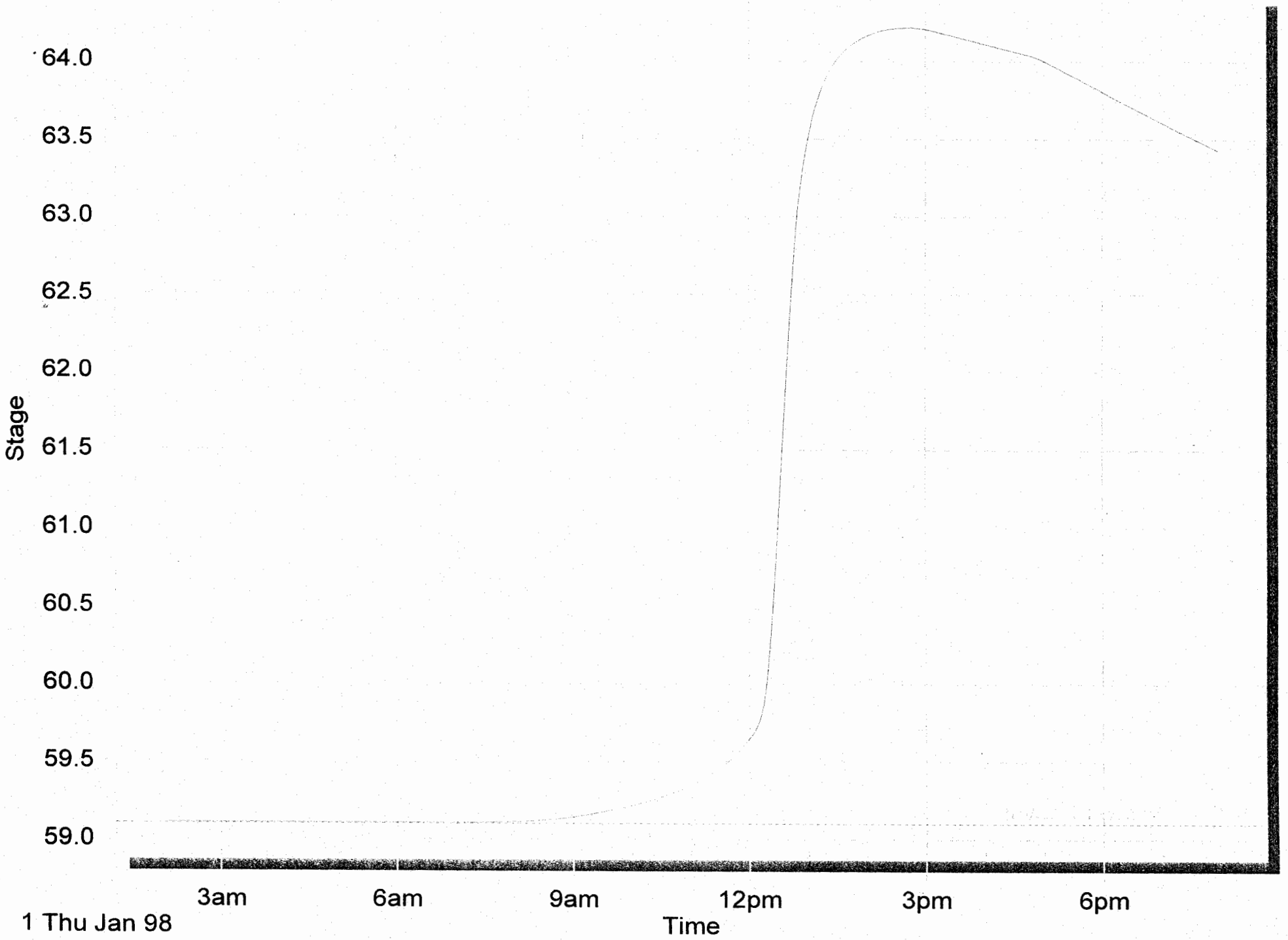
```
*=========================================================*
|        Table E9 - JUNCTION SUMMARY STATISTICS           |
| The Maximum area is only the area of the node, it       |
| does not include the area of the surrounding conduits|
*=========================================================*
```

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Meters of Surcharge at Max Elevation	Freeboard of node meters	Maximum Junction Area ft^2
10	75.00	75.00	64.21	14	44	0.00	10.79	4.977E+04
21	75.00	66.00	64.93	12	42	0.00	10.07	1.300E+01
22	75.00	63.80	64.22	14	44	0.42	10.78	1.300E+01
30	70.00	59.75	59.20	14	44	0.00	10.80	1.300E+01
40	76.00	72.60	69.55	12	33	0.00	6.45	1.300E+01
20	80.00	76.50	72.30	12	39	0.00	7.70	1.300E+01
50	80.00	76.60	72.53	12	39	0.00	7.47	1.300E+01
31	75.00	60.05	61.30	14	43	1.25	13.70	1.300E+01

```
*=========================================================*
|        Table E10 - CONDUIT SUMMARY STATISTICS           |
| Note: The peak flow may be less than the design flow |
| and the conduit may still surcharge because of the      |
| downstream boundary conditions.                         |
*=========================================================*
```

Name Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Conduit Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Upstream (ft)	Ends Dwnstrm (ft)
201	60.	3.76	54.00	3.35E+01	12	34	2.15	12	34	0.56	64.93	64.22
202	42.	2.64	54.00	3.35E+01	12	35	3.01	12	27	0.80	64.22	64.21
300	11.	9.12	15.00	6.69E+00	14	44	6.72	14	44	0.60	61.30	59.20
200	4.03E+02	32.04	48.00	2.91E+01	12	34	6.05	12	10	0.07	69.55	64.93
100	2.54E+02	20.21	48.00	2.98E+01	12	36	6.40	12	23	0.12	69.55	64.21
500	85.	1.74	94.80	5.93E+01	12	36	2.96	12	26	0.69	72.53	72.30
310	8.9	11.35	12.00	6.69E+00	14	44	8.36	14	44	0.75	64.21	61.30
ORF # 1	98.	0.80	36.00	5.83E+01	12	38	12.16	12	39	0.59	72.30	69.55
WEIR # 1	Undefnd	Undefnd	Undefnd	0.00E+00	0	0						
FREE # 1	Undefnd	Undefnd	Undefnd	6.69E+00	14	44						

Node - 10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61.0
60.5
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59.5
59.0
Stage
3am
6am
9am
12pm
3pm
6pm
Time
1 Thu Jan 98

12-15 PIPE
10 YEAR STORM (P=5.04 inch)

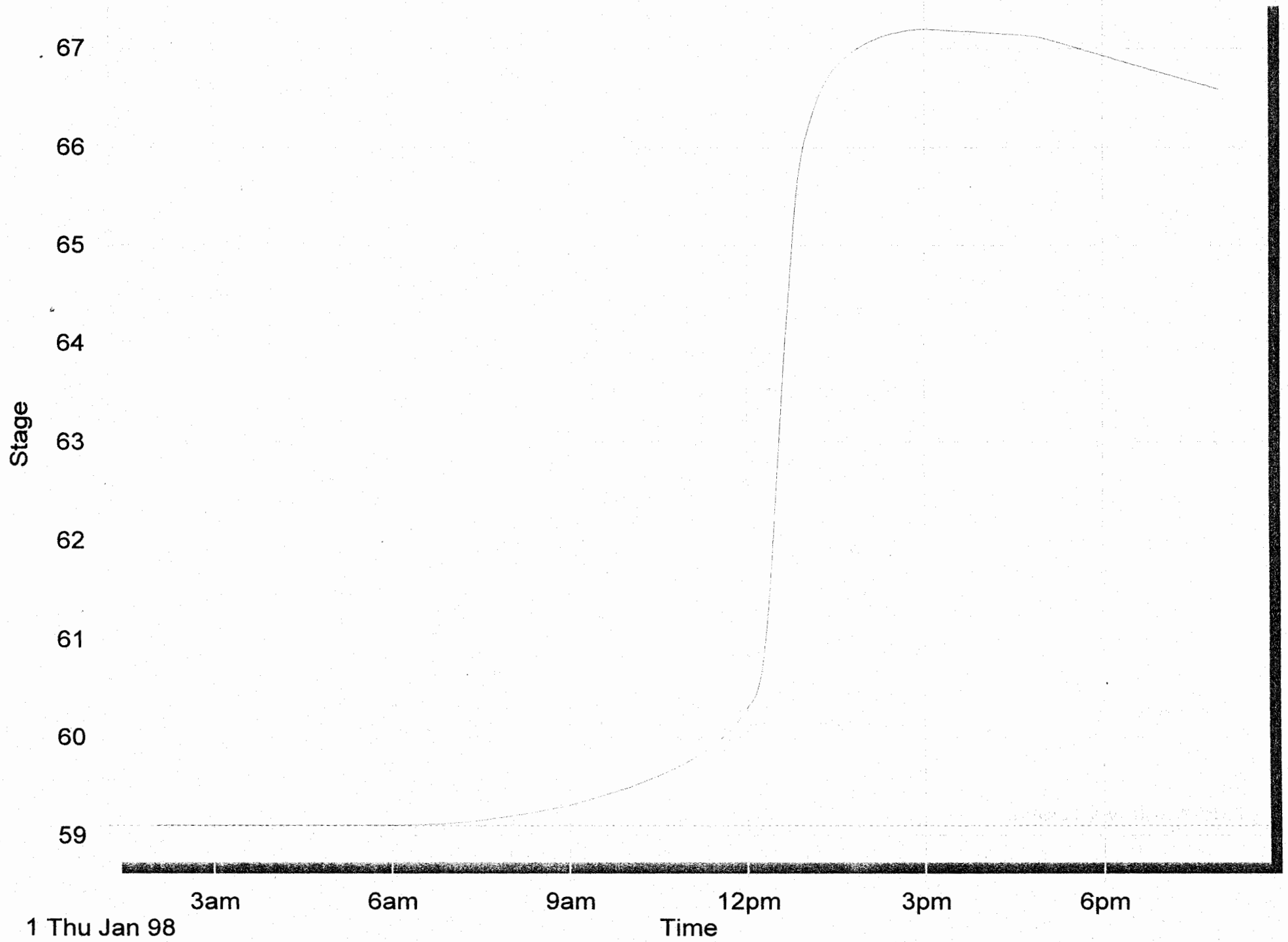
==========
| Table E9 - JUNCTION SUMMARY STATISTICS |
| The Maximum area is only the area of the node, it |
| does not include the area of the surrounding conduits |
==========

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Meters of Surcharge at Max Elevation	Freeboard of node meters	Maximum Junction Area ft^2
10	75.00	75.00	67.19	14	59	0.00	7.81	6.114E+04
21	75.00	66.00	67.53	12	41	1.53	7.47	1.300E+01
22	75.00	63.80	67.20	14	57	3.40	7.80	1.300E+01
30	70.00	59.75	59.32	14	59	0.00	10.68	1.300E+01
40	76.00	72.60	70.41	12	39	0.00	5.59	1.300E+01
20	80.00	76.50	73.82	12	34	0.00	6.18	1.300E+01
50	80.00	76.60	74.04	12	35	0.00	5.96	1.300E+01
31	75.00	60.05	62.40	14	59	2.35	12.60	1.300E+01

==========
| Table E10 - CONDUIT SUMMARY STATISTICS |
| Note: The peak flow may be less than the design flow |
| and the conduit may still surcharge because of the |
| downstream boundary conditions. |
==========

Name Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Conduit Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Ends Upstream (ft)	Dwnstrm (ft)
201	60.	3.76	54.00	5.24E+01	12	35	3.28	12	35	0.87	67.53	67.20
202	42.	2.64	54.00	5.30E+01	12	34	3.63	12	27	1.26	67.20	67.19
300	11.	9.12	15.00	8.59E+00	14	59	8.05	14	59	0.77	62.40	59.32
200	4.03E+02	32.04	48.00	4.50E+01	12	36	8.12	6	5	0.11	70.41	67.53
100	2.54E+02	20.21	48.00	5.43E+01	12	36	6.54	12	27	0.21	70.41	67.19
500	85.	1.74	94.80	9.97E+01	12	35	2.98	12	17	1.17	74.04	73.82
310	8.9	11.35	12.00	8.59E+00	14	58	10.59	14	58	0.96	67.19	62.40
ORF # 1	98.	0.80	36.00	8.88E+01	12	38	15.10	12	33	0.90	73.82	70.41
WEIR # 1	Undefnd	Undefnd	Undefnd	1.18E+01	12	34						
FREE # 1	Undefnd	Undefnd	Undefnd	8.59E+00	14	59						

Node - 10



MC039_LA_FONTAINE_DRY_POND_2 - 170

12-15 PIPE
100 YEAR STORM (P=7.68 inch)

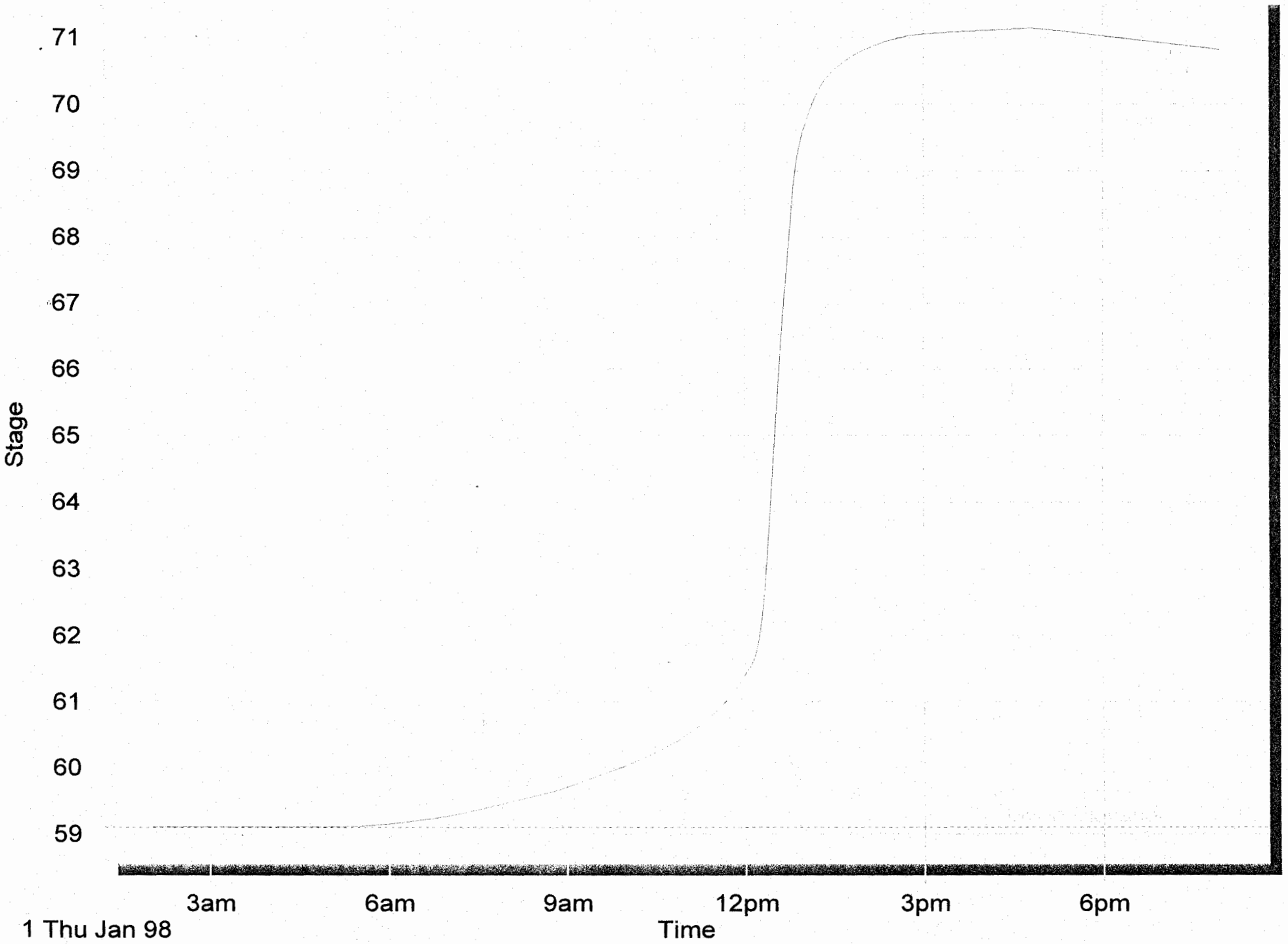
==========
| Table E9 - JUNCTION SUMMARY STATISTICS |
| The Maximum area is only the area of the node, it |
| does not include the area of the surrounding conduits |
==========

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Meters of Surcharge at Max Elevation	Freeboard of node meters	Maximum Junction Area ft^2
10	75.00	75.00	71.14	16	43	0.00	3.86	8.277E+04
21	75.00	66.00	73.79	12	47	7.79	1.21	1.300E+01
22	75.00	63.80	71.63	12	47	7.83	3.37	1.300E+01
30	70.00	59.75	59.48	16	44	0.00	10.52	1.300E+01
40	76.00	72.60	76.00	12	36	3.40	0.00	1.300E+01
20	80.00	76.50	79.02	12	37	2.52	0.98	1.300E+01
50	80.00	76.60	79.41	12	37	2.81	0.59	1.300E+01
31	75.00	60.05	63.77	16	43	3.72	11.23	1.300E+01

==========
| Table E10 - CONDUIT SUMMARY STATISTICS |
| Note: The peak flow may be less than the design flow |
| and the conduit may still surcharge because of the |
| downstream boundary conditions. |
==========

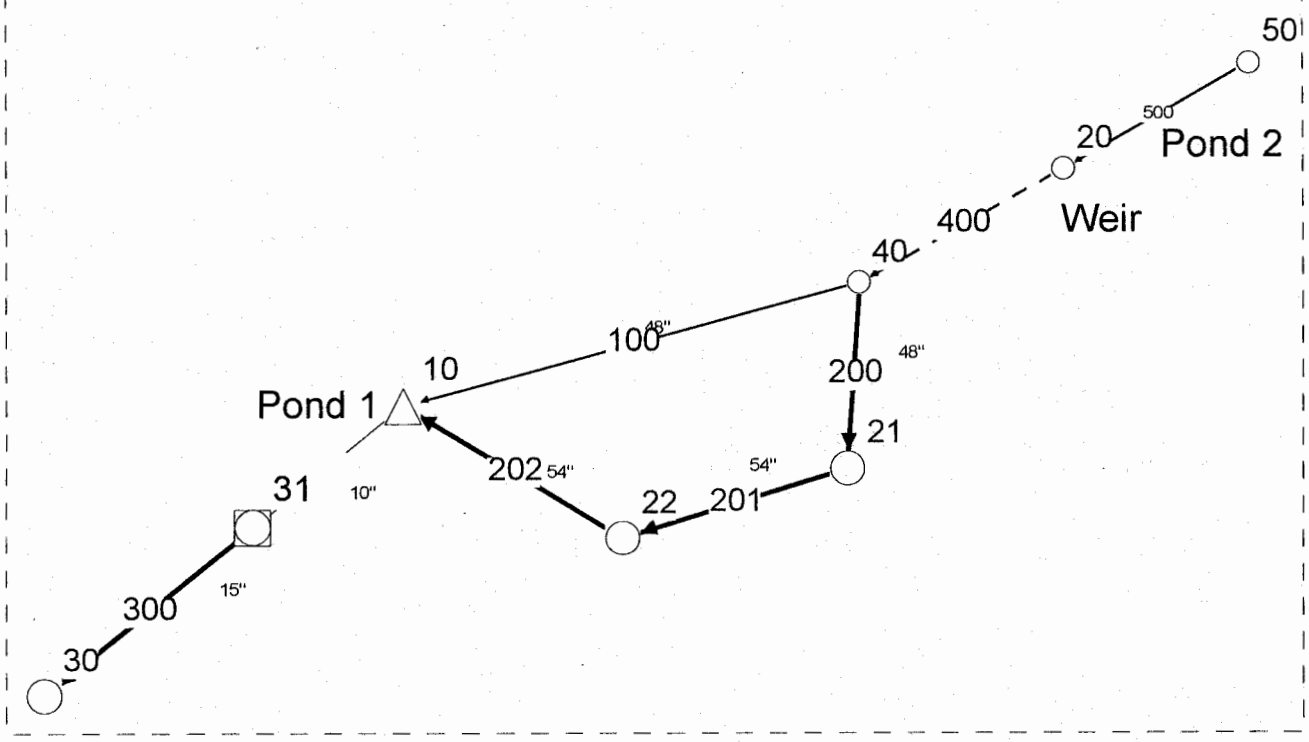
Name Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Conduit Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Ends Upstream (ft)	Dwnstrm (ft)
201	60.	3.76	54.00	8.11E+01	12	36	5.05	12	36	1.35	73.80	71.63
202	42.	2.64	54.00	8.25E+01	12	36	5.15	12	36	1.97	71.63	71.14
300	11.	9.12	15.00	1.07E+01	16	44	9.30	16	44	0.96	63.77	59.48
200	4.03E+02	32.04	48.00	6.83E+01	12	36	5.89	10	56	0.17	76.00	73.80
100	2.54E+02	20.21	48.00	9.12E+01	12	38	7.21	12	38	0.36	76.00	71.14
500	85.	1.74	94.80	1.61E+02	12	35	3.72	12	30	1.89	79.41	79.02
310	8.9	11.35	12.00	1.07E+01	16	43	12.99	16	43	1.20	71.14	63.77
ORF # 1	98.	0.80	36.00	9.91E+01	12	24	15.29	12	18	1.01	79.02	76.00
WEIR # 1	Undefnd	Undefnd	Undefnd	1.84E+02	12	36						
FREE # 1	Undefnd	Undefnd	Undefnd	1.07E+01	16	44						

Node - 10



MC039_LA_FONTAINE_DRY_POND_2 - 172

Riverside SWMM Model Conduit/ Node Connection



10-15 PIPE
2 YEAR STORM (P=3.36 inch)

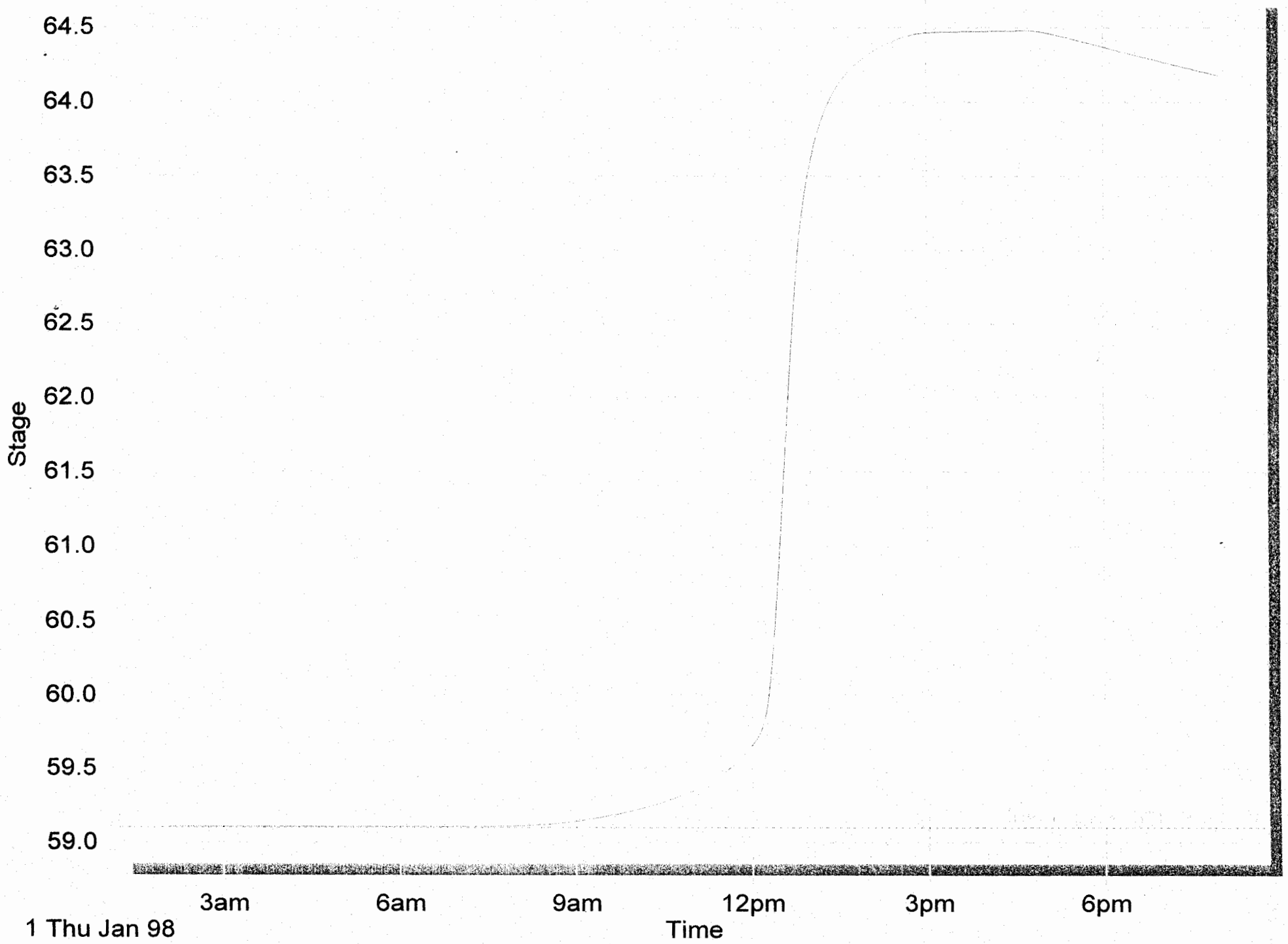
==========
| Table E9 - JUNCTION SUMMARY STATISTICS |
| The Maximum area is only the area of the node, it |
| does not include the area of the surrounding conduits |
==========

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Meters of Surcharge at Max Elevation	Freeboard of node meters	Maximum Junction Area ft^2
10	75.00	75.00	64.48	16	41	0.00	10.52	5.075E+04
21	75.00	66.00	64.94	12	42	0.00	10.06	1.300E+01
22	75.00	63.80	64.49	16	40	0.69	10.51	1.300E+01
30	70.00	59.75	59.07	16	41	0.00	10.93	1.300E+01
40	76.00	72.60	69.54	12	33	0.00	6.46	1.300E+01
20	80.00	76.50	72.31	12	39	0.00	7.69	1.300E+01
50	80.00	76.60	72.53	12	39	0.00	7.47	1.300E+01
31	75.00	60.05	60.96	16	41	0.91	14.04	1.300E+01

==========
| Table E10 - CONDUIT SUMMARY STATISTICS |
| Note: The peak flow may be less than the design flow |
| and the conduit may still surcharge because of the |
| downstream boundary conditions. |
==========

Name Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Conduit Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Ends Upstream (ft)	Dwnstrm (ft)
201	60.	3.76	54.00	3.35E+01	12	35	2.15	12	35	0.56	64.94	64.49
202	42.	2.64	54.00	3.34E+01	12	34	3.00	12	27	0.80	64.49	64.48
300	11.	9.12	15.00	4.82E+00	16	41	5.21	16	41	0.43	60.96	59.07
200	4.03E+02	32.04	48.00	2.90E+01	12	34	6.05	12	10	0.07	69.54	64.94
100	2.54E+02	20.21	48.00	2.98E+01	12	36	6.39	12	23	0.12	69.54	64.48
500	85.	1.74	94.80	5.93E+01	12	36	2.96	12	26	0.69	72.53	72.31
310	5.4	10.02	9.96	4.82E+00	16	41	8.69	16	41	0.89	64.48	60.96
ORF # 1	98.	0.80	36.00	5.83E+01	12	38	12.18	12	39	0.59	72.31	69.54
WEIR # 1	Undefnd	Undefnd	Undefnd	0.00E+00	0	0						
FREE # 1	Undefnd	Undefnd	Undefnd	4.82E+00	16	41						

Node - 10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Stage
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6pm
1 Thu Jan 98
Time

10-15 PIPE
10 YEAR STORM (P=5.04 inch)

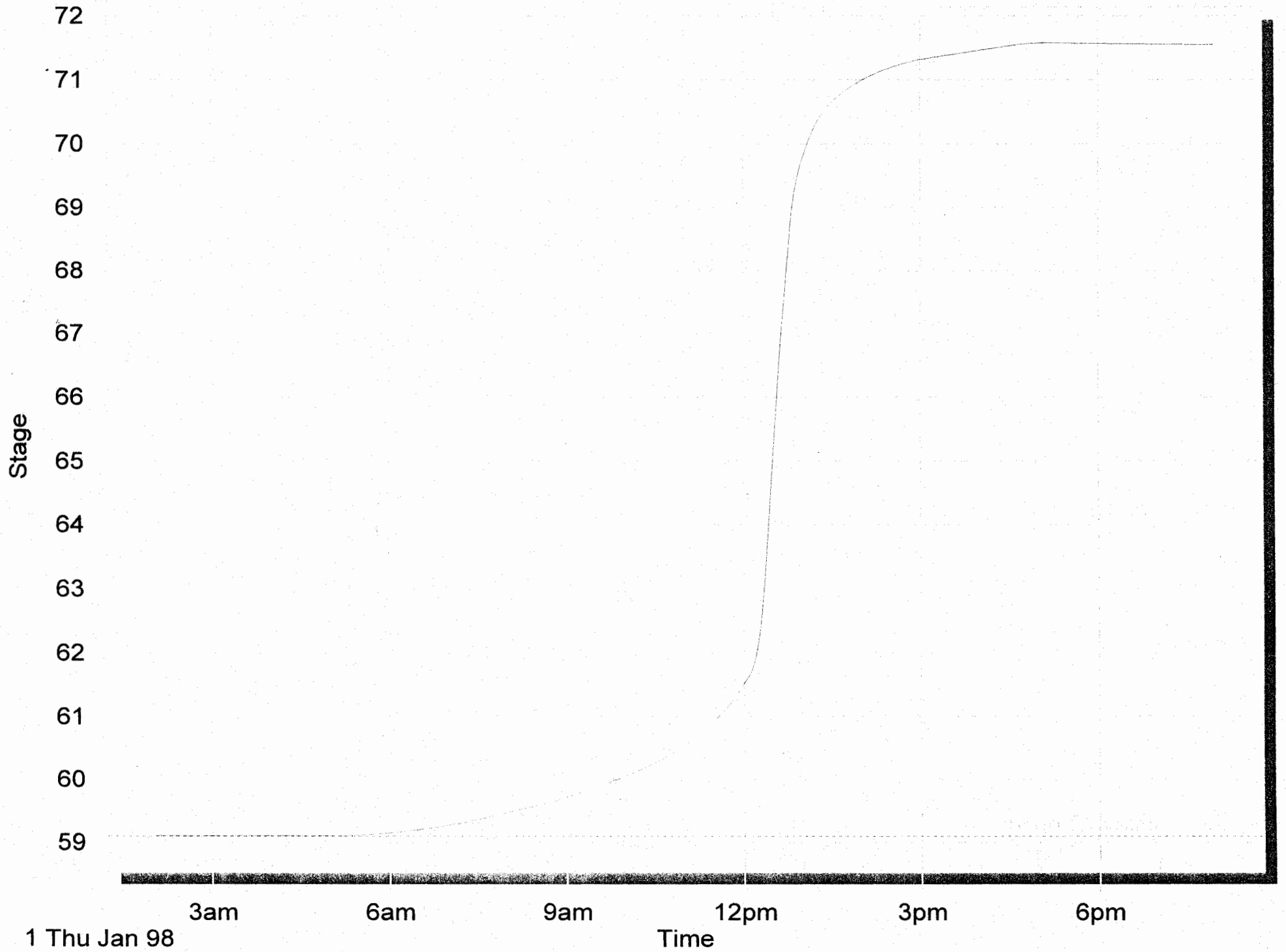
==========
| Table E9 - JUNCTION SUMMARY STATISTICS |
| The Maximum area is only the area of the node, it |
| does not include the area of the surrounding conduits |
==========

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Meters of Surcharge at Max Elevation	Freeboard of node meters	Maximum Junction Area ft^2
10	75.00	75.00	67.62	16	52	0.00	7.38	6.288E+04
21	75.00	66.00	67.64	16	45	1.64	7.36	1.300E+01
22	75.00	63.80	67.63	16	50	3.83	7.37	1.300E+01
30	70.00	59.75	59.16	16	53	0.00	10.84	1.300E+01
40	76.00	72.60	70.43	12	39	0.00	5.57	1.300E+01
20	80.00	76.50	73.82	12	34	0.00	6.18	1.300E+01
50	80.00	76.60	74.04	12	35	0.00	5.96	1.300E+01
31	75.00	60.05	61.96	16	52	1.91	13.04	1.300E+01

==========
| Table E10 - CONDUIT SUMMARY STATISTICS |
| Note: The peak flow may be less than the design flow |
| and the conduit may still surcharge because of the |
| downstream boundary conditions. |
==========

Name Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Conduit Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Ends Upstream (ft)	Dwnstrm (ft)
201	60.	3.76	54.00	5.23E+01	12	35	3.28	12	35	0.87	67.64	67.63
202	42.	2.64	54.00	5.29E+01	12	35	3.60	12	27	1.26	67.63	67.62
300	11.	9.12	15.00	6.17E+00	16	53	6.31	16	53	0.55	61.96	59.16
200	4.03E+02	32.04	48.00	4.49E+01	12	35	8.12	6	5	0.11	70.43	67.64
100	2.54E+02	20.21	48.00	5.43E+01	12	36	6.52	12	27	0.21	70.43	67.62
500	85.	1.74	94.80	9.97E+01	12	35	2.98	12	17	1.17	74.04	73.82
310	5.4	10.02	9.96	6.17E+00	16	52	10.97	16	52	1.14	67.62	61.96
ORF # 1	98.	0.80	36.00	8.90E+01	12	38	15.10	12	32	0.91	73.82	70.43
WEIR # 1	Undefnd	Undefnd	Undefnd	1.18E+01	12	34						
FREE # 1	Undefnd	Undefnd	Undefnd	6.17E+00	16	53						

Node - 10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Stage
3am
6am
9am
12pm
3pm
6pm
1 Thu Jan 98
Time

10-15 PIPE
100 YEAR STORM (P=7.68 inch)

==========
| Table E9 - JUNCTION SUMMARY STATISTICS |
| The Maximum area is only the area of the node, it |
| does not include the area of the surrounding conduits |
==========

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Meters of Surcharge at Max Elevation	Freeboard of node meters	Maximum Junction Area ft^2
10	75.00	75.00	71.58	17	11	0.00	3.42	8.526E+04
21	75.00	66.00	72.93	12	47	6.93	2.07	1.300E+01
22	75.00	63.80	71.59	17	11	7.79	3.41	1.300E+01
30	70.00	59.75	59.26	17	12	0.00	10.74	1.300E+01
40	76.00	72.60	76.01	12	38	3.41	0.00	5.057E+03
20	80.00	76.50	79.14	12	37	2.64	0.86	1.300E+01
50	80.00	76.60	79.48	12	37	2.88	0.52	1.300E+01
31	75.00	60.05	63.17	17	11	3.12	11.83	1.300E+01

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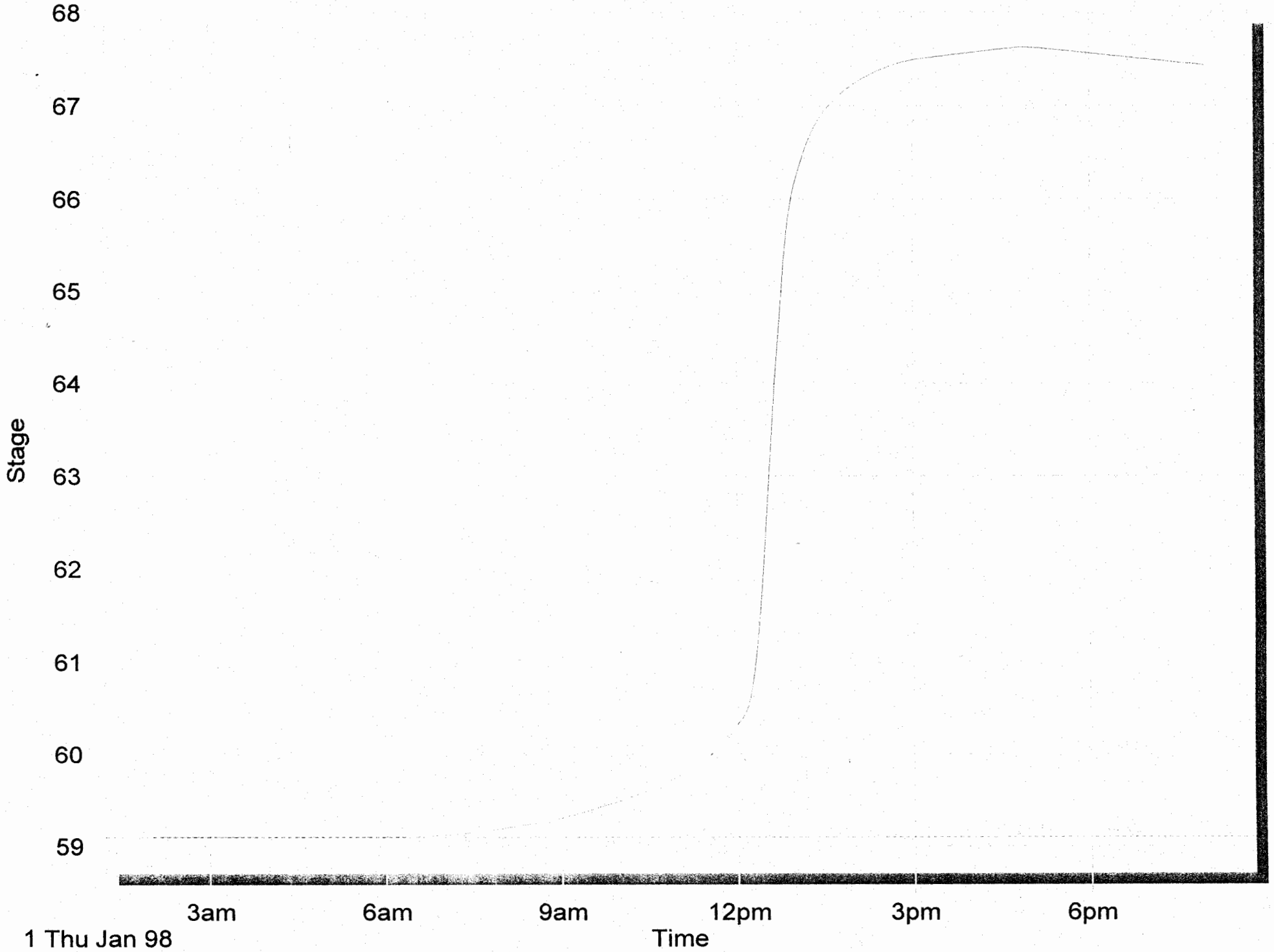
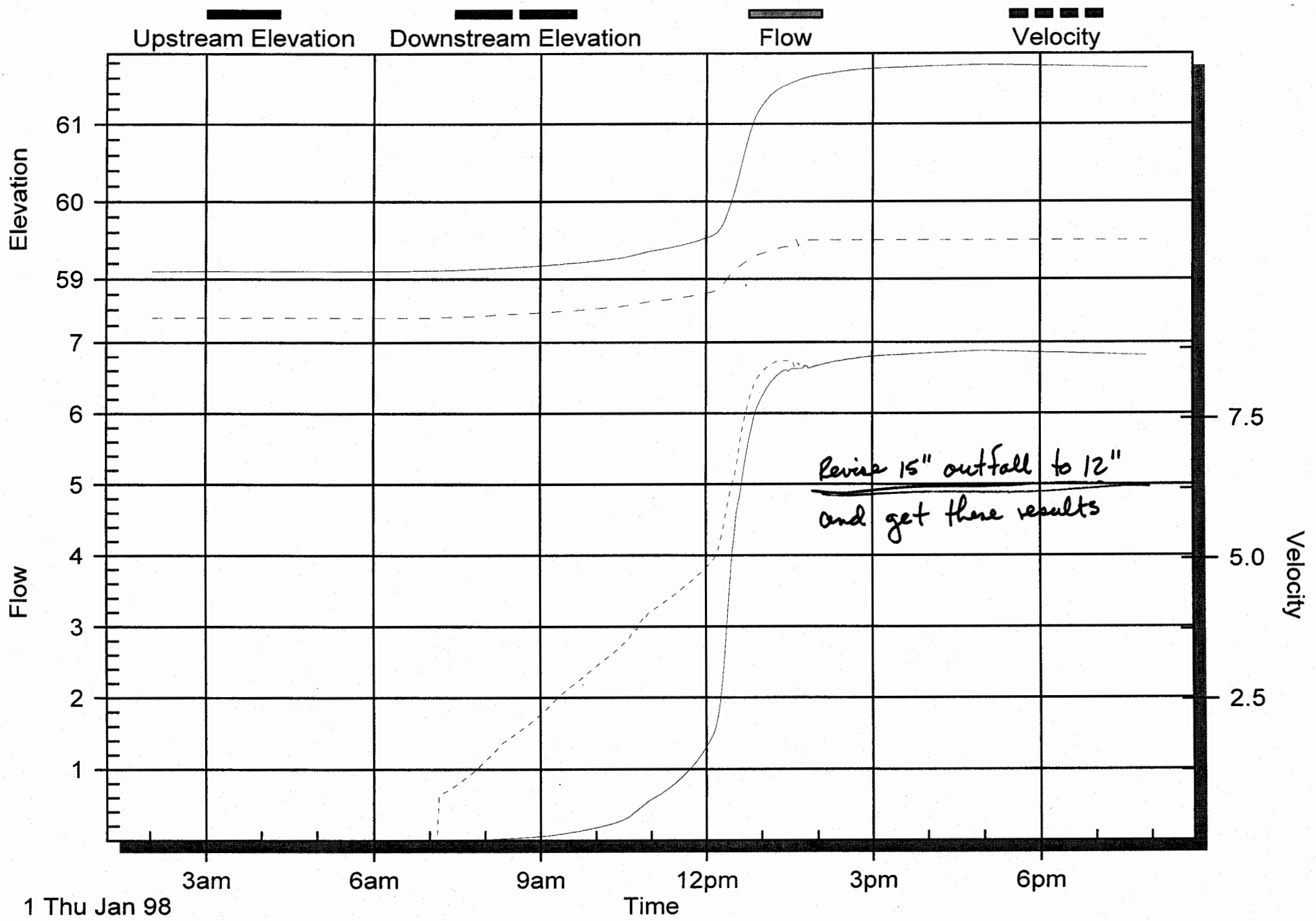
| Table E10 - CONDUIT SUMMARY STATISTICS |
| Note: The peak flow may be less than the design flow |
| and the conduit may still surcharge because of the |
| downstream boundary conditions. |
==========

Name Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Conduit Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Ends Upstream (ft)	Dwnstrm (ft)
201	60.	3.76	54.00	8.15E+01	12	36	5.08	12	36	1.36	72.93	71.59
202	42.	2.64	54.00	8.19E+01	12	36	5.12	12	36	1.95	71.59	71.58
300	11.	9.12	15.00	7.64E+00	17	12	7.37	17	12	0.68	63.17	59.26
200	4.03E+02	32.04	48.00	6.87E+01	12	34	5.88	10	53	0.17	76.00	72.93
100	2.54E+02	20.21	48.00	9.13E+01	12	36	7.22	12	36	0.36	76.00	71.58
500	85.	1.74	94.80	1.61E+02	12	36	3.71	12	30	1.88	79.48	79.14
310	5.4	10.02	9.96	7.64E+00	17	11	13.30	17	11	1.41	71.58	63.17
ORF # 1	98.	0.80	36.00	9.91E+01	12	23	15.29	12	18	1.01	79.14	76.00
WEIR # 1	Undefnd	Undefnd	Undefnd	1.68E+02	12	36						
FREE # 1	Undefnd	Undefnd	Undefnd	7.64E+00	17	12						

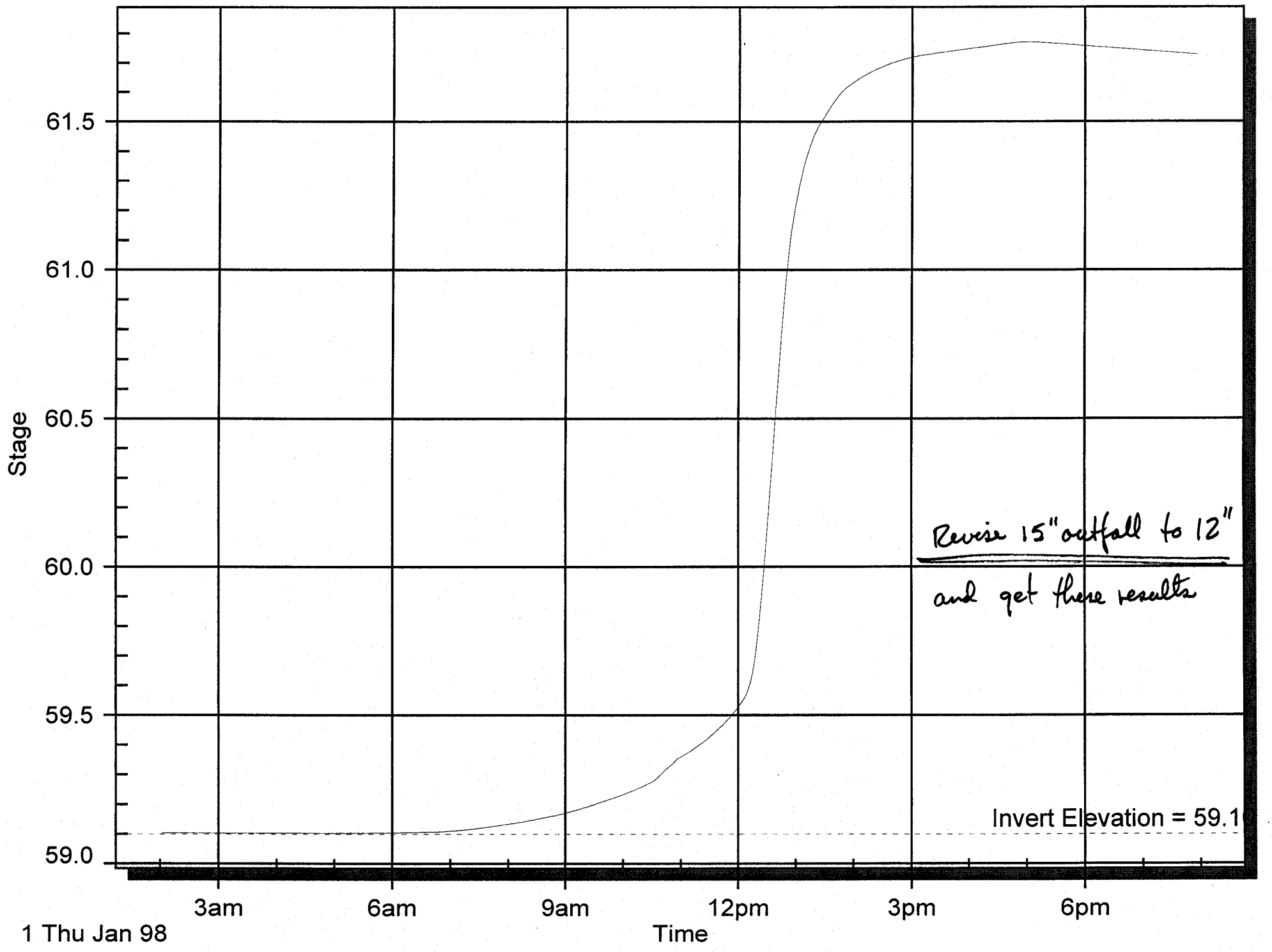
Node - 10


68
67
66
65
64
63
62
61
60
59
Stage
3am
6am
9am
12pm
3pm
6pm
1 Thu Jan 98
Time

[Max Flow = 6.88][Max Velocity = 8.71]



Node - 16



1 Thu Jan 98

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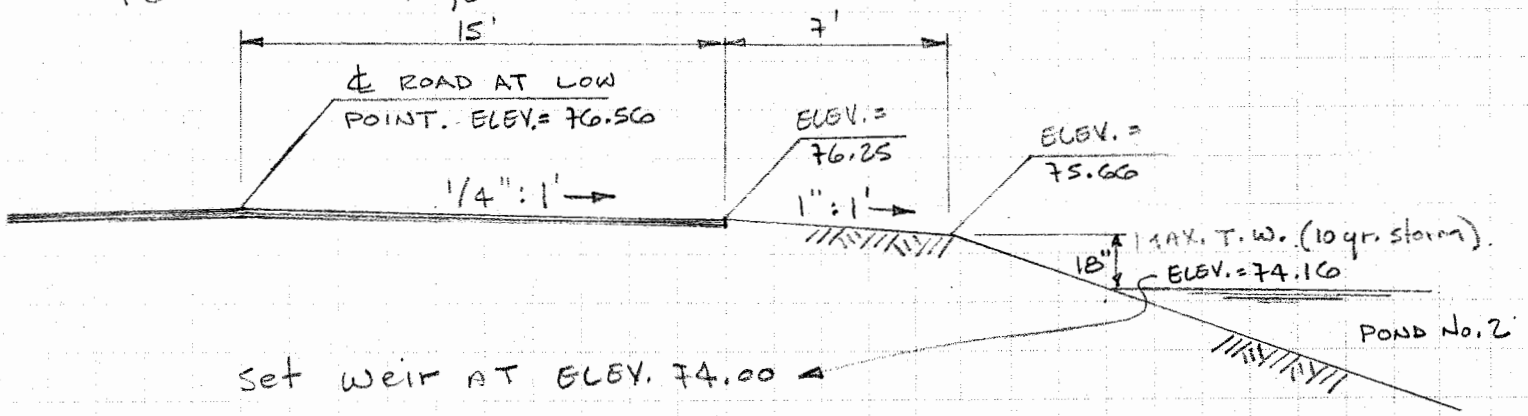
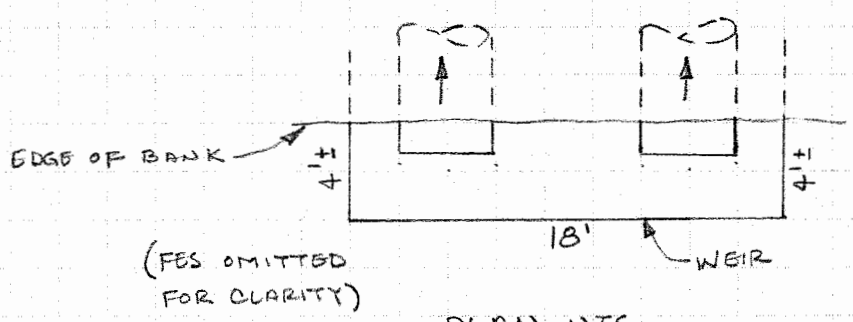
Subject POND No. 2 (DRY POND)
Computed By WEH Checked By _____

Project No. _____
Client _____
Date 4/27/98 Sheet No. 1

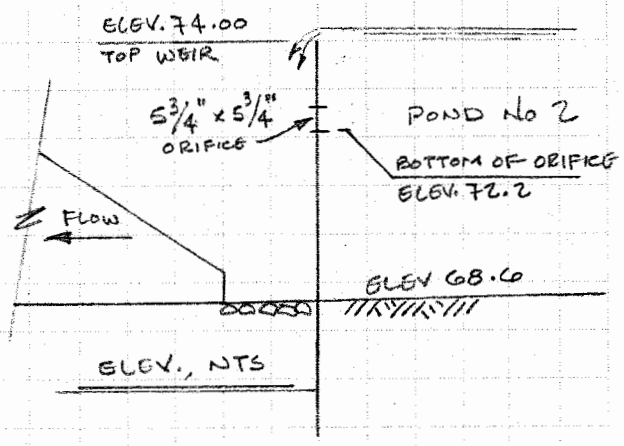
CONTOUR ELEV.	AREA S.F.	AVERAGE AREA S.F.	Vert. distance FT.	VOLUME INCRG. CF.	VOLUME CUMMl. CF
68.6	0				
		703.	0.4	281	281.
69.0	1,406.				
		3044	1.0	3044	3325.
70.0	4,682.				
		5909	0.6	3545	6870.
70.6	7,136.				
		8597.	1.4	12,036	18,906
72.0	10,058.				
		11,850.	2.0	23,700.	42,606.
74.0	13,642.				
		15,736.	2.0	31,472.	74,078.
76.0	17,830.				



ELEVATION, NTS



PLAN, NTS



ELEV., NTS

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Subject POND No. 2

Computed By WEH Checked By

Project No.

Client

Date 4/27/99 Sheet No. 2

POND No. 2

In accordance w/ VDOT telephone information (Speed Holliwell and Jack Harrell), the max. top of water for a 10 year storm should be 18" below the edge of the shoulder of the road. This is ELEV. 74.16 for POND No. 2. The weir is set at ELEV. 74.00.

AT ELEV. 74.00, the total storage behind the weir is 42,606 C.F.

Set temporary orifice to draw-down the wet storage to 1/2 this amt.

42,606 ÷ 2 = 21,303 C.F. each of wet storage and dry storage.

FROM TABLE:

ELEV. 74	Vol. in storage =	42,606 C.F.	21,303 C.F.
ELEV. 72	" " " =	18,906	18,906
		23,700	2,397.

$\frac{2397}{23,700} = 0.10 \times 2$ VERT. FT. = 0.20 FT

72.00

ELEV. = 72.20 ; 21,303 C.F. in dry storage

ELEV. = 74.00 ; 42,606 C.F. " wet "

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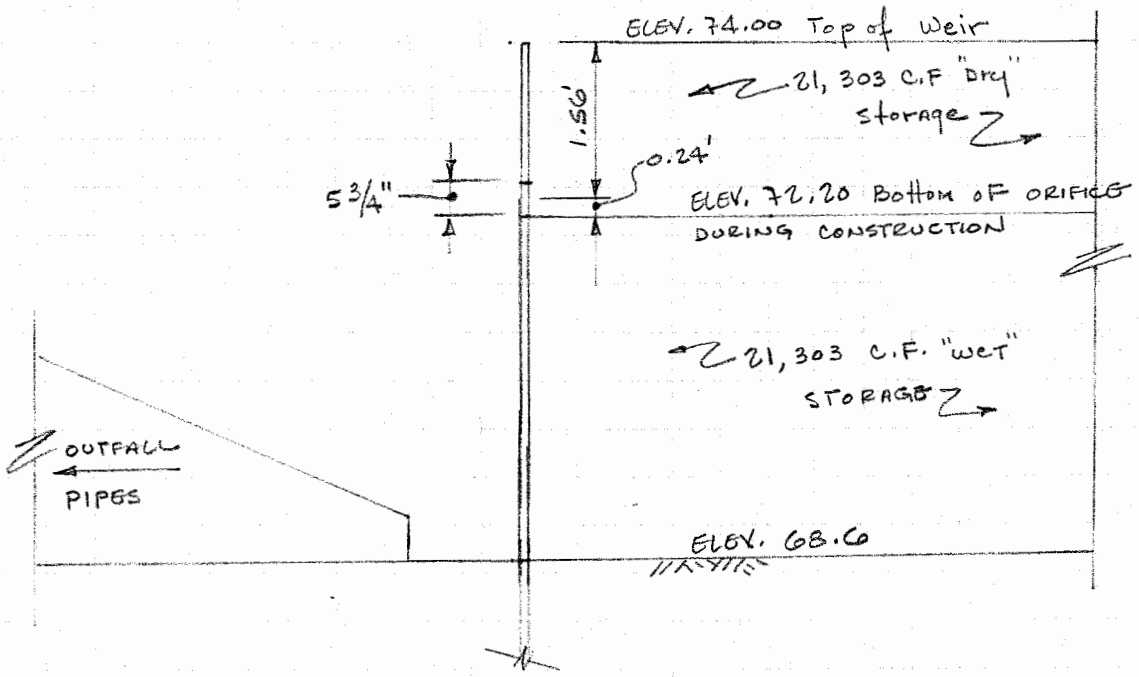
Subject POND No. 2

Computed By _____ Checked By _____

Project No. _____
Client _____
Date _____ Sheet No. 3



Assume 6" x 6" orifice $\quad \frac{6''}{2} = 3'' = 0.25' \quad h = 1.80 - 0.25 = \underline{1.55 = h}$

$$Q = \frac{21,303 \text{ CF}}{21,600 \text{ sec}} = 0.9863$$

$$A = \frac{Q}{\left(64.32 \times \frac{h}{2}\right)^{1/2}(0.6)} = \frac{0.9863}{\left[(64.32) \times \left(\frac{1.55}{2}\right)\right]^{1/2} 0.6} = 0.2328 \text{ S.F.} = 33.53 \text{ S.I.}$$

$$= 5.79'' \times 5.79''$$

$\Rightarrow$ use $\underline{5\frac{3}{4}'' \times 5\frac{3}{4}''}$

TEMPORARY WEIR WITH ORIFICE (USE DURING CONST. OF ROAD 'A')

NTS

Langley and McDonald, P.C.	Subject POND No. 2	Project No.
ENGINEERS • SURVEYORS• PLANNERS LANDSCAPE ARCHITECTS • ENVIRONMENTAL CONSULTANTS	DRY POND	Client
VIRGINIA BEACH • WILLIAMSBURG, VIRGINIA	Computed By WEH Checked by	Date 9/28/93 Sheet No. 1

POND No. 2

Q at Weir = 123 CFS

$Q = 3.33 (L - 0.2 H) H^{1.5}$

When L = 20.0' ; H = 1.52'

MAX allowable T.W. = 74.16 (from 4/27/98 calcs., 1.5' freeboard)
H = − 1.52
72.64 = MAX. Wier ELEV.; use 72.50

→ 72.50 = Weir elev.
1.52 = H
74.02 = MAX Top. of Water

AT ELEV. 72.50, 18,906 CF + (0.25)(23,700 CF) are in storage
= 24,831. C.F.

FOR FUTURE wet AND DRY storage (during future upstream construction), 24,831 ÷ 2 = 12,416 = "Dry" storage & "Wet" storage

ELEV. 72.0	Vol. in storage = 18,906.	12,416 CF
ELEV. 70.6	Vol. in Storage = 6,870.	6,870 CF
	12,036.	5,546. CF.

$\frac{5546}{12,036} = 0.46 \times 1.4$ vert. FT. = 0.645'
70.6
71.245 ⇒ ELEV. 71.25 ; 12,416 C.F. 'Dry' storag
ELEV. 72.50 ; 12,416 CF. 'Wet' Storage
24,832 CF, total storag

ASSUME 6" Dia ϕ pipe for drawdown (to elev. of "wet" storage)

6"/2 = 3" to ℄ pipe $h = 72.50 - 71.24' - 0.25' = 1.01'$

$$Q = \frac{12,416 \text{ C.F.}}{21,600 \text{ sec.}} = 0.5748 \text{ CFS}$$

$$VA = Q \qquad A = \frac{Q}{V} = \frac{0.5748 \text{ CFS}}{\left(64.32 \times \frac{h}{2}\right)^{1/2}(0.6)} = 0.1681 \text{ S.F.} \times 144 = 24.2 \text{ S.I. Needed}$$

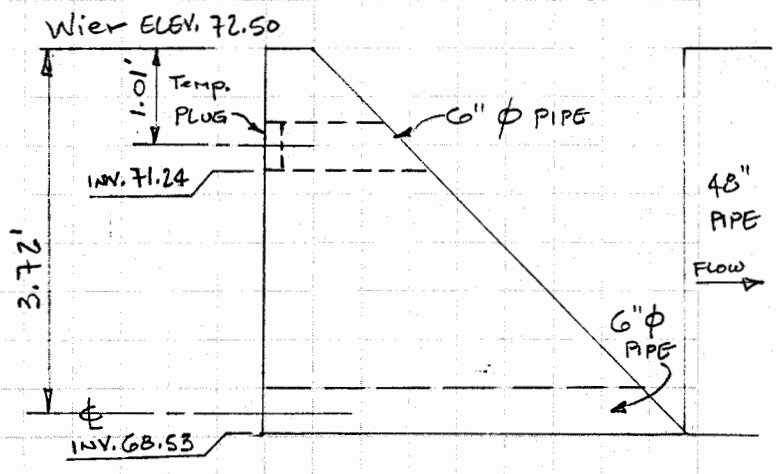
$(3)^2\pi = 28.3$ S.I. Actual (in 6" pipe)

FOR INITIAL Dry Detention, set 6" Dia ϕ pipe at base of weir, INV. elev. 68.53.

$A = 0.1963$ S.F.
$C = 0.6$
$h = 3.72$

$Q_1 = Ac\sqrt{2gh}$
$= 1.82$ CFS (initial rate of flow)

$Q_{Average}$ (when $h/2 = 1.86$)
$Q_{Avg.} = Ac\sqrt{2gh}$
$= \underline{1.29 \text{ CFS}}$ (flow rate at ½h)



Time to dewater "dry" pond

$$\frac{24,832 \text{ CF.}}{1.29 \text{ CFS}} = 19,264 \text{ sec.} = 5.35 \text{ Hours} = 5 \text{ Hours, } 21 \text{ min.}$$
(using "Average" height)

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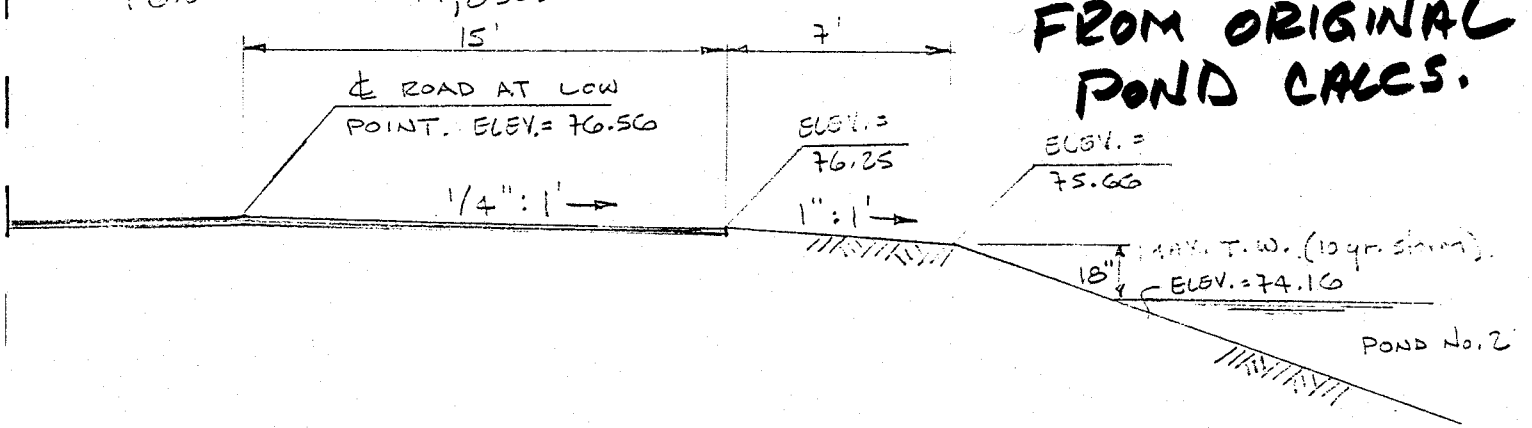
Subject POND No. 2 (DRY POND)
Computed By WEH Checked By

Project No.
Client
Date 4/27/98 Sheet No. 1

CONTOUR ELEV.	AREA S.F.	AVERAGE AREA S.F.	Vert. distance FT.	VOLUME INCRG. C.F.	VOLUME CUMM. C.F.
68.6	0				
		703.	0.4	281	281.
69.0	1,406.				
		3044	1.0	3044	3325.
70.0	4,682.				
		5909	0.6	3545	6870.
70.6	7,136.				
		8597.	1.4	12,036	18,906
72.0	10,058.				
		11,850.	2.0	23,700.	42,606.
74.0	13,642.				
		15,736.	2.0	31,472.	74,078.
76.0	17,830.				

FROM ORIGINAL POND CALCS.



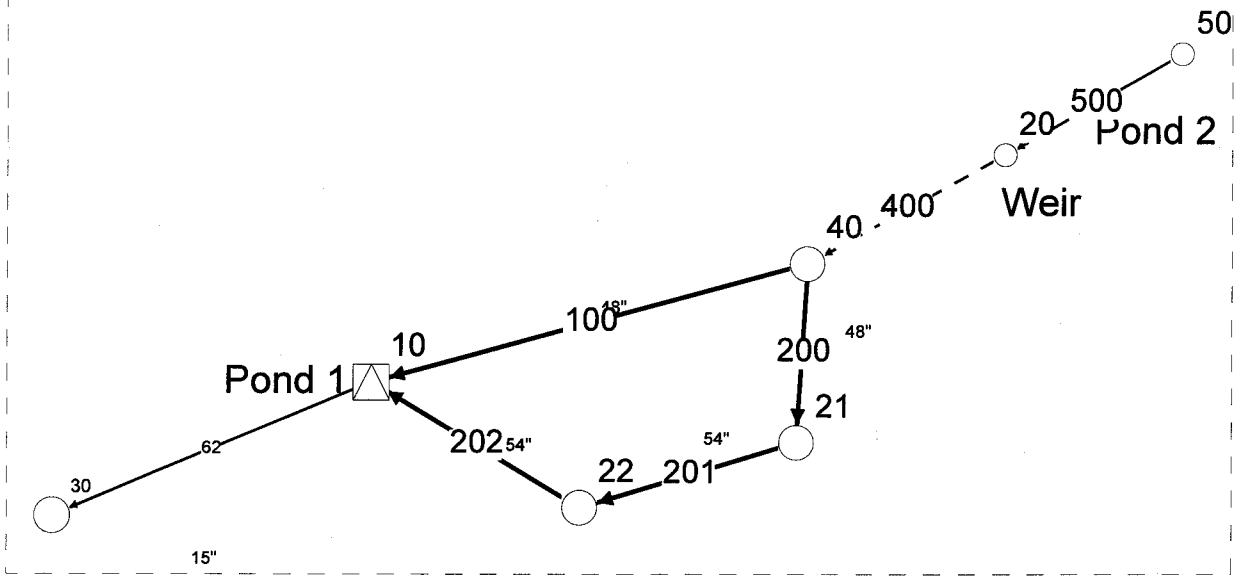
Project Name: Riverside - Off-site Drainage

Project No.: 188079

Date: 9/23/98

SUMMARY OF RESULTS FROM SWMM		
Junction and Conduit as labeled in SWMM	Maximum Pond Water Elevation (ft)	Maximum Computed Flow (cfs)
EXISTING CONDITION (20'-15" RCP)		
Junction 10/ Conduit 62	68.35	17.70
SCENARIO No. 1 (10'-12" PVC inside 15" RCP)		
Junction 10/ Conduit 310	68.60	9.39
SCENARIO No. 2 (10'-10" PVC inside 15"RCP)		
Junction 10/ Conduit 310	69.09	6.74

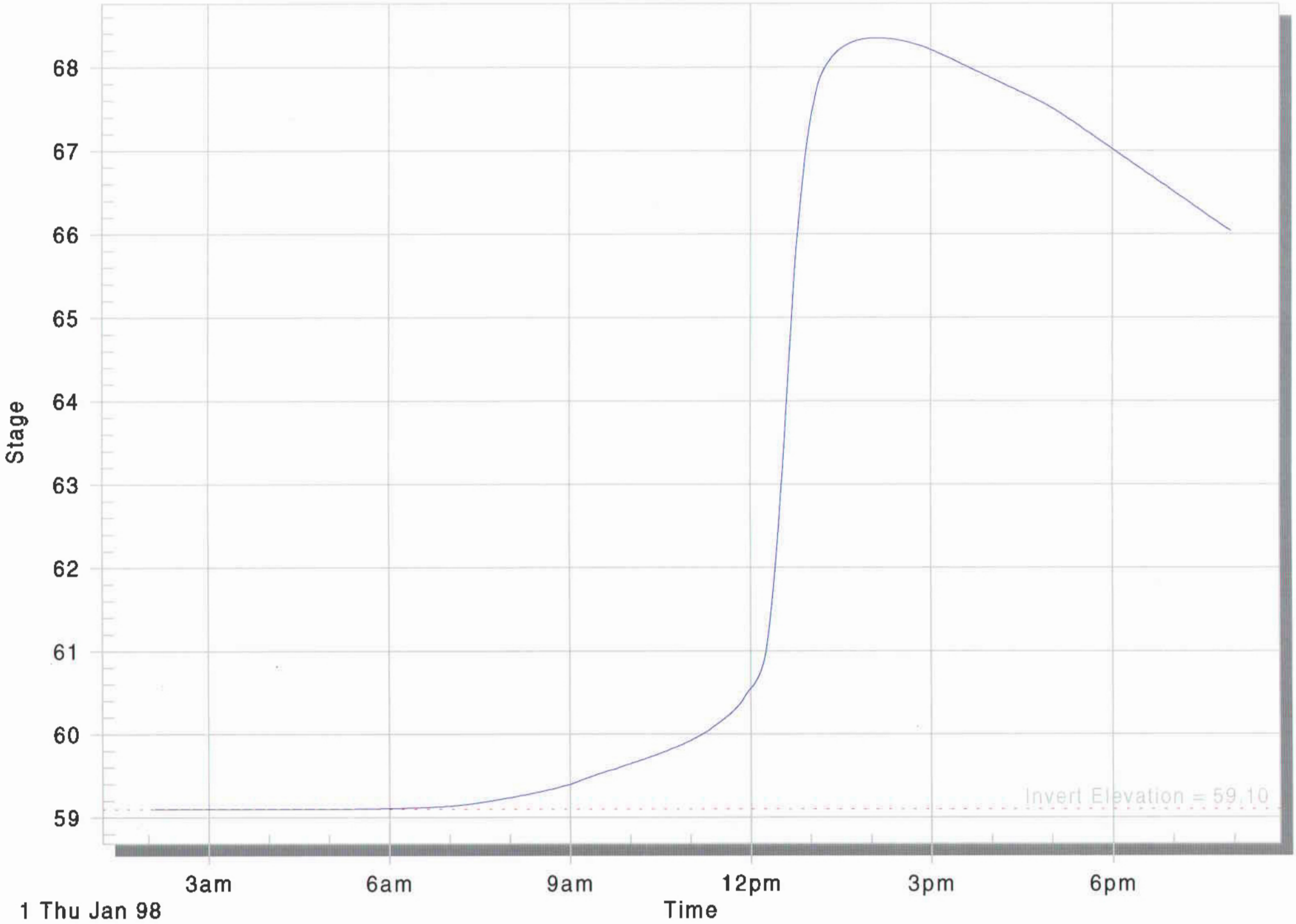
Riverside SWMM Model Conduit/ Node Connection



A

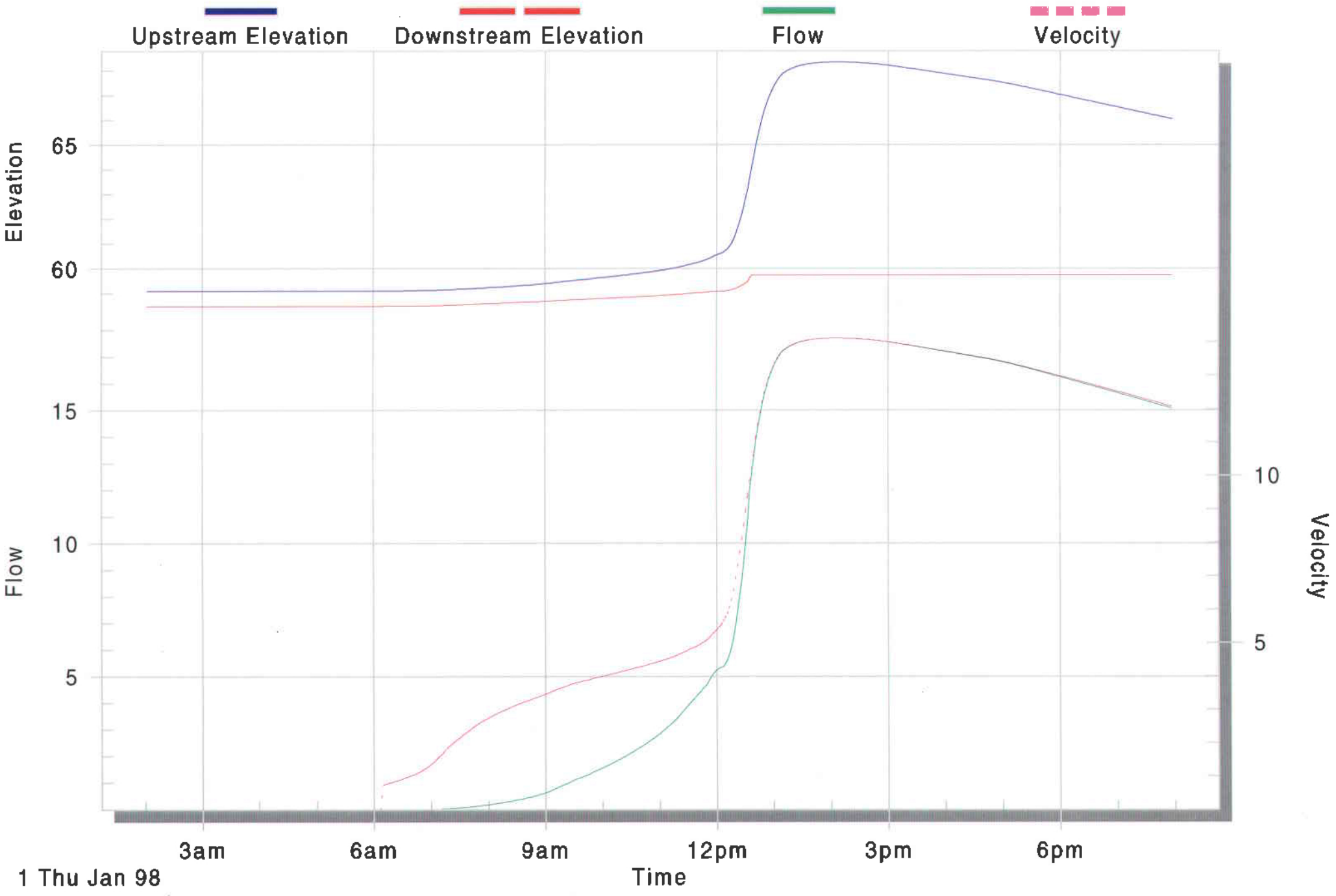
EXISTING CONDITION
20'-15"

Node - 10

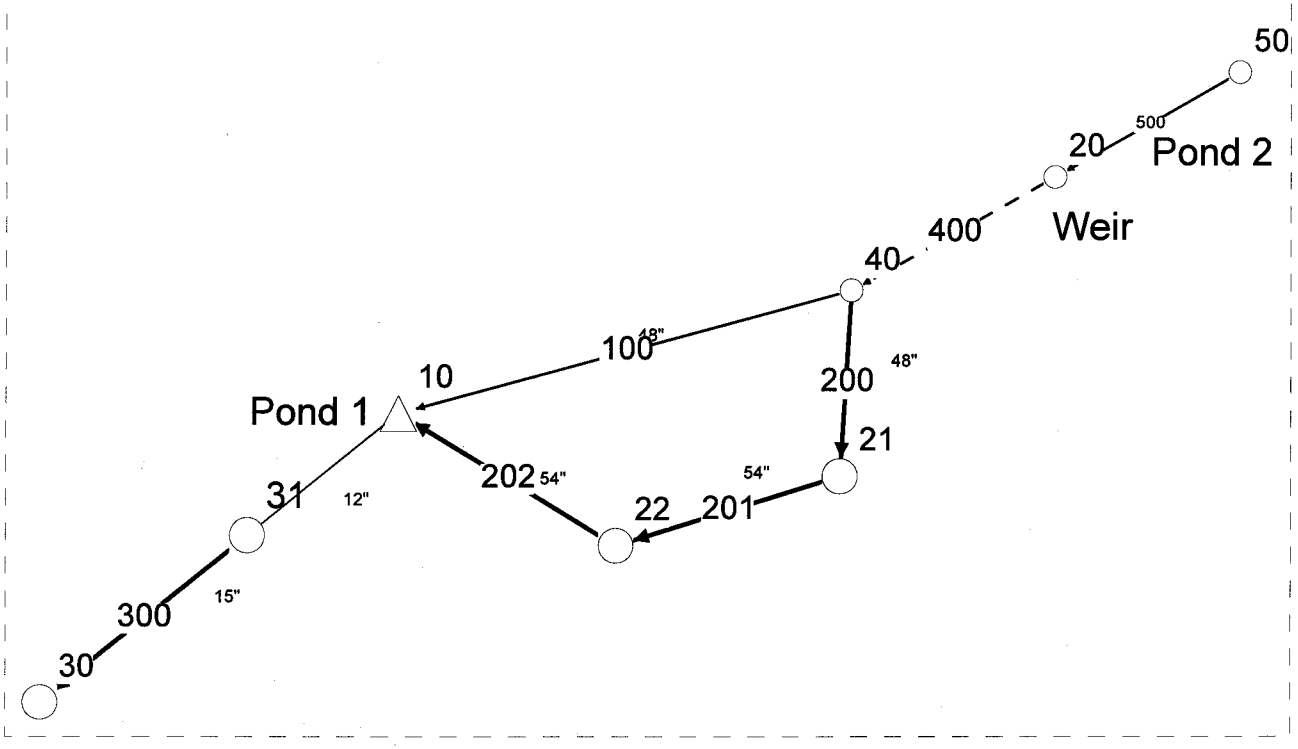

68
67
66
65
64
63
62
61
60
59
Stage
Invert Elevation = 59.10
3am
6am
9am
12pm
3pm
6pm
1 Thu Jan 98
Time

Conduit 62 from 10 to 30

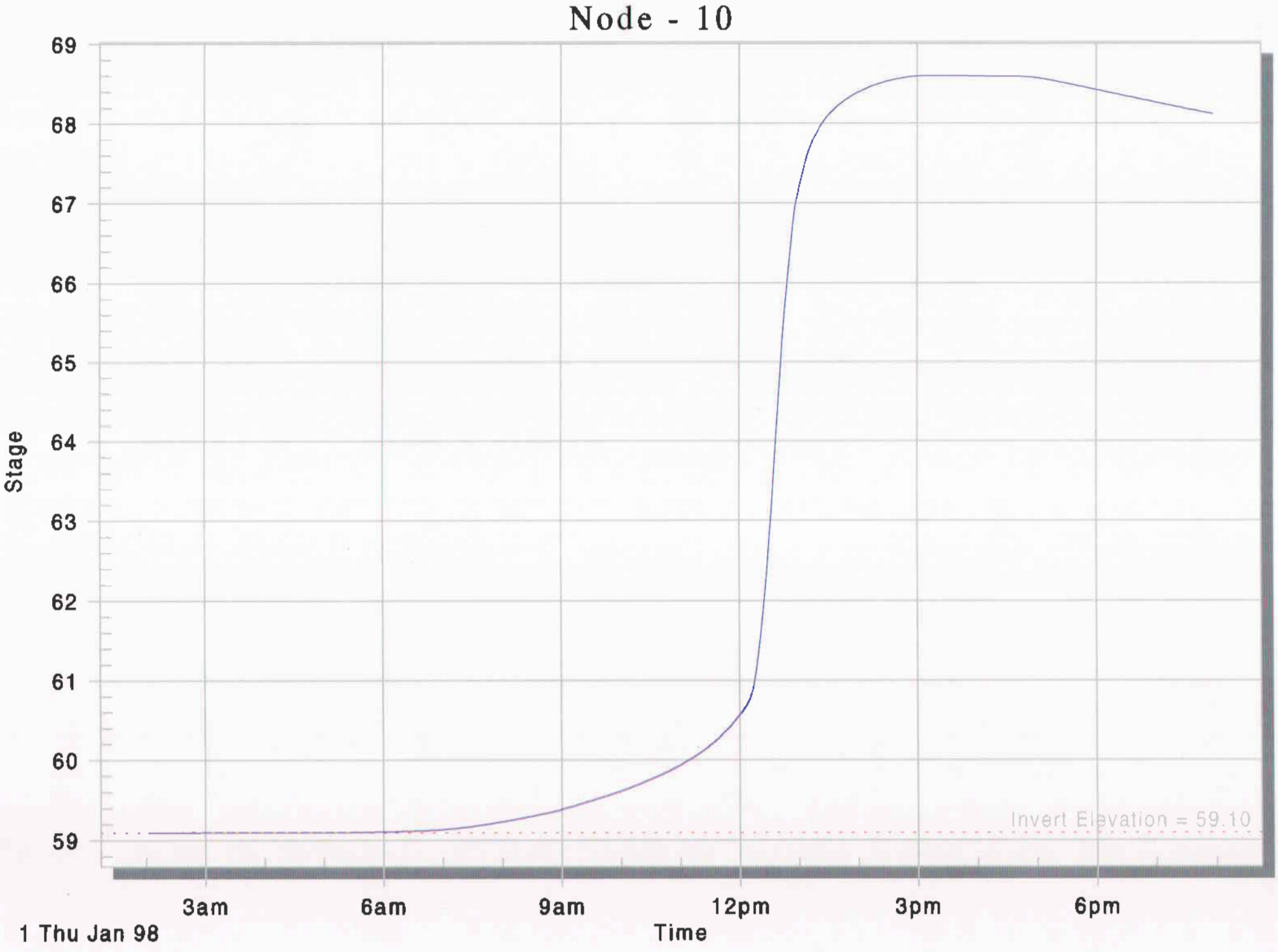
[Max Flow = 17.71][Max Velocity = 14.12]

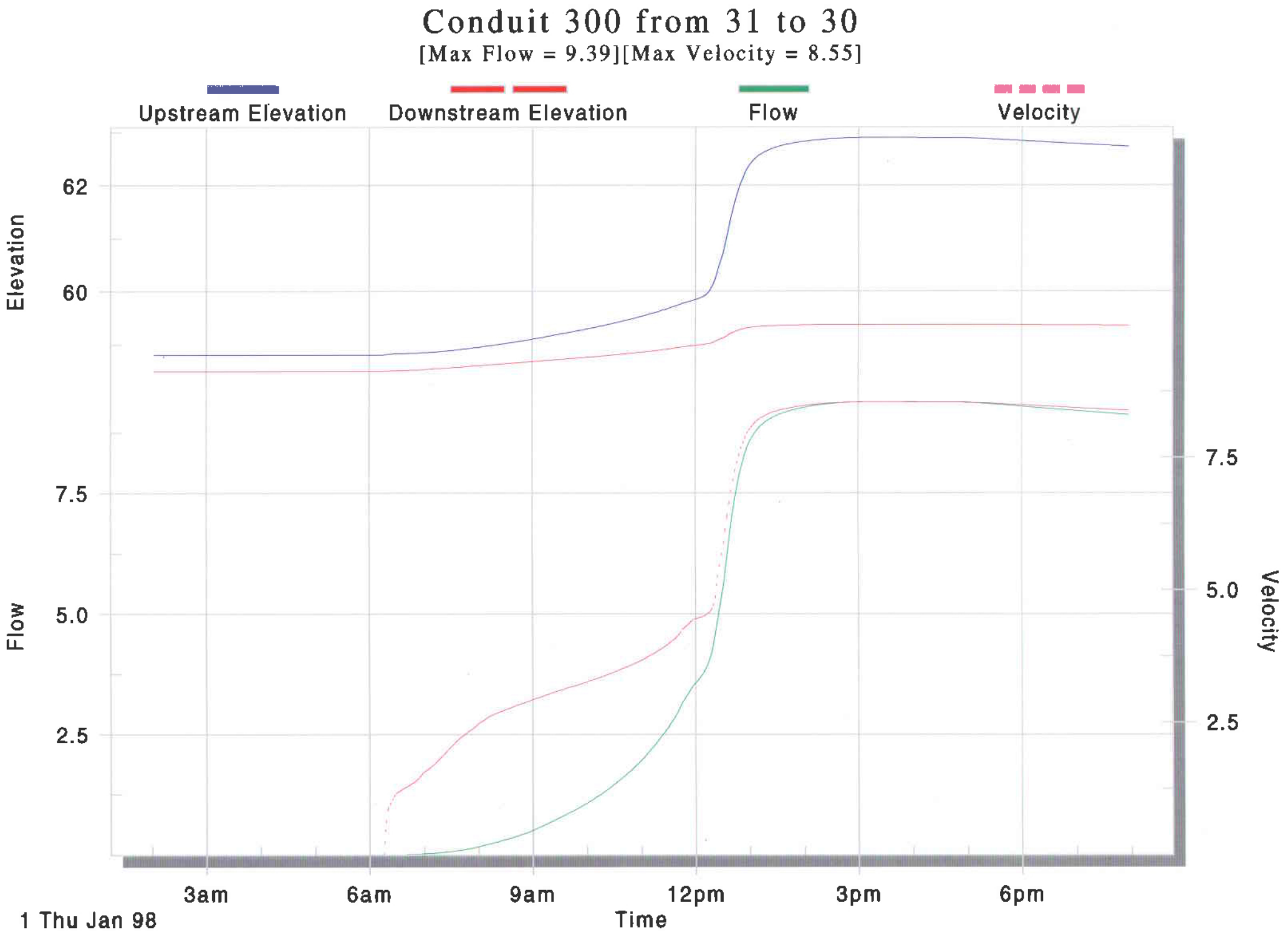


Riverside SWMM Model Conduit/ Node Connection

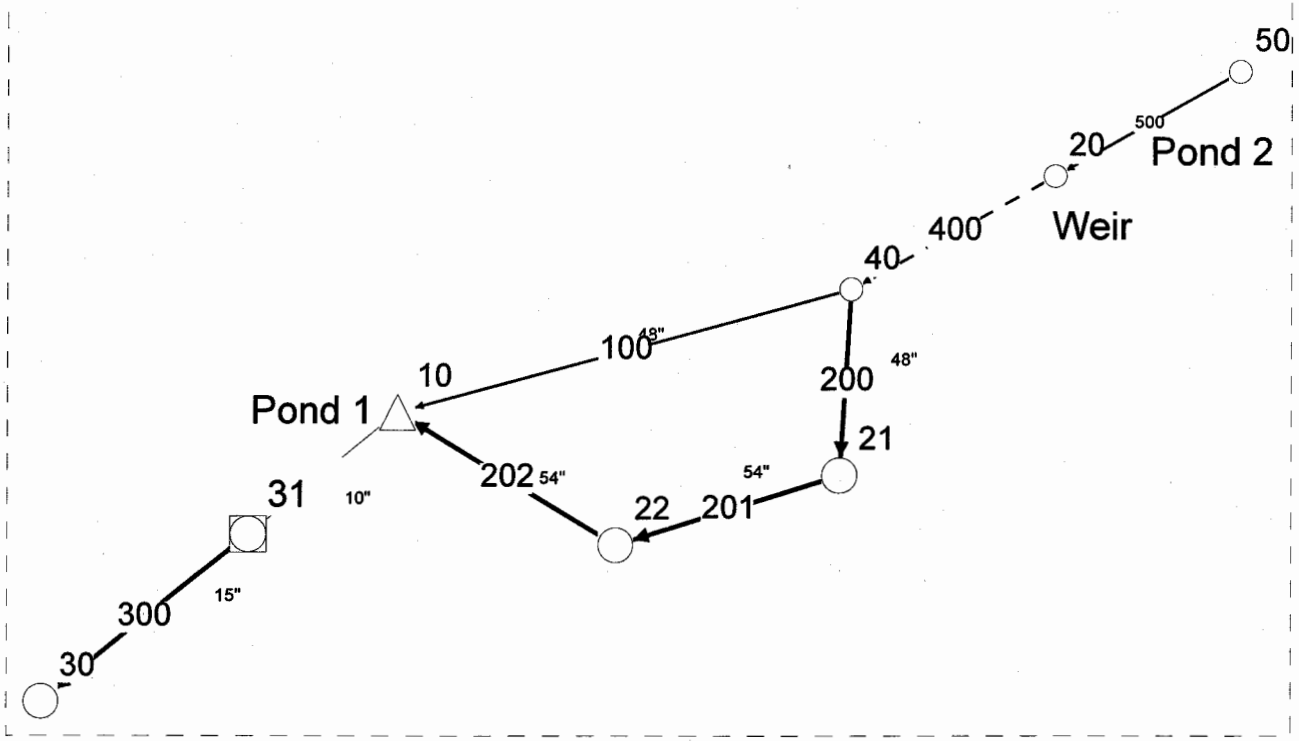


SCENARIO #1
12"

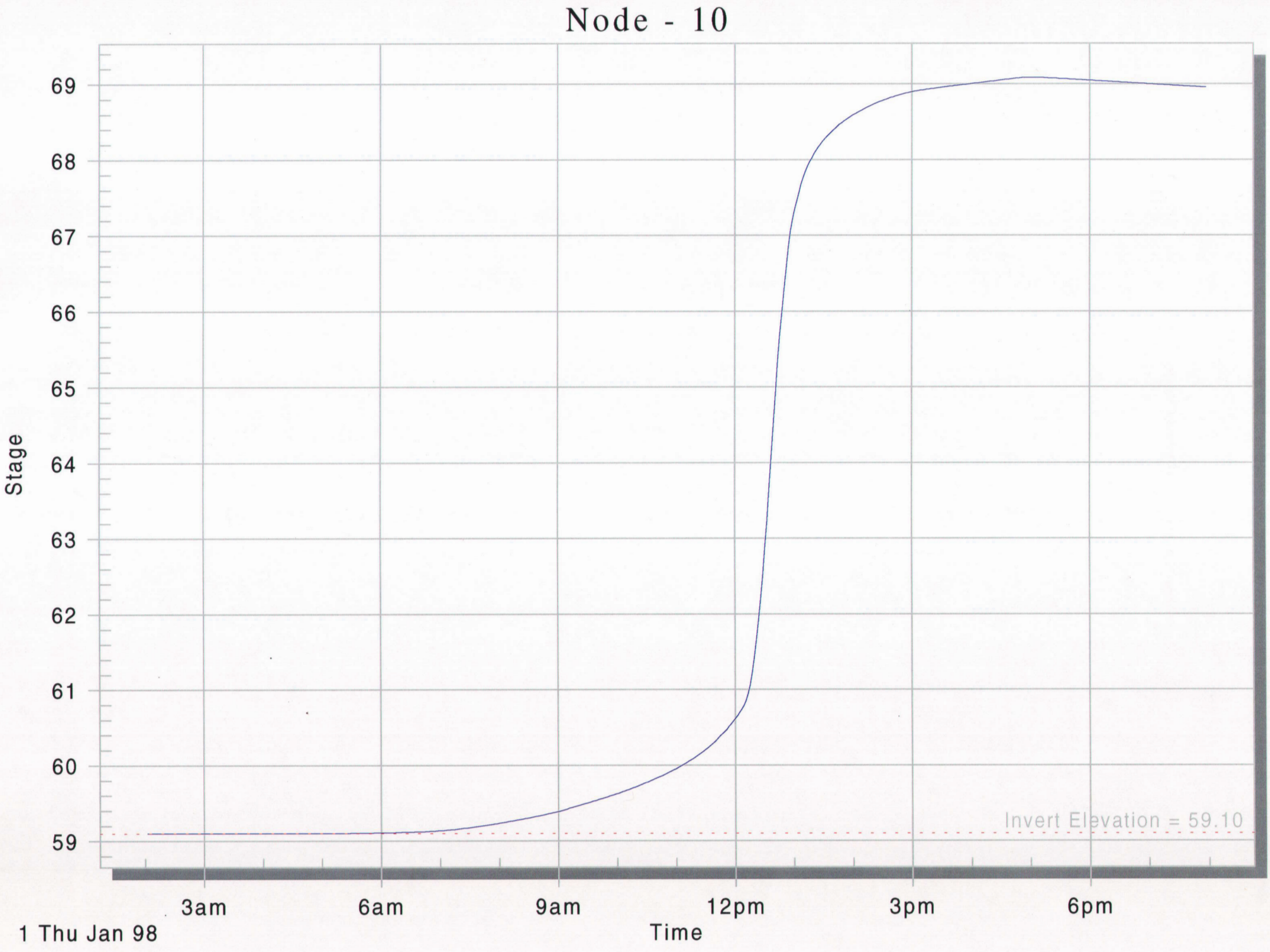

Node - 10
69
68
67
66
65
64
63
62
61
60
59
Stage
Invert Elevation = 59.10
3am
6am
9am
12pm
3pm
6pm
1 Thu Jan 98
Time


Conduit 300 from 31 to 30
[Max Flow = 9.39][Max Velocity = 8.55]
Upstream Elevation
Downstream Elevation
Flow
Velocity
Elevation
62
60
Flow
7.5
5.0
2.5
Velocity
7.5
5.0
2.5
3am
6am
9am
12pm
3pm
6pm
1 Thu Jan 98
Time

Riverside SWMM Model Conduit/ Node Connection

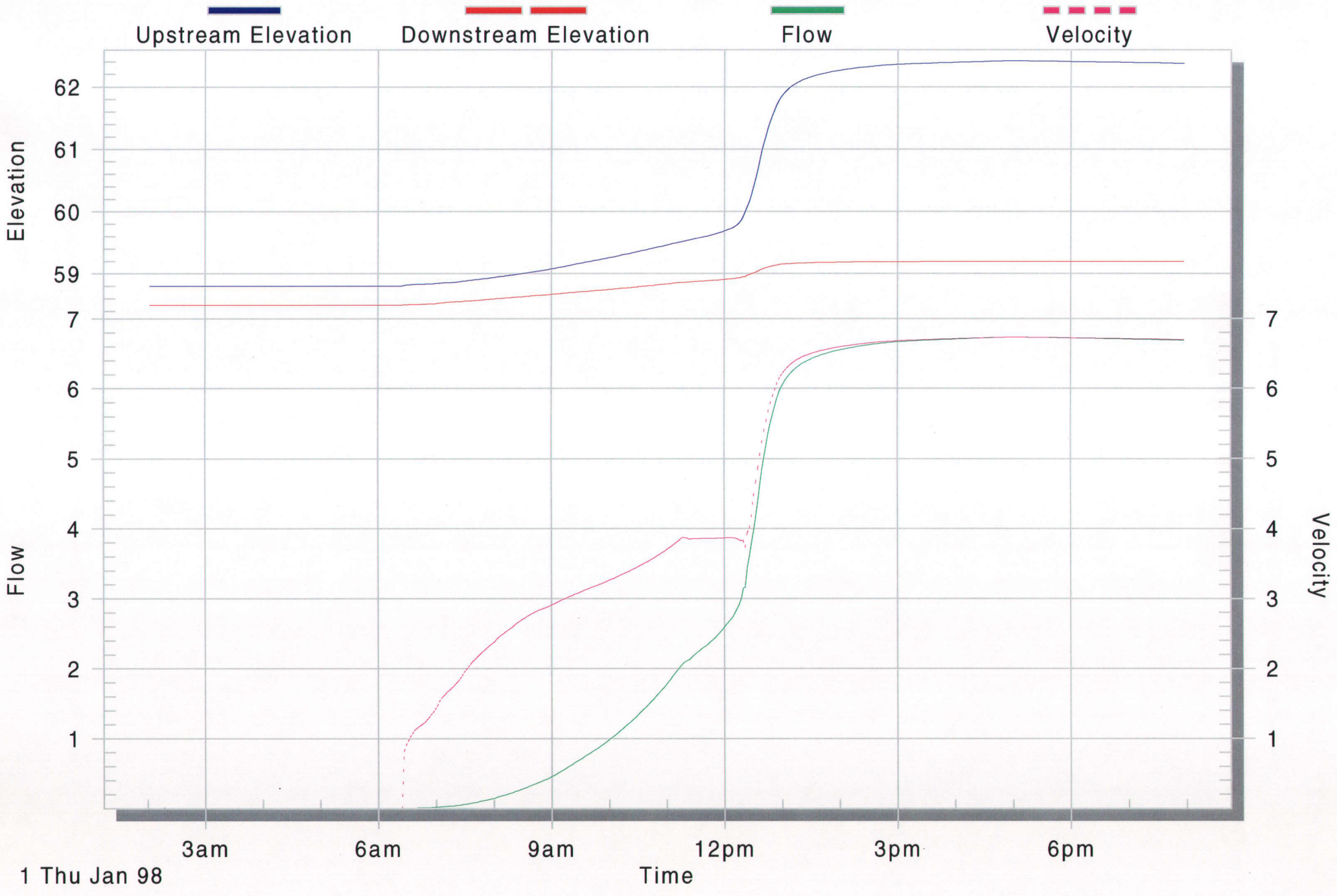


SCENARIO #2
10"


Node - 10
Stage
69
68
67
66
65
64
63
62
61
60
59
Invert Elevation = 59.10
3am
6am
9am
12pm
3pm
6pm
1 Thu Jan 98
Time

Conduit 300 from 31 to 30

[Max Flow = 6.74][Max Velocity = 6.73]



```
Input File :          C:\XPS\Riverrev.XP
Current Directory:    C:\PROGRA~1\XPS\XP-SWM~1
Executable Name:      C:\Program Files\XPS\XP-SWMM32\XPSWMM32.EXE
Read      0 line(s) and found    0 items(s) from your cfg file.
          *==================================================*
          |                    XP - SWMM                     |
          |            Storm Water Management Model          |
          |                   Version 5.10a                  |
          |==================================================|
          |                 Developed by                     |
          |==================================================|
          |            XP Software Inc. and Pty. Ltd.        |
          |                                                  |
          |               Based on the U.S. EPA              |
          |    Storm Water Management Model Version 4.40     |
          |                                                  |
          |             Originally Developed by              |
          |              Metcalf & Eddy, Inc.                |
          |             University of Florida                |
          |           Camp Dresser & McKee Inc.              |
          |               September 1970                     |
          |                                                  |
          |             EPA-SWMM is maintained by            |
          |             Oregon State University              |
          |             Camp Dresser & McKee Inc.            |
          |==================================================|
          |    XP Software          August 7, 1997           |
          |        Data File Version --->     7.1             |
          |==================================================|
          |      If problems occur in running this model     |
          |      please contact XP Software - Australia      |
          |                 or XP Software - U.S.A.          |
          |      Phone +61-6 253-1844  in Australia          |
          |      Fax # +61-6 253-1847  in Australia          |
          |      Phone (813)-886-7724  in U.S.A.             |
          |      Fax # (813)-885-4198  in U.S.A.             |
          *==================================================*


*==========================================================*
|       Input and Output file names by SWMM Layer          |
*==========================================================*

 Input File  to Layer #     1 C:\XPS\INTER.INT
 Output File to Layer #     1 JOT.US

*==========================================================*
|   Special command line arguments in XP-SWMM. This section |
|   now includes program defaults. $Keywords are the program|
|   defaults.  Other Keywords are from the SWMMCOM.CFG file.|
|   or the command line or any cfg file on the command line.|
```

20'-15" RCP

JT. 10, 20'-15" RCP
(EXIST.)

```
|   Examples include these in the file xpswm.bat under the  |
|   section :solve or in the windows version XPSWMM32 in the|
|   file solve.bat                                          |
|                                                           |
|   Note: the cfg file should be in the subdirectory swmxp  |
|         or defined by the set variable in the xpswm.bat   |
|         file.  Some examples of the command lines possible|
|         are shown below:                                  |
|                                                           |
|   swmmd swmmcom.cfg                                       |
|   swmmd my.cfg                                            |
|   swmmd nokeys nconv5 perv extranwq                       |
*===========================================================*

 $powerstation        0.0000         0          2
 $perv                0.0000         0          4
 $oldegg              0.0000         0          7
 $as                  0.0000         0         11
 $noflat              0.0000         0         21
 $oldomega            0.0000         0         24
 $oldvol              0.0000         1         28
 $implicit            0.0000         1         29
 $oldhot              0.0000         1         31
 $oldscs              0.0000         0         33
 $flood               0.0000         1         40
 $nokeys              0.0000         0         42
 $pzero               0.0000         0         55
 $oldvol2             0.0000         2         59
 $storage_97          0.0000         1         62
 $oldhot1             0.0000         0         63
 $pumpwt              0.0000         1         70
 $ecloss              0.0000         1         77
 $exout               0.0000         0         97
 $neweir              0.0000         1        153
 $ncmid               0.0000         0        164
 $h_ellipse           0.0000         1        270
 $v_ellipse           0.0000         1        271
 $arch                0.0000         2        272
 $fast_pump           0.0000         1        288
 $new_nl_97           0.0000         2        290
 $best97              0.0000         1        294
 $newbound            0.0000         1        295

 *===========================================================*
 | Parameter Values on the Tapes Common Block.These are the |
 | values read from the data file and dynamically allocated |
 | by the model for this simulation.                        |
 *===========================================================*

  Number of Subcatchments in the Runoff Block (NW)....     0
  Number of Channel/Pipes in the Runoff Block (NG)....     0
```

```
 Runoff Water quality constituents (NRQ)............     0
 Runoff Land Uses per Subcatchment (NLU)............     0
 Number of Elements in the Transport Block (NET).....     0
 Number of Storage Junctions in Transport (NTSE).....     0
 Number of Input Hydrographs in Transport (NTH......     0
 Number of Elements in the Extran Block (NEE)........     9
 Number of Groundwater Subcatchments in Runoff (NGW).     0
 Number of Interface locations for all Blocks (NIE)..     9
 Number of Pumps in Extran (NEP).....................     0
 Number of Orifices in Extran (NEO)..................     1
 Number of Tide Gates/Free Outfalls in Extran (NTG)..     1
 Number of Extran Weirs (NEW)........................     1
 Number of scs hydrograph points.....................     0
 Number of Extran printout locations (NPO)...........     2
 Number of Tide elements in Extran (NTE).............     1
 Number of Natural channels (NNC)....................     0
 Number of Storage junctions in Extran (NVSE)........     1
 Number of Time history data points in Extran(NTVAL).     0
 Number of Variable storage elements in Extran (NVST)     7
 Number of Input Hydrographs in Extran (NEH).........     0
 Number of Particle sizes in Transport Block (NPS)...     0
 Number of User defined conduits (NHW)...............     9
 Number of Connecting conduits in Extran (NECC)......    20
 Number of Upstream elements in Transport (NTCC).....    10
 Number of Storage/treatment plants (NSTU)...........     0
 Number of Values for R1 lines in Transport (NR1)....     0
 Number of Nodes to be allowed for (NNOD)............     9
 Number of Plugs in a Storage Treatment Unit.........     1


#######################################################
#    Entry made to the EXTRAN Layer(Block) of SWMM    #
#    Last Updated August,1997 by XP Software          #

    Riverside Two Pond Analysis
    Proposed Conditions 10 Year Storm


*==============================================================*
|          EXTRAN TABLES IN THE OUTPUT FILE                    |
|  These are the more important tables in the output file.     |
|  You can use your editor to find the table numbers,          |
|  for example: search for Table E20 to check continuity.      |
|  This output file can be imported into a Word Processor      |
|  and printed on US letter or A4 paper using portrait         |
|  mode, courier font, a size of 8 pt. and margins of 0.75     |
|                                                              |
| Table E1  - Basic Conduit Data                               |
| Table E2  - Conduit Factor Data                              |
| Table E3  - Junction Data                                    |
| Table E4  - Conduit Connectivity Data                        |
```

```
| Table E5  - Junction Time Step Limitation Summary        |
| Table E5a - Conduit Explicit Condition Summary           |
| Table E6  - Final Model Condition                        |
| Table E7  - Extran Iteration Summary                     |
| Table E8  - Junction Time Step Limitation Summary        |
| Table E9  - Junction  Summary  Statistics                |
| Table E10 - Conduit   Summary  Statistics                |
| Table E11 - Area assumptions used in the analysis        |
| Table E12 - Mean conduit information                     |
| Table E13 - Channel losses(H) and culvert info           |
| Table E14 - Natural Channel Overbank Flow Information    |
| Table E15 - Spreadsheet Info List                        |
| Table E16 - New Conduit Output Section                   |
| Table E17 - Pump Operation                               |
| Table E18 - Junction Continuity Error                    |
| Table E19 - Junction Inflow Sources                      |
| Table E20 - Junction Flooding and Volume List            |
| Table E21 - Extran continuity balance at simulation end  |
| Table E22 - Model Judgement Section                      |
*==========================================================*

Time Control from Extran Job Control
Year.........      98 Month.......       1
Day..........       1 Hour........       2
Minute.......       0 Second......       0


Control information for simulation
----------------------------------

Integration cycles.................      6480
Length of integration step is......     10.00 seconds
Simulation length..................     18.00 hours
Do not create equiv. pipes(NEQUAL).         0
Use U.S. customary units for I/O...         0
Printing starts in cycle...........      2880
Intermediate printout intervals of.        90 cycles
Intermediate printout intervals of.     15.00 minutes
Summary printout intervals of......        90 cycles
Summary printout time interval of..     15.00 minutes
Hot start file parameter (REDO)....         0
Initial time.......................      2.00 hours

Iteration variables: SURTOL........    0.0010
                     SURJUN........    0.0060 mm or inch
                     QREF..........    1.0000
    Minimum depth (m or ft)........    0.0033
    Underrelaxation parameter......    0.6500
    Time weighting parameter.......    0.6500
    Default Expansion/Contraction K    0.0000
    Default Entrance/Exit K........    0.0000
```

```
Default surface area of junctions..     13.00 square feet.
NJSW input hydrograph junctions....     0
     or user defined hydrographs...

Flow rate will be plotted for the following   2 Conduits

    202       100
```

==========
| Table E1 - Conduit Data |
==========

Inp Num	Conduit Name	Length (ft)	Conduit Class	Area (ft^2)	Manning Coef.	Max Width (ft)	Depth (ft)	Trapezoid Side Slopes	
1	201	108.00	Circular	15.90	0.01300	4.50	4.50		
2	202	110.00	Circular	15.90	0.01300	4.50	4.50		
3	200	84.00	Circular	12.57	0.01300	4.00	4.00		
4	100	304.00	Circular	12.57	0.01300	4.00	4.00		
5	500	200.00	Trapezoid	486.64	0.03000	30.00	7.90	4.00	4.00
6	62	20.00	Circular	1.23	0.01300	1.25	1.25		

Total length of all conduits .... 826.0000 feet

==========
| Table E2 - Conduit Factor Data |
==========

Conduit Name	Number of Barrels	Entrance Loss Coef	Exit Loss Coef	Exp/Contc Coefficnt	Time Weighting Parameter	Low Flow Roughness Factor	Depth at Which n Changes	Flow Routing
201	1.0000	2.9000	2.9000	2.9000	0.6500	1.0000	0.0000	Standard - Dynamic Wave
202	1.0000	2.9000	2.9000	2.9000	0.6500	1.0000	0.0000	Standard - Dynamic Wave
200	1.0000	2.9000	2.9000	2.9000	0.6500	1.0000	0.0000	Standard - Dynamic Wave
100	1.0000	2.9000	2.9000	2.9000	0.6500	1.0000	0.0000	Standard - Dynamic Wave
62	1.0000	1.0000	1.0000	1.0000	0.6500	1.0000	0.0000	Standard - Dynamic Wave

==========
| If there are messages about (sqrt(g*d)*dt/dx), or|
| the sqrt(wave celerity)*time step/conduit length |
| in the output file all it means is that the |
| program will lower the internal time step to |
| satisfy this condition (explicit condition). |
| You control the actual internal time step by |
| using the minimum courant time step factor in the|
| Extran job control. The message put in words |
| states that the smallest conduit with the fastest|
| velocity will control the time step selection. |
| You have further control by using the modify |
| conduit option in the Extran Job Control. |

```
*==================================================*

===> Warning ! (sqrt(wave celerity)*time step/conduit length)
                in conduit 201        is     1.11 at full depth.
===> Warning ! (sqrt(wave celerity)*time step/conduit length)
                in conduit 202        is     1.09 at full depth.
===> Warning ! (sqrt(wave celerity)*time step/conduit length)
                in conduit 200        is     1.35 at full depth.
===> Warning ! (sqrt(wave celerity)*time step/conduit length)
                in conduit 62         is     3.17 at full depth.

*===================*
|  Conduit Volume   |
*===================*

Full pipe or full open conduit volume
Input full depth volume............    1.0570E+05 cubic feet


*====================================================*
|           Table E3 - Junction Data                 |
*====================================================*
```

Inp Num	Junction Name	Ground Elev.	Crown Elev.	Invert Elev.	Qinst cfs	Initial Depth-ft	X Coord.	Y Coord.	Type of Manhole
1	10	75.00	63.6	59.1	0.000	0.000	76.1	418.	Flooded Ponding
2	21	75.00	66.0	59.4	0.000	0.000	109.	413.	Flooded Ponding
3	22	75.00	63.8	59.2	0.000	0.000	92.1	408.	No Ponding
4	40	76.00	72.6	68.6	0.000	0.000	110.	427.	Flooded Ponding
5	20	80.00	76.5	68.6	0.000	0.000	125.	435.	Flooded Ponding
6	50	80.00	78.9	68.6	0.000	0.000	139.	443.	Flooded Ponding
7	30	70.00	59.8	58.5	0.000	0.000	49.6	396.	Flooded Ponding

```
*=====================================================*
| The junction surface elevation was over the top of  |
| the following open channels.  The following changes |
| have been made to the surface elevation.            |
*=====================================================*

The ground elevation of junction 50
has been changed to     78.900 m or ft from     80.000
The ground elevation of junction 20
has been changed to     76.500 m or ft from     80.000
The ground elevation of junction 50
has been changed to.    78.900 m or ft from     78.900
The ground elevation of junction 20
has been changed to     76.500 m or ft from     76.500


*==================================================*
```

Table E4 - Conduit Connectivity

Input Number	Conduit Name	Upstream Node	Downstream Node	Upstream Elevation	Downstream Elevation	
1	201	21	22	59.400	59.300	No Design
2	202	22	10	59.200	59.150	No Design
3	200	40	21	68.600	62.000	No Design
4	100	40	10	68.600	59.100	No Design
5	500	50	20	71.000	68.600	No Design
6	62	10	30	59.100	58.500	No Design

Storage Junction Data

STORAGE JUNCTION NUMBER OR NAME	JUNCTION TYPE	MAXIMUM OR CONSTANT SURFACE AREA (FT2)	PEAK OR CONSTANT VOLUME (CUBIC FEET)	CROWN ELEVATION (FT)
10	Stage/Area	7.4052E+04	5.3583E+05	75.00

Variable storage data for node 10

Data Point	Depth ft	Area ft^2	Volume ft^3
1	0.0000	3.2409E+04	0.0000
2	0.1667	3.2931E+04	5445.
3	0.3333	3.3454E+04	1.0977E+04
4	0.5000	3.3977E+04	1.6596E+04
5	1.167	3.6155E+04	3.9974E+04
6	1.833	3.8333E+04	6.4803E+04
7	2.500	4.0511E+04	9.1084E+04
8	3.167	4.2834E+04	1.1887E+05
9	3.833	4.5157E+04	1.4820E+05
10	4.500	4.7480E+04	1.7908E+05
11	5.167	4.9949E+04	2.1155E+05
12	5.833	5.2417E+04	2.4567E+05
13	6.500	5.4886E+04	2.8144E+05
14	7.167	5.7499E+04	3.1890E+05
15	7.833	6.0113E+04	3.5811E+05
16	8.500	6.2726E+04	3.9905E+05
17	9.167	6.6502E+04	4.4213E+05
18	9.833	7.0277E+04	4.8772E+05
19	10.50	7.4052E+04	5.3583E+05

```
*==========================================*
|              Orifice Data                |
*==========================================*

      From         To                 Area     Depth      Discharge   Height Above
  Junction   Junction      Type      (ft2)     (ft)     Coefficient  Junction (ft)
  --------   --------      ----      -----     -----    -----------  -------------
20        40         Circ Side      7.07      3.00          1.000          0.000

====> EQUIVALENT PIPE INFORMATION FOR ORIFICE       1
      CONDUIT NAME........................... ORF #  1
      Upstream node...........................20
      Downstream node.........................40
      PIPE DIAMETER.......................        3.00
      PIPE LENGTH.........................      300.00
      MANNINGS ROUGHNESS..................      0.0088
      INVERT ELEVATION AT UPSTREAM END.....     68.6000
      INVERT ELEVATION AT DOWNSTREAM END...     68.5900


*==========================================*
|                Weir Data                 |
*==========================================*

      From        To      Link                  Crest      Weir        Weir     Discharge          Weir
  Junction  Junction    Number      Type  Height(ft)   Top(ft)  Length(ft)   Coefficient         Power
  --------  --------    ------      ----  ----------   -------  ----------   -----------   -----------
20        40        WEIR # 1          1        4.90      7.40       22.00        3.0000        1.5000


*================================================*
|          FREE OUTFALL DATA (DATA GROUP I1)     |
|         BOUNDARY CONDITION ON DATA GROUP J1    |
*================================================*

Outfall at Junction....30         has boundary condition number...         1


*================================================*
|        INTERNAL CONNECTIVITY INFORMATION       |
*================================================*

    CONDUIT       JUNCTION      JUNCTION
    -------       --------      --------
    ORF #  1      20            40
    WEIR # 1      20            40
    FREE # 1      30            BOUNDARY

*==================================================*
|        Boundary Condition Information            |
|                 Data Groups J1-J4                |
```

```
*==================================================*


BC NUMBER..          1 has no control water surface.


##########################################
# Header information from interface file: #
##########################################

Title from first computational layer:
Riverside Two Pond Analysis
Proposed Conditions 10 year Storm

Title from immediately preceding computational layer
Riverside Two Pond Analysis
Proposed Conditions 10 year Storm

Name of preceding layer:................Runoff Layer
Initial Julian date (IDATEZ)......................   98001
Initial time of day in seconds (TZERO)............  7200.0
No. Transfered input locations....................       4
No. Transfered pollutants........................       0
Size of total catchment area (acres)..............   53.40

##################################################
# Element numbers of interface inlet locations: #
##################################################
50

##################################################
# Element numbers of interface inlet locations: #
##################################################
21

##################################################
# Element numbers of interface inlet locations: #
##################################################
22

##################################################
# Element numbers of interface inlet locations: #
##################################################
10

Conversion factor to cfs for flow units
on interface file.  Multiply by:     1.00000

######## Important Information ########
Start date/time of interface file was..   98001 7200.0000 hours
```

```
Start date/time of the simulation was..   98001 7200.0000 hours
                                Same date/time found in interface file and model

 *==================================================*
 |             XP Note Field Summary                |
 *==================================================*


XP Note for: 10         Pond 1
XP Note for: 40         Pond 2
XP Note for: 20         Upstream Weir


 *==================================*
 |   Conduit Convergence Criteria   |
 *==================================*

   Conduit      Full   Conduit   Conduit      Full   Conduit
      Name      Flow     Slope      Name      Flow     Slope
---------- --------- --------- --------- --------- ---------
 201          60.      9.26E-04 202          42.      4.55E-04
 200         4.03E+02  7.86E-02 100         2.54E+02  3.12E-02
 500         7.84E+03  1.20E-02 62           11.      3.00E-02
 ORF #  1     98.      3.33E-05

 *==================================*
 |    Initial Model Condition       |
 | Initial Time =      2.00 hours   |
 *==================================*

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.00 /    59.10 21        /   0.00 /    59.40 22        /   0.00 /    59.20
40        /   0.00 /    68.59 20        /   0.00 /    68.60 50        /   0.00 /    68.60
30        /   0.00 /    58.50

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       0.00 202       /       0.00 200       /       0.00
100       /       0.00 500       /       0.00 62        /       0.00
ORF #  1  /       0.00 WEIR # 1  /       0.00 FREE # 1  /       0.00

   Conduit/   Velocity
201       /       0.00 202       /       0.00 200       /       0.00
100       /       0.00 500       /       0.00 62        /       0.00
ORF #  1  /       0.00

   Conduit/ Cross Sectional Area
201       /       0.00 202       /       0.00 200       /       0.00
100       /       0.00 500       /       0.00 62        /       0.00
ORF #  1  /       0.00

   Conduit/ Hydraulic Radius
```

```
201        /        0.00 202        /        0.00 200        /        0.00
100        /        0.00 500        /        0.00 62         /        0.00
ORF #  1   /        0.00

   Conduit/ Upstream/ Downstream Elevation
201        /    59.20/    59.20202        /    59.10/    59.10200        /    59.40/    59.40
201        /    59.20/    59.20202        /    59.10/    59.10200        /    59.40/    59.40
100        /    59.10/    59.10500        /    68.60/    68.6062         /    58.50/    58.50
201        /    59.20/    59.20202        /    59.10/    59.10200        /    59.40/    59.40
100        /    59.10/    59.10500        /    68.60/    68.6062         /    58.50/    58.50
ORF #  1   /    68.59/    68.59

 ===> System inflows (file) at     2.25 hours (  Junction / Inflow, cfs)

 50         / 0.00E+00 21         / 0.00E+00 22         / 0.00E+00 10         / 0.00E+00

 ===> System inflows (file) at     2.50 hours (  Junction / Inflow, cfs)

 50         / 0.00E+00 21         / 0.00E+00 22         / 0.00E+00 10         / 0.00E+00

 ===> System inflows (file) at     2.75 hours (  Junction / Inflow, cfs)

 50         / 0.00E+00 21         / 0.00E+00 22         / 0.00E+00 10         / 0.00E+00

 ===> System inflows (file) at     3.00 hours (  Junction / Inflow, cfs)

 50         / 0.00E+00 21         / 0.00E+00 22         / 0.00E+00 10         / 0.00E+00

 ===> System inflows (file) at     3.25 hours (  Junction / Inflow, cfs)

 50         / 0.00E+00 21         / 0.00E+00 22         / 0.00E+00 10         / 0.00E+00

 ===> System inflows (file) at     3.50 hours (  Junction / Inflow, cfs)

 50         / 0.00E+00 21         / 0.00E+00 22         / 0.00E+00 10         / 0.00E+00

 ===> System inflows (file) at     3.75 hours (  Junction / Inflow, cfs)

 50         / 0.00E+00 21         / 0.00E+00 22         / 0.00E+00 10         / 0.00E+00

 ===> System inflows (file) at     4.00 hours (  Junction / Inflow, cfs)

 50         / 0.00E+00 21         / 0.00E+00 22         / 0.00E+00 10         / 0.00E+00

 ===> System inflows (file) at     4.25 hours (  Junction / Inflow, cfs)

 50         / 0.00E+00 21         / 0.00E+00 22         / 0.00E+00 10         / 0.00E+00

 ===> System inflows (file) at     4.50 hours (  Junction / Inflow, cfs)

 50         / 0.00E+00 21         / 0.00E+00 22         / 0.00E+00 10         / 0.00E+00
```

```
===> System inflows (file) at     4.75 hours (  Junction / Inflow, cfs)
50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00
===> System inflows (file) at     5.00 hours (  Junction / Inflow, cfs)
50        / 8.12E-05 21        / 0.00E+00 22        / 1.06E-05 10        / 6.67E-06
===> System inflows (file) at     5.25 hours (  Junction / Inflow, cfs)
50        / 3.30E-02 21        / 0.00E+00 22        / 7.13E-04 10        / 7.13E-03
===> System inflows (file) at     5.50 hours (  Junction / Inflow, cfs)
50        / 1.32E-01 21        / 0.00E+00 22        / 1.65E-03 10        / 4.83E-02
===> System inflows (file) at     5.75 hours (  Junction / Inflow, cfs)
50        / 2.43E-01 21        / 0.00E+00 22        / 2.53E-03 10        / 1.11E-01
===> System inflows (file) at     6.00 hours (  Junction / Inflow, cfs)
50        / 3.50E-01 21        / 0.00E+00 22        / 3.37E-03 10        / 1.78E-01
===> System inflows (file) at     6.25 hours (  Junction / Inflow, cfs)
50        / 4.51E-01 21        / 0.00E+00 22        / 4.15E-03 10        / 2.43E-01
===> System inflows (file) at     6.50 hours (  Junction / Inflow, cfs)
50        / 5.46E-01 21        / 0.00E+00 22        / 4.90E-03 10        / 3.05E-01
===> System inflows (file) at     6.75 hours (  Junction / Inflow, cfs)
50        / 7.03E-01 21        / 0.00E+00 22        / 6.95E-03 10        / 3.76E-01
===> System inflows (file) at     7.00 hours (  Junction / Inflow, cfs)
50        / 9.05E-01 21        / 0.00E+00 22        / 8.10E-03 10        / 4.96E-01
===> System inflows (file) at     7.25 hours (  Junction / Inflow, cfs)
50        / 1.04E+00 21        / 0.00E+00 22        / 9.05E-03 10        / 5.97E-01
===> System inflows (file) at     7.50 hours (  Junction / Inflow, cfs)
50        / 1.16E+00 21        / 0.00E+00 22        / 9.95E-03 10        / 6.79E-01
===> System inflows (file) at     7.75 hours (  Junction / Inflow, cfs)
```

```
 50        / 1.27E+00 21        / 3.69E-04 22        / 1.08E-02 10        / 7.51E-01

 ===> System inflows (file) at     8.00 hours (  Junction / Inflow, cfs)

 50        / 1.37E+00 21        / 5.91E-03 22        / 1.16E-02 10        / 8.18E-01

 ===> System inflows (file) at     8.25 hours (  Junction / Inflow, cfs)

 50        / 1.46E+00 21        / 1.34E-02 22        / 1.23E-02 10        / 8.81E-01

 ===> System inflows (file) at     8.50 hours (  Junction / Inflow, cfs)

 50        / 1.55E+00 21        / 2.09E-02 22        / 1.30E-02 10        / 9.39E-01

 ===> System inflows (file) at     8.75 hours (  Junction / Inflow, cfs)

 50        / 1.89E+00 21        / 3.66E-02 22        / 1.87E-02 10        / 1.05E+00

 ===> System inflows (file) at     9.00 hours (  Junction / Inflow, cfs)

 50        / 2.37E+00 21        / 5.28E-02 22        / 2.04E-02 10        / 1.33E+00

 ===> System inflows (file) at     9.25 hours (  Junction / Inflow, cfs)

 50        / 2.50E+00 21        / 6.26E-02 22        / 2.01E-02 10        / 1.50E+00

 ===> System inflows (file) at     9.50 hours (  Junction / Inflow, cfs)

 50        / 2.53E+00 21        / 7.20E-02 22        / 2.09E-02 10        / 1.56E+00

 ===> System inflows (file) at     9.75 hours (  Junction / Inflow, cfs)

 50        / 2.85E+00 21        / 9.53E-02 22        / 2.63E-02 10        / 1.65E+00

 ===> System inflows (file) at    10.00 hours (  Junction / Inflow, cfs)

 50        / 3.30E+00 21        / 1.15E-01 22        / 2.79E-02 10        / 1.92E+00

 Cycle  2880      Time   10 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.54 /    59.64 21        /   1.96 /    61.36 22        /   0.77 /    59.97
40        /   0.24 /    68.83 20        /   0.77 /    69.37 50        /   2.50 /    71.10
30        /   0.31 /    58.81

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       1.34 202       /       1.33 200       /       1.26 100       /       1.72*
500       /       3.27*62        /       1.56 ORF #  1  /       3.00 WEIR # 1  /       0.00
FREE # 1  /       1.56

 ===> System inflows (file) at    10.25 hours (  Junction / Inflow, cfs)
```

```
 50        / 3.66E+00 21        / 1.41E-01 22        / 3.23E-02 10        / 2.14E+00

 Cycle  2970      Time   10 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.60 /    59.70 21        /   2.04 /    61.44 22        /   0.82 /    60.02
40        /   0.26 /    68.85 20        /   0.80 /    69.40 50        /   2.50 /    71.10
30        /   0.34 /    58.84

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       1.48 202       /       1.48 200       /       1.37 100       /       1.96*
500       /       3.60*62        /       1.82 ORF #  1  /       3.35 WEIR # 1  /       0.00
FREE # 1  /       1.82

 ===> System inflows (file) at    10.50 hours (  Junction / Inflow, cfs)

 50        / 4.04E+00 21        / 1.63E-01 22        / 3.38E-02 10        / 2.40E+00

 Cycle  3060      Time   10 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.67 /    59.77 21        /   2.13 /    61.53 22        /   0.87 /    60.07
40        /   0.27 /    68.86 20        /   0.84 /    69.44 50        /   2.51 /    71.11
30        /   0.37 /    58.87

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       1.64 202       /       1.64 200       /       1.51 100       /       2.26*
500       /       4.02*62        /       2.12 ORF #  1  /       3.79 WEIR # 1  /       0.00
FREE # 1  /       2.12

 ===> System inflows (file) at    10.75 hours (  Junction / Inflow, cfs)

 50        / 4.68E+00 21        / 2.13E-01 22        / 4.38E-02 10        / 2.66E+00

 Cycle  3150      Time   10 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.74 /    59.84 21        /   2.20 /    61.60 22        /   0.93 /    60.13
40        /   0.29 /    68.88 20        /   0.88 /    69.48 50        /   2.52 /    71.12
30        /   0.40 /    58.90

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       1.80 202       /       1.79 200       /       1.63 100       /       2.53*
500       /       4.56*62        /       2.45 ORF #  1  /       4.19 WEIR # 1  /       0.00
FREE # 1  /       2.45

 ===> System inflows (file) at    11.00 hours (  Junction / Inflow, cfs)

 50        / 5.49E+00 21        / 2.52E-01 22        / 4.64E-02 10        / 3.17E+00
```

```
 Cycle  3240      Time   11 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.82 /    59.92 21        /   2.35 /    61.75 22        /   1.03 /    60.23
40        /   0.32 /    68.91 20        /   0.95 /    69.55 50        /   2.53 /    71.13
30        /   0.43 /    58.93

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.08 202       /       2.06 200       /       1.88 100       /       3.13*
500       /       5.45*62        /       2.84 ORF #  1  /       5.06 WEIR # 1  /       0.00
FREE # 1  /       2.84

 ===> System inflows (file) at    11.25 hours (  Junction / Inflow, cfs)

 50        / 6.57E+00 21        / 3.42E-01 22        / 6.32E-02 10        / 3.64E+00

 Cycle  3330      Time   11 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.92 /    60.02 21        /   2.48 /    61.88 22        /   1.13 /    60.33
40        /   0.35 /    68.94 20        /   1.00 /    69.60 50        /   2.54 /    71.14
30        /   0.46 /    58.96

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.37 202       /       2.36 200       /       2.10 100       /       3.67*
500       /       6.39*62        /       3.30 ORF #  1  /       5.82 WEIR # 1  /       0.00
FREE # 1  /       3.30

 ===> System inflows (file) at    11.50 hours (  Junction / Inflow, cfs)

 50        / 7.91E+00 21        / 4.09E-01 22        / 6.72E-02 10        / 4.51E+00

 Cycle  3420      Time   11 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   1.05 /    60.15 21        /   2.68 /    62.08 22        /   1.28 /    60.48
40        /   0.39 /    68.98 20        /   1.10 /    69.70 50        /   2.56 /    71.16
30        /   0.51 /    59.01

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.88 202       /       2.83 200       /       2.53 100       /       4.76*
500       /       7.84*62        /       3.92 ORF #  1  /       7.34 WEIR # 1  /       0.00
FREE # 1  /       3.92

 ===> System inflows (file) at    11.75 hours (  Junction / Inflow, cfs)

 50        / 1.01E+01 21        / 6.15E-01 22        / 1.04E-01 10        / 5.38E+00

 Cycle  3510      Time   11 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
```

```
10        /   1.21 /    60.31 21        /   3.11 /    62.51 22        /   1.46 /    60.66
40        /   0.37 /    68.96 20        /   1.19 /    69.79 50        /   2.58 /    71.18
30        /   0.55 /    59.05

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       4.94 202       /       4.81 200       /       4.39 100       /       4.39*
500       /       9.82*62        /       4.53 ORF #  1  /       8.66 WEIR # 1  /       0.00
FREE # 1  /       4.53

 ===> System inflows (file) at    12.00 hours (  Junction / Inflow, cfs)

 50        / 1.30E+01 21        / 7.63E-01 22        / 1.12E-01 10        / 7.21E+00

 Cycle  3600      Time   12 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   1.45 /    60.55 21        /   3.36 /    62.76 22        /   1.74 /    60.94
40        /   0.42 /    69.01 20        /   1.38 /    69.98 50        /   2.62 /    71.22
30        /   0.60 /    59.10

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       7.16 202       /       7.10 200       /       6.50 100       /       5.54*
500       /      12.93*62        /       5.24 ORF #  1  /      12.10 WEIR # 1  /       0.00
FREE # 1  /       5.24

 ===> System inflows (file) at    12.25 hours (  Junction / Inflow, cfs)

 50        / 5.24E+01 21        / 5.25E+00 22        / 8.85E-01 10        / 1.59E+01

 Cycle  3690      Time   12 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   1.87 /    60.97 21        /   4.50 /    63.90 22        /   2.97 /    62.17
40        /   0.68 /    69.27 20        /   2.33 /    70.93 50        /   2.88 /    71.48
30        /   0.65 /    59.15

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /      22.04 202       /      20.90 200       /      18.06 100       /      15.29*
500       /      49.27*62        /       6.03 ORF #  1  /      34.27 WEIR # 1  /       0.00
FREE # 1  /       6.02

 ===> System inflows (file) at    12.50 hours (  Junction / Inflow, cfs)

 50        / 1.13E+02 21        / 9.12E+00 22        / 1.05E+00 10        / 5.16E+01

 Cycle  3780      Time   12 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   3.68 /    62.78 21        /   6.44*/    65.84 22        /   5.03*/    64.23
40        /   1.12 /    69.71 20        /   5.17 /    73.77 50        /   5.16 /    73.76
30        /   0.91 /    59.41
```

```
   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201        /       43.67 202        /       44.31 200        /       34.92 100        /       39.24
500        /       93.24 62         /        9.89 ORF #  1   /       75.12 WEIR # 1   /        0.14
FREE # 1   /        9.88

 ===> System inflows (file) at    12.75 hours (  Junction / Inflow, cfs)

 50         / 8.89E+01 21         / 4.85E+00 22         / 2.93E-01 10         / 6.46E+01

 Cycle  3870      Time   12 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   6.59 /    65.69 21         /   9.42*/    68.82 22         /   8.06*/    67.26
40         /   2.50 /    71.09 20         /   5.18 /    73.78 50         /   5.18 /    73.78
30         /   1.25 /    59.75

   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201        /       51.82 202        /       52.11 200        /       46.90 100        /       58.43
500        /       97.89 62         /       14.68 ORF #  1   /       94.56 WEIR # 1   /        9.67
FREE # 1   /       14.68

 ===> System inflows (file) at    13.00 hours (  Junction / Inflow, cfs)

 50         / 3.65E+01 21         / 2.29E+00 22         / 2.06E-01 10         / 3.74E+01

 Cycle  3960      Time   13 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   8.28 /    67.38 21         /   9.48*/    68.88 22         /   8.87*/    68.07
40         /   1.61 /    70.20 20         /   3.34 /    71.94 50         /   3.35 /    71.95
30         /   1.25 /    59.75

   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201        /       31.53 202        /       31.73 200        /       29.21 100        /       34.37
500        /       46.47 62         /       16.66 ORF #  1   /       62.58 WEIR # 1   /        0.00
FREE # 1   /       16.66

 ===> System inflows (file) at    13.25 hours (  Junction / Inflow, cfs)

 50         / 2.24E+01 21         / 1.42E+00 22         / 1.16E-01 10         / 2.15E+01

 Cycle  4050      Time   13 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   8.91 /    68.01 21         /   9.04*/    68.44 22         /   8.99*/    68.19
40         /   0.68 /    69.27 20         /   1.94 /    70.54 50         /   2.71 /    71.31
30         /   1.25 /    59.75

   Conduit/        FLOW   ===> "*" Conduit uses the normal flow option.
201        /       14.57 202        /       14.64 200        /       13.11 100        /       14.41
```

```
500        /      23.23*62        /      17.35 ORF #  1  /      27.07 WEIR # 1  /       0.00
FREE # 1  /      17.35

 ===> System inflows (file) at    13.50 hours (  Junction / Inflow, cfs)

 50        / 1.46E+01 21        / 1.10E+00 22        / 1.06E-01 10        / 1.30E+01

 Cycle  4140      Time   13 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.12 /    68.22 21        /   9.02*/    68.42 22        /   9.10*/    68.30
40        /   0.49 /    69.08 20        /   1.55 /    70.15 50        /   2.64 /    71.24
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /      10.02 202       /      10.13 200       /       8.92 100       /       7.64*
500       /      14.77*62        /      17.58 ORF #  1  /      16.43 WEIR # 1  /       0.00
FREE # 1  /      17.58

 ===> System inflows (file) at    13.75 hours (  Junction / Inflow, cfs)

 50        / 1.20E+01 21        / 8.86E-01 22        / 8.02E-02 10        / 9.26E+00

 Cycle  4230      Time   13 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.21 /    68.31 21        /   9.04*/    68.44 22        /   9.16*/    68.36
40        /   0.42 /    69.01 20        /   1.42 /    70.02 50        /   2.61 /    71.21
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       8.36 202       /       8.45 200       /       7.47 100       /       5.79*
500       /      12.20*62        /      17.68 ORF #  1  /      13.19 WEIR # 1  /       0.00
FREE # 1  /      17.68

 ===> System inflows (file) at    14.00 hours (  Junction / Inflow, cfs)

 50        / 9.97E+00 21        / 7.95E-01 22        / 7.74E-02 10        / 7.16E+00

 Cycle  4320      Time   14 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.24 /    68.34 21        /   9.04*/    68.44 22        /   9.17*/    68.37
40        /   0.37 /    68.96 20        /   1.29 /    69.89 50        /   2.59 /    71.19
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       7.17 202       /       7.22 200       /       6.36 100       /       4.27*
500       /      10.03*62        /      17.71 ORF #  1  /      10.59 WEIR # 1  /       0.00
FREE # 1  /      17.71
```

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 ===> System inflows (file) at    14.25 hours (  Junction / Inflow, cfs)

 50        / 8.84E+00 21        / 6.76E-01 22        / 6.20E-02 10        / 6.15E+00

 Cycle  4410      Time   14 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.24 /    68.34 21        /   9.02*/    68.42 22        /   9.17*/    68.37
40        /   0.35 /    68.94 20        /   1.24 /    69.84 50        /   2.58 /    71.18
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       6.54 202       /       6.60 200       /       5.86*100       /       3.69*
500       /       8.98*62        /      17.71 ORF #  1  /       9.53 WEIR # 1  /       0.00
FREE # 1  /      17.71

 ===> System inflows (file) at    14.50 hours (  Junction / Inflow, cfs)

 50        / 7.69E+00 21        / 6.21E-01 22        / 6.03E-02 10        / 5.25E+00

 Cycle  4500      Time   14 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.22 /    68.32 21        /   8.97*/    68.37 22        /   9.13*/    68.33
40        /   0.32 /    68.91 20        /   1.16 /    69.76 50        /   2.56 /    71.16
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       5.61 202       /       5.70 200       /       5.00*100       /       3.15*
500       /       7.73*62        /      17.68 ORF #  1  /       8.13 WEIR # 1  /       0.00
FREE # 1  /      17.68

 ===> System inflows (file) at    14.75 hours (  Junction / Inflow, cfs)

 50        / 6.70E+00 21        / 5.04E-01 22        / 4.49E-02 10        / 4.68E+00

 Cycle  4590      Time   14 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.17 /    68.27 21        /   8.92*/    68.32 22        /   9.09*/    68.29
40        /   0.31 /    68.90 20        /   1.11 /    69.71 50        /   2.55 /    71.15
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       5.06 202       /       5.11 200       /       4.54*100       /       2.86*
500       /       6.85*62        /      17.63 ORF #  1  /       7.38 WEIR # 1  /       0.00
FREE # 1  /      17.63

 ===> System inflows (file) at    15.00 hours (  Junction / Inflow, cfs)

 50        / 5.57E+00 21        / 4.48E-01 22        / 4.32E-02 10        / 3.88E+00
```

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 Cycle  4680      Time   15 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.11 /    68.21 21        /   8.84*/    68.24 22        /   9.01*/    68.21
40        /   0.28 /    68.87 20        /   1.03 /    69.63 50        /   2.53 /    71.13
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       4.19 202       /       4.24 200       /       3.74*100       /       2.36*
500       /       5.61*62        /      17.56 ORF #  1  /       6.07 WEIR # 1  /       0.00
FREE # 1  /      17.56

 ===> System inflows (file) at    15.25 hours (  Junction / Inflow, cfs)

 50        / 5.37E+00 21        / 4.43E-01 22        / 4.32E-02 10        / 3.50E+00

 Cycle  4770      Time   15 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.03 /    68.13 21        /   8.75*/    68.15 22        /   8.94*/    68.14
40        /   0.27 /    68.86 20        /   0.99 /    69.59 50        /   2.53 /    71.13
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       3.81 202       /       3.88 200       /       3.38*100       /       2.13*
500       /       5.38*62        /      17.47 ORF #  1  /       5.50 WEIR # 1  /       0.00
FREE # 1  /      17.47

 ===> System inflows (file) at    15.50 hours (  Junction / Inflow, cfs)

 50        / 5.34E+00 21        / 4.44E-01 22        / 4.32E-02 10        / 3.40E+00

 Cycle  4860      Time   15 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   8.94 /    68.04 21        /   8.67*/    68.07 22        /   8.85*/    68.05
40        /   0.26 /    68.85 20        /   0.98 /    69.58 50        /   2.53 /    71.13
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       3.72 202       /       3.78 200       /       3.29*100       /       2.08*
500       /       5.35*62        /      17.38 ORF #  1  /       5.37 WEIR # 1  /       0.00
FREE # 1  /      17.38

 ===> System inflows (file) at    15.75 hours (  Junction / Inflow, cfs)

 50        / 5.34E+00 21        / 4.45E-01 22        / 4.32E-02 10        / 3.36E+00

 Cycle  4950      Time   15 Hrs - 45.00 Min
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 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   8.86 /    67.96 21        /   8.58*/    67.98 22        /   8.76*/    67.96
40        /   0.26 /    68.85 20        /   0.98 /    69.58 50        /   2.53 /    71.13
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       3.71 202       /       3.76 200       /       3.28*100       /       2.07*
500       /       5.34*62        /      17.29 ORF #  1  /       5.35 WEIR # 1  /       0.00
FREE # 1  /      17.29

 ===> System inflows (file) at    16.00 hours (  Junction / Inflow, cfs)

 50        / 5.35E+00 21        / 4.46E-01 22        / 4.32E-02 10        / 3.36E+00

 Cycle  5040      Time   16 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   8.77 /    67.87 21        /   8.49*/    67.89 22        /   8.67*/    67.87
40        /   0.26 /    68.85 20        /   0.98 /    69.58 50        /   2.53 /    71.13
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       3.72 202       /       3.76 200       /       3.28*100       /       2.07*
500       /       5.35*62        /      17.19 ORF #  1  /       5.35 WEIR # 1  /       0.00
FREE # 1  /      17.19

 ===> System inflows (file) at    16.25 hours (  Junction / Inflow, cfs)

 50        / 5.35E+00 21        / 4.46E-01 22        / 4.33E-02 10        / 3.36E+00

 Cycle  5130      Time   16 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   8.68 /    67.78 21        /   8.41*/    67.81 22        /   8.59*/    67.79
40        /   0.26 /    68.85 20        /   0.98 /    69.58 50        /   2.53 /    71.13
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       3.76 202       /       3.78 200       /       3.28*100       /       2.07*
500       /       5.35*62        /      17.10 ORF #  1  /       5.35 WEIR # 1  /       0.00
FREE # 1  /      17.10

 ===> System inflows (file) at    16.50 hours (  Junction / Inflow, cfs)

 50        / 5.35E+00 21        / 4.47E-01 22        / 4.33E-02 10        / 3.36E+00

 Cycle  5220      Time   16 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   8.60 /    67.70 21        /   8.32*/    67.72 22        /   8.50*/    67.70
40        /   0.26 /    68.85 20        /   0.98 /    69.58 50        /   2.53 /    71.13
```

```
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       3.73 202       /       3.74 200       /       3.28*100       /       2.07*
500       /       5.35*62        /      17.00 ORF #  1  /       5.35 WEIR # 1  /       0.00
FREE # 1  /      17.00

 ===> System inflows (file) at    16.75 hours (  Junction / Inflow, cfs)

 50        / 4.56E+00 21        / 3.32E-01 22        / 2.78E-02 10        / 3.20E+00

 Cycle  5310      Time   16 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   8.51 /    67.61 21        /   8.24*/    67.64 22        /   8.42*/    67.62
40        /   0.26 /    68.85 20        /   0.96 /    69.56 50        /   2.52 /    71.12
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       3.50 202       /       3.50 200       /       3.18*100       /       2.01*
500       /       4.72*62        /      16.91 ORF #  1  /       5.17 WEIR # 1  /       0.00
FREE # 1  /      16.91

 ===> System inflows (file) at    17.00 hours (  Junction / Inflow, cfs)

 50        / 3.45E+00 21        / 2.75E-01 22        / 2.60E-02 10        / 2.51E+00

 Cycle  5400      Time   17 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   8.41 /    67.51 21        /   8.13*/    67.53 22        /   8.32*/    67.52
40        /   0.23 /    68.82 20        /   0.87 /    69.47 50        /   2.50 /    71.10
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.74 202       /       2.75 200       /       2.50*100       /       1.57*
500       /       3.50*62        /      16.80 ORF #  1  /       4.04 WEIR # 1  /       0.00
FREE # 1  /      16.80

 ===> System inflows (file) at    17.25 hours (  Junction / Inflow, cfs)

 50        / 3.25E+00 21        / 2.70E-01 22        / 2.60E-02 10        / 2.16E+00

 Cycle  5490      Time   17 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   8.30 /    67.40 21        /   8.01*/    67.41 22        /   8.20*/    67.40
40        /   0.22 /    68.81 20        /   0.82 /    69.42 50        /   2.50 /    71.10
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
```

```
201        /        2.37 202        /        2.37 200        /        2.12*100        /        1.34*
500        /        3.26*62         /       16.66 ORF #  1  /        3.45 WEIR # 1  /        0.00
FREE # 1  /       16.66

 ===> System inflows (file) at    17.50 hours (  Junction / Inflow, cfs)

 50         / 3.22E+00 21         / 2.70E-01 22         / 2.60E-02 10         / 2.06E+00

 Cycle  5580      Time   17 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   8.17 /    67.27 21         /   7.88*/    67.28 22         /   8.08*/    67.28
40         /   0.21 /    68.80 20         /   0.80 /    69.40 50         /   2.49 /    71.09
30         /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201        /        2.29 202        /        2.33 200        /        2.01*100        /        1.27*
500        /        3.22*62         /       16.52 ORF #  1  /        3.27 WEIR # 1  /        0.00
FREE # 1  /       16.52

 ===> System inflows (file) at    17.75 hours (  Junction / Inflow, cfs)

 50         / 3.22E+00 21         / 2.70E-01 22         / 2.60E-02 10         / 2.03E+00

 Cycle  5670      Time   17 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   8.05 /    67.15 21         /   7.76*/    67.16 22         /   7.95*/    67.15
40         /   0.21 /    68.80 20         /   0.80 /    69.40 50         /   2.49 /    71.09
30         /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201        /        2.26 202        /        2.30 200        /        1.98*100        /        1.25*
500        /        3.22*62         /       16.38 ORF #  1  /        3.23 WEIR # 1  /        0.00
FREE # 1  /       16.38

 ===> System inflows (file) at    18.00 hours (  Junction / Inflow, cfs)

 50         / 3.22E+00 21         / 2.70E-01 22         / 2.60E-02 10         / 2.02E+00

 Cycle  5760      Time   18 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   7.92 /    67.02 21         /   7.63*/    67.03 22         /   7.82*/    67.02
40         /   0.21 /    68.80 20         /   0.80 /    69.40 50         /   2.49 /    71.09
30         /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201        /        2.25 202        /        2.30 200        /        1.98*100        /        1.25*
500        /        3.22*62         /       16.23 ORF #  1  /        3.22 WEIR # 1  /        0.00
FREE # 1  /       16.23
```

```
 ===> System inflows (file) at    18.25 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.70E-01 22        / 2.60E-02 10        / 2.02E+00

 Cycle  5850      Time   18 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   7.79 /    66.89 21        /   7.50*/    66.90 22        /   7.70*/    66.90
40        /   0.21 /    68.80 20        /   0.80 /    69.40 50        /   2.49 /    71.09
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.25 202       /       2.30 200       /       1.97*100       /       1.25*
500       /       3.22*62        /      16.09 ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1  /      16.09

 ===> System inflows (file) at    18.50 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.71E-01 22        / 2.60E-02 10        / 2.02E+00

 Cycle  5940      Time   18 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   7.67 /    66.77 21        /   7.38*/    66.78 22        /   7.57*/    66.77
40        /   0.21 /    68.80 20        /   0.80 /    69.40 50        /   2.49 /    71.09
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.25 202       /       2.30 200       /       1.97*100       /       1.25*
500       /       3.22*62        /      15.94 ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1  /      15.94

 ===> System inflows (file) at    18.75 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.71E-01 22        / 2.60E-02 10        / 2.02E+00

 Cycle  6030      Time   18 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   7.54 /    66.64 21        /   7.25*/    66.65 22        /   7.45*/    66.65
40        /   0.21 /    68.80 20        /   0.80 /    69.40 50        /   2.49 /    71.09
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.26 202       /       2.30 200       /       1.98*100       /       1.25*
500       /       3.22*62        /      15.79 ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1  /      15.79

 ===> System inflows (file) at    19.00 hours (  Junction / Inflow, cfs)
```

```
 50        / 3.22E+00 21        / 2.71E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6120      Time   19 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   7.42 /    66.52 21        /   7.13*/    66.53 22        /   7.32*/    66.52
40        /   0.21 /    68.80 20        /   0.80 /    69.40 50        /   2.49 /    71.09
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.27 202       /       2.30 200       /       1.98*100       /       1.25*
500       /       3.22*62        /      15.64 ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1  /      15.64

 ===> System inflows (file) at    19.25 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.72E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6210      Time   19 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   7.29 /    66.39 21        /   7.00*/    66.40 22        /   7.19*/    66.39
40        /   0.21 /    68.80 20        /   0.80 /    69.40 50        /   2.49 /    71.09
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.27 202       /       2.30 200       /       1.98*100       /       1.25*
500       /       3.22*62        /      15.49 ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1  /      15.49

 ===> System inflows (file) at    19.50 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.72E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6300      Time   19 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   7.16 /    66.26 21        /   6.87*/    66.27 22        /   7.06*/    66.26
40        /   0.21 /    68.80 20        /   0.80 /    69.40 50        /   2.49 /    71.09
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.27 202       /       2.30 200       /       1.98*100       /       1.25*
500       /       3.22*62        /      15.33 ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1  /      15.33

 ===> System inflows (file) at    19.75 hours (  Junction / Inflow, cfs)

 50        / 3.23E+00 21        / 2.72E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6390      Time   19 Hrs - 45.00 Min
```

```
 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   7.04 /    66.14 21        /   6.75*/    66.15 22        /   6.94*/    66.14
40        /   0.21 /    68.80 20        /   0.80 /    69.40 50        /   2.49 /    71.09
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.27 202       /       2.31 200       /       1.98*100       /       1.25*
500       /       3.23*62        /      15.18 ORF #  1  /       3.22 WEIR # 1  /       0.00
FREE # 1  /      15.18

 ===> System inflows (file) at    20.00 hours (  Junction / Inflow, cfs)

 50        / 3.23E+00 21        / 2.72E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6480      Time   20 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   6.91 /    66.01 21        /   6.62*/    66.02 22        /   6.81*/    66.01
40        /   0.21 /    68.80 20        /   0.80 /    69.40 50        /   2.49 /    71.09
30        /   1.25 /    59.75

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.27 202       /       2.30 200       /       1.98*100       /       1.25*
500       /       3.23*62        /      15.03 ORF #  1  /       3.23 WEIR # 1  /       0.00
FREE # 1  /      15.03


 *=====================================================*
 | Table E5 - Junction Time Limitation Summary         |
 |              (0.10 or 0.25)* Depth * Area           |
 | Time step = ------------------------------          |
 |                  Sum of Flow                        |
 *=====================================================*
 |  The time this junction was the limiting junction |
 |                is listed in the third column.       |
 *=====================================================*

Junction     Time(.10)  Time(.25)  Time(sec)
--------     ---------  ---------  ---------
 10            100.00    100.00   11050.0
 21             12.19     30.47       0.0
 22             30.64     76.59       0.0
 40             18.48     46.21       0.0
 20              7.88     19.71   52630.0
 50              9.36     23.41    1120.0
 30            100.00    100.00       0.0
The junction requiring the smallest time step was...20


 *==========================================================*
```

```
|       Table E5a - Conduit Explicit Condition Summary     |
|       Courant   =         Conduit Length                |
|       Time step = -------------------------------       |
|                      Velocity + sqrt(g*depth)           |
|                                                         |
|                  Conduit Implicit Condition Summary     |
|       Courant   =         Conduit Length                |
|       Time step = -------------------------------       |
|                              Velocity                   |
*=========================================================*
|  The 3rd column is the Explicit time step times the     |
|      minimum courant time step factor                   |
|                                                         |
|  Minimum Conduit Time Step in seconds in the 4th column |
|  in the list. Maximum possible is 10 * maximum time step |
|                                                         |
|  The 5th column is the maximum change at any time step  |
|  during the simulation. The 6th column is the wobble    |
|  value which is an indicator of the flow stability.     |
|                                                         |
|  You should use this section to find those conduits that |
|  are slowing your model down.  Use modify conduits to   |
|  alter the length of the slow conduits to make your     |
|  simulation faster, or change the conduit name to       |
|  "CHME?????" where ????? are any characters, this will  |
|  lengthen the conduit based on the model time step,     |
|  not the value listed in modify conduits.               |
*=========================================================*
```

Conduit	Time(exp)	Expl*Cmin	Time(imp)	Time(min)	Max Qchange	Wobble
201	5.15	10.30	27.23	323.2	0.623	1.043
202	5.66	11.31	27.16	0.0	0.635	1.224
200	4.30	8.59	14.10	0.0	0.481	0.060
100	14.78	29.57	45.77	0.0	0.683	0.112
500	18.76	37.52	100.00	0.0	-1.503	0.014
62	0.64	1.28	1.42	756.8	-0.035	0.650
ORF # 1	10.51	21.02	19.49	0.0	0.456	0.460

The conduit with the smallest time step limitation was..62
The conduit with the largest wobble was.....202
The conduit with the largest flow change in any
consecutive time step.....500

```
*==================================================*
|  Table E6. Final Model Condition                 |
|            This table is used for steady state   |
|            flow comparison and is the information|
|            saved to the hot-restart file.        |
|            Final Time =    20.003 hours         |
*==================================================*
```

```
 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   6.91 /    66.0121        /   6.62*/    66.0222        /   6.81*/    66.01
40        /   0.21 /    68.8020        /   0.80 /    69.4050        /   2.49 /    71.09
30        /   1.25 /    59.75

   Conduit/       Flow   ===> "*" Conduit uses the normal flow option.
201       /       2.27 202       /       2.30 200       /       1.98*
100       /       1.25*500       /       3.23*62        /      15.03
ORF #  1  /       3.23 WEIR # 1  /       0.00 FREE # 1  /      15.03
201       /       0.14 202       /       0.14 200       /       0.34
100       /       0.21 500       /       0.24 62        /      12.05
ORF #  1  /       3.48

   Conduit/ Cross Sectional Area
201       /      15.95 202       /      15.96 200       /       5.80
100       /       5.81 500       /      13.48 62        /       1.25
ORF #  1  /       0.93

   Conduit/ Cross Sectional Area
201       /    1722.92 202       /    1755.26 200       /     487.48
100       /    1767.44 500       /    2696.09 62        /      24.93
ORF #  1  /     278.18

   Conduit/ Hydraulic Radius
201       /       1.13 202       /       1.13 200       /       0.52
100       /       0.52 500       /       0.38 62        /       0.31
ORF #  1  /       0.31

   Conduit/ Upstream/ Downstream Elevation
201       /    66.02/    66.01202       /    66.01/    66.01200       /    68.80/    66.02
201       /    66.02/    66.01202       /    66.01/    66.01200       /    68.80/    66.02
100       /    68.80/    66.01500       /    71.09/    69.4062        /    66.01/    59.75
201       /    66.02/    66.01202       /    66.01/    66.01200       /    68.80/    66.02
100       /    68.80/    66.01500       /    71.09/    69.4062        /    66.01/    59.75
ORF #  1  /    69.40/    68.80


 *==========================================================*
 |         Table E7 -  Extran Iteration Summary             |
 *==========================================================*

 Total number of time steps simulated............       6480
 Total number of passes in the simulation........      29948
 Total number of time steps during simulation....      23340
 Ratio of actual # of time steps / NTCYC.........      3.602
 Average number of iterations per time step......      1.283
 Average  time step size(seconds)................      2.776
 Smallest time step size(seconds)................      1.429
 Largest  time step size(seconds)................     10.000
 Average minimum Conduit Courant time step (sec).      5.034
 Average minimum implicit time step (sec)........      1.830
```

```
Average minimum junction time step (sec)........      1.830
Average Courant Factor Tf......................      1.830
Number of times omega reduced..................         27
```

```
*==========================================================*
|     Table E8 - Junction Time Step Limitation Summary     |
*==========================================================*
|   Not Convr = Number of times this junction did not      |
|               converge during the simulation.            |
|   Avg Convr = Average junction iterations.               |
|   Conv err  = Mean convergence error.                    |
|   Omega Cng = Change of omega during iterations          |
|   Max Itern = Maximum number of iterations               |
*==========================================================*
```

Junction	Not Convr	Avg Convr	Total Itt	Omega Cng	Max Itern	Ittrn >10	Ittrn >25	Ittrn >40
10	0	1.69	39443	1	8	0	0	0
21	0	1.84	42902	19	16	30	0	0
22	0	2.22	51882	3	26	11	1	0
40	0	1.11	26024	0	32	2	1	0
20	0	1.15	26854	0	6	0	0	0
50	0	1.15	26936	4	31	4	1	0
30	2	1.05	24622	0	51	3	2	2

```
Total number of iterations for all junctions..    238663
Minimum number of possible iterations.........    163380
Efficiency of the simulation..................      1.46
                                                 Good Efficiency
```

```
*==========================================================*
| Extran Efficiency is an indicator of the efficiency of   |
| the simulation.  Ideal efficiency is one iteration per   |
| time step.  Altering the underrelaxation parameter,      |
| lowering the time step, increasing the flow and head     |
| tolerance are good ways of improving the efficiency,     |
| another is lowering the internal time step. The lower the|
| efficiency generally the faster your model will run.     |
| If your efficiency is less than 1.5 then you may try     |
| increasing your time step so that your overall simulation|
| is faster.  Ideal efficiency would be around 2.0         |
|                                                          |
| Good Efficiency      < 1.5           mean iterations     |
| Excellent Efficiency < 2.5 and > 1.5 mean iterations     |
| Good      Efficiency < 4.0 and > 2.5 mean iterations     |
| Fair      Efficiency < 7.5 and > 4.0 mean iterations     |
| Poor Efficiency      > 7.5           mean iterations     |
*==========================================================*
```

```
*=========================================================*
|        Table E9 - JUNCTION SUMMARY STATISTICS           |
```

| The Maximum area is only the area of the node, it
| does not include the area of the surrounding conduits|

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Meters of Surcharge at Max Elevation	Freeboard of node meters	Maximum Junction Area ft^2
10	75.00	75.00	68.35	14	5	0.00	6.65	6.697E+04
21	75.00	66.00	68.89	12	54	2.89	6.11	1.300E+01
22	75.00	63.80	68.38	14	3	4.58	6.62	1.300E+01
40	76.00	72.60	71.27	12	41	0.00	4.73	1.300E+01
20	76.50	76.50	74.05	12	32	0.00	2.45	1.300E+01
50	78.90	78.90	74.05	12	32	0.00	4.85	1.300E+01
30	70.00	59.75	59.75	12	35	0.00	10.25	1.300E+01

Table E10 - CONDUIT SUMMARY STATISTICS

Note: The peak flow may be less than the design flow and the conduit may still surcharge because of the downstream boundary conditions.

Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Conduit Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Upstream (ft)	Ends Dwnstrm (ft)
201	60.	3.76	54.00	6.34E+01	12	34	3.97	12	34	1.06	68.89	68.38
202	42.	2.64	54.00	6.43E+01	12	34	4.05	12	33	1.53	68.38	68.35
200	4.03E+02	32.04	48.00	5.40E+01	12	34	5.96	11	44	0.13	71.27	68.89
100	2.54E+02	20.21	48.00	6.90E+01	12	34	6.64	12	33	0.27	71.27	68.35
500	7.84E+03	16.11	94.80	1.23E+02	12	33	1.04	12	17	0.02	74.05	74.05
62	11.	9.12	15.00	1.77E+01	14	5	14.12	14	5	1.58	68.35	59.75
ORF # 1	98.	0.80	36.00	9.85E+01	12	34	15.39	12	31	1.00	74.05	71.27
WEIR # 1	Undefnd	Undefnd	Undefnd	2.69E+01	12	32						
FREE # 1	Undefnd	Undefnd	Undefnd	1.77E+01	14	5						

Table E11. Area assumptions used in the analysis
Subcritical and Critical flow assumptions from
Subroutine Head. See Figure 17-1 in the
manual for further information.

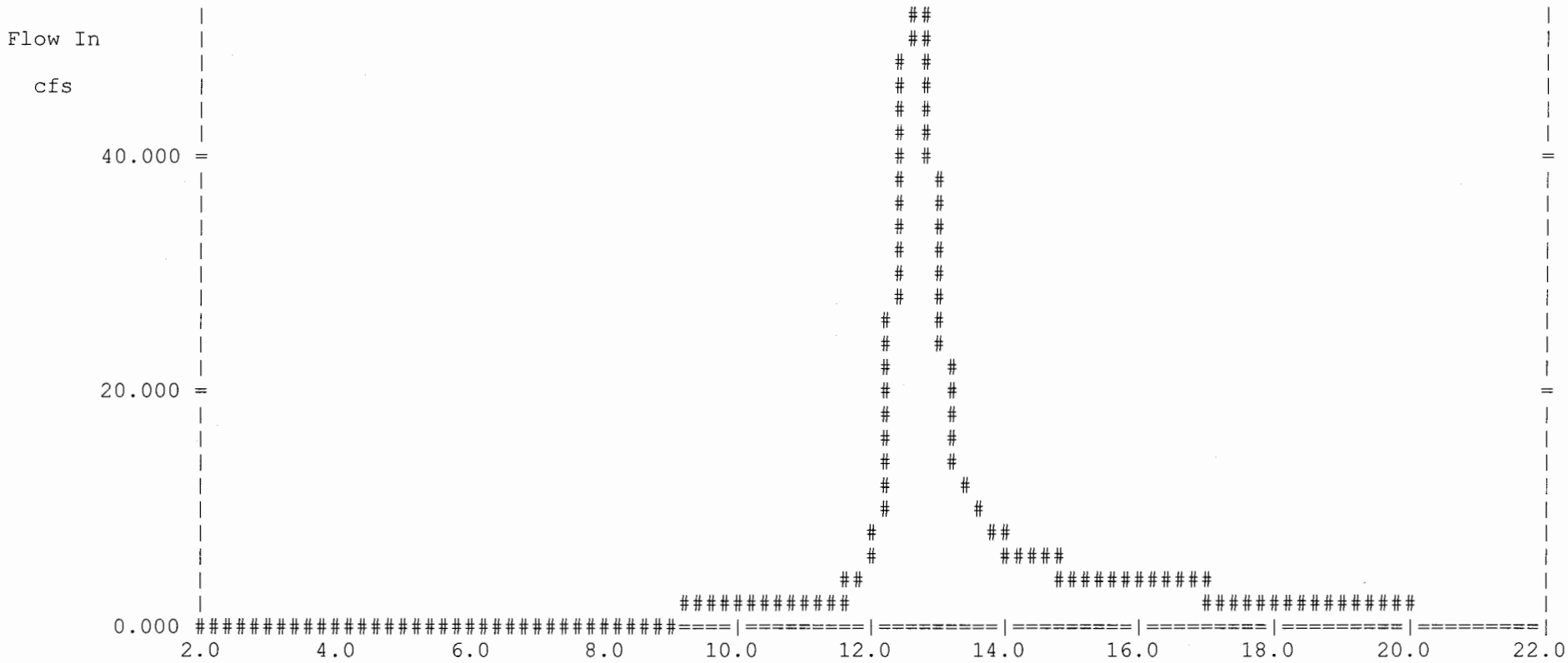
Conduit Name	Length of Dry Flow(min)	Length of Sub-Critical Flow(min)	Length of Upstream Critical Flow(min)	Length of Downstream Critical Flow(min)	Maximum Hydraulic Radius-m	Maximum X-Sect Area(ft^2)	Maximum Vel*D (ft^2/s)

201	0.00	793.50	0.00	286.50	1.268	16.278	0.178E+02
202	0.00	664.67	0.00	415.33	1.277	16.283	0.182E+02
200	232.50	497.83	0.00	349.67	1.091	10.584	0.215E+02
100	232.50	847.50	0.00	0.00	1.091	10.576	0.254E+02
500	202.67	877.33	0.00	0.00	2.979	197.826	0.264E+01
62	0.00	248.83	0.00	831.17	0.343	1.255	0.176E+02
ORF # 1	202.67	877.33	0.00	0.00	0.823	6.907	0.462E+02

==========
| Table E12. Mean Conduit Flow Information |
==========

Conduit Name	Mean Flow (cfs)	Total Flow (ft^3)	Mean Percent Change	Low Flow Weightng	Mean Froude Number	Mean Hydraulic Radius	Mean Cross Area	Mean Conduit Roughness
201	4.23	2.740E+05	2.674E-02	1.00	6.929E-02	1.00	13.4	1.227E-04
202	4.25	2.757E+05	2.199E-02	1.00	8.806E-02	0.965	13.0	1.227E-04
200	3.73	2.416E+05	1.039E-02	0.940	0.553	0.488	4.99	1.454E-05
100	3.75	2.427E+05	1.217E-02	0.940	0.334	0.501	5.03	1.454E-05
500	7.49	4.855E+05	4.599E-02	0.948	0.141	0.560	24.7	3.369E-05
62	7.52	4.872E+05	3.115E-03	0.936	1.85	0.279	1.06	1.451E-05
ORF # 1	7.20	4.666E+05	1.938E-02	0.948	1.36	0.381	1.53	9.910E-06
WEIR # 1	0.280	1.814E+04						
FREE # 1	7.52	4.872E+05						

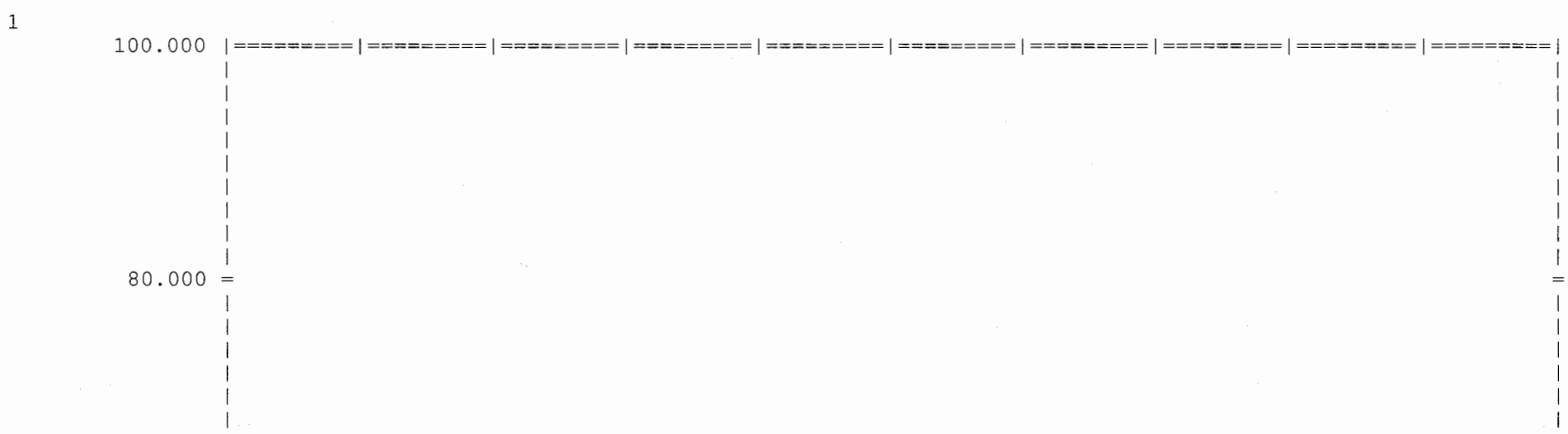
1

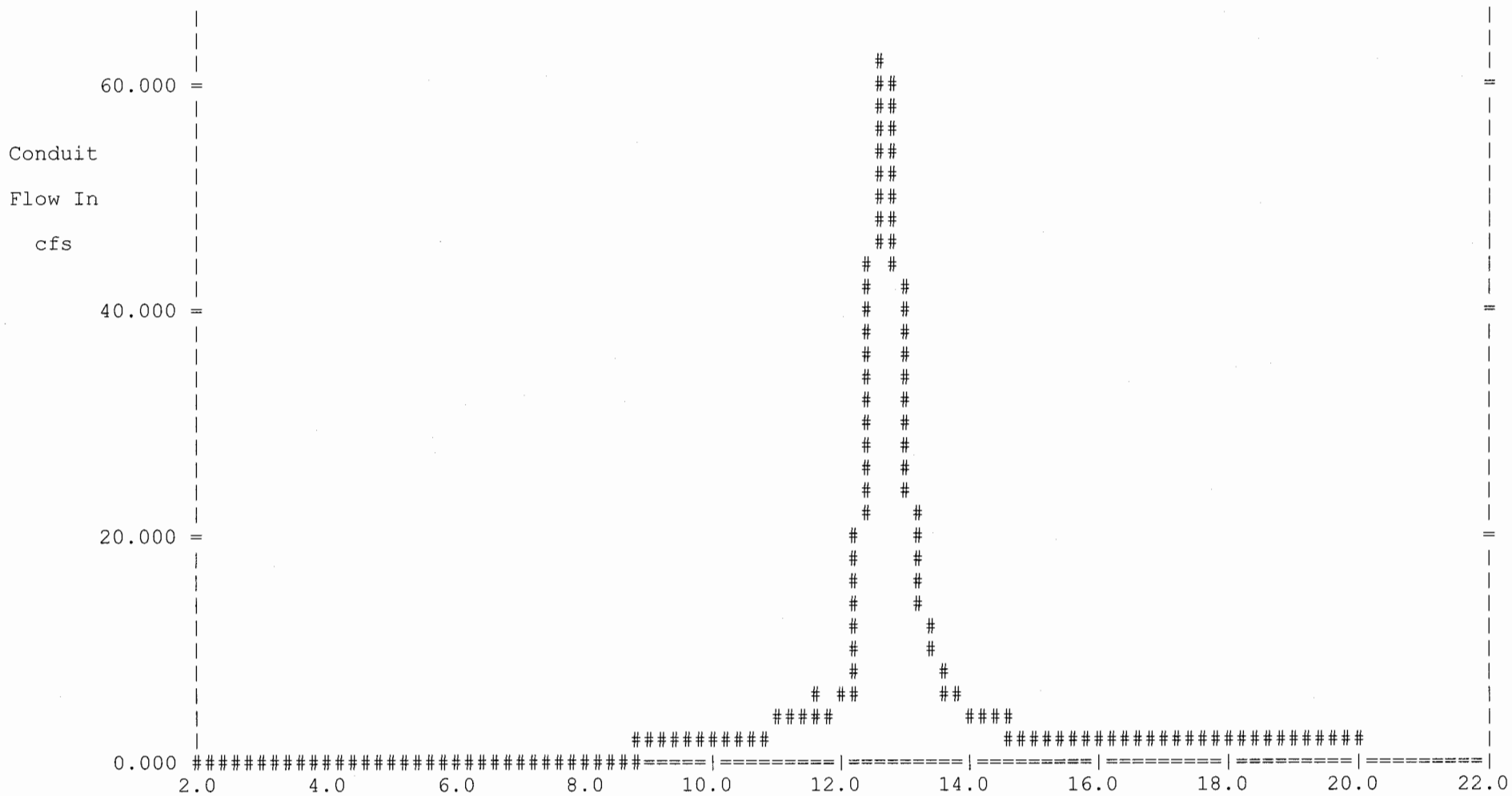


LOCATION NO. : 202 Clock time in hours.

Plot of conduit flow

1





LOCATION NO. : 100 Clock time in hours.

Plot of conduit flow

| Table E13. Channel losses(H), headwater depth (HW), tailwater depth (TW), critical and normal depth (Yc and Yn). Use this section for culvert comparisons |

Conduit Name	Maximum Flow	Head Loss	Friction Loss	Critical Depth	Normal Depth	HW Elevat	TW Elevat	
201	63.136	2.044	0.110	2.310	3.968	68.098	65.943	Max Flow
202	64.089	2.126	0.116	2.329	4.500	65.943	63.704	Max Flow

200	53.742	3.512	0.163	2.202	0.986	71.090	68.098	Max Flow
100	68.845	7.226	0.922	2.506	1.422	71.090	63.704	Max Flow
62	17.712	7.118	1.438	9.246	1.250	68.346	59.750	Max Flow
ORF # 1	98.468	0.000	2.930	5.414	3.000	74.014	71.090	Max Flow

==========
| CULVERT ANALYSIS CLASSIFICATION, and the time the culvert was in a particular classification during the simulation. The time is in minutes. Extran used the Dynamic Wave Equation for all conduit analysis but classifies the culvert flow condition based on the HW and TW depths. |
==========

Conduit Name	Critical D Outlet Control	Mild Slope TW Control Outlet Control	Steep Slope TW Insignf Entrance Control	Mild Slope TW Slug Flow Outlet/ Entrance Control	Mild Slope TW > D Outlet Control	Mild Slope TW <= D Outlet Control	Outlet Control	Inlet Control
201	11.333	617.667	0.000	0.000	451.000	0.000	0.000	0.000
202	79.333	555.333	0.000	0.000	445.333	0.000	0.000	0.000
200	0.000	0.000	1051.667	0.000	0.000	0.000	0.000	28.333
100	0.000	0.000	1080.000	0.000	0.000	0.000	0.000	0.000
500	0.000	876.000	204.000	0.000	0.000	0.000	0.000	0.000
62	0.000	0.000	600.667	0.000	0.000	0.000	22.667	456.667
ORF # 1	802.333	45.333	204.000	0.000	0.000	0.000	28.333	0.000

==========
| Kinematic Wave Approximations Time in Minutes for Each Condition |
==========

Conduit Name	Length of Normal Flow	Slope Criteria	Super-Critical	Roll Waves
201	0.00	380.67	0.00	0.00
202	0.00	381.83	0.00	0.00
200	349.00	497.50	385.83	0.00
100	665.33	762.00	259.00	0.00
500	822.67	868.50	0.00	0.00
62	0.00	0.00	831.50	0.00
ORF # 1	0.00	0.00	696.67	0.00

==========
| Table E15 - SPREADSHEET INFO LIST
| Conduit Flow and Junction Depth Information for use in spreadsheets. The maximum values in this table are the true maximum values because they sample every time step. The values in the review results may only be the maximum of a subset of all the time steps in the run. |

| Note: These flows are only the flows in a single barrel.|
==========

Conduit Name	Maximum Flow	Total Flow	Maximum Velocity	##	Junction Name	Invert Elevation	Maximum Elevation
201	63.36082	274041.6	3.966088	##	10	59.10000	68.34638
202	64.29150	275652.8	4.049655	##	21	59.40000	68.88992
200	54.00844	241613.0	5.955959	##	22	59.20000	68.37588
100	69.00405	242735.5	6.641286	##	40	68.59000	71.27187
500	122.9055	485467.3	1.038701	##	20	68.60000	74.05021
62	17.71206	487196.2	14.11688	##	50	68.60000	74.05265
ORF # 1	98.53121	466588.9	15.39374	##	30	58.50000	59.75000
WEIR # 1	26.94701	18136.69	0.0000000	##			
FREE # 1	17.71206	487168.9	0.0000000	##			

```
#######################################################
# Table E16. New Conduit Information Section          #
#            Conduit Invert (IE) Elevation and Conduit #
#            Maximum Water Surface (WS) Elevations    #
#######################################################
```

Conduit Name	Upstream Node	Downstream Node	IE Up	IE Dn	WS Up	WS Dn	Conduit Type
201	21	22	59.40	59.30	68.89	68.38	Circular
202	22	10	59.20	59.15	68.38	68.35	Circular
200	40	21	68.60	62.00	71.27	68.89	Circular
100	40	10	68.60	59.10	71.27	68.35	Circular
500	50	20	71.00	68.60	74.05	74.05	Trapezoid
62	10	30	59.10	58.50	68.35	59.75	Circular
ORF # 1	20	40	68.60	68.59	74.05	71.27	Circ Orif

```
*==============================================================================*
|    Table E18 - Junction Continuity Error.   Division by Volume added 11/96   |
|                                                                              |
|  Continuity Error = Net Flow + Beginning Volume - Ending Volume              |
|                     ---------------------------------------------------      |
|                     Total Flow + (Beginning Volume + Ending Volume)/2        |
|                                                                              |
|  Net Flow   = Node Inflow - Node Outflow                                     |
|  Total Flow = absolute (Inflow + Outflow                                     |
|  Intermediate column is a judgement on the node continuity error.            |
|                                                                              |
|  Excellent  < 1 percent    Great  1 to  2 percent  Good  2 to  5 percent     |
|  Fair  5 to 10  percent    Poor  10 to 25 percent  Bad  25 to 50 percent     |
|  Terrible > 50  percent                                                      |
*==============================================================================*
```

Junction Name	Continuity Error	% Error in Node Contn	Remaining Volume	Beginning Volume	Net Flow Thru Node

10	2.644E+04	1.808	3.076E+05	0.000	3.341E+05
21	130.	0.024	1.563E+03	0.000	1.693E+03
22	386.	0.070	1.916E+03	0.000	2.303E+03
40	258.	0.027	145.	0.000	402.
20	-795.	0.082	1.508E+03	0.000	713.
50	-321.	0.033	1.413E+03	0.000	-1.092E+03
30	-14.2	0.001	32.5	0.000	18.3

The total continuity error was 26080. cubic feet
The remaining total volume was 3.14196E+05 cubic feet
Your mean node continuity error was Excellent
Your worst node continuity error was Great

```
*=====================================================*
|  Table E19 - Junction Inflow Sources                |
|              Units are either ft^3 or m^3           |
|              depending on the units in your model.|
*=====================================================*
```

Junction Name	Constant Inflow to Node	User Inflow Inflow to Node	Interface Inflow to Node	Outflow from Node
10	0.000	0.000	3.028E+05	2.612E-23
21	0.000	0.000	3.411E+04	2.943E-21
22	0.000	0.000	3.930E+03	0.000
40	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000
50	0.000	0.000	4.843E+05	9.962E-23
30	0.000	0.000	0.000	4.872E+05

```
*=====================================================*
|  Table E20 - Junction Flooding and Volume List      |
|              Units are either ft^3 or m^3           |
|              depending on the units in your model.|
*=====================================================*
```

Junction Name	Surcharged Time (min)	Flooded Time(min)	Out of System Flooded Volume	Maximum Volume	Stored in System Ponding Allowed Flood Pond Volume
10	0.000	0.000	0.000	4.476E+05	0.000
21	449.	0.000	0.000	123.	0.000
22	453.	0.000	0.000	119.	0.000
40	0.000	0.000	0.000	34.9	0.000
20	0.000	0.000	0.000	70.9	0.000
50	0.000	0.000	0.000	70.9	0.000
30	0.000	0.000	0.000	16.3	0.000

```
*==================================*
| Simulation Specific Information  |
```

```
*==================================*
Number of Input Conduits.........        6 Number of Simulated Conduits......        9
Number of Natural Channels........        0 Number of Junctions...............        7
Number of Storage Junctions.......        1 Number of Weirs...................        1
Number of Orifices................        1 Number of Pumps...................        0
Number of Free Outfalls...........        1 Number of Tide Gate Outfalls......        0


*==========================================================*
| Average % Change in Junction or Conduit is defined as:  |
| Conduit  % Change ==> 100.0 ( Q(n+1) - Q(n) ) / Qfull   |
| Junction % Change ==> 100.0 ( Y(n+1) - Y(n) ) / Yfull   |
*==========================================================*

The Conduit with the largest average change was..500        with     0.046 percent
The Junction with the largest average change was.22         with     0.111 percent
The Conduit with the largest sinuosity was.......202        with     1.224


*====================================================================*
| Table E21. Extran continuity balance at the end of the simulation |
|            Junction Inflow, Outflow or Street Flooding             |
| Error = Inflow  + Initial Volume - Outflow - Final   Volume        |
*====================================================================*

   Inflow          Inflow       Average
   Junction     Volume,ft^3   Inflow, cfs
   --------    ------------  -------------
 10              3.0284E+05    4.6734E+00
 21              3.4119E+04    5.2653E-01
 22              3.9307E+03    6.0659E-02
 50              4.8438E+05    7.4750E+00

   Outflow       Outflow          Average
   Junction    Volume,ft^3    Outflow, cfs
   --------    ------------   ------------
 30              4.8717E+05    7.5180E+00

*=====================================================*
| Initial system volume        =     3.7158E+00 Cu Ft |
| Total system inflow volume   =     8.2527E+05 Cu Ft |
| Inflow + Initial volume      =     8.2527E+05 Cu Ft |
|=====================================================|
| Total system outflow         =     4.8717E+05 Cu ft |
| Volume left in system        =     3.1354E+05 Cu ft |
| Outflow + Final Volume       =     8.0071E+05 Cu ft |
*=====================================================*

*==============================================*
| Total Model Continuity Error                 |
| Error in Continuity, Percent =        2.97559 |
```

```
| Error in Continuity, ft^3    =      24556.637 |
| + Error means a continuity loss, - a gain     |
*==============================================*

##################################################
# Table E22. Numerical Model judgement section    #
##################################################

Your overall error was                            2.9756 percent
Worst nodal error was in node 10         with     1.8079 percent
Of the total inflow this loss was                 3.2033 percent
Your overall continuity error was                  Good
                                                   Good  Efficiency
Efficiency of the simulation                       1.46
Most Number of Non Convergences at one Node        2.
Total Number Non Convergences at all Nodes         2.
Total Number of Nodes with Non Convergences        1.

===> Extended Transport model simulation ended normally.
 ===> SWMM Simulation ended normally.
===> Your input file was named  : C:\XPS\Riverrev.DAT
===> Your output file was named : C:\XPS\Riverrevsept.out

*==============================================================*
|             SWMM Simulation Date and Time Summary            |
*==============================================================*
| Starting Date... September  23, 1998  Time...    9: 0:43:11  |
|   Ending Date... September  23, 1998  Time...    9: 2: 7:37  |
|  Elapsed Time...    1.40433 minutes or     84.26000 seconds  |
*==============================================================*
```

```
|                                                          |
| Good Efficiency      < 1.5           mean iterations     |
| Excellent Efficiency < 2.5 and > 1.5 mean iterations     |
| Good      Efficiency < 4.0 and > 2.5 mean iterations     |
| Fair      Efficiency < 7.5 and > 4.0 mean iterations     |
| Poor Efficiency      > 7.5           mean iterations     |
*==========================================================*
```

```
*=====================================================*
|        Table E9 - JUNCTION SUMMARY STATISTICS        |
| The Maximum area is only the area of the node, it    |
| does not include the area of the surrounding conduits|
*=====================================================*
```

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Meters of Surcharge at Max Elevation	Freeboard of node meters	Maximum Junction Area ft^2
10	75.00	75.00	68.60	15	19	0.00	6.40	6.839E+04
21	75.00	66.00	68.80	12	56	2.80	6.20	1.300E+01
22	75.00	63.80	68.61	15	18	4.81	6.39	1.300E+01
30	70.00	59.75	59.38	15	19	0.00	10.62	1.300E+01
40	76.00	72.60	71.20	12	41	0.00	4.80	1.300E+01
20	76.50	76.50	73.98	12	37	0.00	2.52	1.300E+01
50	78.90	78.90	73.98	12	36	0.00	4.92	1.300E+01
31	75.00	60.05	62.90	15	19	2.85	12.10	1.300E+01

```
*=====================================================*
|        Table E10 - CONDUIT SUMMARY STATISTICS        |
| Note: The peak flow may be less than the design flow |
| and the conduit may still surcharge because of the   |
| downstream boundary conditions.                      |
*=====================================================*
```

Name Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Conduit Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Ends Upstream (ft)	Dwnstrm (ft)
201	60.	3.76	54.00	6.15E+01	12	37	3.85	12	37	1.03	68.80	68.61
202	42.	2.64	54.00	6.22E+01	12	36	3.88	12	34	1.48	68.61	68.60
300	11.	9.12	15.00	9.39E+00	15	19	8.55	15	19	0.84	62.90	59.38
200	4.03E+02	32.04	48.00	5.27E+01	12	37	5.95	11	43	0.13	71.20	68.80
100	2.54E+02	20.21	48.00	6.59E+01	12	36	6.52	12	33	0.26	71.20	68.60
500	7.84E+03	16.11	94.80	1.24E+02	12	35	1.04	12	17	0.02	73.98	73.98
310	8.9	11.35	12.00	9.39E+00	15	19	11.51	15	19	1.05	68.60	62.90
ORF # 1	98.	0.80	36.00	9.78E+01	12	37	15.02	12	30	0.99	73.98	71.20
WEIR # 1	Undefnd	Undefnd	Undefnd	2.20E+01	12	37						
FREE # 1	Undefnd	Undefnd	Undefnd	9.39E+00	15	19						

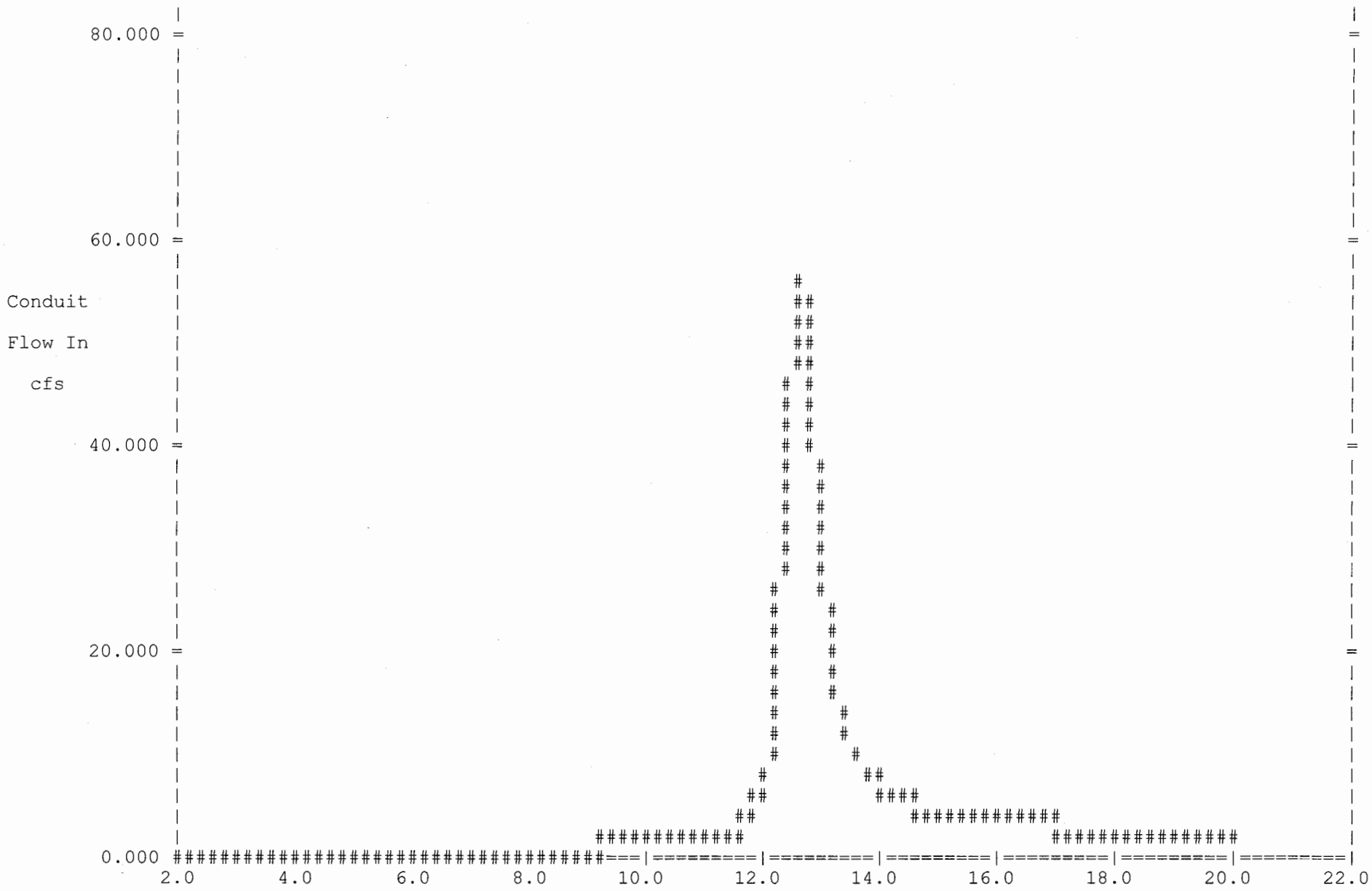
```
*==================================================*
| Table E11.  Area assumptions used in the analysis|
| Subcritical and Critical flow assumptions from   |
|    Subroutine Head.  See Figure 17-1 in the      |
|         manual for further information.          |
*==================================================*
```

Conduit Name	Length of Dry Flow(min)	Length of Sub-Critical Flow(min)	Length of Upstream Critical Flow(min)	Length of Downstream Critical Flow(min)	Maximum Hydraulic Radius-m	Maximum X-Sect Area(ft^2)	Maximum Vel*D (ft^2/s)
201	0.00	793.50	0.00	286.50	1.268	16.279	0.173E+02
202	0.00	665.67	0.00	414.33	1.275	16.283	0.175E+02
300	0.00	257.83	0.00	822.17	0.338	1.099	0.107E+02
200	232.50	498.33	0.00	349.17	1.084	10.437	0.212E+02
100	232.50	847.50	0.00	0.00	1.084	10.429	0.252E+02
500	202.67	877.33	0.00	0.00	2.934	193.117	0.267E+01
310	0.00	1080.00	0.00	0.00	0.302	0.816	0.115E+02
ORF # 1	202.67	877.33	0.00	0.00	0.823	6.846	0.451E+02

```
*==========================================*
| Table E12. Mean Conduit Flow Information |
*==========================================*
```

Conduit Name	Mean Flow (cfs)	Total Flow (ft^3)	Mean Percent Change	Low Flow Weightng	Mean Froude Number	Mean Hydraulic Radius	Mean Cross Area	Mean Conduit Roughness
201	4.22	2.733E+05	1.148E-02	1.00	5.167E-02	1.04	14.0	6.363E-05
202	4.24	2.747E+05	1.093E-02	1.00	7.280E-02	1.00	13.6	6.363E-05
300	4.23	2.740E+05	4.145E-04	0.966	1.48	0.309	0.959	1.058E-05
200	3.72	2.413E+05	2.861E-03	0.969	0.528	0.505	5.14	1.060E-05
100	3.75	2.427E+05	4.045E-03	0.969	0.327	0.519	5.22	1.060E-05
500	7.49	4.854E+05	1.964E-02	0.973	0.143	0.571	25.0	2.450E-05
310	4.23	2.741E+05	3.226E-04	0.966	0.945	0.236	0.737	7.323E-06
ORF # 1	7.21	4.670E+05	5.207E-03	0.973	1.41	0.392	1.55	7.208E-06
WEIR # 1	0.267	1.729E+04						
FREE # 1	4.23	2.740E+05						

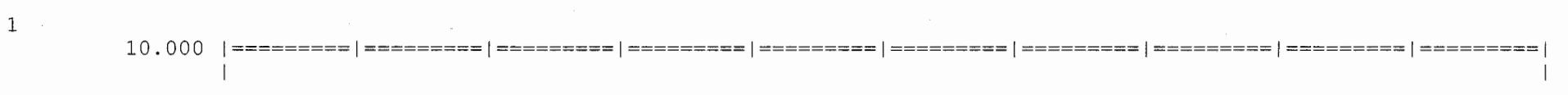
```
1
        100.000 |=========|=========|=========|=========|=========|=========|=========|=========|=========|=========|
                |                                                                                                     |
                |                                                                                                     |
                |                                                                                                     |
                |                                                                                                     |
                |                                                                                                     |
                |                                                                                                     |
                |                                                                                                     |
                |                                                                                                     |
```

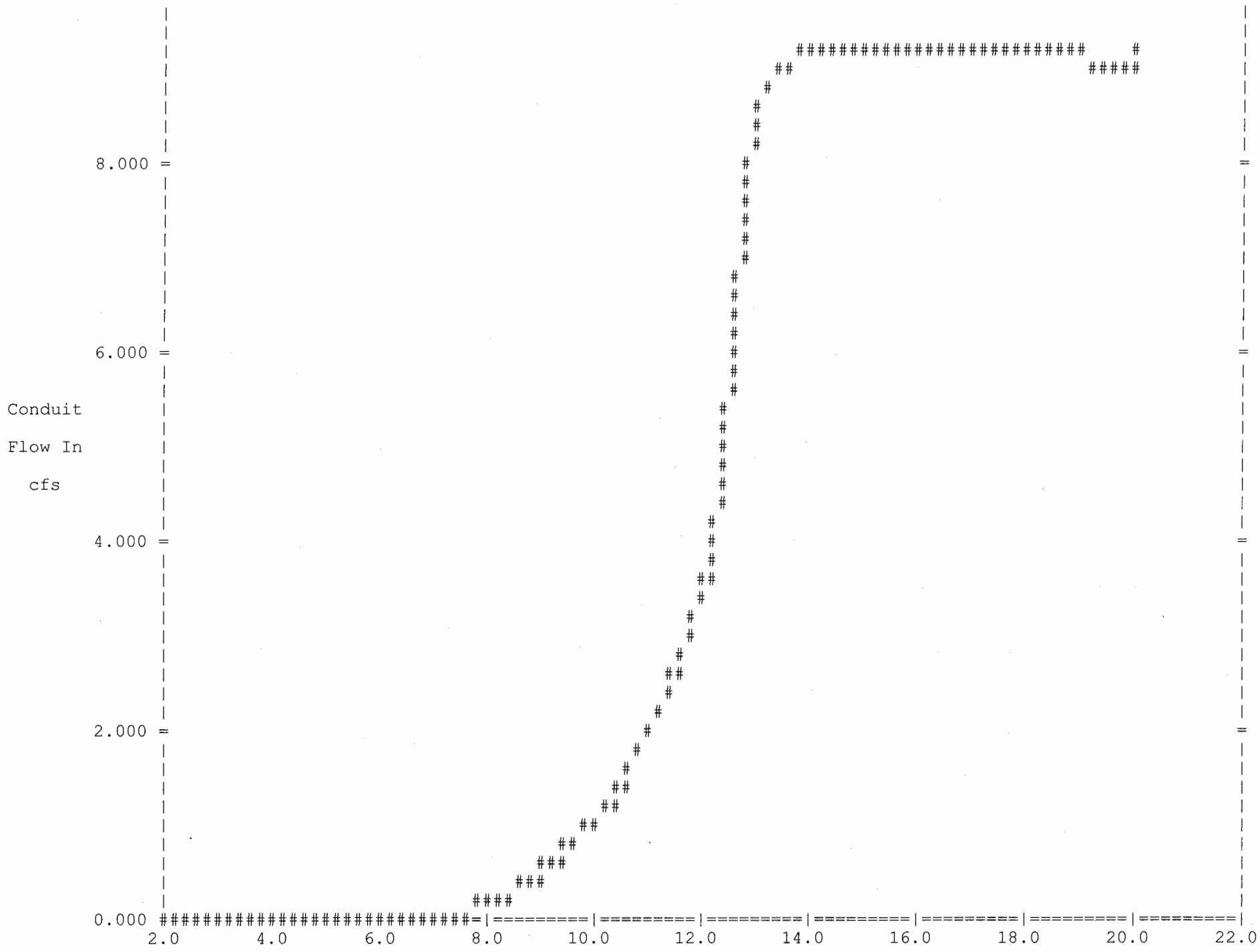


LOCATION NO. : 202 Clock time in hours.

Plot of conduit flow

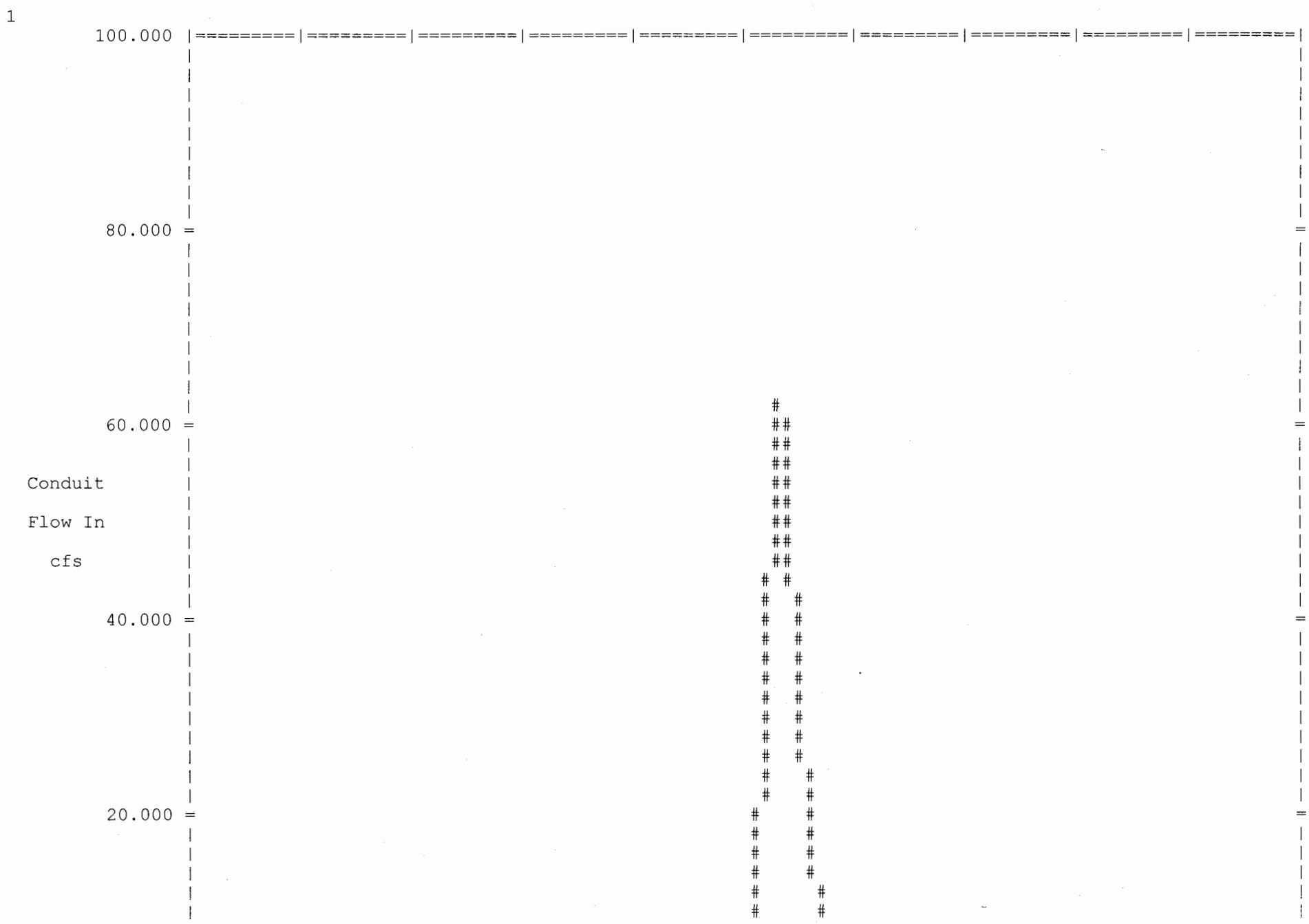
1

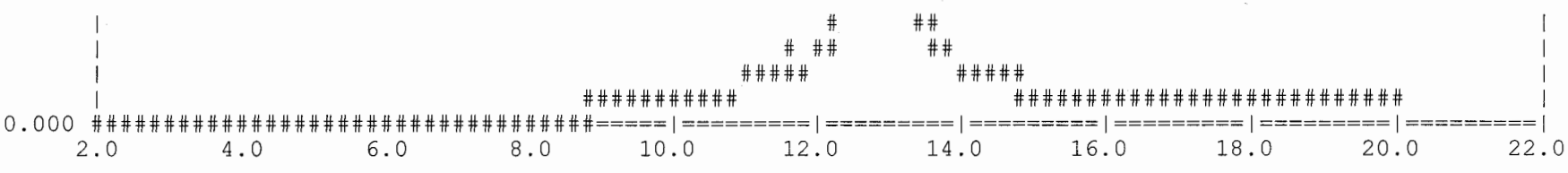



Conduit
Flow In
cfs
8.000
6.000
4.000
2.000
0.000
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0

LOCATION NO. : 300 Clock time in hours.

Plot of conduit flow





LOCATION NO. : 100 Clock time in hours.

Plot of conduit flow

==========
| Table E13. Channel losses(H), headwater depth (HW), tailwater |
| depth (TW), critical and normal depth (Yc and Yn). |
| Use this section for culvert comparisons |
==========

Conduit Name	Maximum Flow	Head Loss	Friction Loss	Critical Depth	Normal Depth	HW Elevat	TW Elevat	
201	60.806	2.014	0.102	2.264	3.760	67.844	65.724	Max Flow
202	61.678	2.032	0.106	2.282	4.500	65.724	63.601	Max Flow
300	9.391	3.176	0.237	1.164	0.877	62.899	59.377	Max Flow
200	51.798	3.098	0.143	2.159	0.968	71.198	68.541	Max Flow
100	64.998	7.172	0.930	2.432	1.379	70.879	63.601	Max Flow
310	9.391	5.370	0.309	9.498	0.879	68.598	62.899	Max Flow
ORF # 1	96.875	0.000	2.765	2.909	3.000	73.950	71.198	Max Flow

==========
| CULVERT ANALYSIS CLASSIFICATION, and the time the |
| culvert was in a particular classification |
| during the simulation. The time is in minutes. |
| Extran used the Dynamic Wave Equation for all |
| conduit analysis but classifies the culvert flow |
| condition based on the HW and TW depths. |
==========

Conduit Name	Critical D Outlet Control	Mild Slope TW Control Outlet Control	Steep Slope TW Insignf Entrance Control	Slug Flow Outlet/ Entrance Control	Mild Slope TW > D Outlet Control	Mild Slope TW <= D Outlet Control	Outlet Control	Inlet Control
201	11.333	617.667	0.000	0.000	451.000	0.000	0.000	0.000
202	85.000	555.333	0.000	0.000	439.667	0.000	0.000	0.000
300	0.000	0.000	510.000	0.000	0.000	0.000	445.333	124.667
200	0.000	0.000	921.333	0.000	0.000	0.000	0.000	158.667
100	0.000	0.000	1080.000	0.000	0.000	0.000	0.000	0.000
500	0.000	876.000	204.000	0.000	0.000	0.000	0.000	0.000
310	0.000	0.000	425.000	11.333	0.000	456.667	0.000	187.000
ORF # 1	802.333	45.333	204.000	0.000	0.000	0.000	28.333	0.000

```
*=====================================*
|    Kinematic Wave Approximations    |
|  Time in Minutes for Each Condition |
*=====================================*
```

Conduit Name	Length of Normal Flow	Slope Criteria	Super-Critical	Roll Waves
201	0.00	378.17	0.00	0.00
202	0.00	381.67	0.00	0.00
300	0.00	0.00	822.33	0.00
200	244.83	498.17	386.00	0.00
100	638.00	750.83	273.33	0.00
500	822.33	868.50	0.00	0.00
310	0.00	206.67	400.17	0.00
ORF # 1	0.00	0.00	695.17	0.00

```
*==========================================================*
|     Table E15 - SPREADSHEET INFO LIST                    |
| Conduit Flow and Junction Depth Information for use in   |
| spreadsheets.  The maximum values in this table are the  |
| true maximum values because they sample every time step.|
| The values in the review results may only be the         |
| maximum of a subset of all the time steps in the run.    |
| Note: These flows are only the flows in a single barrel.|
*==========================================================*
```

Conduit Name	Maximum Flow	Total Flow	Maximum Velocity	##	Junction Name	Invert Elevation	Maximum Elevation
201	61.45915	273311.9	3.845278	##	10	59.10000	68.59800
202	62.17638	274678.6	3.878413	##	21	59.40000	68.80280
300	9.391075	274013.0	8.548037	##	22	59.20000	68.61254
200	52.74076	241333.1	5.945335	##	30	58.50000	59.37716
100	65.92921	242694.7	6.522254	##	40	68.59000	71.20157
500	123.6877	485354.1	1.038728	##	20	68.60000	73.98038
310	9.391076	274111.9	11.51234	##	50	68.60000	73.98042
ORF # 1	97.76664	467036.2	15.01903	##	31	58.80000	62.89866
WEIR # 1	21.95860	17287.19	0.0000000	##			
FREE # 1	9.391075	274000.9	0.0000000	##			

```
#########################################################
# Table E16. New Conduit Information Section            #
#            Conduit Invert (IE) Elevation and Conduit  #
#            Maximum Water Surface (WS) Elevations      #
#########################################################
```

Conduit Name	Upstream Node	Downstream Node	IE Up	IE Dn	WS Up	WS Dn	Conduit Type
201	21	22	59.40	59.30	68.80	68.61	Circular

202	22	10	59.20	59.15	68.61	68.60	Circular
300	31	30	58.80	58.50	62.90	59.38	Circular
200	40	21	68.60	62.00	71.20	68.80	Circular
100	40	10	68.60	59.10	71.20	68.60	Circular
500	50	20	71.00	68.60	73.98	73.98	Trapezoid
310	10	31	59.10	58.80	68.60	62.90	Circular
ORF # 1	20	40	68.60	68.59	73.98	71.20	Circ Orif

```
*==============================================================================*
|    Table E18 - Junction Continuity Error.   Division by Volume added 11/96   |
|                                                                              |
|  Continuity Error = Net Flow + Beginning Volume - Ending Volume              |
|                     ---------------------------------------------------      |
|                     Total Flow + (Beginning Volume + Ending Volume)/2        |
|                                                                              |
|  Net Flow   = Node Inflow - Node Outflow                                     |
|  Total Flow = absolute (Inflow + Outflow                                     |
|  Intermediate column is a judgement on the node continuity error.            |
|                                                                              |
|  Excellent  < 1 percent    Great  1 to  2 percent  Good  2 to  5 percent     |
|  Fair  5 to 10  percent    Poor  10 to 25 percent  Bad  25 to 50 percent     |
|  Terrible > 50  percent                                                      |
*==============================================================================*
```

Junction Name	Continuity Error	% Error in Node Contn	Remaining Volume	Beginning Volume	Net Flow Thru Node
10	1.111E+05	8.469	4.350E+05	0.000	5.461E+05
21	536.	0.098	1.620E+03	0.000	2.157E+03
22	599.	0.108	1.976E+03	0.000	2.575E+03
30	-11.9	0.002	22.3	0.000	10.4
40	164.	0.017	145.	0.000	309.
20	-466.	0.048	1.508E+03	0.000	1.042E+03
50	-482.	0.050	1.413E+03	0.000	-931.
31	-12.1	0.002	117.	0.000	105.

The total continuity error was 1.11431E+05 cubic feet
The remaining total volume was 4.41831E+05 cubic feet
Your mean node continuity error was Excellent
Your worst node continuity error was Fair

```
*=================================================*
|  Table E19 - Junction Inflow Sources            |
|              Units are either ft^3 or m^3       |
|              depending on the units in your model.|
*=================================================*
```

Junction Name	Constant User Inflow to Node	Inflow to Node	Interface Inflow to Node	Outflow from Node
10	0.000	0.000	3.028E+05	2.612E-23

21	0.000	0.000	3.412E+04	2.207E-21
22	0.000	0.000	3.931E+03	0.000
30	0.000	0.000	0.000	2.740E+05
40	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000
50	0.000	0.000	4.844E+05	9.962E-23
31	0.000	0.000	0.000	0.000

```
*==================================================*
|  Table E20 - Junction Flooding and Volume List    |
|              Units are either ft^3 or m^3         |
|              depending on the units in your model.|
*==================================================*
```

Junction Name	Surcharged Time (min)	Flooded Time(min)	Out of System Flooded Volume	Maximum Volume	Stored in System Ponding Allowed Flood Pond Volume
10	0.000	0.000	0.000	4.648E+05	0.000
21	450.	0.000	0.000	122.	0.000
22	453.	0.000	0.000	122.	0.000
30	0.000	0.000	0.000	11.4	0.000
40	0.000	0.000	0.000	33.9	0.000
20	0.000	0.000	0.000	69.9	0.000
50	0.000	0.000	0.000	69.9	0.000
31	463.	0.000	0.000	53.3	0.000

```
*==================================*
| Simulation Specific Information  |
*==================================*
Number of Input Conduits..........        7 Number of Simulated Conduits......        10
Number of Natural Channels........        0 Number of Junctions...............         8
Number of Storage Junctions.......        1 Number of Weirs...................         1
Number of Orifices................        1 Number of Pumps...................         0
Number of Free Outfalls...........        1 Number of Tide Gate Outfalls......         0


*==========================================================*
| Average % Change in Junction or Conduit is defined as:   |
| Conduit  % Change ==> 100.0 ( Q(n+1) - Q(n) ) / Qfull    |
| Junction % Change ==> 100.0 ( Y(n+1) - Y(n) ) / Yfull    |
*==========================================================*

The Conduit with the largest average change was..500        with     0.020 percent
The Junction with the largest average change was.22         with     0.121 percent
The Conduit with the largest sinuosity was.......202        with     1.181


*==================================================================*
| Table E21. Extran continuity balance at the end of the simulation |
```

```
|            Junction Inflow, Outflow or Street Flooding            |
| Error = Inflow  + Initial Volume - Outflow - Final   Volume       |
*=================================================================*

   Inflow          Inflow       Average
   Junction    Volume,ft^3   Inflow, cfs
   --------   ------------  -------------
 10             3.0286E+05    4.6738E+00
 21             3.4121E+04    5.2656E-01
 22             3.9310E+03    6.0663E-02
 50             4.8441E+05    7.4755E+00

   Outflow      Outflow          Average
   Junction   Volume,ft^3    Outflow, cfs
   --------   ------------   ------------
 30             2.7400E+05    4.2284E+00

*=====================================================*
| Initial system volume        =     3.7158E+00 Cu Ft |
| Total system inflow volume   =     8.2532E+05 Cu Ft |
| Inflow + Initial volume      =     8.2533E+05 Cu Ft |
|=====================================================|
| Total system outflow         =     2.7400E+05 Cu ft |
| Volume left in system        =     4.4092E+05 Cu ft |
| Outflow + Final Volume       =     7.1492E+05 Cu ft |
*=====================================================*

*==============================================*
| Total Model Continuity Error                 |
| Error in Continuity, Percent =       13.37698 |
| Error in Continuity, ft^3    =     110403.856 |
| + Error means a continuity loss, - a gain    |
*==============================================*

#####################################################
# Table E22. Numerical Model judgement section    #
#####################################################

Your overall error was                            13.3770 percent
Worst nodal error was in node 10         with      8.4693 percent
Of the total inflow this loss was                 13.4620 percent
Your overall continuity error was                   Poor
                                                    Good  Efficiency
Efficiency of the simulation                        1.37
Most Number of Non Convergences at one Node         0.
Total Number Non Convergences at all Nodes          0.
Total Number of Nodes with Non Convergences         0.

===> Extended Transport model simulation ended normally.
 ===> SWMM Simulation ended normally.
===> Your input file was named  : C:\XPS\River12&15.DAT
```

```
===> Your output file was named : C:\XPS\River12&15.out

*==============================================================*
|             SWMM Simulation Date and Time Summary            |
*==============================================================*
| Starting Date... September  23, 1998  Time...    9:32:54:73  |
|   Ending Date... September  23, 1998  Time...    9:35:33:47  |
|  Elapsed Time...    2.64567 minutes or    158.74000 seconds  |
*==============================================================*
```

```
Input File :          C:\XPS\River10&15.XP
Current Directory:    C:\PROGRA~1\XPS\XP-SWM~1
Executable Name:      C:\Program Files\XPS\XP-SWMM32\XPSWMM32.EXE
Read      0 line(s) and found    0 items(s) from your cfg file.
*==================================================*
|                     XP - SWMM                    |
|            Storm Water Management Model          |
|                   Version 5.10a                  |
|==================================================|
|                 Developed by                     |
|==================================================|
|            XP Software Inc. and Pty. Ltd.        |
|                                                  |
|               Based on the U.S. EPA              |
|    Storm Water Management Model Version 4.40     |
|                                                  |
|             Originally Developed by              |
|              Metcalf & Eddy, Inc.                |
|             University of Florida                |
|           Camp Dresser & McKee Inc.              |
|               September 1970                     |
|                                                  |
|             EPA-SWMM is maintained by            |
|             Oregon State University              |
|             Camp Dresser & McKee Inc.            |
|==================================================|
|   XP Software          August 7, 1997            |
|       Data File Version --->     7.1             |
|==================================================|
|     If problems occur in running this model      |
|     please contact XP Software - Australia       |
|                 or XP Software - U.S.A.          |
|     Phone +61-6 253-1844  in Australia           |
|     Fax # +61-6 253-1847  in Australia           |
|     Phone (813)-886-7724  in U.S.A.              |
|     Fax # (813)-885-4198  in U.S.A.              |
*==================================================*
```

10" PVC
15" RCP
} 10' each

JT. 10, 10' - 10" PVC
10' - 15" RCP

```
*==========================================================*
|       Input and Output file names by SWMM Layer          |
*==========================================================*

 Input File  to Layer #     1 C:\XPS\INTER.INT
 Output File to Layer #     1 JOT.US

*==========================================================*
|   Special command line arguments in XP-SWMM. This section |
|   now includes program defaults. $Keywords are the program|
|   defaults.  Other Keywords are from the SWMMCOM.CFG file.|
|   or the command line or any cfg file on the command line.|
```

```
|   Examples include these in the file xpswm.bat under the  |
|   section :solve or in the windows version XPSWMM32 in the|
|   file solve.bat                                          |
|                                                           |
|   Note: the cfg file should be in the subdirectory swmxp  |
|         or defined by the set variable in the xpswm.bat   |
|         file.  Some examples of the command lines possible|
|         are shown below:                                  |
|                                                           |
|   swmmd swmmcom.cfg                                       |
|   swmmd my.cfg                                            |
|   swmmd nokeys nconv5 perv extranwq                       |
*===========================================================*

 $powerstation        0.0000         0         2
 $perv                0.0000         0         4
 $oldegg              0.0000         0         7
 $as                  0.0000         0        11
 $noflat              0.0000         0        21
 $oldomega            0.0000         0        24
 $oldvol              0.0000         1        28
 $implicit            0.0000         1        29
 $oldhot              0.0000         1        31
 $oldscs              0.0000         0        33
 $flood               0.0000         1        40
 $nokeys              0.0000         0        42
 $pzero               0.0000         0        55
 $oldvol2             0.0000         2        59
 $storage_97          0.0000         1        62
 $oldhot1             0.0000         0        63
 $pumpwt              0.0000         1        70
 $ecloss              0.0000         1        77
 $exout               0.0000         0        97
 $neweir              0.0000         1       153
 $ncmid               0.0000         0       164
 $h_ellipse           0.0000         1       270
 $v_ellipse           0.0000         1       271
 $arch                0.0000         2       272
 $fast_pump           0.0000         1       288
 $new_nl_97           0.0000         2       290
 $best97              0.0000         1       294
 $newbound            0.0000         1       295

 *===========================================================*
 | Parameter Values on the Tapes Common Block.These are the |
 | values read from the data file and dynamically allocated |
 | by the model for this simulation.                        |
 *===========================================================*

  Number of Subcatchments in the Runoff Block (NW)....     0
  Number of Channel/Pipes in the Runoff Block (NG)....     0
```

```
 Runoff Water quality constituents (NRQ)............     0
 Runoff Land Uses per Subcatchment (NLU)............     0
 Number of Elements in the Transport Block (NET).....     0
 Number of Storage Junctions in Transport (NTSE).....     0
 Number of Input Hydrographs in Transport (NTH......     0
 Number of Elements in the Extran Block (NEE)........    10
 Number of Groundwater Subcatchments in Runoff (NGW).     0
 Number of Interface locations for all Blocks (NIE)..    10
 Number of Pumps in Extran (NEP).....................     0
 Number of Orifices in Extran (NEO)..................     1
 Number of Tide Gates/Free Outfalls in Extran (NTG)..     1
 Number of Extran Weirs (NEW)........................     1
 Number of scs hydrograph points.....................     0
 Number of Extran printout locations (NPO)...........     3
 Number of Tide elements in Extran (NTE).............     1
 Number of Natural channels (NNC)....................     0
 Number of Storage junctions in Extran (NVSE)........     1
 Number of Time history data points in Extran(NTVAL).     0
 Number of Variable storage elements in Extran (NVST)     7
 Number of Input Hydrographs in Extran (NEH).........     0
 Number of Particle sizes in Transport Block (NPS)...     0
 Number of User defined conduits (NHW)...............    10
 Number of Connecting conduits in Extran (NECC)......    20
 Number of Upstream elements in Transport (NTCC).....    10
 Number of Storage/treatment plants (NSTU)...........     0
 Number of Values for R1 lines in Transport (NR1)....     0
 Number of Nodes to be allowed for (NNOD)............    10
 Number of Plugs in a Storage Treatment Unit.........     1


#######################################################
#    Entry made to the EXTRAN Layer(Block) of SWMM    #
#    Last Updated August,1997 by XP Software          #

    Riverside Two Pond Analysis
    Proposed Conditions 10 Year Storm


*==========================================================*
|          EXTRAN TABLES IN THE OUTPUT FILE                |
|  These are the more important tables in the output file. |
|  You can use your editor to find the table numbers,      |
|  for example: search for Table E20 to check continuity.  |
|  This output file can be imported into a Word Processor  |
|  and printed on US letter or A4 paper using portrait     |
|  mode, courier font, a size of 8 pt. and margins of 0.75 |
|                                                          |
| Table E1  - Basic Conduit Data                           |
| Table E2  - Conduit Factor Data                          |
| Table E3  - Junction Data                                |
| Table E4  - Conduit Connectivity Data                    |
```

```
| Table E5  - Junction Time Step Limitation Summary        |
| Table E5a - Conduit Explicit Condition Summary           |
| Table E6  - Final Model Condition                        |
| Table E7  - Extran Iteration Summary                     |
| Table E8  - Junction Time Step Limitation Summary        |
| Table E9  - Junction  Summary  Statistics                |
| Table E10 - Conduit   Summary  Statistics                |
| Table E11 - Area assumptions used in the analysis        |
| Table E12 - Mean conduit information                     |
| Table E13 - Channel losses(H) and culvert info           |
| Table E14 - Natural Channel Overbank Flow Information    |
| Table E15 - Spreadsheet Info List                        |
| Table E16 - New Conduit Output Section                   |
| Table E17 - Pump Operation                               |
| Table E18 - Junction Continuity Error                    |
| Table E19 - Junction Inflow Sources                      |
| Table E20 - Junction Flooding and Volume List            |
| Table E21 - Extran continuity balance at simulation end  |
| Table E22 - Model Judgement Section                      |
*==========================================================*

Time Control from Extran Job Control
Year.........      98 Month.......       1
Day..........       1 Hour........       2
Minute.......       0 Second......       0


Control information for simulation
----------------------------------

Integration cycles.................      6480
Length of integration step is......     10.00 seconds
Simulation length..................     18.00 hours
Do not create equiv. pipes(NEQUAL).         0
Use U.S. customary units for I/O...         0
Printing starts in cycle...........      2880
Intermediate printout intervals of.        90 cycles
Intermediate printout intervals of.     15.00 minutes
Summary printout intervals of......        90 cycles
Summary printout time interval of..     15.00 minutes
Hot start file parameter (REDO)....         0
Initial time.......................      2.00 hours

Iteration variables: SURTOL........    0.0010
                     SURJUN........    0.0060 mm or inch
                     QREF..........    1.0000
    Minimum depth (m or ft)........    0.0033
    Underrelaxation parameter......    0.6500
    Time weighting parameter.......    0.6500
    Default Expansion/Contraction K    0.0000
    Default Entrance/Exit K........    0.0000
```

```
Default surface area of junctions..     13.00 square feet.
NJSW input hydrograph junctions....     0
     or user defined hydrographs...

Flow rate will be plotted for the following   3 Conduits

    202       300       100
```

==========
| Table E1 - Conduit Data |
==========

Inp Num	Conduit Name	Length (ft)	Conduit Class	Area (ft^2)	Manning Coef.	Max Width (ft)	Depth (ft)	Trapezoid Side Slopes	
1	201	108.00	Circular	15.90	0.01300	4.50	4.50		
2	202	110.00	Circular	15.90	0.01300	4.50	4.50		
3	300	10.00	Circular	1.23	0.01300	1.25	1.25		
4	200	84.00	Circular	12.57	0.01300	4.00	4.00		
5	100	304.00	Circular	12.57	0.01300	4.00	4.00		
6	500	200.00	Trapezoid	486.64	0.03000	30.00	7.90	4.00	4.00
7	310	10.00	Circular	0.54	0.00900	0.83	0.83		

Total length of all conduits .... 826.0000 feet

==========
| Table E2 - Conduit Factor Data |
==========

Conduit Name	Number of Barrels	Entrance Loss Coef	Exit Loss Coef	Exp/Contc Coefficnt	Time Weighting Parameter	Low Flow Roughness Factor	Depth at Which n Changes	Flow Routing
201	1.0000	2.9000	2.9000	2.9000	0.6500	1.0000	0.0000	Standard - Dynamic Wave
202	1.0000	2.9000	2.9000	2.9000	0.6500	1.0000	0.0000	Standard - Dynamic Wave
300	1.0000	1.0000	1.0000	1.0000	0.6500	1.0000	0.0000	Standard - Dynamic Wave
200	1.0000	2.9000	2.9000	2.9000	0.6500	1.0000	0.0000	Standard - Dynamic Wave
100	1.0000	2.9000	2.9000	2.9000	0.6500	1.0000	0.0000	Standard - Dynamic Wave
310	1.0000	1.0000	1.0000	1.0000	0.6500	1.0000	0.0000	Standard - Dynamic Wave

==========
| If there are messages about (sqrt(g*d)*dt/dx), or|
| the sqrt(wave celerity)*time step/conduit length |
| in the output file all it means is that the |
| program will lower the internal time step to |
| satisfy this condition (explicit condition). |
| You control the actual internal time step by |
| using the minimum courant time step factor in the|
| Extran job control. The message put in words |
| states that the smallest conduit with the fastest|
| velocity will control the time step selection. |

```
| You have further control by using the modify     |
| conduit option in the Extran Job Control.        |
*=================================================*

===> Warning ! (sqrt(wave celerity)*time step/conduit length)
                in conduit 201        is     1.11 at full depth.
===> Warning ! (sqrt(wave celerity)*time step/conduit length)
                in conduit 202        is     1.09 at full depth.
===> Warning ! (sqrt(wave celerity)*time step/conduit length)
                in conduit 300        is     6.34 at full depth.
===> Warning ! (sqrt(wave celerity)*time step/conduit length)
                in conduit 200        is     1.35 at full depth.
===> Warning ! (sqrt(wave celerity)*time step/conduit length)
                in conduit 310        is     5.17 at full depth.

*==================*
|  Conduit Volume  |
*==================*

Full pipe or full open conduit volume
Input full depth volume............    1.0569E+05 cubic feet


*=================================================*
|           Table E3 - Junction Data              |
*=================================================*
```

Inp Num	Junction Name	Ground Elev.	Crown Elev.	Invert Elev.	Qinst cfs	Initial Depth-ft	X Coord.	Y Coord.	Type of Manhole
1	10	75.00	63.6	59.1	0.000	0.000	76.1	418.	Flooded Ponding
2	21	75.00	66.0	59.4	0.000	0.000	109.	413.	Flooded Ponding
3	22	75.00	63.8	59.2	0.000	0.000	92.1	408.	No Ponding
4	30	70.00	59.8	58.5	0.000	0.000	49.6	396.	No Ponding
5	40	76.00	72.6	68.6	0.000	0.000	110.	427.	Flooded Ponding
6	20	80.00	76.5	68.6	0.000	0.000	125.	435.	Flooded Ponding
7	50	80.00	78.9	68.6	0.000	0.000	139.	443.	Flooded Ponding
8	31	75.00	60.0	58.8	0.000	0.000	64.8	409.	No Ponding

```
*=====================================================*
| The junction surface elevation was over the top of  |
| the following open channels.  The following changes |
| have been made to the surface elevation.            |
*=====================================================*

The ground elevation of junction 50
has been changed to     78.900 m or ft from     80.000
The ground elevation of junction 20
has been changed to     76.500 m or ft from     80.000
The ground elevation of junction 50
has been changed to     78.900 m or ft from     78.900
```

The ground elevation of junction 20
has been changed to 76.500 m or ft from 76.500

==========
| Table E4 - Conduit Connectivity |
==========

Input Number	Conduit Name	Upstream Node	Downstream Node	Upstream Elevation	Downstream Elevation	
1	201	21	22	59.400	59.300	No Design
2	202	22	10	59.200	59.150	No Design
3	300	31	30	58.800	58.500	No Design
4	200	40	21	68.600	62.000	No Design
5	100	40	10	68.600	59.100	No Design
6	500	50	20	71.000	68.600	No Design
7	310	10	31	59.100	58.800	No Design

==========
| Storage Junction Data |
==========

STORAGE JUNCTION NUMBER OR NAME	JUNCTION TYPE	MAXIMUM OR CONSTANT SURFACE AREA (FT2)	PEAK OR CONSTANT VOLUME (CUBIC FEET)	CROWN ELEVATION (FT)
10	Stage/Area	7.4052E+04	5.3583E+05	75.00

==========
| Variable storage data for node |10
==========

Data Point	Depth ft	Area ft^2	Volume ft^3
1	0.0000	3.2409E+04	0.0000
2	0.1667	3.2931E+04	5445.
3	0.3333	3.3454E+04	1.0977E+04
4	0.5000	3.3977E+04	1.6596E+04
5	1.167	3.6155E+04	3.9974E+04
6	1.833	3.8333E+04	6.4803E+04
7	2.500	4.0511E+04	9.1084E+04
8	3.167	4.2834E+04	1.1887E+05
9	3.833	4.5157E+04	1.4820E+05
10	4.500	4.7480E+04	1.7908E+05
11	5.167	4.9949E+04	2.1155E+05
12	5.833	5.2417E+04	2.4567E+05
13	6.500	5.4886E+04	2.8144E+05
14	7.167	5.7499E+04	3.1890E+05
15	7.833	6.0113E+04	3.5811E+05

16	8.500	6.2726E+04	3.9905E+05
17	9.167	6.6502E+04	4.4213E+05
18	9.833	7.0277E+04	4.8772E+05
19	10.50	7.4052E+04	5.3583E+05

```
*==========================================*
|              Orifice Data                |
*==========================================*
```

From Junction	To Junction	Type	Area (ft2)	Depth (ft)	Discharge Coefficient	Height Above Junction (ft)
20	40	Circ Side	7.07	3.00	1.000	0.000

```
====> EQUIVALENT PIPE INFORMATION FOR ORIFICE       1
      CONDUIT NAME........................... ORF #  1
      Upstream node...........................20
      Downstream node.........................40
      PIPE DIAMETER.......................        3.00
      PIPE LENGTH.........................      300.00
      MANNINGS ROUGHNESS..................      0.0088
      INVERT ELEVATION AT UPSTREAM END.....     68.6000
      INVERT ELEVATION AT DOWNSTREAM END...     68.5900
```

```
*==========================================*
|                Weir Data                 |
*==========================================*
```

From Junction	To Junction	Link Number	Type	Crest Height(ft)	Weir Top(ft)	Weir Length(ft)	Discharge Coefficient	Weir Power
20	40	WEIR # 1	1	4.90	7.40	22.00	3.0000	1.5000

```
*==================================================*
|          FREE OUTFALL DATA (DATA GROUP I1)       |
|         BOUNDARY CONDITION ON DATA GROUP J1      |
*==================================================*

Outfall at Junction....30         has boundary condition number...         1

*==================================================*
|        INTERNAL CONNECTIVITY INFORMATION         |
*==================================================*
```

CONDUIT	JUNCTION	JUNCTION
ORF # 1	20	40

```
    WEIR # 1     20           40
    FREE # 1     30           BOUNDARY

*=====================================================*
|        Boundary Condition Information               |
|                 Data Groups J1-J4                   |
*=====================================================*


BC NUMBER..         1 has no control water surface.

##############################################
# Header information from interface file: #
##############################################

Title from first computational layer:
Riverside Two Pond Analysis
Proposed Conditions 10 year Storm

Title from immediately preceding computational layer
Riverside Two Pond Analysis
Proposed Conditions 10 year Storm

Name of preceding layer:................Runoff Layer
Initial Julian date (IDATEZ)......................   98001
Initial time of day in seconds (TZERO)............  7200.0
No. Transfered input locations....................       4
No. Transfered pollutants........................       0
Size of total catchment area (acres)..............   53.40

##################################################
# Element numbers of interface inlet locations: #
##################################################
50

##################################################
# Element numbers of interface inlet locations: #
##################################################
21

##################################################
# Element numbers of interface inlet locations: #
##################################################
22

##################################################
# Element numbers of interface inlet locations: #
##################################################
10
```

```
 Conversion factor to cfs for flow units
 on interface file.  Multiply by:     1.00000

######## Important Information ########
Start date/time of interface file was..   98001 7200.0000 hours
Start date/time of the simulation was..   98001 7200.0000 hours
                              Same date/time found in interface file and model

 *==================================================*
 |             XP Note Field Summary                |
 *==================================================*


XP Note for: 10         Pond 1
XP Note for: 40         Pond 2
XP Note for: 20         Upstream Weir


 *==================================*
 |   Conduit Convergence Criteria   |
 *==================================*

   Conduit      Full   Conduit   Conduit      Full   Conduit
      Name      Flow     Slope      Name      Flow     Slope
---------- --------- --------- --------- --------- ---------
 201          60.      9.26E-04 202          42.      4.55E-04
 300          11.      3.00E-02 200         4.03E+02  7.86E-02
 100         2.54E+02  3.12E-02 500         7.84E+03  1.20E-02
 310          5.4      3.00E-02 ORF #  1     98.      3.33E-05

 *==================================*
 |    Initial Model Condition       |
 | Initial Time =      2.00 hours   |
 *==================================*

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.00 /    59.10 21        /   0.00 /    59.40 22        /   0.00 /    59.20
30        /   0.00 /    58.50 40        /   0.00 /    68.59 20        /   0.00 /    68.60
50        /   0.00 /    68.60 31        /   0.00 /    58.80

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       0.00 202       /       0.00 300       /       0.00
200       /       0.00 100       /       0.00 500       /       0.00
310       /       0.00 ORF #  1  /       0.00 WEIR # 1  /       0.00
FREE # 1  /       0.00

   Conduit/   Velocity
201       /       0.00 202       /       0.00 300       /       0.00
200       /       0.00 100       /       0.00 500       /       0.00
310       /       0.00 ORF #  1  /       0.00
```

```
   Conduit/ Cross Sectional Area
201       /       0.00 202       /       0.00 300       /       0.00
200       /       0.00 100       /       0.00 500       /       0.00
310       /       0.00 ORF #  1  /       0.00

   Conduit/ Hydraulic Radius
201       /       0.00 202       /       0.00 300       /       0.00
200       /       0.00 100       /       0.00 500       /       0.00
310       /       0.00 ORF #  1  /       0.00

   Conduit/ Upstream/ Downstream Elevation
201       /    59.20/    59.20202       /    59.10/    59.10300       /    58.50/    58.50
201       /    59.20/    59.20202       /    59.10/    59.10300       /    58.50/    58.50
200       /    59.40/    59.40100       /    59.10/    59.10500       /    68.60/    68.60
201       /    59.20/    59.20202       /    59.10/    59.10300       /    58.50/    58.50
200       /    59.40/    59.40100       /    59.10/    59.10500       /    68.60/    68.60
310       /    58.80/    58.80ORF #  1  /    68.59/    68.59

 ===> System inflows (file) at     2.25 hours (  Junction / Inflow, cfs)

 50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00

 ===> System inflows (file) at     2.50 hours (  Junction / Inflow, cfs)

 50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00

 ===> System inflows (file) at     2.75 hours (  Junction / Inflow, cfs)

 50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00

 ===> System inflows (file) at     3.00 hours (  Junction / Inflow, cfs)

 50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00

 ===> System inflows (file) at     3.25 hours (  Junction / Inflow, cfs)

 50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00

 ===> System inflows (file) at     3.50 hours (  Junction / Inflow, cfs)

 50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00

 ===> System inflows (file) at     3.75 hours (  Junction / Inflow, cfs)

 50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00

 ===> System inflows (file) at     4.00 hours (  Junction / Inflow, cfs)

 50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00
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===> System inflows (file) at     4.25 hours (  Junction / Inflow, cfs)
50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00
===> System inflows (file) at     4.50 hours (  Junction / Inflow, cfs)
50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00
===> System inflows (file) at     4.75 hours (  Junction / Inflow, cfs)
50        / 0.00E+00 21        / 0.00E+00 22        / 0.00E+00 10        / 0.00E+00
===> System inflows (file) at     5.00 hours (  Junction / Inflow, cfs)
50        / 8.12E-05 21        / 0.00E+00 22        / 1.06E-05 10        / 6.67E-06
===> System inflows (file) at     5.25 hours (  Junction / Inflow, cfs)
50        / 3.30E-02 21        / 0.00E+00 22        / 7.13E-04 10        / 7.13E-03
===> System inflows (file) at     5.50 hours (  Junction / Inflow, cfs)
50        / 1.32E-01 21        / 0.00E+00 22        / 1.65E-03 10        / 4.83E-02
===> System inflows (file) at     5.75 hours (  Junction / Inflow, cfs)
50        / 2.43E-01 21        / 0.00E+00 22        / 2.53E-03 10        / 1.11E-01
===> System inflows (file) at     6.00 hours (  Junction / Inflow, cfs)
50        / 3.50E-01 21        / 0.00E+00 22        / 3.37E-03 10        / 1.78E-01
===> System inflows (file) at     6.25 hours (  Junction / Inflow, cfs)
50        / 4.51E-01 21        / 0.00E+00 22        / 4.15E-03 10        / 2.43E-01
===> System inflows (file) at     6.50 hours (  Junction / Inflow, cfs)
50        / 5.46E-01 21        / 0.00E+00 22        / 4.90E-03 10        / 3.05E-01
===> System inflows (file) at     6.75 hours (  Junction / Inflow, cfs)
50        / 7.03E-01 21        / 0.00E+00 22        / 6.95E-03 10        / 3.76E-01
===> System inflows (file) at     7.00 hours (  Junction / Inflow, cfs)
50        / 9.05E-01 21        / 0.00E+00 22        / 8.10E-03 10        / 4.96E-01
===> System inflows (file) at     7.25 hours (  Junction / Inflow, cfs)
50        / 1.04E+00 21        / 0.00E+00 22        / 9.05E-03 10        / 5.97E-01
```

```
===> System inflows (file) at     7.50 hours (  Junction / Inflow, cfs)
50        / 1.16E+00 21        / 0.00E+00 22        / 9.95E-03 10        / 6.79E-01
===> System inflows (file) at     7.75 hours (  Junction / Inflow, cfs)
50        / 1.27E+00 21        / 3.69E-04 22        / 1.08E-02 10        / 7.51E-01
===> System inflows (file) at     8.00 hours (  Junction / Inflow, cfs)
50        / 1.37E+00 21        / 5.91E-03 22        / 1.16E-02 10        / 8.18E-01
===> System inflows (file) at     8.25 hours (  Junction / Inflow, cfs)
50        / 1.46E+00 21        / 1.34E-02 22        / 1.23E-02 10        / 8.81E-01
===> System inflows (file) at     8.50 hours (  Junction / Inflow, cfs)
50        / 1.55E+00 21        / 2.09E-02 22        / 1.30E-02 10        / 9.39E-01
===> System inflows (file) at     8.75 hours (  Junction / Inflow, cfs)
50        / 1.89E+00 21        / 3.66E-02 22        / 1.87E-02 10        / 1.05E+00
===> System inflows (file) at     9.00 hours (  Junction / Inflow, cfs)
50        / 2.37E+00 21        / 5.28E-02 22        / 2.04E-02 10        / 1.33E+00
===> System inflows (file) at     9.25 hours (  Junction / Inflow, cfs)
50        / 2.50E+00 21        / 6.26E-02 22        / 2.01E-02 10        / 1.50E+00
===> System inflows (file) at     9.50 hours (  Junction / Inflow, cfs)
50        / 2.53E+00 21        / 7.20E-02 22        / 2.09E-02 10        / 1.56E+00
===> System inflows (file) at     9.75 hours (  Junction / Inflow, cfs)
50        / 2.85E+00 21        / 9.53E-02 22        / 2.63E-02 10        / 1.65E+00
===> System inflows (file) at    10.00 hours (  Junction / Inflow, cfs)
50        / 3.30E+00 21        / 1.15E-01 22        / 2.79E-02 10        / 1.92E+00
Cycle  2880      Time   10 Hrs -  0.00 Min
Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.52 /    59.62 21        /   1.96 /    61.36 22        /   0.77 /    59.97
30        /   0.25 /    58.75 40        /   0.24 /    68.83 20        /   0.77 /    69.37
50        /   2.50 /    71.10 31        /   0.46 /    59.26
```

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   Conduit/        FLOW    ===> "*" Conduit uses the normal flow option.
201        /        1.33 202        /        1.32 300        /        0.98 200        /        1.25
100        /        1.71*500        /        3.27*310        /        0.98 ORF #  1   /        2.99
WEIR # 1   /        0.00 FREE # 1   /        0.98

 ===> System inflows (file) at    10.25 hours (  Junction / Inflow, cfs)

 50         / 3.66E+00 21         / 1.41E-01 22         / 3.23E-02 10         / 2.14E+00

 Cycle  2970      Time   10 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   0.59 /    59.69 21         /   2.04 /    61.44 22         /   0.82 /    60.02
30         /   0.27 /    58.77 40         /   0.26 /    68.85 20         /   0.80 /    69.40
50         /   2.50 /    71.10 31         /   0.50 /    59.30

   Conduit/        FLOW    ===> "*" Conduit uses the normal flow option.
201        /        1.48 202        /        1.48 300        /        1.15 200        /        1.37
100        /        1.96*500        /        3.60*310        /        1.15 ORF #  1   /        3.35
WEIR # 1   /        0.00 FREE # 1   /        1.15

 ===> System inflows (file) at    10.50 hours (  Junction / Inflow, cfs)

 50         / 4.04E+00 21         / 1.63E-01 22         / 3.38E-02 10         / 2.40E+00

 Cycle  3060      Time   10 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   0.67 /    59.77 21         /   2.13 /    61.53 22         /   0.87 /    60.07
30         /   0.29 /    58.79 40         /   0.27 /    68.86 20         /   0.84 /    69.44
50         /   2.51 /    71.11 31         /   0.56 /    59.36

   Conduit/        FLOW    ===> "*" Conduit uses the normal flow option.
201        /        1.64 202        /        1.63 300        /        1.34 200        /        1.51
100        /        2.26*500        /        4.02*310        /        1.34 ORF #  1   /        3.79
WEIR # 1   /        0.00 FREE # 1   /        1.34

 ===> System inflows (file) at    10.75 hours (  Junction / Inflow, cfs)

 50         / 4.68E+00 21         / 2.13E-01 22         / 4.38E-02 10         / 2.66E+00

 Cycle  3150      Time   10 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   0.76 /    59.86 21         /   2.20 /    61.60 22         /   0.93 /    60.13
30         /   0.31 /    58.81 40         /   0.29 /    68.88 20         /   0.88 /    69.48
50         /   2.52 /    71.12 31         /   0.61 /    59.41

   Conduit/        FLOW    ===> "*" Conduit uses the normal flow option.
201        /        1.79 202        /        1.79 300        /        1.55 200        /        1.62
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100        /       2.53*500        /       4.57*310        /       1.55 ORF #  1  /       4.18
WEIR # 1  /       0.00 FREE # 1  /       1.55

 ===> System inflows (file) at    11.00 hours (  Junction / Inflow, cfs)

 50        / 5.49E+00 21        / 2.52E-01 22        / 4.64E-02 10        / 3.17E+00

 Cycle  3240      Time   11 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.86 /    59.96 21        /   2.35 /    61.75 22        /   1.04 /    60.24
30        /   0.34 /    58.84 40        /   0.32 /    68.91 20        /   0.95 /    69.55
50        /   2.53 /    71.13 31        /   0.66 /    59.46

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.07 202       /       2.03 300       /       1.78 200       /       1.88
100       /       3.13*500       /       5.45*310       /       1.78 ORF #  1  /       5.05
WEIR # 1  /       0.00 FREE # 1  /       1.78

 ===> System inflows (file) at    11.25 hours (  Junction / Inflow, cfs)

 50        / 6.57E+00 21        / 3.42E-01 22        / 6.32E-02 10        / 3.64E+00

 Cycle  3330      Time   11 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   0.97 /    60.07 21        /   2.48 /    61.88 22        /   1.14 /    60.34
30        /   0.36 /    58.86 40        /   0.34 /    68.93 20        /   1.00 /    69.60
50        /   2.54 /    71.14 31        /   0.71 /    59.51

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.36 202       /       2.33 300       /       2.04 200       /       2.09
100       /       3.65*500       /       6.40*310       /       2.05 ORF #  1  /       5.79
WEIR # 1  /       0.00 FREE # 1  /       2.04

 ===> System inflows (file) at    11.50 hours (  Junction / Inflow, cfs)

 50        / 7.91E+00 21        / 4.09E-01 22        / 6.72E-02 10        / 4.51E+00

 Cycle  3420      Time   11 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   1.11 /    60.21 21        /   2.69 /    62.09 22        /   1.30 /    60.50
30        /   0.38 /    58.88 40        /   0.39 /    68.98 20        /   1.10 /    69.70
50        /   2.56 /    71.16 31        /   0.77 /    59.57

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.83 202       /       2.78 300       /       2.21 200       /       2.52
100       /       4.74*500       /       7.85*310       /       2.21 ORF #  1  /       7.32
WEIR # 1  /       0.00 FREE # 1  /       2.21
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 ===> System inflows (file) at    11.75 hours (  Junction / Inflow, cfs)

 50        / 1.01E+01 21        / 6.15E-01 22        / 1.04E-01 10        / 5.38E+00

 Cycle  3510      Time   11 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   1.29 /    60.39 21        /   3.11 /    62.51 22        /   1.48 /    60.68
30        /   0.39 /    58.89 40        /   0.37 /    68.96 20        /   1.19 /    69.79
50        /   2.58 /    71.18 31        /   0.82 /    59.62

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       4.86 202       /       4.91 300       /       2.37 200       /       4.28
100       /       4.18*500       /       9.81*310       /       2.38 ORF #  1  /       8.54
WEIR # 1  /       0.00 FREE # 1  /       2.37

 ===> System inflows (file) at    12.00 hours (  Junction / Inflow, cfs)

 50        / 1.30E+01 21        / 7.63E-01 22        / 1.12E-01 10        / 7.21E+00

 Cycle  3600      Time   12 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   1.51 /    60.61 21        /   3.36 /    62.76 22        /   1.76 /    60.96
30        /   0.41 /    58.91 40        /   0.41 /    69.00 20        /   1.37 /    69.97
50        /   2.62 /    71.22 31        /   0.89 /    59.69

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       7.12 202       /       7.01 300       /       2.59 200       /       6.48
100       /       5.48*500       /      12.93*310       /       2.60 ORF #  1  /      12.02
WEIR # 1  /       0.00 FREE # 1  /       2.59

 ===> System inflows (file) at    12.25 hours (  Junction / Inflow, cfs)

 50        / 5.24E+01 21        / 5.25E+00 22        / 8.85E-01 10        / 1.59E+01

 Cycle  3690      Time   12 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   1.95 /    61.05 21        /   4.45 /    63.85 22        /   2.93 /    62.13
30        /   0.43 /    58.93 40        /   0.67 /    69.26 20        /   2.30 /    70.90
50        /   2.88 /    71.48 31        /   1.02 /    59.82

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /      21.47 202       /      20.39 300       /       2.91 200       /      17.52
100       /      14.91*500       /      48.72*310       /       2.92 ORF #  1  /      33.42
WEIR # 1  /       0.00 FREE # 1  /       2.91

 ===> System inflows (file) at    12.50 hours (  Junction / Inflow, cfs)

 50        / 1.13E+02 21        / 9.12E+00 22        / 1.05E+00 10        / 5.16E+01
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 Cycle  3780      Time   12 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   3.67 /    62.77 21        /   6.42*/    65.82 22        /   5.01*/    64.21
30        /   0.51 /    59.01 40        /   1.12 /    69.71 20        /   5.12 /    73.72
50        /   5.11 /    73.71 31        /   1.58*/    60.38

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /      43.42 202       /      43.90 300       /       3.93 200       /      34.96
100       /      39.18 500       /      91.32 310       /       3.96 ORF #  1  /      74.41
WEIR # 1  /       3.02 FREE # 1  /       3.93

 ===> System inflows (file) at    12.75 hours (  Junction / Inflow, cfs)

 50        / 8.89E+01 21        / 4.85E+00 22        / 2.93E-01 10        / 6.46E+01

 Cycle  3870      Time   12 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   6.48 /    65.58 21        /   9.35*/    68.75 22        /   7.97*/    67.17
30        /   0.61 /    59.11 40        /   2.47 /    71.06 20        /   5.18 /    73.78
50        /   5.17 /    73.77 31        /   2.52*/    61.32

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /      52.02 202       /      52.29 300       /       5.31 200       /      47.10
100       /      58.56 500       /      94.03 310       /       5.33 ORF #  1  /      94.76
WEIR # 1  /       9.95 FREE # 1  /       5.31

 ===> System inflows (file) at    13.00 hours (  Junction / Inflow, cfs)

 50        / 3.65E+01 21        / 2.29E+00 22        / 2.06E-01 10        / 3.74E+01

 Cycle  3960      Time   13 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   8.20 /    67.30 21        /   9.45*/    68.85 22        /   8.82*/    68.02
30        /   0.65 /    59.15 40        /   1.62 /    70.21 20        /   3.40 /    72.00
50        /   3.41 /    72.01 31        /   3.06*/    61.86

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /      32.06 202       /      32.18 300       /       6.04 200       /      29.71
100       /      35.01 500       /      45.72 310       /       6.05 ORF #  1  /      63.67
WEIR # 1  /       0.00 FREE # 1  /       6.04

 ===> System inflows (file) at    13.25 hours (  Junction / Inflow, cfs)

 50        / 2.24E+01 21        / 1.42E+00 22        / 1.16E-01 10        / 2.15E+01

 Cycle  4050      Time   13 Hrs - 15.00 Min
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 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   8.84 /    67.94 21        /   8.98*/    68.38 22        /   8.93*/    68.13
30        /   0.67 /    59.17 40        /   0.67 /    69.26 20        /   1.95 /    70.55
50        /   2.71 /    71.31 31        /   3.26*/    62.06

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /      14.69 202       /      14.86 300       /       6.30 200       /      13.28
100       /      14.58 500       /      23.24*310       /       6.30 ORF #  1  /      27.37
WEIR # 1  /       0.00 FREE # 1  /       6.30

 ===> System inflows (file) at    13.50 hours (  Junction / Inflow, cfs)

 50        / 1.46E+01 21        / 1.10E+00 22        / 1.06E-01 10        / 1.30E+01

 Cycle  4140      Time   13 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.16 /    68.26 21        /   9.04*/    68.44 22        /   9.12*/    68.32
30        /   0.68 /    59.18 40        /   0.49 /    69.08 20        /   1.56 /    70.16
50        /   2.64 /    71.24 31        /   3.36*/    62.16

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       9.86 202       /      10.05 300       /       6.42 200       /       8.83
100       /       7.75*500       /      14.77*310       /       6.42 ORF #  1  /      16.46
WEIR # 1  /       0.00 FREE # 1  /       6.42

 ===> System inflows (file) at    13.75 hours (  Junction / Inflow, cfs)

 50        / 1.20E+01 21        / 8.86E-01 22        / 8.02E-02 10        / 9.26E+00

 Cycle  4230      Time   13 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.35 /    68.45 21        /   9.17*/    68.57 22        /   9.29*/    68.49
30        /   0.68 /    59.18 40        /   0.44 /    69.03 20        /   1.42 /    70.02
50        /   2.61 /    71.21 31        /   3.42*/    62.22

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       7.82 202       /       7.98 300       /       6.50 200       /       6.99
100       /       6.27*500       /      12.20*310       /       6.50 ORF #  1  /      13.21
WEIR # 1  /       0.00 FREE # 1  /       6.50

 ===> System inflows (file) at    14.00 hours (  Junction / Inflow, cfs)

 50        / 9.97E+00 21        / 7.95E-01 22        / 7.74E-02 10        / 7.16E+00

 Cycle  4320      Time   14 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.49 /    68.59 21        /   9.27*/    68.67 22        /   9.42*/    68.62
30        /   0.69 /    59.19 40        /   0.40 /    68.99 20        /   1.29 /    69.89
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50        /   2.59 /    71.19 31        /   3.46*/    62.26

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       6.22 202       /       6.40 300       /       6.55 200       /       5.49
100       /       5.15*500       /      10.04*310       /       6.55 ORF #  1  /      10.62
WEIR # 1  /       0.00 FREE # 1  /       6.55

 ===> System inflows (file) at    14.25 hours (  Junction / Inflow, cfs)

 50        / 8.84E+00 21        / 6.76E-01 22        / 6.20E-02 10        / 6.15E+00

 Cycle  4410      Time   14 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.60 /    68.70 21        /   9.36*/    68.76 22        /   9.53*/    68.73
30        /   0.69 /    59.19 40        /   0.40 /    68.99 20        /   1.23 /    69.83
50        /   2.58 /    71.18 31        /   3.49*/    62.29

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       5.34 202       /       5.37 300       /       6.59 200       /       4.65
100       /       4.89 500       /       9.00*310       /       6.59 ORF #  1  /       9.56
WEIR # 1  /       0.00 FREE # 1  /       6.59

 ===> System inflows (file) at    14.50 hours (  Junction / Inflow, cfs)

 50        / 7.69E+00 21        / 6.21E-01 22        / 6.03E-02 10        / 5.25E+00

 Cycle  4500      Time   14 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.68 /    68.78 21        /   9.43*/    68.83 22        /   9.61*/    68.81
30        /   0.69 /    59.19 40        /   0.40 /    68.99 20        /   1.15 /    69.75
50        /   2.56 /    71.16 31        /   3.52*/    62.32

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       4.60 202       /       4.63 300       /       6.62 200       /       3.97
100       /       4.18 500       /       7.74*310       /       6.62 ORF #  1  /       8.16
WEIR # 1  /       0.00 FREE # 1  /       6.62

 ===> System inflows (file) at    14.75 hours (  Junction / Inflow, cfs)

 50        / 6.70E+00 21        / 5.04E-01 22        / 4.49E-02 10        / 4.68E+00

 Cycle  4590      Time   14 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.75 /    68.85 21        /   9.48*/    68.88 22        /   9.67*/    68.87
30        /   0.69 /    59.19 40        /   0.42 /    69.01 20        /   1.10 /    69.70
50        /   2.55 /    71.15 31        /   3.54*/    62.34

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
```

```
201        /       4.13 202       /       4.13 300       /       6.65 200       /       3.60
100        /       3.80 500       /       6.87*310       /       6.65 ORF #  1  /       7.42
WEIR # 1   /       0.00 FREE # 1  /       6.65

 ===> System inflows (file) at    15.00 hours (  Junction / Inflow, cfs)

 50        / 5.57E+00 21        / 4.48E-01 22        / 4.32E-02 10        / 3.88E+00

 Cycle  4680      Time   15 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   9.80 /    68.90 21        /   9.52*/    68.92 22        /   9.71*/    68.91
30         /   0.69 /    59.19 40        /   0.42 /    69.01 20        /   1.01 /    69.61
50         /   2.53 /    71.13 31        /   3.56*/    62.36

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201        /       3.41 202       /       3.45 300       /       6.67 200       /       2.96
100        /       3.13 500       /       5.62*310       /       6.67 ORF #  1  /       6.09
WEIR # 1   /       0.00 FREE # 1  /       6.67

 ===> System inflows (file) at    15.25 hours (  Junction / Inflow, cfs)

 50        / 5.37E+00 21        / 4.43E-01 22        / 4.32E-02 10        / 3.50E+00

 Cycle  4770      Time   15 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   9.83 /    68.93 21        /   9.55*/    68.95 22        /   9.75*/    68.95
30         /   0.70 /    59.20 40        /   0.43 /    69.02 20        /   0.97 /    69.57
50         /   2.53 /    71.13 31        /   3.57*/    62.37

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201        /       3.11 202       /       3.16 300       /       6.68 200       /       2.67
100        /       2.83 500       /       5.38*310       /       6.68 ORF #  1  /       5.52
WEIR # 1   /       0.00 FREE # 1  /       6.68

 ===> System inflows (file) at    15.50 hours (  Junction / Inflow, cfs)

 50        / 5.34E+00 21        / 4.44E-01 22        / 4.32E-02 10        / 3.40E+00

 Cycle  4860      Time   15 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10         /   9.86 /    68.96 21        /   9.57*/    68.97 22        /   9.77*/    68.97
30         /   0.70 /    59.20 40        /   0.45 /    69.04 20        /   0.96 /    69.56
50         /   2.53 /    71.13 31        /   3.57*/    62.37

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201        /       3.02 202       /       3.11 300       /       6.69 200       /       2.60
100        /       2.76 500       /       5.35*310       /       6.69 ORF #  1  /       5.38
WEIR # 1   /       0.00 FREE # 1  /       6.69
```

```
 ===> System inflows (file) at    15.75 hours (  Junction / Inflow, cfs)

 50        / 5.34E+00 21        / 4.45E-01 22        / 4.32E-02 10        / 3.36E+00

 Cycle  4950      Time   15 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.88 /    68.98 21        /   9.60*/    69.00 22        /   9.79*/    68.99
30        /   0.70 /    59.20 40        /   0.46 /    69.05 20        /   0.95 /    69.55
50        /   2.53 /    71.13 31        /   3.58*/    62.38

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.98 202       /       3.11 300       /       6.70 200       /       2.59
100       /       2.75 500       /       5.34*310       /       6.70 ORF #  1  /       5.35
WEIR # 1  /       0.00 FREE # 1  /       6.70

 ===> System inflows (file) at    16.00 hours (  Junction / Inflow, cfs)

 50        / 5.35E+00 21        / 4.46E-01 22        / 4.32E-02 10        / 3.36E+00

 Cycle  5040      Time   16 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.90 /    69.00 21        /   9.62*/    69.02 22        /   9.81*/    69.01
30        /   0.70 /    59.20 40        /   0.48 /    69.07 20        /   0.99 /    69.59
50        /   2.53 /    71.13 31        /   3.59*/    62.39

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.99 202       /       2.96 300       /       6.71 200       /       2.51
100       /       2.67 500       /       5.35*310       /       6.71 ORF #  1  /       5.21
WEIR # 1  /       0.00 FREE # 1  /       6.71

 ===> System inflows (file) at    16.25 hours (  Junction / Inflow, cfs)

 50        / 5.35E+00 21        / 4.46E-01 22        / 4.33E-02 10        / 3.36E+00

 Cycle  5130      Time   16 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.93 /    69.03 21        /   9.64*/    69.04 22        /   9.84*/    69.04
30        /   0.70 /    59.20 40        /   0.50 /    69.09 20        /   1.01 /    69.61
50        /   2.53 /    71.13 31        /   3.60*/    62.40

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.97 202       /       3.06 300       /       6.72 200       /       2.55
100       /       2.73 500       /       5.35*310       /       6.72 ORF #  1  /       5.30
WEIR # 1  /       0.00 FREE # 1  /       6.72

 ===> System inflows (file) at    16.50 hours (  Junction / Inflow, cfs)
```

```
 50        / 5.35E+00 21        / 4.47E-01 22        / 4.33E-02 10        / 3.36E+00

 Cycle  5220      Time   16 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.95 /    69.05 21        /   9.67*/    69.07 22        /   9.86*/    69.06
30        /   0.70 /    59.20 40        /   0.52 /    69.11 20        /   1.01 /    69.61
50        /   2.53 /    71.13 31        /   3.60*/    62.40

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       3.05 202       /       3.00 300       /       6.73 200       /       2.55
100       /       2.74 500       /       5.35*310       /       6.73 ORF #  1  /       5.32
WEIR # 1  /       0.00 FREE # 1  /       6.73

 ===> System inflows (file) at    16.75 hours (  Junction / Inflow, cfs)

 50        / 4.56E+00 21        / 3.32E-01 22        / 2.78E-02 10        / 3.20E+00

 Cycle  5310      Time   16 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.98 /    69.08 21        /   9.69*/    69.09 22        /   9.88*/    69.08
30        /   0.70 /    59.20 40        /   0.54 /    69.13 20        /   1.00 /    69.60
50        /   2.52 /    71.12 31        /   3.61*/    62.41

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.85 202       /       2.83 300       /       6.73 200       /       2.48
100       /       2.67 500       /       4.73*310       /       6.73 ORF #  1  /       5.16
WEIR # 1  /       0.00 FREE # 1  /       6.73

 ===> System inflows (file) at    17.00 hours (  Junction / Inflow, cfs)

 50        / 3.45E+00 21        / 2.75E-01 22        / 2.60E-02 10        / 2.51E+00

 Cycle  5400      Time   17 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.99 /    69.09 21        /   9.70*/    69.10 22        /   9.89*/    69.09
30        /   0.70 /    59.20 40        /   0.53 /    69.12 20        /   0.91 /    69.51
50        /   2.50 /    71.10 31        /   3.61*/    62.41

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       2.25 202       /       2.26 300       /       6.74 200       /       1.96
100       /       2.12 500       /       3.50*310       /       6.74 ORF #  1  /       4.07
WEIR # 1  /       0.00 FREE # 1  /       6.74

 ===> System inflows (file) at    17.25 hours (  Junction / Inflow, cfs)

 50        / 3.25E+00 21        / 2.70E-01 22        / 2.60E-02 10        / 2.16E+00

 Cycle  5490      Time   17 Hrs - 15.00 Min
```

```
 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.98 /    69.08 21        /   9.69*/    69.09 22        /   9.88*/    69.08
30        /   0.70 /    59.20 40        /   0.52 /    69.11 20        /   0.85 /    69.45
50        /   2.50 /    71.10 31        /   3.61*/    62.41

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       1.96 202       /       1.97 300       /       6.74 200       /       1.68
100       /       1.81 500       /       3.26*310       /       6.74 ORF #  1  /       3.47
WEIR # 1  /       0.00 FREE # 1  /       6.74

 ===> System inflows (file) at    17.50 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.70E-01 22        / 2.60E-02 10        / 2.06E+00

 Cycle  5580      Time   17 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.97 /    69.07 21        /   9.68*/    69.08 22        /   9.87*/    69.07
30        /   0.70 /    59.20 40        /   0.51 /    69.10 20        /   0.83 /    69.43
50        /   2.49 /    71.09 31        /   3.61*/    62.41

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       1.87 202       /       1.88 300       /       6.73 200       /       1.59
100       /       1.70 500       /       3.22*310       /       6.73 ORF #  1  /       3.28
WEIR # 1  /       0.00 FREE # 1  /       6.73

 ===> System inflows (file) at    17.75 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.70E-01 22        / 2.60E-02 10        / 2.03E+00

 Cycle  5670      Time   17 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.96 /    69.06 21        /   9.67*/    69.07 22        /   9.86*/    69.06
30        /   0.70 /    59.20 40        /   0.50 /    69.09 20        /   0.83 /    69.43
50        /   2.49 /    71.09 31        /   3.61*/    62.41

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       1.83 202       /       1.88 300       /       6.73 200       /       1.57
100       /       1.68 500       /       3.22*310       /       6.73 ORF #  1  /       3.23
WEIR # 1  /       0.00 FREE # 1  /       6.73

 ===> System inflows (file) at    18.00 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.70E-01 22        / 2.60E-02 10        / 2.02E+00

 Cycle  5760      Time   18 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.95 /    69.05 21        /   9.66*/    69.06 22        /   9.85*/    69.05
```

```
30        /   0.70 /    59.20 40        /   0.48 /    69.07 20        /   0.83 /    69.43
50        /   2.49 /    71.09 31        /   3.60*/    62.40

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       1.81 202       /       1.89 300       /       6.72 200       /       1.57
100       /       1.67 500       /       3.22*310       /       6.72 ORF #  1  /       3.22
WEIR # 1  /       0.00 FREE # 1  /       6.72

 ===> System inflows (file) at    18.25 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.70E-01 22        / 2.60E-02 10        / 2.02E+00

 Cycle  5850      Time   18 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.94 /    69.04 21        /   9.64*/    69.04 22        /   9.84*/    69.04
30        /   0.70 /    59.20 40        /   0.47 /    69.06 20        /   0.83 /    69.43
50        /   2.49 /    71.09 31        /   3.60*/    62.40

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       1.85 202       /       1.85 300       /       6.72 200       /       1.57
100       /       1.67 500       /       3.22*310       /       6.72 ORF #  1  /       3.22
WEIR # 1  /       0.00 FREE # 1  /       6.72

 ===> System inflows (file) at    18.50 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.71E-01 22        / 2.60E-02 10        / 2.02E+00

 Cycle  5940      Time   18 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.93 /    69.03 21        /   9.63*/    69.03 22        /   9.82*/    69.02
30        /   0.70 /    59.20 40        /   0.46 /    69.05 20        /   0.83 /    69.43
50        /   2.49 /    71.09 31        /   3.60*/    62.40

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       1.86 202       /       1.85 300       /       6.72 200       /       1.57
100       /       1.67 500       /       3.22*310       /       6.72 ORF #  1  /       3.22
WEIR # 1  /       0.00 FREE # 1  /       6.72

 ===> System inflows (file) at    18.75 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.71E-01 22        / 2.60E-02 10        / 2.02E+00

 Cycle  6030      Time   18 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.91 /    69.01 21        /   9.62*/    69.02 22        /   9.82*/    69.02
30        /   0.70 /    59.20 40        /   0.45 /    69.04 20        /   0.83 /    69.43
50        /   2.49 /    71.09 31        /   3.59*/    62.39
```

```
   Conduit/        FLOW    ===> "*" Conduit uses the normal flow option.
201        /       1.81 202        /       1.89 300        /       6.71 200        /       1.57
100        /       1.67 500        /       3.22*310        /       6.71 ORF #  1  /       3.22
WEIR # 1  /        0.00 FREE # 1  /       6.71

 ===> System inflows (file) at    19.00 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.71E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6120      Time   19 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.90 /    69.00 21        /   9.61*/    69.01 22        /   9.81*/    69.01
30        /   0.70 /    59.20 40        /   0.44 /    69.03 20        /   0.83 /    69.43
50        /   2.49 /    71.09 31        /   3.59*/    62.39

   Conduit/        FLOW    ===> "*" Conduit uses the normal flow option.
201        /       1.87 202        /       1.84 300        /       6.71 200        /       1.57
100        /       1.66 500        /       3.22*310        /       6.71 ORF #  1  /       3.22
WEIR # 1  /        0.00 FREE # 1  /       6.71

 ===> System inflows (file) at    19.25 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.72E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6210      Time   19 Hrs - 15.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.89 /    68.99 21        /   9.60*/    69.00 22        /   9.79*/    68.99
30        /   0.70 /    59.20 40        /   0.43 /    69.02 20        /   0.83 /    69.43
50        /   2.49 /    71.09 31        /   3.58*/    62.38

   Conduit/        FLOW    ===> "*" Conduit uses the normal flow option.
201        /       1.81 202        /       1.90 300        /       6.70 200        /       1.57
100        /       1.66 500        /       3.22*310        /       6.70 ORF #  1  /       3.22
WEIR # 1  /        0.00 FREE # 1  /       6.70

 ===> System inflows (file) at    19.50 hours (  Junction / Inflow, cfs)

 50        / 3.22E+00 21        / 2.72E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6300      Time   19 Hrs - 30.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.88 /    68.98 21        /   9.59*/    68.99 22        /   9.78*/    68.98
30        /   0.70 /    59.20 40        /   0.42 /    69.01 20        /   0.83 /    69.43
50        /   2.49 /    71.09 31        /   3.58*/    62.38

   Conduit/        FLOW    ===> "*" Conduit uses the normal flow option.
201        /       1.88 202        /       1.84 300        /       6.70 200        /       1.57
100        /       1.66 500        /       3.22*310        /       6.70 ORF #  1  /       3.23
```

```
WEIR # 1  /       0.00 FREE # 1  /       6.70

 ===> System inflows (file) at    19.75 hours (  Junction / Inflow, cfs)

 50        / 3.23E+00 21        / 2.72E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6390      Time   19 Hrs - 45.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.87 /    68.97 21        /   9.57*/    68.97 22        /   9.77*/    68.97
30        /   0.70 /    59.20 40        /   0.41 /    69.00 20        /   0.83 /    69.43
50        /   2.49 /    71.09 31        /   3.58*/    62.38

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       1.82 202       /       1.90 300       /       6.69 200       /       1.58
100       /       1.66 500       /       3.23*310       /       6.69 ORF #  1  /       3.23
WEIR # 1  /       0.00 FREE # 1  /       6.69

 ===> System inflows (file) at    20.00 hours (  Junction / Inflow, cfs)

 50        / 3.23E+00 21        / 2.72E-01 22        / 2.61E-02 10        / 2.02E+00

 Cycle  6480      Time   20 Hrs -  0.00 Min

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.86 /    68.96 21        /   9.56*/    68.96 22        /   9.76*/    68.96
30        /   0.70 /    59.20 40        /   0.40 /    68.99 20        /   0.83 /    69.43
50        /   2.49 /    71.09 31        /   3.57*/    62.37

   Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
201       /       1.87 202       /       1.86 300       /       6.69 200       /       1.58
100       /       1.66 500       /       3.23*310       /       6.69 ORF #  1  /       3.23
WEIR # 1  /       0.00 FREE # 1  /       6.69


 *=================================================*
 | Table E5 - Junction Time Limitation Summary     |
 |              (0.10 or 0.25)* Depth * Area       |
 | Time step = ------------------------------      |
 |                  Sum of Flow                    |
 *=================================================*
 |  The time this junction was the limiting junction |
 |                is listed in the third column.   |
 *=================================================*

Junction     Time(.10)  Time(.25)  Time(sec)
--------     ---------  ---------  ---------
 10            100.00     100.00   11050.0
 21             12.19      30.47       0.0
 22             34.11      85.27       0.0
 30            100.00     100.00       0.0
```

```
 40              36.97     92.42       0.0
 20               7.88     19.71    3690.0
 50               9.36     23.41    1120.0
 31               2.33      5.83   48940.0
The junction requiring the smallest time step was...31


 *==========================================================*
 |       Table E5a - Conduit Explicit Condition Summary     |
 |       Courant   =         Conduit Length                 |
 |       Time step = -------------------------------        |
 |                     Velocity + sqrt(g*depth)             |
 |                                                          |
 |                  Conduit Implicit Condition Summary      |
 |       Courant   =         Conduit Length                 |
 |       Time step = -------------------------------        |
 |                             Velocity                     |
 *==========================================================*
 |  The 3rd column is the Explicit time step times the      |
 |      minimum courant time step factor                    |
 |                                                          |
 |  Minimum Conduit Time Step in seconds in the 4th column  |
 |  in the list. Maximum possible is 10 * maximum time step |
 |                                                          |
 |  The 5th column is the maximum change at any time step   |
 |  during the simulation. The 6th column is the wobble     |
 |  value which is an indicator of the flow stability.      |
 |                                                          |
 |  You should use this section to find those conduits that |
 |  are slowing your model down.  Use modify conduits to    |
 |  alter the length of the slow conduits to make your      |
 |  simulation faster, or change the conduit name to        |
 |  "CHME?????" where ????? are any characters, this will   |
 |  lengthen the conduit based on the model time step,      |
 |  not the value listed in modify conduits.                |
 *==========================================================*

   Conduit  Time(exp)  Expl*Cmin  Time(imp)  Time(min)  Max Qchange   Wobble
  --------  ---------  ---------  ---------  ---------  -----------  -------
 201             5.17      10.34      28.04      264.3        0.208    0.882
 202             5.68      11.37      28.48        0.0        0.143    1.052
 300             0.57       1.14       1.49       95.5       -0.139    0.130
 200             4.31       8.61      14.15        0.0        0.153    0.034
 100            14.79      29.59      46.87        0.0        0.158    0.052
 500            18.82      37.65     100.00        0.0        0.909    0.009
 310             0.34       0.67       0.84      720.2        0.007    0.293
 ORF #  1       10.68      21.36      20.04        0.0        0.139    0.236
The conduit with the smallest time step limitation was..310
The conduit with the largest wobble was.................202
The conduit with the largest flow change in any
consecutive time step...................................500
```

```
*==================================================*
|  Table E6. Final Model Condition                 |
|            This table is used for steady state   |
|            flow comparison and is the information|
|            saved to the hot-restart file.        |
|            Final Time =    20.003 hours         |
*==================================================*

 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
10        /   9.86 /    68.9621        /   9.56*/    68.9622        /   9.76*/    68.96
30        /   0.70 /    59.2040        /   0.40 /    68.9920        /   0.83 /    69.43
50        /   2.49 /    71.0931        /   3.57*/    62.37

   Conduit/       Flow   ===> "*" Conduit uses the normal flow option.
201       /       1.87 202       /       1.86 300       /       6.69
200       /       1.58 100       /       1.66 500       /       3.23*
310       /       6.69 ORF #  1  /       3.23 WEIR # 1  /       0.00
FREE # 1  /       6.69
201       /       0.12 202       /       0.12 300       /       6.70
200       /       0.26 100       /       0.27 500       /       0.23
310       /      11.80 ORF #  1  /       2.88

   Conduit/ Cross Sectional Area
201       /      16.02 202       /      16.02 300       /       1.00
200       /       6.03 100       /       6.06 500       /      13.95
310       /       0.57 ORF #  1  /       1.12

   Conduit/ Cross Sectional Area
201       /    1730.07 202       /    1762.54 300       /       9.99
200       /     506.68 100       /    1841.60 500       /    2789.77
310       /       5.67 ORF #  1  /     336.81

   Conduit/ Hydraulic Radius
201       /       1.13 202       /       1.13 300       /       0.32
200       /       0.59 100       /       0.59 500       /       0.39
310       /       0.21 ORF #  1  /       0.37

   Conduit/ Upstream/ Downstream Elevation
201       /    68.96/    68.96202       /    68.96/    68.96300       /    62.37/    59.20
201       /    68.96/    68.96202       /    68.96/    68.96300       /    62.37/    59.20
200       /    68.99/    68.96100       /    68.99/    68.96500       /    71.09/    69.43
201       /    68.96/    68.96202       /    68.96/    68.96300       /    62.37/    59.20
200       /    68.99/    68.96100       /    68.99/    68.96500       /    71.09/    69.43
310       /    68.96/    62.37ORF #  1  /    69.43/    68.99


*==========================================================*
|         Table E7 -  Extran Iteration Summary             |
*==========================================================*
```

```
Total number of time steps simulated...........        6480
Total number of passes in the simulation........       49067
Total number of time steps during simulation....       45456
Ratio of actual # of time steps / NTCYC.........       7.015
Average number of iterations per time step......       1.079
Average  time step size(seconds)................       1.426
Smallest time step size(seconds)................       0.714
Largest  time step size(seconds)................      10.000
Average minimum Conduit Courant time step (sec).       3.872
Average minimum implicit time step (sec)........       1.033
Average minimum junction time step (sec)........       1.033
Average Courant Factor Tf.......................       1.033
Number of times omega reduced...................          24
```

```
*============================================================*
|     Table E8 - Junction Time Step Limitation Summary       |
*============================================================*
|   Not Convr = Number of times this junction did not        |
|               converge during the simulation.              |
|   Avg Convr = Average junction iterations.                 |
|   Conv err  = Mean convergence error.                      |
|   Omega Cng = Change of omega during iterations            |
|   Max Itern = Maximum number of iterations                 |
*============================================================*
```

Junction	Not Convr	Avg Convr	Total Itt	Omega Cng	Max Itern	Ittrn >10	Ittrn >25	Ittrn >40
10	0	1.73	78678	2	19	2	0	0
21	0	1.84	83779	13	20	25	0	0
22	0	2.28	103825	5	17	11	0	0
30	0	1.01	45793	0	18	13	0	0
40	0	1.05	47871	0	8	0	0	0
20	0	1.10	49873	0	20	1	0	0
50	0	1.09	49394	4	31	4	1	0
31	0	1.02	46140	0	20	11	0	0

```
Total number of iterations for all junctions..    505353
Minimum number of possible iterations.........    363648
Efficiency of the simulation..................      1.39
                                                 Good Efficiency
```

```
*============================================================*
| Extran Efficiency is an indicator of the efficiency of     |
| the simulation.  Ideal efficiency is one iteration per     |
| time step.  Altering the underrelaxation parameter,        |
| lowering the time step, increasing the flow and head       |
| tolerance are good ways of improving the efficiency,       |
| another is lowering the internal time step. The lower the|
| efficiency generally the faster your model will run.       |
| If your efficiency is less than 1.5 then you may try       |
| increasing your time step so that your overall simulation|
| is faster.  Ideal efficiency would be around 2.0           |
```

```
|                                                          |
| Good Efficiency      < 1.5           mean iterations     |
| Excellent Efficiency < 2.5 and > 1.5 mean iterations     |
| Good      Efficiency < 4.0 and > 2.5 mean iterations     |
| Fair      Efficiency < 7.5 and > 4.0 mean iterations     |
| Poor Efficiency      > 7.5           mean iterations     |
*==========================================================*
```

```
*=======================================================*
|        Table E9 - JUNCTION SUMMARY STATISTICS         |
| The Maximum area is only the area of the node, it     |
| does not include the area of the surrounding conduits|
*=======================================================*
```

Junction Name	Ground Elevation feet	Uppermost PipeCrown Elevation feet	Maximum Junction Elevation feet	Time of Occurence Hr.	Min.	Meters of Surcharge at Max Elevation	Freeboard of node meters	Maximum Junction Area ft^2
10	75.00	75.00	69.09	17	1	0.00	5.91	7.116E+04
21	75.00	66.00	69.10	16	57	3.10	5.90	1.300E+01
22	75.00	63.80	69.10	17	0	5.30	5.90	1.300E+01
30	70.00	59.75	59.20	17	2	0.00	10.80	1.300E+01
40	76.00	72.60	71.22	12	41	0.00	4.78	1.300E+01
20	76.50	76.50	73.98	12	37	0.00	2.52	1.300E+01
50	78.90	78.90	73.98	12	36	0.00	4.92	1.300E+01
31	75.00	60.05	62.41	17	1	2.36	12.59	1.300E+01

```
*=======================================================*
|        Table E10 - CONDUIT SUMMARY STATISTICS         |
| Note: The peak flow may be less than the design flow |
| and the conduit may still surcharge because of the   |
| downstream boundary conditions.                      |
*=======================================================*
```

Name Conduit Name	Design Flow (cfs)	Design Velocity (ft/s)	Conduit Vertical Depth (in)	Maximum Computed Flow (cfs)	Time of Occurence Hr.	Min.	Maximum Computed Velocity (ft/s)	Time of Occurence Hr.	Min.	Ratio of Max. to Design Flow	Maximum Depth > at Pipe Ends Upstream (ft)	Dwnstrm (ft)
201	60.	3.76	54.00	6.16E+01	12	37	3.85	12	37	1.03	69.10	69.10
202	42.	2.64	54.00	6.23E+01	12	37	3.86	12	34	1.49	69.10	69.09
300	11.	9.12	15.00	6.74E+00	17	2	6.73	17	2	0.60	62.41	59.20
200	4.03E+02	32.04	48.00	5.27E+01	12	37	5.94	11	42	0.13	71.22	69.10
100	2.54E+02	20.21	48.00	6.58E+01	12	37	6.49	12	34	0.26	71.22	69.09
500	7.84E+03	16.11	94.80	1.25E+02	12	35	1.04	12	17	0.02	73.98	73.98
310	5.4	10.02	9.96	6.74E+00	17	1	11.88	17	1	1.24	69.09	62.41
ORF # 1	98.	0.80	36.00	9.78E+01	12	37	14.97	12	32	0.99	73.98	71.22
WEIR # 1	Undefnd	Undefnd	Undefnd	2.21E+01	12	37						
FREE # 1	Undefnd	Undefnd	Undefnd	6.74E+00	17	2						

==========
| Table E11. Area assumptions used in the analysis|
| Subcritical and Critical flow assumptions from |
| Subroutine Head. See Figure 17-1 in the |
| manual for further information. |
==========

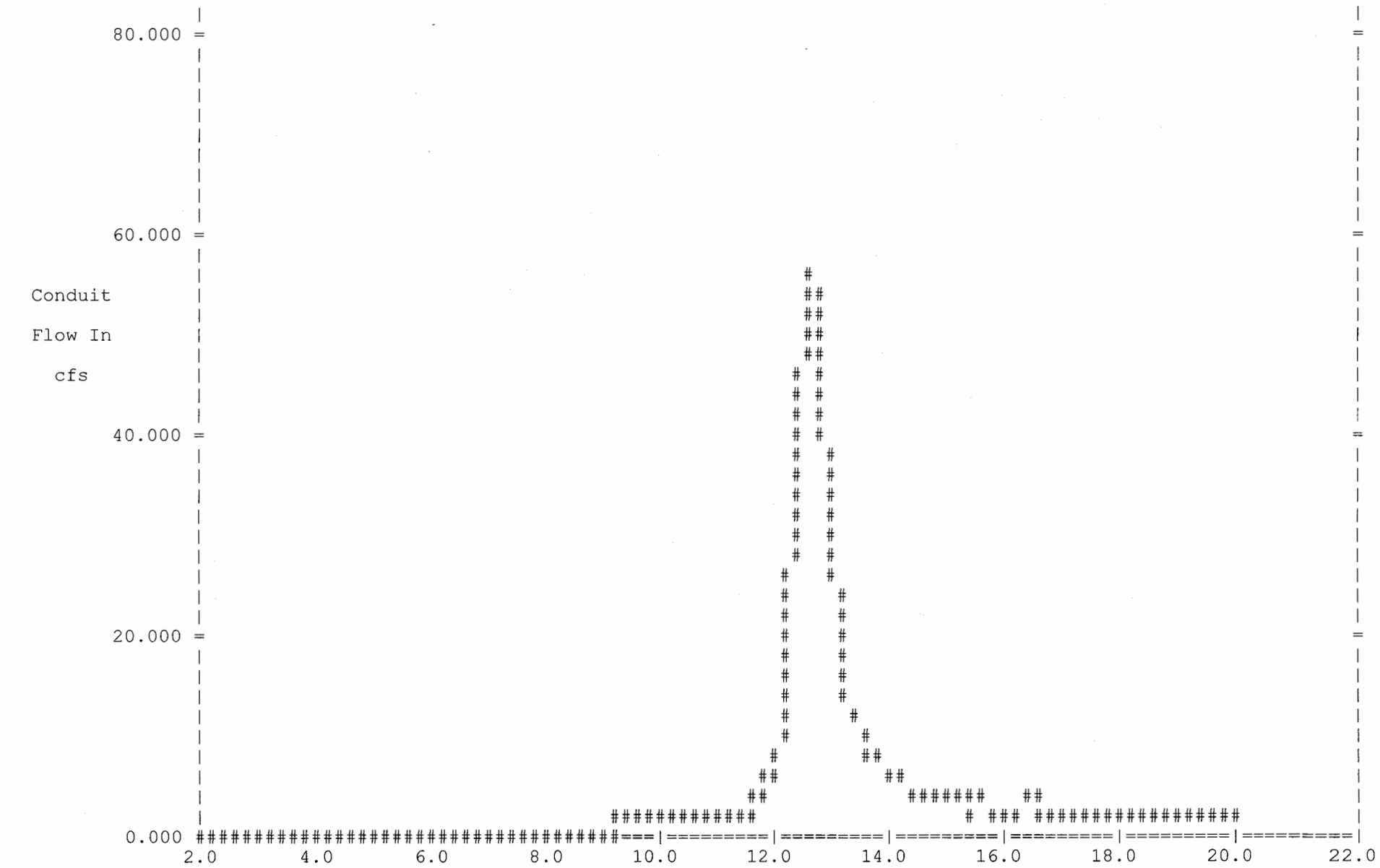
Conduit Name	Length of Dry Flow(min)	Length of Sub-Critical Flow(min)	Length of Upstream Critical Flow(min)	Length of Downstream Critical Flow(min)	Maximum Hydraulic Radius-m	Maximum X-Sect Area(ft^2)	Maximum Vel*D (ft^2/s)
201	0.00	793.50	0.00	286.50	1.270	16.279	0.173E+02
202	0.00	669.00	0.00	411.00	1.281	16.283	0.174E+02
300	0.00	264.67	0.00	815.33	0.322	1.001	0.841E+01
200	232.50	499.17	0.00	348.33	1.086	10.484	0.212E+02
100	232.50	847.50	0.00	0.00	1.086	10.476	0.252E+02
500	202.67	877.33	0.00	0.00	2.934	193.122	0.269E+01
310	0.00	1080.00	0.00	0.00	0.249	0.567	0.986E+01
ORF # 1	202.67	877.33	0.00	0.00	0.823	6.867	0.449E+02

==========
| Table E12. Mean Conduit Flow Information |
==========

Conduit Name	Mean Flow (cfs)	Total Flow (ft^3)	Mean Percent Change	Low Flow Weightng	Mean Froude Number	Mean Hydraulic Radius	Mean Cross Area	Mean Conduit Roughness
201	4.00	2.593E+05	1.161E-02	1.00	5.002E-02	1.05	14.0	6.342E-05
202	4.02	2.606E+05	9.706E-03	1.00	7.035E-02	1.01	13.6	6.342E-05
300	3.07	1.991E+05	3.189E-04	0.965	1.32	0.294	0.874	1.056E-05
200	3.51	2.274E+05	2.982E-03	0.969	0.477	0.554	5.32	1.058E-05
100	3.95	2.562E+05	2.891E-03	0.969	0.322	0.568	5.41	1.058E-05
500	7.49	4.853E+05	1.633E-02	0.973	0.142	0.577	25.3	2.446E-05
310	3.07	1.992E+05	3.495E-04	0.965	1.04	0.197	0.516	7.308E-06
ORF # 1	7.20	4.668E+05	5.093E-03	0.973	1.06	0.434	1.70	7.196E-06
WEIR # 1	0.267	1.729E+04						
FREE # 1	3.07	1.991E+05						

1

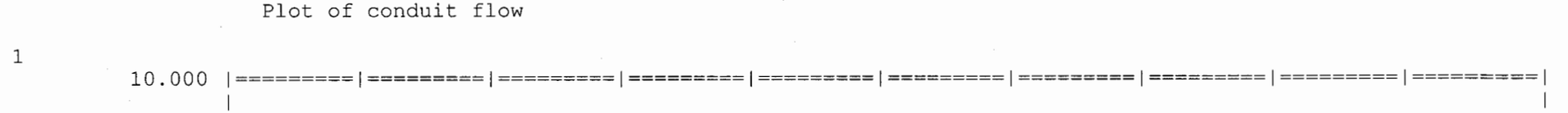
100.000 |==========|==========|==========|==========|==========|==========|==========|==========|==========|==========|

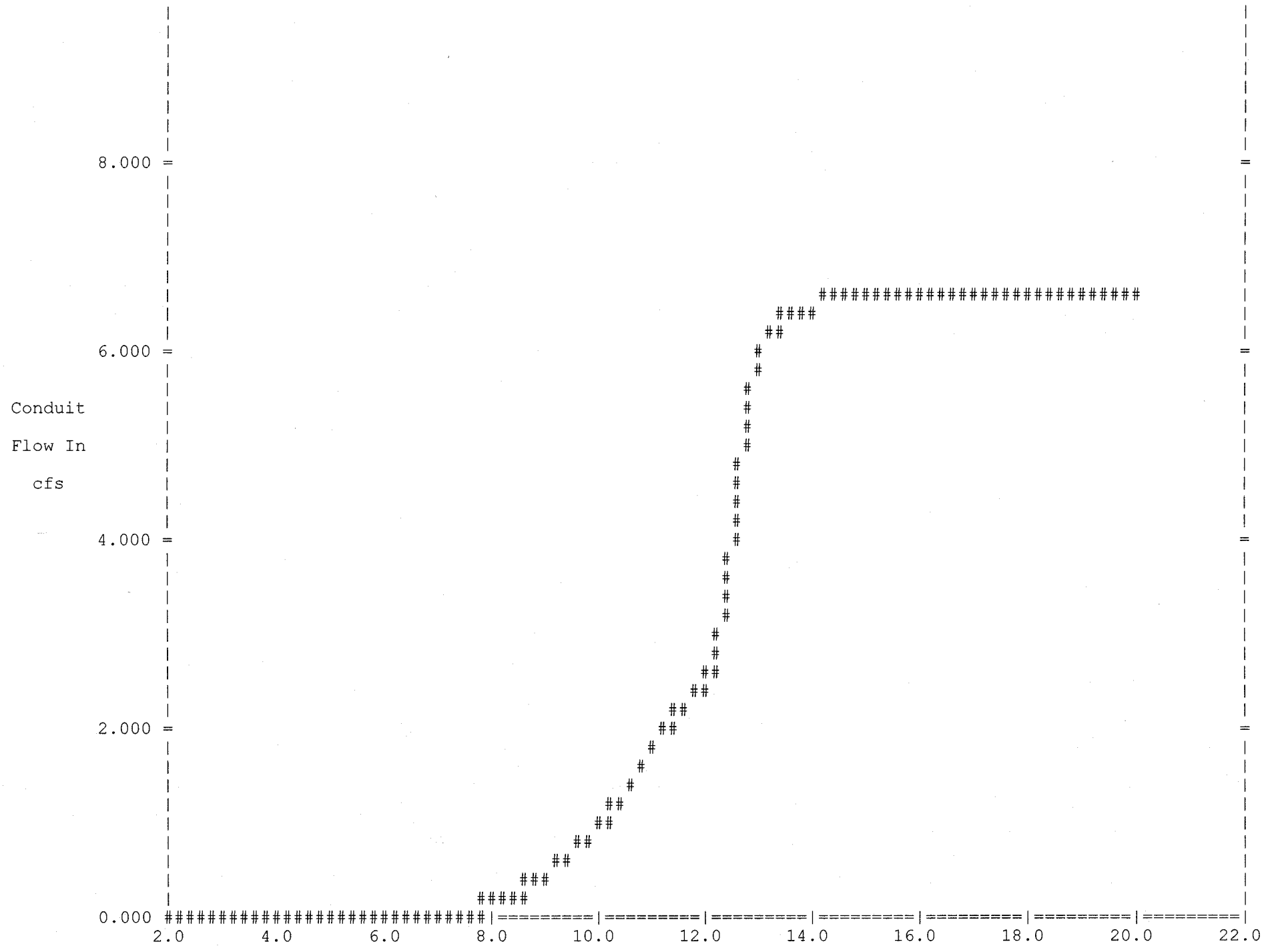


LOCATION NO. : 202 Clock time in hours.

Plot of conduit flow

1

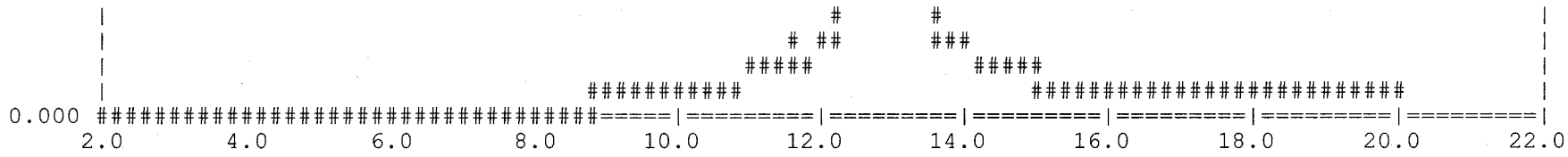



Conduit
Flow In
cfs
8.000
6.000
4.000
2.000
0.000
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0

LOCATION NO. : 300 Clock time in hours.

Plot of conduit flow

1



LOCATION NO. : 100 Clock time in hours.

Plot of conduit flow

==========
| Table E13. Channel losses(H), headwater depth (HW), tailwater |
| depth (TW), critical and normal depth (Yc and Yn). |
| Use this section for culvert comparisons |
==========

Conduit Name	Maximum Flow	Head Loss	Friction Loss	Critical Depth	Normal Depth	HW Elevat	TW Elevat	
201	60.711	1.994	0.102	2.263	3.753	67.891	65.789	Max Flow
202	61.596	2.014	0.107	2.280	4.500	65.789	63.676	Max Flow
300	6.738	2.922	0.157	1.043	0.700	62.414	59.200	Max Flow
200	51.477	3.045	0.140	2.152	0.966	71.210	68.595	Max Flow
100	64.967	7.127	0.923	2.432	1.378	70.889	63.676	Max Flow
310	6.738	6.219	0.421	9.986	0.830	69.086	62.414	Max Flow
ORF # 1	96.750	0.000	3.026	2.901	3.000	73.967	70.890	Max Flow

==========
| CULVERT ANALYSIS CLASSIFICATION, and the time the |
| culvert was in a particular classification |
| during the simulation. The time is in minutes. |
| Extran used the Dynamic Wave Equation for all |
| conduit analysis but classifies the culvert flow |
| condition based on the HW and TW depths. |
==========

Conduit Name	Critical D Outlet Control	Mild Slope TW Control Outlet Control	Steep Slope TW Insignf Entrance Control	Slug Flow Outlet/ Entrance Control	Mild Slope TW > D Outlet Control	Mild Slope TW <= D Outlet Control	Outlet Control	Inlet Control
201	11.333	617.667	0.000	0.000	451.000	0.000	0.000	0.000
202	107.667	527.000	0.000	0.000	445.333	0.000	0.000	0.000
300	0.000	0.000	515.667	0.000	0.000	0.000	445.333	119.000
200	0.000	0.000	691.333	213.000	0.000	0.000	0.000	175.667
100	0.000	0.000	725.333	187.000	0.000	0.000	0.000	167.667
500	0.000	876.000	204.000	0.000	0.000	0.000	0.000	0.000
310	0.000	0.000	430.667	5.667	0.000	456.667	5.667	181.333
ORF # 1	802.333	45.333	204.000	0.000	0.000	0.000	28.333	0.000

```
*=====================================*
|    Kinematic Wave Approximations    |
|  Time in Minutes for Each Condition |
*=====================================*
```

Conduit Name	Length of Normal Flow	Slope Criteria	Super-Critical	Roll Waves
201	0.00	384.00	0.00	0.00
202	0.00	381.17	0.00	0.00
300	0.00	46.83	814.83	0.00
200	0.00	498.83	386.33	0.00
100	280.83	751.33	266.00	0.00
500	822.33	868.50	0.00	0.00
310	0.00	114.17	615.50	0.00
ORF # 1	0.00	0.00	695.83	0.00

```
*==========================================================*
|     Table E15 - SPREADSHEET INFO LIST                    |
| Conduit Flow and Junction Depth Information for use in   |
| spreadsheets.  The maximum values in this table are the  |
| true maximum values because they sample every time step.|
| The values in the review results may only be the         |
| maximum of a subset of all the time steps in the run.    |
| Note: These flows are only the flows in a single barrel.|
*==========================================================*
```

Conduit Name	Maximum Flow	Total Flow	Maximum Velocity	##	Junction Name	Invert Elevation	Maximum Elevation
201	61.56557	259278.8	3.851879	##	10	59.10000	69.08615
202	62.26774	260624.2	3.861712	##	21	59.40000	69.09731
300	6.738234	199082.9	6.731072	##	22	59.20000	69.09576
200	52.72946	227377.4	5.935540	##	30	58.50000	59.19953
100	65.82502	256186.8	6.485689	##	40	68.59000	71.22427
500	124.6121	485286.0	1.037359	##	20	68.60000	73.98163
310	6.738234	199178.1	11.88068	##	50	68.60000	73.98170
ORF # 1	97.76628	466775.5	14.97008	##	31	58.80000	62.41399
WEIR # 1	22.08025	17286.30	0.0000000	##			
FREE # 1	6.738234	199074.1	0.0000000	##			

```
#######################################################
# Table E16. New Conduit Information Section          #
#            Conduit Invert (IE) Elevation and Conduit #
#            Maximum Water Surface (WS) Elevations    #
#######################################################
```

Conduit Name	Upstream Node	Downstream Node	IE Up	IE Dn	WS Up	WS Dn	Conduit Type
201	21	22	59.40	59.30	69.10	69.10	Circular

202	22	10	59.20	59.15	69.10	69.09	Circular
300	31	30	58.80	58.50	62.41	59.20	Circular
200	40	21	68.60	62.00	71.22	69.10	Circular
100	40	10	68.60	59.10	71.22	69.09	Circular
500	50	20	71.00	68.60	73.98	73.98	Trapezoid
310	10	31	59.10	58.80	69.09	62.41	Circular
ORF # 1	20	40	68.60	68.59	73.98	71.22	Circ Orif

```
*==============================================================================*
|    Table E18 - Junction Continuity Error.   Division by Volume added 11/96   |
|                                                                              |
|  Continuity Error = Net Flow + Beginning Volume - Ending Volume              |
|                     ---------------------------------------------------      |
|                     Total Flow + (Beginning Volume + Ending Volume)/2        |
|                                                                              |
|  Net Flow   = Node Inflow - Node Outflow                                     |
|  Total Flow = absolute (Inflow + Outflow                                     |
|  Intermediate column is a judgement on the node continuity error.            |
|                                                                              |
|  Excellent  < 1 percent    Great  1 to  2 percent  Good  2 to  5 percent     |
|  Fair  5 to 10  percent    Poor  10 to 25 percent  Bad  25 to 50 percent     |
|  Terrible > 50  percent                                                      |
*==============================================================================*
```

Junction Name	Continuity Error	% Error in Node Contn	Remaining Volume	Beginning Volume	Net Flow Thru Node
10	1.281E+05	10.122	4.925E+05	0.000	6.205E+05
21	590.	0.113	1.644E+03	0.000	2.234E+03
22	594.	0.113	2.000E+03	0.000	2.594E+03
30	-10.1	0.003	18.1	0.000	7.98
40	335.	0.035	179.	0.000	514.
20	-352.	0.036	1.585E+03	0.000	1.233E+03
50	-602.	0.062	1.460E+03	0.000	-858.
31	-6.41	0.002	106.	0.000	99.3

The total continuity error was 1.28604E+05 cubic feet
The remaining total volume was 4.99447E+05 cubic feet
Your mean node continuity error was Excellent
Your worst node continuity error was Poor

```
*=====================================================*
|  Table E19 - Junction Inflow Sources                |
|              Units are either ft^3 or m^3           |
|              depending on the units in your model.|
*=====================================================*
```

Junction Name	Constant Inflow to Node	User Inflow to Node	Interface Inflow to Node	Outflow from Node
10	0.000	0.000	3.029E+05	2.612E-23

21	0.000	0.000	3.412E+04	2.207E-21
22	0.000	0.000	3.931E+03	0.000
30	0.000	0.000	0.000	1.991E+05
40	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000
50	0.000	0.000	4.844E+05	9.962E-23
31	0.000	0.000	0.000	0.000

```
*=================================================*
|  Table E20 - Junction Flooding and Volume List    |
|              Units are either ft^3 or m^3         |
|              depending on the units in your model.|
*=================================================*
```

Junction Name	Surcharged Time (min)	Flooded Time(min)	Out of System Flooded Volume	Maximum Volume	Stored in System Ponding Allowed Flood Pond Volume
10	0.000	0.000	0.000	4.987E+05	0.000
21	450.	0.000	0.000	126.	0.000
22	453.	0.000	0.000	129.	0.000
30	0.000	0.000	0.000	9.09	0.000
40	0.000	0.000	0.000	34.2	0.000
20	0.000	0.000	0.000	70.0	0.000
50	0.000	0.000	0.000	70.0	0.000
31	457.	0.000	0.000	47.0	0.000

```
*==================================*
| Simulation Specific Information  |
*==================================*
Number of Input Conduits.........        7 Number of Simulated Conduits......      10
Number of Natural Channels........        0 Number of Junctions...............       8
Number of Storage Junctions.......        1 Number of Weirs...................       1
Number of Orifices................        1 Number of Pumps...................       0
Number of Free Outfalls...........        1 Number of Tide Gate Outfalls......       0


*==========================================================*
| Average % Change in Junction or Conduit is defined as:   |
| Conduit  % Change ==> 100.0 ( Q(n+1) - Q(n) ) / Qfull    |
| Junction % Change ==> 100.0 ( Y(n+1) - Y(n) ) / Yfull    |
*==========================================================*

The Conduit with the largest average change was..500        with     0.016 percent
The Junction with the largest average change was.22         with     0.105 percent
The Conduit with the largest sinuosity was.......202        with     1.052


*=================================================================*
| Table E21. Extran continuity balance at the end of the simulation |
```

```
|            Junction Inflow, Outflow or Street Flooding            |
| Error = Inflow  + Initial Volume - Outflow - Final   Volume       |
*==================================================================*

   Inflow          Inflow       Average
   Junction   Volume,ft^3   Inflow, cfs
   --------  ------------  -------------
 10            3.0287E+05    4.6739E+00
 21            3.4121E+04    5.2656E-01
 22            3.9309E+03    6.0662E-02
 50            4.8442E+05    7.4755E+00

   Outflow      Outflow          Average
   Junction  Volume,ft^3    Outflow, cfs
   --------  ------------   ------------
 30            1.9907E+05    3.0721E+00

*=====================================================*
| Initial system volume        =     3.7158E+00 Cu Ft |
| Total system inflow volume   =     8.2534E+05 Cu Ft |
| Inflow + Initial volume      =     8.2534E+05 Cu Ft |
|=====================================================|
| Total system outflow         =     1.9907E+05 Cu ft |
| Volume left in system        =     4.9848E+05 Cu ft |
| Outflow + Final Volume       =     6.9756E+05 Cu ft |
*=====================================================*

*==============================================*
| Total Model Continuity Error                 |
| Error in Continuity, Percent =       15.48289 |
| Error in Continuity, ft^3    =     127786.823 |
| + Error means a continuity loss, - a gain    |
*==============================================*

##################################################
# Table E22. Numerical Model judgement section    #
##################################################

Your overall error was                          15.4829 percent
Worst nodal error was in node 10         with   10.1222 percent
Of the total inflow this loss was               15.5155 percent
Your overall continuity error was                 Poor
                                                  Good  Efficiency
Efficiency of the simulation                      1.39
Most Number of Non Convergences at one Node       0.
Total Number Non Convergences at all Nodes        0.
Total Number of Nodes with Non Convergences       0.

===> Extended Transport model simulation ended normally.
 ===> SWMM Simulation ended normally.
===> Your input file was named  : C:\XPS\River10&15.DAT
```

```
===> Your output file was named : C:\XPS\River10&15.out

*==============================================================*
|             SWMM Simulation Date and Time Summary            |
*==============================================================*
| Starting Date... September  23, 1998  Time...    9:51:10:66  |
|   Ending Date... September  23, 1998  Time...    9:53:46:43  |
|  Elapsed Time...    2.59617 minutes or    155.77000 seconds  |
*==============================================================*
```

Langley and McDonald, P.C.
ENGINEERS • SURVEYORS • PLANNERS
LANDSCAPE ARCHITECTS • ENVIRONMENTAL CONSULTANTS
VIRGINIA BEACH • WILLIAMSBURG, VIRGINIA

Subject Riverside Pond No. 2
TEMP. SEDIMENT BASIN
Computed By WEH Checked By

Project No.
Client
Date JAN. 5, 1998 Sheet No. 1

① WET STORAGE

ELEV.	AREA S.F.	INC. VOL C.Y.	TOTAL VOL C.Y.
62	10		
		47	47
64	1250		
		169	216
66	3310		
		337	553
68	5800		
		539	1092.
70	8760		

O.K!

ELEV. 68.50; 687 C.Y. in storage

① Need storage for 10.25 AC disturbed area
(10.25)(67) = 687 C.Y.

687
553
134

$\frac{134}{539} = 0.2486 \times 2' = 0.497 \Rightarrow 0.50' + 68.0 =$ ELEV. 68.50

② Dry Storage

ELEV.	AREA SF	INC. VOL. C.Y.	Total VOL. C.Y.
68	5800		
		539 − 134 = 405	Vol. from ELEV. 68.50 to 70.00
70	8760		
		(758)(0.375) = 284 = 689	Vol. in storage to ELEV. 70.75
72	11,700.		

② Need: 687 C.Y.

687 CY
− 405 CY
282 C.Y.

$\frac{282}{758} = 0.372 \times 2' = 0.744' \Rightarrow 0.75'$
70.00
Top water "Dry" storage = 70.75'

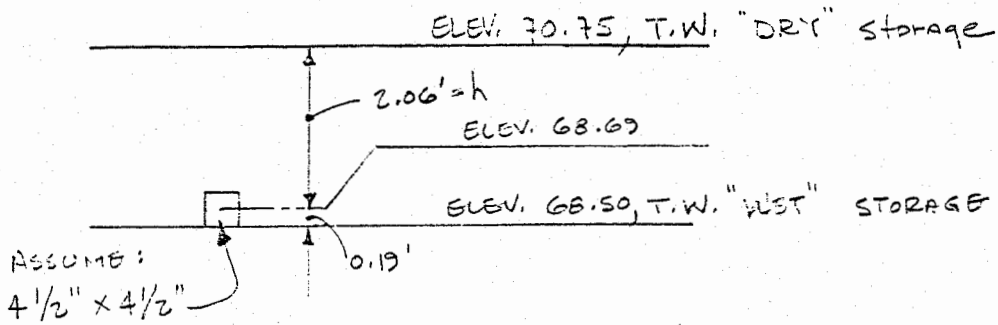
Need 282 C.Y. Above 70.0 contour

Langley and McDonald, P.C.
ENGINEERS • SURVEYORS • PLANNERS
LANDSCAPE ARCHITECTS • ENVIRONMENTAL CONSULTANTS
VIRGINIA BEACH • WILLIAMSBURG, VIRGINIA

Subject _____

Computed By _____ Checked By _____

Project No. _____
Client _____
Date _____ Sheet No. 2



= 20.25 S.I. = 0.1406 S.F., Area of opening

$Q = \frac{S}{21,600}$ $S = (687\ C.Y)(27) = 18,549\ C.F.$

$Q = \frac{18,549}{21,600} = 0.8588$

$A = \frac{Q}{\left(64.32 \times \frac{h}{2}\right)^{1/2}(0.6)}$

$A = \frac{0.8588}{\left(64.32 \times \frac{2.06}{2}\right)^{1/2}(0.6)} = \frac{0.8588}{4.8836} = 0.1759\ S.F. = 25.3\ S.I.$

5" x 5" opening
AT "WET" STORAGE LEVEL

Roadway A at Williamsburg Crossing
Drainage and Erosion Control Narrative

The site for this project is the northern portion of parcel 20 at Williamsburg Crossing Shopping Center. Riverside Health Systems (Riverside) has purchased Parcel 20 from the shopping center to develop as a medical facility. The purchase agreement requires Riverside to construct a road along the northern perimeter of the parcel to provide the rear access from Kings Way (road) to the eastern portion of the shopping center, as well as to provide access to the future medical facility. Road A is approximately 800 feet long with right-of-way of 60 feet and varies. The existing terrain along the path of the road varies from approximately 1% to 23% slopes.

Approximately 80% of the existing roadway drains to existing Pond No. 1 located west of and adjacent to Riverside's Parcel 20. The remainder of the road, at the east end, currently drains to a drainage slough in Parcel 20. This drainage slough is the future location of Pond No. 3. Pond No. 3 will be developed with the future site development plans for the medical facility. The master drainage plan for the shopping center has the existing design of Pond No. 1 encompassing 53.2 acres of developed land. All of the existing portion of the shopping center as well as the existing multi-family area drains to Pond No. 1. Additionally, all of Road A, some future shopping center expansion and a small portion of the future medical facility will drain to Pond No. 1. All remaining land in excess of the 53.2 acres will drain to future Pond No. 3.

The existing multi-family area drains to Pond No. 1 directly by pipe system. The existing portion of the shopping center drains to a low area north of Pond No. 1 in the vicinity of Road A. This drainage is conveyed to Pond No. 1 by an existing 54-inch diameter pipe. Upon construction of Road A, the 54-

inch pipe must be extended north of Road A. Additionally, provision must be made for the remaining portion of the 53.2 acres in the Pond No. 1 drainage area. When "dry" Pond No. 2 is added to the north side of Road A to attenuate the total future flow, the additional pipe size requirement drops to 48-inch diameter.

While "parallel" 54-inch and 48-inch diameter pipes are being provided with Road A, the additional capacity is not needed until further upstream build out. In the interim, Pond No. 2 will be constructed in two phases. The initial phase will provide the sediment basin for Road A and other upstream construction. Once all upstream construction is completed, the sediment basin at Pond No. 2 will be filled in, graded and vegetated to be a "dry" pond. During the construction of the Riverside facility's portion of Pond No. 1 drainage area, the sediment basin at Pond No. 2 can function as a sediment basin for Riverside by forcing the flow of the affected Riverside runoff to Pond No. 2 via the new 54-inch pipe. The pipe will be temporarily sandbagged to redirect the flow. This will eliminate Pond No. 1 from functioning as a sediment basin for any of the new construction.

Pond No. 1 was designed as an 8-point BMP wet detention facility. The natural open space adds 2.9 points for a total of 10.9 points for the 53.2 acres of the Pond No. 1 drainage area.

The following erosion control measures were utilized on the site:

- Gravel construction entrance at the access on Kings Way.
- Silt fences to prevent sediment from leaving the site. Also the silt fences trap sediment along the route of roadside ditch flow.

- Temporary sediment basin at the location of Pond No. 2.
- Temporary outlet structure from sediment basin into pipe system.
- Soil stabilization blankets and matting will be utilized on slopes 4H:1V or steeper.
- Inlet protection for structures receiving storm runoff.

Langley and McDonald, P.C.

Engineers
Surveyors
Planners
Landscape Architects
Environmental Consultants

GEORGE E. LANGLEY
Consultant
T. JOSEPH McDONALD
1906-1982

November 13, 1998

RECEIVED
NOV 1998
ENVIRONMENTAL DIVISION

Mr. Darryl E. Cook, PE
Environmental Director
101-E Mounts Bay Road
Williamsburg, VA 23187-8784

Re: Williamsburg Crossing Shopping Center, Off-Site Drainage
L&M No. 1880079-000.28

Dear Mr. Cook:

This letter is in response to your telephone inquiry regarding information for the 10 and 100 year storms for ponds 1 and 2. We have developed the hydraulic information requested and transmit a copy with this cover. Additionally, please be aware that the revised calculations utilize rainfall intensities previously provided by the County for other projects. These rainfall intensities are somewhat less than the Norfolk intensities used in previous calculations.

We also transmit three prints of the revised plans. The plans have been modified to show: greater detail of the 10-inch pipe sleeve installation; "trash" protection at the outfall; and to note that heavy equipment is not to be allowed on the existing berm. These were owner concerns.

We trust the information provided with this cover addresses your concerns and the plans are now ready to be approved. I will be out of town next week. If you have any questions, please direct them to Greg Johnson at our Virginia Beach office.

Very truly yours,

LANGLEY AND McDONALD, P.C.

Wiley Hall

Wiley Hall

WEH/njr

cc: Ron Galloway
Calvin Davis

MAIN OFFICE
5544 Greenwich Road
Virginia Beach, VA 23462
(757) 473-2000
FAX: (757) 497-7933

201 Packets Court
Williamsburg, VA 23185
(757) 253-2975
FAX: (757) 229-0049

Run 10 yr + 100 yr storms for 15" + 10" pipes

Langley and McDonald, P.C.

Engineers
Surveyors
Planners
Landscape Architects
Environmental Consultants

GEORGE E. LANGLEY
Consultant
T. JOSEPH McDONALD
1906-1982

October 7, 1998

OCT 1998
RECEIVED
ENVIRONMENTAL DIVISION

Mr. Darryl E. Cook, P.E.
Environmental Director
101-E Mounts Bay Road
Williamsburg, VA 23187-8784

Re: Williamsburg Crossing Shopping Center, Off-Site Drainage
L&M Job No. 1880079-000.28

Dear Mr. Cook:

This letter is in response to the drainage issues in your letter of May 20, 1998 to Mr. Calvin Davis. We have performed an "as-built" survey for pond No. 1 at the referenced site. Utilizing the as-built information, the SWMM program was re-run for the drainage system. Three outfalls were analyzed: The existing 15" RCP outfall; possible 12" diameter outfall; and possible 10" diameter outfall. We did not analyze smaller diameter pipes due to the possibility of drain blockage; also, further rise will go over the existing emergency spillway. ~~In order to effect maximum decrease in stormwater discharge, we have shown the pond outfall modifications with the 10-inch diameter restriction~~.

All flow figures were developed with pond No. 2 upstream as "dry" detention placed in series with pond No. 1. The plan shows the permanent weir for "dry" pond No. 2. Two drawdown pipes are shown. The bottom pipe is for the initial condition to draw the water level all the way down to the outfall pipe invert. The intermediate drawdown pipe is to be used when upstream development causes the need for "wet" and "dry" detention during future upstream construction. At that time, the intermediate pipe will be unplugged and the lower pipe temporarily plugged until development is completed; then the drawdown pipes will again operate as in the initial condition shown on the plan.

We trust that the foregoing and the plan and calculations transmitted with this cover adequately address the stormwater concerns for the portion of the shopping center and related development flowing through existing pond No. 1 and new pond No. 2. Pond No. 3 is being developed with the Riverside Medical facility site plan; this will be submitted to the County for full review and approval soon.

MAIN OFFICE
5544 Greenwich Road
Virginia Beach, VA 23462
(757) 473-2000
FAX: (757) 497-7933

201 Packets Court
Williamsburg, VA 23185
(757) 253-2975
FAX: (757) 229-0049

Please call us if you have any questions.

Very truly yours,

LANGLEY AND McDONALD, P.C.

Wiley Hall

WEH/njr
Enclosures

cc: Ron Galloway
Calvin Davis

Smith Demer Normann
Engineers & Planners

RECEIVED 3-23-88

File

transmittal

date 3/21/88 **Job No.** 87021.03

to James City County
P. O. Box J.C.
Williamsburg, Virginia

attention Mr. Darrell Cook

reference Williamsburg Crossing - Phase I
(Revise 3/8/88)

description 4 copies of storm drainage calculations (Rev. 3/8/88)

transmitted

- X for your use
- ___ for your review and comment
- ___ as requested
- ___ for approval
- ___ please return ___ copies
- ___ approved
- ___ approved as noted
- ___ disapproved
- ___ _____

remarks

very truly yours
Smith Demer Normann

by William H. Salley, Jr.
William H. Salley, Jr., P.E.

2101 Executive Drive / Tower Box 50 / Hampton, Virginia 23666
Telephone 804-826-4800 / Norfolk 804-627-6900

LANDMARK DESIGN GROUP

TRANSMITTAL

SEP 2000
RECEIVED
ENVIRONMENTAL DIVISION

To: Darryl Cook, Environmental Director, P.O. Box 8784
Williamsburg, VA. 23187-8784

Company: James City County

From: Wiley Hall

Date: 9/19/00

Subject: Drainage Calcs. Pond 1 & 2

LMDG Job No.: 1880079-000.23

Attached please find:

- ☐ Prints
- ☐ Plans
- ☐ Specifications
- ☐ Drawings
- ☐ Report
- ☐ Letter
- ☑ Calculations

Transmitted as checked below:

- ☑ For your use
- ☑ As requested
- ☐ For review and comment
- ☐ For approval
- ☐ Approved
- ☐

Notes: Its been a couple of years since we were in these files and my memory has grown cold. Additionally, there are so many sets of ~~calc~~ calculations, it is confusing as to which supercedes what. We transmit what we think is the most recent set of calcs. We could not find the calcs for the permanent weir at pond No. 2 outfall. We hope this helps.

Wiley Hall

Engineers • Planners • Surveyors • Landscape Architects • Environmental Consultants
5544 Greenwich Road, Suite 200, Virginia Beach, VA 23462 (757) 473-2000 FAX: (757) 497-7933 lmdg@landmarkdg.com

Langley and McDonald Transmittal

ENGINEERS•PLANNERS•SURVEYORS

☒ 5544 Greenwich Road
Virginia Beach, Virginia 23462
(804) 473-2000

☐ 201 Packets Court
Williamsburg, Virginia 23185
(804) 253-2975

Project: WILLIAMSBURG CROSSING (L&M # 88079-MF4)

To: DARYL COOKE
CODE COMPLIANCE
JAMES CITY COUNTY

From: SCOTT GRAVER
Date: 10/3/96
Reply requested: ☒ Yes ☐ No
Reply to: KEN MERNER

We are sending you:
☒ Attached
☐ Under separate cover via:

☒ Prints
☐ Copy of letter
☐ Plans
☐ Specifications
☐ Shop drawings
☐

Transmitted as checked below:
☐ For your use
☐ As requested
☐ For review and comment
☒ For approval
☐ Return for correction
☐ Approved as noted
☐ Approved
☐

OCT 1996 RECEIVED CODE COMPLIANCE OFFICE

Copies	Date	No.	Description
2	10/2/96	23906I	DETENTION POND RECORD DRAWING
2	1/31/95	23906F	GRADING & EROSION CONTROL PLAN
2	1/31/95	23906E	UTILITY PLAN

Remarks: PLEASE REVIEW PRINTS FOR THE ABOVE REFERENCED PROJECT FOR RELEASE OF THE EROSION AND SEDIMENT CONTROL BOND.

Copies
1. File: 88079-MF4
2. KSM
3. CMH
4. ~~MC039_LA_FONTAINE_DRY_POND_2_297~~

Enclosures
☐
☐
☐
☐

Langley and McDonald

By: _____

If enclosures are not as noted, kindly notify us at once.

Date Record Created:

Created By:

Effective Year_Declaration of Covenants:

WS_BMPNO: MC039

WATERSHED	MC
BMP ID NO	039
PLAN NO	SP-10-95
TAX PARCEL	(47-2)(15-5A)
PIN NO	4721500005A
CONSTRUCTION DATE	6/1/1996
PROJECT NAME	Williamsburg Crossing-LaFontaine
FACILITY LOCATION	Wet Pond # 1-Parcel 12
CITY-STATE	Williamsburg, Va. 23185
CURRENT OWNER	University Square Associates
OWNER ADDRESS	620 Village Drive
OWNER ADDRESS 2	Suite E
CITY-STATE-ZIP CODE	Virginia Beach, Va. 23454
OWNER PHONE	
MAINT AGREEMENT	Yes
EMERG ACTION PLAN	No

Get Last BMP No | Return to Menu

Other affected parcels:

PIN_NO2:

PIN_NO3:

PIN_NO4:

PIN_NO5:

PIN_NO6:

PIN_NO7:

PIN_NO8:

PIN_NO9:

MAINTENANCE PLAN	No	CTRL STRUC DESC	PVC Barrel
SITE AREA acre		CTRL STRUC SIZE inches	10
LAND USE	Multi-Family	OTLT BARRL DESC	RCP
old BMP TYP	Wet Pond	OTLT BARRL SIZE inch	36
JCC BMP CODE			
POINT VALUE	8	EMERG SPILLWAY	Yes
		DESIGN HW ELEV	71.58
		PERM POOL ELEV	57.0
SVC DRAIN AREA acres	53.3	2-YR OUTFLOW cfs	13.23
		10-YR OUTFLOW cfs	19.89
		REC DRAWING	Yes
SERVICE AREA DESCRI	Multi-Family & Shopping Center		
IMPERV AREA acres	37.80	CONSTR CERTIF	No
RECV STREAM	UT of Mill Creek		
EXT DET-WQ-CTRL	No	LAST INSP DATE	12/18/2000
WTR QUAL VOL acre-ft		INTERNAL RATING	4
CHAN PROT CTRL	No	MISC/COMMENTS	
CHAN PROT VOL acre-ft			
SW/FLOOD CONTROL	Yes	Modified SP-93-00. Also See MC 038 & 040.	
GEOTECH REPORT	No		

Inspected by:

Additional Comments:

IMPORTANT MESSAGE

FOR FILE MC 039

DATE 10:40 pm TIME 6/25/01 A.M. P.M.

WHILE YOU WERE OUT

M JANE KOVAR

OF BOARD MEMBER LAFONTAINE

PHONE NO. (253-1178)

TELEPHONED		PLEASE CALL	
CALLED TO SEE YOU		WILL CALL AGAIN	
WANTS TO SEE YOU		RUSH	

RETURNED YOUR CALL	

MESSAGE NOTIFIED US THAT THEY WOULD BE REMOVING TREES ALONG POND & CATTAILS IN CRTAIN AREAS. DISCUSSED WITH HER OUR OPINION ON CATTAILS + SW FUNCTION / STRUCTURAL

SIGNED Sent

HighMark™ P3-A2334 PRINTED IN U.S.A.

MC039_LA_FONTAINE_DRY_POND_2 - 300

STORMWATER MANAGEMENT/ BMP FACILITY MAINTENANCE PLAN

PROPER MAINTENANCE OF THIS FACILITY IS ENCOURAGED TO PREVENT THE INTRODUCTION OF DEBRIS AND SEDIMENT IN TO THE FACILITY, SPILLWAY(S) AND DOWNSTREAM WATERWAYS. FOLLOWING INSTALLATION OF THE FACILITY AND ESTABLISHMENT OF VEGETATION IN DISTURBED AREAS, INSPECTIONS FOR SEDIMENT BUILDUPS WILL BE PERFORMED AT LEAST QUARTERLY. IT IS ANTICIPATED THAT UNDER NORMAL CONDITIONS, SEDIMENT REMOVAL FROM THE FACILITY WILL BE REQUIRED ONCE EVERY 10 YEARS. IF OTHER CONSTRUCTION OR RELATED ACTIVITIES ARE PERFORMED ON UPSLOPE PARCELS, ADEQUATE PROTECTION SHOULD BE PROVIDED AND INSPECTIONS PERFORMED AT LEAST ONCE WEEKLY OF THESE NEWLY DISTRIBUTED AREAS AS WELL AS INSPECTIONS FOR ACCUMULATED SEDIMENTS AT THE BMP FACILITY.

A DESIGNATED REPRESENTATIVE OF THE OWNER WILL INSPECT THE BMP STRUCTURE AFTER EACH SIGNIFICANT RAINFALL EVENT OR THE FOLLOWING WORKING DAY IF A WEEKEND OR HOLIDAY OCCURS. A SIGNIFICANT RAINFALL FOR THIS STRUCTURE IS DEFINED AS ONE (1) INCH OR MORE OF GAUGED RAINFALL WITHIN A 24 HOUR PERIOD. ONCE PER YEAR, A REPRESENTATIVE OF THE COUNTY MAY JOINTLY INSPECT THE STRUCTURE. APPROPRIATE ACTION, PERFORMED AT THE COST OF THE OWNER, WILL BE TAKEN TO ENSURE APPROPRIATE MAINTENANCE. KEYS TO LOCKED ACCESS POINTS SHALL BE MADE AVAILABLE TO COUNTY INSPECTION PERSONNEL UPON REQUEST. INSPECTION AND MAINTENANCE OF THE FACILITY WILL CONSIST OF THE FOLLOWING ADDITIONAL MEASURES:

1. THE INSPECTION FOR SEDIMENT BUILDUP WILL BE PERFORMED BY VISUAL INSPECTION AND A PHYSICAL DETERMINATION OF SEDIMENT DEPTH WITHIN THE STORAGE AREA. SEDIMENT REMOVAL IS REQUIRED USING A RUBBER-WHEELED BACKHOE. AT THE SAME TIME, OR AT LEAST ONCE PER YEAR, THE RISER BOTTOM AND OUTLET PIPE SHALL BE CLEANED OF ACCUMULATED SEDIMENTS. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA. SEDIMENT SHALL NOT BE ALLOWED TO ACCUMULATE IN DEPTHS GREATER THAN 1-FOOT. NO SEDIMENT SHALL BE ALLOWED TO ACCUMULATE TO PREVENT THE PROPER FUNCTION OF ANY PIPE OR CULVERT.

2. PERFORM MAINTENANCE MOWING OF GRASSED AREAS AT LEAST TWICE EACH YEAR. GRASSES SUCH AS TALL FESCUE SHOULD BE MOWED IN EARLY SUMMER AFTER EMERGENCE OF THE HEADS ON COOL SEASON GRASSES AND IN LATE FALL TO PREVENT SEEDS OF ANNUAL WEEDS FROM MATURING. MOWING OF LEGUMES CAN BE LESS FREQUENT. TREES AND SHRUBS SHOULD NOT BE PERMITTED TO GROW ON ANY PART OF THE GRADED EMBANKMENT.

3. PERFORM SOIL SAMPLING ON STABILIZED BMP SOIL AREAS ONCE EVERY FOUR (4) YEARS. SOIL SAMPLING AND TESTING SHOULD BE PERFORMED BY A QUALIFIED INDEPENDENT TESTING LABORATORY. APPLY ADDITIONAL LIME AND FERTILIZER IN ACCORDANCE WITH TEST RECOMMENDATIONS.

4. IN STABILIZED BMP AREAS, IF VEGETATION COVERS LESS THAN 40% FERTILIZE AND SEED IN ACCORDANCE WITH RECOMMENDATIONS FOR NEW SEEDLINGS, AS LISTED IN DAM CONSTRUCTION NOTES. IF VEGETATION COVERS MORE THAN 40% SURFACES, LIME FERTILIZE AND OVERSEED IN ACCORDANCE WITH CURRENT SEEDLING RECOMMENDATIONS.

5. PERFORM QUARTERLY INSPECTIONS OF THE RELEASE STRUCTURES, RISER SECTION AND CREST OF SPILLWAY FOR THE OBSERVANCE OF COLLECTED DEBRIS. IMMEDIATELY REMOVE ANY DEBRIS TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE AN ATTRACTIVE APPEARANCE. DURING QUARTERLY INSPECTIONS, THE POND DRAIN VALVE, USUALLY LEFT IN THE VALVE "CLOSED" POSITION, SHALL BE INSPECTED AND OPERATED THROUGH TWO COMPLETE FULL-OPEN TO FULL-CLOSE TO FULL-OPEN CYCLES.

6. PERFORM YEARLY STRUCTURAL INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE CONCRETE RISER, ANTI-VORTEX DEVICE, TRASH RACK, ORIFICE/WEIR(S), OUTLET BARREL AND POND EMBANKMENT. IF DAMAGE IS EVIDENT, FURTHER INVESTIGATION BY A PROFESSIONAL ENGINEER MAY BE REQUIRED TO ASSESS THE CONTINUED INTEGRITY OF THE STRUCTURE.

7. PERFORM QUARTERLY INSPECTIONS OF THE GRADED SIDE SLOPES OF THE FACILITY FOR SIGNS OF ANIMAL/ RODENT BORROWS OR SLOPE EROSION. IMMEDIATELY PERFORM NECESSARY REPAIRS, REFILLING OR RESEEDING AS APPROPRIATE.

8. RECORD KEEPING. THE LANDOWNER OR DESIGNATED REPRESENTATIVE SHALL KEEP REASONABLE, ACCURATE WRITTEN RECORDS OR INSPECTIONS PERFORMED FOR THE STRUCTURE. RECORDS SHALL DOCUMENT ROUTINE MAINTENANCE AND/OR REPAIRS PERFORMED. COPIES SHALL BE PROVIDED TO THE COUNTY UPON REQUEST.

9. THE FACILITY SHALL NOT BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT/APPROVAL OF THE COUNTY.

10. YEARLY INSPECTIONS OF SEDIMENT FOREBAYS SHALL BE PERFORMED. AT ANY TIME MORE THAN 2 FEET OF SEDIMENT HAS ACCUMULATED FOREBAYS SHOULD BE DEWATERED AND SEDIMENT REMOVED.

11. SHOULD MAINTENANCE REQUIRE DEWATERING OF THE FACILITY, A DEWATERING DEVICE APPROVED BY THE JAMES CITY COUNTY ENVIRONMENTAL DIVISION SHALL BE USED THAT IS RATED TO HANDLE THE MAXIMUM DISCHARGE OF THE DEWATERING PUMP. DISCHARGE FROM DEWATERING SHALL BE FOCUSED INTO THE DOWNSTREAM OUTLET PROTECTION OR THROUGH THE BMP OUTFALL BARREL.

 # 9 **Stormwater Division:** **Williamsburg Crossing Shopping Center Dry Pond # 2, Phase 2, S-10-95, County BMP ID Codes: MC 039 and MC 040**

Printed On 06/22/2009 By WOOLRIDGE

018241

DECLARATION OF CONDOMINIUM

OF

LA FONTAINE, A CONDOMINIUM

Prepared by:

Elwood C. Isley, Jr.
LIVESAY, McLEMORE & ISLEY, P. C.
301 Columbia Street
Portsmouth, Virginia 23704

1-49

Printed On 06/22/2009 By WOOLRIDGE

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DECLARATION OF CONDOMINIUM

OF

LA FONTAINE, A CONDOMINIUM

University Square Associates, a Virginia general partnership, duly organized under the Laws of the Commonwealth of Virginia, being the owner of record of the fee simple title to the real property situate, lying and being in James City County, Virginia, more particularly described in Exhibit A, and being more particularly shown and depicted as "PHASE 1" on that certain plat entitled "LA FONTAINE CONDOMINIUMS AT WILLIAMSBURG CROSSING PHASE ONE FOR THE FRANCISCUS COMPANY JAMESTOWN DISTRICT JAMES CITY COUNTY, VIRGINIA", Scale 1" = 50', dated 08/09/96, made by Hassell & Folkes, P.C., both of which Exhibits are incorporated herein by reference, does hereby state and declare that the realty described in Exhibit A, together with the improvements thereon, is submitted to condominium ownership pursuant to the Condominium Act of the Commonwealth of Virginia, Title 55, Section 55-79.39 et seq., Code of Virginia of 1950, as the same exists at the time of recording this Declaration in the Clerk's Office of the Circuit Court of James City County, Virginia, as hereinbelow more particularly set forth.

1. PURPOSE: NAME, ADDRESS AND LOCATION: LEGAL DESCRIPTION: EFFECT.

1.1 PURPOSE. The purpose of this Declaration is to submit the realty and improvements of the above mentioned property to condominium ownership and use in the manner prescribed by the Laws of the Commonwealth of Virginia.

1.2 NAME, ADDRESS AND LOCATION. The name of this Condominium is La Fontaine, a Condominium. The Condominium is located in James City County, Virginia. The address of the Condominium is 301 Queens Crescent, Williamsburg, Virginia 23185. The addresses of the individual Units within the Condominium are shown on Exhibit #1. Each Unit's "Unit Designation" or "Unit Number" is also shown in Exhibit #1, and all are in Williamsburg, Virginia 23185.

1.3 THE SUBMITTED LAND. The real property described in Exhibit A and depicted as "PHASE ONE" on Exhibit #1 is the land hereby submitted to condominium ownership. Such property is subject to such easements, restrictions, reservations and rights of way of record, together with those contained or provided in this instrument and the Exhibits attached hereto at such time as they become subject to the terms hereof.

1.4 EFFECT. All of the provisions of this Declaration of Condominium and all Exhibits referenced herein and attached hereto shall be binding upon all Unit Owners and are enforceable equitable servitudes running with the Land and existing in perpetuity until this Declaration is revoked and the Condominium is terminated as provided herein. In consideration of receiving, and by acceptance of a grant, devise or mortgage, all grantees, devisees or mortgagees, their heirs, personal representatives, successors and assigns, and all parties claiming by, through, or under such persons agree to be bound by the provisions hereof. Both the burdens imposed and the benefits granted by this instrument shall run with each Unit as herein defined.

2. SURVEY AND DESCRIPTION OF IMPROVEMENTS. On Exhibit #1 there is a plat of the land which encompasses both the Submitted Land and the Additional Land. On Exhibit #1 there is a Plat which shows the location and dimension of the Submitted Land, the location of the Common Elements and the location and Unit Number designation of the Units located thereon. No Unit bears the same number as any other Unit. The plans of the various Units are depicted on Exhibit E-1

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and the table on Exhibit #1 designates the Unit plan type for each Unit. On Exhibit E-1 there is a graphic description of the exterior styles and elevations.

3. DEFINITION OF TERMS. The terms used in this Declaration and the Exhibits attached hereto shall have the meanings stated as follows, unless the context otherwise requires.

3.1 "Additional Land" means those lands described in Exhibit B and shown as "ADDITIONAL LAND" on Exhibit #1, which may subsequently be submitted to condominium ownership hereunder by amendment to this Declaration as provided in paragraphs 6.1 through 6.13, below.

3.2 "Articles of Incorporation", means the Articles of Incorporation of the Association, heretofore filed with the State Corporation Commission.

3.3 "Assessment" means a share of the funds required for the payment of Common Expenses which is assessed against the Unit Owners from time to time.

3.4 "Association" means La Fontaine Condominium Association, Inc., a non-stock, non-profit Virginia corporation which is the entity responsible for the operation of the Condominium.

3.5 "Board" or "Board of Directors" means the Board of Directors of the Association responsible for the administration of the Association.

3.6 "By-laws" means the By-laws of the Association as they exist from time to time.

3.7 "Common Elements" means all portions of the Condominium Property other than the Units.

3.8 "Common Expenses" means all expenditures lawfully made or incurred by or on behalf of the Association, together with all funds lawfully assessed for the creation and/or maintenance of reserves pursuant to the provisions of the Condominium Instruments.

3.9 "Common Profits" means the excess of all receipts of the Association, including but not limited to, assessments, rents, profits, and revenues on account of the Common Elements, in excess of the amount of Common Expenses.

3.10 "Condominium" means that form of ownership of real property which is created pursuant to the laws of the Commonwealth of Virginia and which is comprised of Units that may be owned by one or more persons, and in which there is appurtenant to each Unit an undivided share in the Common Elements. The term shall also mean La Fontaine, a Condominium, as established by this Declaration.

3.11 "Condominium Act" means the Condominium Act of the Commonwealth of Virginia as set forth in Section 55-79.39, et seq. of the Code of Virginia of 1950, as the same exists at the time of recording this Declaration in the Clerk's Office of the Circuit Court of James City County, Virginia.

3.12 "Condominium Instruments" shall be a collective term referring to this Declaration, By-laws, and plats and plans, recorded pursuant to the provisions of the Condominium Act. Any exhibit, schedule, or certification accompanying a Condominium Instrument and recorded simultaneously therewith shall be deemed an integral part of that Condominium Instrument. Any amendment or certification of any Condominium Instrument shall, from the time of the recordation of such amendment or certification, be deemed an integral part of the affected Condominium Instrument, so long as

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such amendment or certification was made in accordance with the provisions of the Condominium Act and this Declaration.

3.13 "Condominium Property" means and includes all lands and personal property hereby or hereafter subjected to condominium ownership and all improvements thereon and all easements and rights appurtenant thereto intended for use in connection with the Condominium.

3.14 "Condominium Unit" means a Unit together with the undivided interest in the Common Elements appertaining to that Unit.

3.15 "Declarant" means University Square Associates, a Virginia general partnership duly organized under the laws of the Commonwealth of Virginia, its successors and assigns, which has created this Condominium.

3.16 "Declaration" means this instrument and all Exhibits attached hereto.

3.17 "Institutional Lender" means a state or federal savings or commercial bank or savings and loan association or trust company, insurance company, real estate investment trust, pension fund, or an agency of the United States Government, mortgage company or like entity holding a mortgage on a Unit, and their successors and assigns.

3.18 "Limited Common Element" shall mean a portion of the Common Elements reserved for the exclusive use of those entitled to the use of one or more, but less than all, of the Units.

3.19 "Occupant" means the person or persons other than the Unit Owner in actual possession of a Unit.

3.20 "Person" means a natural person, corporation, partnership, association, trust, or other entity capable of holding title to real property, or any combination thereof.

3.21 "Submitted Lands" means those lands which are hereby and herein submitted to condominium ownership and described in Exhibit A.

3.22 "Unit" means a portion of the Condominium designed and intended for individual ownership and use.

3.23 "Unit Owner" means one or more persons who own a Condominium Unit.

The definitions herein contained shall prevail as the context requires whether or not the same are capitalized in their usage herein.

4. INTEREST IN COMMON ELEMENTS, OWNERSHIP AND BOUNDARIES OF UNITS.

4.1 INTEREST IN COMMON ELEMENTS AND UNITS. Each Unit Owner shall own, as an appurtenance to his Unit, an equal interest in the Common Elements. The percentage of undivided interest of each Unit shall not be changed without the unanimous consent of all Unit Owners, or unless the Condominium is expanded as provided in paragraphs 6.1 through 6.13 of this Declaration. No Unit Owner shall bring an action for partition or division of his undivided interest in the Common Elements. Each Unit Owner shall own his Unit in fee simple absolute, in addition to the undivided fee simple interest as a tenant in common with the Unit Owners, in Common Elements.

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4.2 BOUNDARIES. A Unit consists of an individual structure and adjacent areas lying within the boundaries described in Paragraphs 4.2.1 through 4.2.5.

4.2.1 HORIZONTAL BOUNDARY:

UPPER AND LOWER BOUNDARIES. The upper and lower boundaries of the Unit shall be the following boundaries extended to an intersection with the perimetrical boundaries:

(1) UPPER BOUNDARY -- The horizontal plane of the upper surface of the sheetrock wallboard comprising the undecorated finished ceiling of the upper floor or upper level of the Unit.

(2) LOWER BOUNDARY -- The horizontal plane of the undecorated upper surface of the sub-floor, immediately below the finished floor.

4.2.2 PERIMETRICAL BOUNDARIES:

The perimetrical boundaries of the Unit shall be the vertical planes of the exterior surface of the sheetrock wallboard comprising the interior walls bounding the Unit extended to intersections with each other and with the Upper and Lower Boundaries.

(1) Where there is an aperture in any perimetrical boundary, including, but not limited to, windows and doors, the vertical boundary shall be extended at all such places, at right angles, to the dimension of such aperture, so that the perimetrical boundary at such places shall be coincident with the exterior finished surface of such aperture, including the framework thereto. Exterior walls made of glass or glass fired to metal framing, exterior windows and frames, exterior glass sliding doors, frames and casings, shall be included within the Unit and shall not be deemed a Common Element.

(2) The interior partitions within a Unit, including the ceilings and floors between the floors within a two story Unit are part of said Unit. The patio or balcony which service a particular Unit are part of the Unit. Where the patio or balcony adjoin any building, the perimetrical boundary of the Unit becomes the exterior surface of the patio or balcony.

4.2.3 STRUCTURAL INTEGRITY EASEMENT. There shall exist, as a Common Element, an easement for structural integrity affecting all of the partitions and floors within each Unit, so that none will be altered, rearranged or removed in any manner which would harmfully affect the structural integrity of the building of which it is a part.

4.2.4 MAINTENANCE EASEMENT. There shall exist, as a Common Element, an easement through each Unit for the ducts, pipes, conduits, plumbing, wiring or other facilities for the furnishing of utility or other services to the Units and the Common Elements, and for maintaining, repairing, servicing and replacing same. Any pipes, ducts, wires, conduits, electrical panels, plumbing, drains, or any utility services serving only one Unit are appurtenant to and a part of such Unit and are not part of the Common Elements.

4.2.5 AIR CONDITIONING/HEATING/MECHANICAL. Notwithstanding any of the provisions of this paragraph 4 to the contrary, the air conditioning, refrigerating, heating and electrical

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lines within the Unit, and the heating/air conditioning unit (heat pump), fan units, water and sewer lines, and other apparatus in connection therewith, which serve an individual unit (wherever located), shall be owned by the Unit Owner as a part of the Unit and are not part of the Common Elements.

4.3 RIGHT TO ALTER. Declarant reserves the right to alter the interior design, boundaries and arrangements of all Units as long as Declarant owns the Units so altered. Said alteration shall be accomplished by an amendment to this Declaration, which need only be signed by Declarant without the approval of any other party. Declarant shall collaterally reapportion, if necessary, the shares of ownership in the Common Elements appurtenant to the Units concerned.

4.4 PARKING. There shall be assigned to each Unit, without charge, the exclusive right to use one automobile parking space, such assignment to be made as a Limited Common Element by this Declaration or by the Board of Directors, and may be made on the plat depicting the Unit. Such space shall be used only by the Unit Owner and such Unit Owner guests and invitees. All other unassigned parking spaces located on the Common Elements shall be available to Unit Owners, their guests and invitees on a first-come, first-served basis.

5. RESTRICTION AGAINST FURTHER SUBDIVIDING OF UNITS. No Unit may be divided or subdivided into a smaller Unit. No Unit, or portion thereof, shall be added to or incorporated into any other Unit.

6. OPTION TO EXPAND THE CONDOMINIUM.

6.1 RESERVATION OF RIGHT. Declarant hereby expressly reserves unto itself and its successors and assigns, the option and right to expand the Condominium pursuant to the Condominium Act and subject to the provisions hereof.

6.2 DECLARANT'S OPTION. The option to expand the Condominium shall be at the sole and exclusive option of Declarant and shall not require the consent of any Unit Owner or Mortgagee.

6.3 DURATION OF OPTION. This option to expand the Condominium shall expire seven (7) years from the date of recordation of this Declaration if not sooner exercised. At any time prior to the expiration of such period, however, Declarant may terminate its option to expand or lessen the period within which it can be exercised by recording among the land records wherein this Declaration is recorded, an executed and notarized document terminating this option or altering the date this option shall expire.

6.4 THE ADDITIONAL LAND. The real property described in Exhibit B and depicted as "ADDITIONAL LAND" on Exhibit #1 is the land which may be added to the Condominium pursuant to Declarant's option to expand, which land is hereafter and heretofore referred to as "Additional Land".

6.5 ADDITION OF PORTIONS OF ADDITIONAL LAND. Declarant expressly reserves the right to add any, all, or any portion or portions of the Additional Land at any time, at different times, in any order, without limitation.

6.6 IMPROVEMENTS ON ADDITIONAL LAND. Declarant may (but shall not be obligated to) place structures, recreational facilities and vehicular parking areas and thoroughfares to be located on portions of the Additional Land, however Declarant reserves the right to make any or all improvements on the Additional land in any or all locations on the Additional Land, without limitation, and no assurances are made in that regard.

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6.7 MAXIMUM NUMBER OF UNITS ON ADDITIONAL LAND. The maximum number of Units which may be created on the Additional Land is one hundred fifty (150). If any portion or portions of the Additional Land are added at any time or times, the maximum number of Units per acre which may be created on such portion or portions is thirty-six (36) Units per acre.

6.8 RESIDENTIAL USE. All Units to be created on any portion of the Additional Land shall be restricted exclusively to residential use, except as otherwise provided in paragraph 19.2 of this Declaration.

6.9 COMPATIBLE STRUCTURES. No assurances are made or given that the structures which may be constructed on any portion of the Additional Land added to the Condominium will be compatible with the structures on the Submitted Land in terms of quality of construction, the principal materials to be used, and architectural style.

6.10 OTHER IMPROVEMENTS. In addition to any structures which may be erected on the Additional Land, Declarant may (but shall not be obligated to) construct improvements thereon for recreational and/or service purposes including vehicular through fares shown on Exhibit #1. Declarant reserves the right to construct such recreational and service facilities as it desires; however, Declarant makes no assurances that any improvements will be made on any portion of the Additional Land.

6.11 ADDITIONAL UNITS. The Units which may be created on any Additional Land may be as shown on the plans attached as Exhibit #1; however, Declarant makes no assurances as to the type or types of Units that may be created thereon, or that such Units will be substantially identical to the Units in the Submitted Land.

6.12 LIMITED COMMON ELEMENTS. Declarant expressly reserves the right to create Common Elements upon the Additional Land which will subsequently be assigned as Limited Common Elements. Such Limited Common Elements shall not otherwise be assigned or reassignable.

7. EASEMENTS.

7.1 PERPETUAL NON-EXCLUSIVE EASEMENT. The Common Elements are hereby declared to be subject to a perpetual nonexclusive easement in favor of all of the Unit Owners in the Condominium for their use and the use of their immediate families, guests, and invitees, for all proper and normal purposes, including the providing of services for the benefit of all Units.

7.2 EASEMENT FOR UNINTENTIONAL AND NON-NEGLIGENT ENCROACHMENTS. In the event that any Unit or Common Element shall encroach upon any other Unit or Common Element for any reason other than the purposeful negligent act of any person, then an easement appurtenant to such affected Unit or Common Element shall exist for so long as such encroachment shall naturally exist.

7.3 UTILITY EASEMENTS. Utility easements are reserved and granted through the Condominium Property as may be required for construction and maintenance of utility services in order to adequately serve the Condominium.

7.4 INGRESS AND EGRESS. A non-exclusive easement for ingress and egress is hereby created for pedestrian traffic over, through and across sidewalks, paths, walks, driveways, passageways and lanes as the same, from time to time, may exist upon the Common Elements; and for vehicular traffic over, through and across such portions of the Common Elements as, from time to time, may be paved and intended for such purposes.

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7.5 USE. The use of any easement by a Unit Owner shall be subject to all of the provisions of this Declaration, as the same may exist from time to time.

7.6 SURVEY EXHIBIT--EASEMENTS. The Declarant shall have the right to create for others or reserve unto itself, such easements as are necessary to accomplish the purposes referred to in this Paragraph 7. Further, Declarant shall have the unequivocal right without the joinder of any other party to grant such easements (ingress, egress and maintenance) to such parties as Declarant deems fit. If such easement is granted, as of the date hereof, the portion thereof that falls within the confines of the Condominium Property shall be governed by the language thereon or may be created by separate document. The responsibility for the maintenance of such easements, if any, shall be as provided for therein, and if no such provision is made, the Association shall be responsible for the maintenance and care thereof. Declarant, or its designee, shall have the right but not the obligation to enter the Condominium Property for the purpose of constructing, maintaining and repairing said easements and the equipment thereon. Should the Declarant grant additional easements which connect with or are intended to supplement, replace or relocate the easements, the same shall automatically be part of the easements provided therein as if originally set forth.

7.7 EASEMENT TO FACILITATE EXPANSION. The Declarant shall have a transferable easement over and on the Common Elements for the purpose of making improvements on the Additional Land pursuant to the provisions of this Declaration and the Condominium Act, and for the purpose of doing all things reasonably necessary and proper in connection therewith.

7.8 ADDITIONAL EASEMENTS. Declarant reserves unto itself, or its designee, the unequivocal right to create additional easements over, upon, or through the Condominium Property, at any time during the period of Declarant's control provided in the By-laws, for any purpose, without the joinder of the Association or any Unit Owners whomsoever, provided, that said easements so created shall not cause a taking of part of the actual buildings. However, if requested, the Association and Unit Owners shall join in the creation thereof.

8. COMMON EXPENSE; COMMON PROFITS. Each Unit shall share in the Common Profits and be liable for the Common Expenses in the same percentage as the percentage representing the undivided interest of each Unit in the Common Elements. The right to share in the Common Profits does not include the right to withdraw or to require payment or distribution thereof except upon termination and dissolution of the Condominium.

9. ADMINISTRATION OF THE CONDOMINIUM: THE ASSOCIATION, MEMBERSHIP, REPORTS TO MEMBERS AND LENDERS, VOTING.

9.1 THE ASSOCIATION. The Association shall administer the operation and management of the Condominium Property and undertake and perform all acts and duties incident thereto in accordance with the provisions of this Declaration and the Condominium Act.

9.2 MEMBERSHIP. Each Unit Owner shall automatically become a member of the Association upon his acquisition of title to any Unit and said membership shall terminate automatically upon said Unit Owner being divested of title to such Unit, regardless of the means by which such ownership may be divested. No person holding any lien, mortgage or other encumbrance upon any Unit shall be entitled, by virtue thereof, to membership in the Association or to any of the rights or privileges of such membership.

9.3 POWERS OF ASSOCIATION. In the administration of the Condominium, the Association shall have, and is hereby granted, the authority and power to enforce the provisions of this Declaration,

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levy and collect assessments in the manner hereinafter provided, and to adopt, promulgate and enforce such Rules and Regulations governing the use of the Units and Common Elements as the Board of Directors of the Association may deem to be in the best interest of the Condominium. The Association shall have all of the powers and duties set forth in the Condominium Act. Further, the Association shall have the right, when determined by the Board of Directors to be in the best interests of the Condominium, to grant exclusive licenses, easements, permits, leases or privileges to any individual or entity, including Non-Unit Owners, which affect Common Elements and to alter, add to, relocate or improve Common Elements, provided that the rights and the exercise thereof are not in abrogation of the requirements of the Condominium Act.

9.4 REPORTS TO LENDERS. So long as an Institutional Lender is the owner or holder of a first mortgage or first deed of trust encumbering a Unit in the Condominium, the Association shall furnish said Institutional Lender with one (1) copy of the annual financial statement and report of the Association pertaining to the Unit upon which the mortgage is held, provided said Institutional Lender requests same in writing.

9.5 INSURANCE REPORTING. In any legal action in which the Association may be exposed to liability in excess of insurance coverage protecting it and the Unit Owners, the Association shall give notice of the exposure within a reasonable time to all Unit Owners who may be exposed to the liability and they shall have the right to intervene and defend.

A copy of each insurance policy obtained by the Association shall be made available for inspection by Unit Owners at reasonable times.

9.6 VOTING. The voting of each Unit Owner shall be governed by the provisions of the By-laws.

9.7 MANAGEMENT AGREEMENT. The Association may enter into an agreement with any person, firm or corporation for the administration, maintenance and repair of the Condominium Property and may delegate to such contractor or manager such of the powers and duties of the Association as the Association and such person, firm or corporation shall agree.

10. USE AND OCCUPANCY.

10.1.1 RESIDENTIAL USE. Each Unit is hereby restricted to residential use as a single-family residence by the owner or owners thereof, their immediate families, guests and invitees. At no time may the Unit be used by more persons than for which it was designated.

10.1.2 OWNERSHIP BY ENTITY. In the event that other than a natural person is a Unit Owner, said entity shall, prior to the purchase of such Unit, designate the person, if any, who is to be the permanent Occupant of such Unit. Such entity shall not thereafter have the right to designate other persons as the Occupants of such Unit, whether in substitution of or in addition to the persons initially designated, except with the approval of the Association. All provisions of the Declaration shall apply to such designated Occupants as though they had title to such Unit and the entity owing such Unit shall be bound thereby. These provisions of Paragraph 10 of the Declaration shall not be applicable to Declarant or to any Corporation formed or controlled by Declarant.

10.1.3 GENERAL USE RESTRICTION. No person shall use the Condominium Property or any part thereof, in any manner contrary to the Condominium Instruments.

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10.1.4 LAWFUL USE. No immoral, improper, offensive or unlawful use shall be made of any or all the Condominium Property, and all laws, zoning ordinances and regulations of all governmental bodies having jurisdiction thereof shall be observed. The responsibility of meeting the requirements of governmental bodies for maintenance, modification or repair of the Condominium Property shall be the same as the responsibility for maintenance and repair of the property concerned.

10.1.5 ALTERATIONS AND ADDITIONS. No Unit Owner shall make or permit to be made any material alteration, addition or modification to his Unit without the prior written consent of the Association. No Unit Owner shall cause any improvements or changes to be made on the exterior of the Unit, including painting or other decoration, without the written permission of the Association and Declarant (during the period of Declarant's control provided in the By-laws). The intended improvement or change must be in substantial conformity with the exterior of the other Units in the Condominium in terms of quality of construction, the principal materials to be used and architectural style. No Unit Owner shall cause to be made any modification or installation of electrical wiring, television antenna systems or connections whether inside or outside of the Unit or in any manner change the appearance of any portion of the Condominium Property without the written permission of the Association and Declarant (during the period of Declarant's control provided in the By-laws). No Unit Owner may cause any material puncture or break in the boundaries of his Unit without the written permission of the Association and Declarant (during the period of Declarant's control provided in the By-laws).

10.1.6 NUISANCES. No nuisance or any use or practice that is the source of unreasonable annoyance to other Unit Owners or which interferes with the peaceful possession and proper use of the Condominium Property by the Unit Owners is permitted. No Unit Owner or Occupant shall permit or suffer anything to be done or kept upon the Condominium Property or his Unit which will increase the rate of insurance on the Condominium.

10.1.7 APPLICABILITY TO DECLARANT. Neither the Unit Owners nor the Association, nor their use of the Condominium, shall interfere with the Declarant's sale of the Condominium Units. Anything contained herein to the contrary notwithstanding, the Declarant may make such use of any unsold Unit and the Common Elements as may facilitate the sale or leasing of any Unit in the Condominium.

10.2 RULES AND REGULATIONS. All Unit Owners and other persons shall use the Condominium Property in accordance with the Rules and Regulations promulgated by the entity in control thereof and the provisions of this Declaration and the By-laws of the Association.

11. MAINTENANCE AND REPAIR OF THE CONDOMINIUM PROPERTY, ALTERATIONS AND IMPROVEMENTS.

11.1 MAINTENANCE BY ASSOCIATION. Except as otherwise provided, the Association, at its expense, shall be responsible for and shall maintain, repair and replace all of the Common Elements, including the Limited Common Elements.

11.2 MAINTENANCE OF UNIT OWNER. Each Unit Owner shall, subject to the other provisions of this Declaration, maintain, repair and replace, at his expense, all portions of his Unit including, but not limited to, all doors, windows, glass, screens, patios, balconies, gutters and downspouts, electrical panels, electric wiring, electric outlets and fixtures, refrigerators, dishwashers and other appliances, drains, plumbing fixtures and

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connections, the interior and exterior surfaces of all walls, floors, fences and ceilings and all other portions of his Unit.

11.3 CONFORMITY OF MAINTENANCE, STYLE AND MATERIALS. All repairs, painting, replacements and maintenance, whether made by Unit Owners or the Association, to the doors, windows, fences, gates or the exterior surface of any building, including roofs, or to any generally visible portion of the Units and Common Elements shall be carried out in such a manner so as to conform to the materials, architecture, style, color and quality of construction initially provided by the Declarant.

11.4 LIABILITY OF UNIT OWNER. Should a Unit Owner undertake unauthorized additions and modifications to his Unit, as specified above, or refuse to maintain, paint and make repairs as required, or should a Unit Owner cause any damage to the Common Elements, the Association may undertake such repairs, painting, replacements or maintenance, and levy a special assessment for the cost thereof against said Unit Owner. In the event a Unit Owner threatens to or violates the provisions hereof, the Association shall also have the right to proceed in a court of equity for an injunction to seek compliance with the provisions hereof.

11.5 INSURANCE PROCEEDS. Whenever any maintenance, repair and replacement of any items for which a Unit Owner is responsible is made necessary by any loss covered by insurance maintained by the Association, the proceeds of the insurance received by Association, or the Insurance Trustee, shall be used for the purpose of accomplishing such maintenance, repair or replacement. The Unit Owner shall be required to pay all of the costs thereof that exceed the amount of the insurance proceeds.

11.6 RIGHT OF ENTRY BY ASSOCIATION. Whenever it is necessary to enter any Unit for the purpose of inspection, including inspection to ascertain a Unit Owner's compliance with the provisions of this Declaration, or for performing any maintenance, alteration or repair to any portion of the Common Elements or Unit, the Unit Owner shall permit an authorized agent, agents or contractor of the Association to enter such Unit, or to go upon the Common Elements PROVIDED, that such entry shall be made only at reasonable times and with reasonable advance notice. In the case of emergency such as, but not limited to, fire or hurricane, entry may be made without notice or permission. Each Unit Owner does hereby appoint the Association as his agent for the purposes herein provided and agrees that the Association shall not be liable for any alleged property damage or theft caused or occurring on account of entry.

12. APPORTIONMENT OF TAX OR SPECIAL ASSESSMENT IF LEVIED OR ASSESSED AGAINST THE CONDOMINIUM PROPERTY.

12.1 RESPONSIBILITY. If any taxing authority levies or assesses any tax or special assessment against the Condominium Property as a whole, and not the individual Units, the same shall be paid as a Common Expense by the Association and assessed to the Unit Owners. In such event, the amount due shall constitute a lien prior to all mortgages and encumbrances upon any Unit to the same extent as though such tax or special assessment had been separately levied by the taxing authority upon each Unit.

12.2 PERSONAL PROPERTY TAXES. All personal property taxes levied or assessed against personal property owned by the Association shall be paid by the Association and shall be a Common Expense.

13. LEASING OF CONDOMINIUM UNITS. The leasing of Condominium Units shall be subject to such reasonable Rules and Regulations as may be established, from time to time, by the Association. The Association shall not have the right, however, to restrict, regulate or determine the period, rent or lessees of any lease of

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a Condominium Unit, except that no Unit may be leased for transient purposes or for a period of less than one (1) month's duration. The Unit Owner shall provide the Association a copy of any lease entered into with respect to his Unit and such reasonable information as the Association requires with respect to the tenants of the Unit. It shall be the responsibility of the lessor of a Condominium Unit to transfer to his lessees all of the Condominium Instruments originally provided to said lessor and to provide in all leases for a Condominium Unit that the lessee shall be bound by the Condominium Instruments and that a breach of the Condominium Instruments by the lessee shall be a breach of the lease. Notwithstanding this paragraph 13, the Lessee shall be bound by the terms of this instrument even though the lessor has failed to comply herewith. None of the provisions of this Paragraph 13 shall apply to any Unit owned, initially or reacquired, by the Declarant or any corporation or entity that is a parent, subsidiary, or affiliate of the Declarant and said firms may lease any such Units as they deem fit (during the period of Declarant's control provided in the By-laws).

14. INSURANCE PROVISIONS. The insurance which shall be purchased and maintained for the benefit of the Condominium shall be governed by the following provisions:

14.1 PURCHASE OF INSURANCE. All insurance purchased pursuant to this Paragraph 14 shall be purchased by the Association for the benefit of the Association, the Unit Owners and their respective mortgagees, as their interest may appear, and shall provide for the issuance of certificates of insurance and mortgagee endorsements to any or all of the holders of first mortgages. The policies shall provide that the insurer waives its rights of subrogation as to any claims against Unit Owners and the Association, their respective servants, agents and guests. Each Unit Owner and the Association hereby agree to waive any claim against each other and against other Unit Owners for any loss or damage for which insurance hereunder is carried where the insurer has waived its rights of subrogation as aforesaid. All Institutional Lenders which hold first mortgages on Units totaling more than $1,000,000.00 shall, if they so request, have the right to reasonably approve the policies and the amount of insurance thereof. In the event the Association fails or refuses to provide the insurance herein provided, said Institutional Lenders shall have the right to pay for same and be subrogated to the lien rights of the Association as herein provided against all the Units in order to recover any such payments.

14.2 COST AND PAYMENT OF PREMIUMS. The cost of obtaining all insurance hereunder, excluding only the insurance as may be purchased by individual Unit Owners, is declared to be a Common Expense, as are any other fees or expenses incurred which may be necessary or incidental to carry out the provisions hereof.

14.3 UNIT OWNER'S RESPONSIBILITY. Each Unit Owner may obtain insurance, at his own expense, affording coverage upon his own property and for his own liability and living expenses as he deems advisable. All such insurance shall contain the same waiver of subrogation referred to herein and shall waive any right to contribution.

14.4 COVERAGE. The following coverage shall be obtained by the Association:

a. The buildings and all other insurable improvements upon the land, including all of the Units as originally constructed, furnished and equipped by Declarant, Common Elements and all personal property owned by the Association shall be insured in an amount equal to the maximum insurable replacement value thereof (exclusive of excavations and foundations) as determined annually by the Association in consultation with the insurance company providing the coverage. Said coverage shall afford protection against loss or

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damage by fire and other hazards, as determined by the Association, including, but not limited to, vandalism, malicious mischief, windstorm, war damage and war risk insurance, if available.

b. Comprehensive general public liability and property damage insurance in such an amount and in such form as shall be required by the Association in limits of not less than $1,000,000.00 for bodily injury or death to any person; not less than $1,000,000.00 for bodily injury or death resulting from any one accident or occurrence, and not less than $1,000,000.00 for property damage. Said coverage shall include, but not be limited to, water damage, legal liability, hired automobile, non-owned automobile, and off-premises employee coverage. All liability insurance shall contain cross liability endorsements to cover liabilities of the Unit Owners as a group to an individual Unit Owner, and one Unit Owner to another.

c. Fidelity insurance or fidelity bond coverage shall be obtained in such an amount and in such form as required by the Association, but in no event shall such coverage be less than the greater of (i) the maximum amount of funds in the Association's custody at any one time, or (ii) the sum of three (3) months assessments on the entire Condominium plus reserves held by the Association. Such coverage shall afford protection against dishonest acts on the part of directors, officers, managers, managing agents, trustees, employees or volunteers responsible for handling funds belonging to, or to be administered by, the Association.

d. Workmen's compensation policies shall be obtained to meet the requirements of law.

e. Such other insurance as the Board of the Association may determine to be necessary from time to time.

14.5 INSURANCE TRUSTEE. All insurance policies purchased in accordance with Paragraph 14.4a shall provide that all proceeds payable to the Association as a result of any insured loss, except those specifically herein excluded, shall be paid to a bank doing business in James City County, Virginia and having trust powers which shall be designated from time to time by the Association as Insurance Trustee, whose appointment is subject to the reasonable approval by the Institutional Lender holding the greatest dollar amount of first mortgages on the Units. The Insurance Trustee shall not be liable for payment of premiums, the renewal of the policies, the sufficiency or content of the policies, or for failure to collect any insurance proceeds. The sole duty of the Insurance Trustee shall be to receive said proceeds, as paid, and to hold the same in trust for the benefit of the Association, the Unit Owners and their respective mortgagees, as follows:

a. Proceeds received on account of damage to Common Elements shall be held for the Units in the same proportion as the share in the Common Elements which is appurtenant to each of the Units.

b. Proceeds on account of damage to the Units shall be held in the following manner in undivided shares:

(1) PARTIAL DESTRUCTION WHEN THE DAMAGE IS TO BE RESTORED: For the benefit of the Unit Owners of the damaged Units in proportion to the cost of restoring the same suffered by each damaged Unit. Upon the request of the Insurance Trustee, the Association shall certify to the Insurance Trustee the appropriate proportions. Each Unit Owner shall be bound thereby and the Insurance Trustee may rely upon said certification.

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(2) TOTAL DESTRUCTION OF A BUILDING WHEN THE DAMAGE IS NOT TO BE RESTORED: For all Unit Owners of the destroyed building, the share of each being in the same proportion as the Unit Owner's undivided share in the Common Elements which is appurtenant to his Unit compared with the other Unit Owners in the destroyed building. In the event a mortgagee endorsement has been issued hereunder, the share of the Unit Owner shall be held in trust for the mortgagee and the Unit Owner as their interests may appear.

14.6 DISTRIBUTION OF PROCEEDS. Proceeds of insurance policies received by the Insurance Trustee shall be distributed to, or for the benefit of, the Unit Owners (after first paying or making provision for payment of the expenses, including a reasonable fee for services rendered, of the Insurance Trustee) in the following manner:

a. If the damage for which the proceeds were paid is to be reconstructed, the proceeds shall be paid to defray the costs thereof. Any proceeds remaining after defraying said costs shall be distributed to the Association.

b. If it is determined that the damage for which the proceeds are paid shall not be reconstructed, the proceeds shall be distributed to the Unit Owners for whom it is being held and their mortgagees as their interests may appear.

c. In making distribution to Unit Owners and their mortgagees, the Insurance Trustee may rely upon a certificate provided by the Association as to the names of the Unit Owners and mortgagees and their respective shares of the distribution. Upon request of the Insurance Trustee the Association shall forthwith deliver said certificate.

14.7 ASSOCIATION AS AGENT. The Association is irrevocably appointed agent for each Unit Owner, for each owner of a mortgage upon a Unit and for each owner of any other interest in the Condominium Property to adjust all claims arising under insurance policies purchased by the Association and to execute and deliver releases upon the payment of claims.

14.8 DETERMINATION TO RECONSTRUCT. If any part of the Condominium Property shall be damaged by casualty the determination as to whether or not it shall be reconstructed shall be made in the following manner:

a. COMMON ELEMENT. If the damage is only to a Common Element the damaged property shall be reconstructed.

b. DAMAGE TO UNITS:

(1) If the damage is to Units and if Units to which more than eighty percent (80%) of the Common Elements are appurtenant are found by the Board of Directors to be untenantable, then the damaged property will not be reconstructed and the Condominium will be terminated unless within sixty (60) days after the casualty Unit Owners owning eighty percent (80%) or more of the Common Elements agree in writing to such reconstruction. Notwithstanding the foregoing, if the damages could be repaired for $1,000,000.00 or less the property shall be reconstructed.

(2) If the damage is to Units, but Units to which twenty percent (20%) or more of the Common Elements are appurtenant are found by the Board of Directors to be tenantable, then reconstruction shall be determined on a building-by-building basis as follows:

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(2.1) If Units in a particular building which represent fifty percent (50%) or more of the Common Elements appurtenant to all the Units in said building are found by the Board of Directors to be tenantable, the damaged property shall be reconstructed unless within sixty (60) days after the casualty the Owners of Units which represent eighty percent (80%) or more of the Common Elements appurtenant to all the Units in said building agree in writing not to reconstruct, in which event the Units in that building shall be removed from the Condominium (without agreement) pursuant to Paragraph 14.16 and 14.17 hereof. Notwithstanding the foregoing, if such property may be reconstructed for $75,000.00 or less, the property shall be reconstructed.

(2.2) If Units in a particular building which represent more than fifty percent (50%) of the Common Elements appurtenant to all the Units in said building are found by the Board of Directors to be untenantable, then said damaged building will not be reconstructed and the Units in the Building will be removed from the Condominium (without agreement) as provided in Paragraph 14.16 and 14.17 hereof, unless within sixty (60) days after the casualty the Owners of Units which represent seventy-five percent (75%) or more of the Common Elements appurtenant to all the Units in said building agree in writing to such reconstruction, PROVIDED, HOWEVER, that notwithstanding the fact that the required number of Units are untenantable, if such property may be reconstructed for $75,000.00 or less, the property shall be reconstructed.

c. CERTIFICATE. The Insurance Trustee may rely upon a certificate of the Association executed by its President or Vice President and Secretary or Assistant Secretary to determine whether or not the damaged property is to be reconstructed or repaired.

14.9 RESPONSIBILITY. If the damage is only to those parts of a Unit for which the responsibility of maintenance and repair is that of the Unit Owner then the Unit Owner shall be responsible for reconstruction after casualty. The Unit shall be repaired immediately. In all other instances, the responsibility of reconstruction after casualty shall be that of the Association.

14.10 NATURE OF RECONSTRUCTION. Any reconstruction included hereunder shall be substantially in accordance with the plans and specifications of the original building, or as the building was last constructed, subject to modification to conform with the then current governmental restrictions and codes, if required, or as may otherwise be agreed upon by the Association and all Institutional Lenders.

14.11 ESTIMATES. In all instances hereunder, immediately after a casualty causing damage to the property for which the Association has the responsibility of maintenance and repair, the Association shall obtain a reliable, detailed estimate of the cost to reconstruct. Such cost may include professional fees and premiums for such bonds as the Board may desire or those required by any Institutional Lender involved.

14.12 ASSESSMENTS. If the proceeds of insurance are not sufficient to defray the estimated costs of reconstruction by the Association, or if, at any time during reconstruction or upon completion of reconstruction, the funds for the payment of the costs of reconstruction are insufficient, assessments shall be made against all Unit Owners in sufficient amounts to provide funds for the payment of such costs. Such assessments against Unit Owners for damage to Units shall be in proportion to the cost of reconstruction of their respective Units. Such assessments on account of damage to Common Elements shall be in proportion to the Unit

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Owner's share in the Common Elements. If, prior to commencement of any reconstruction, the insurance proceeds are not sufficient to defray the estimated costs of reconstruction, the special assessments against Unit Owners as herein provided must be paid in full before any of said insurance proceeds may be disbursed as hereinafter provided, so as to ensure there are sufficient funds currently available to complete said reconstruction. This requirement may be waived by the Association, but only upon approval by all Institutional Lenders.

14.13 DISPOSITION OF PROCEEDS. The proceeds of insurance and any special assessments, if any, collected on account of a casualty and deposited with the Insurance Trustee by the Association shall constitute a construction fund which shall be disbursed in payment of the costs of reconstruction in the following manner:

a. That portion of insurance proceeds representing damage for which the responsibility of reconstruction lies with the Unit Owner: to such contractors, suppliers, and personnel for work done, materials supplied or services required for such reconstruction. Payments shall be in such amounts and at such times as the Unit Owners may direct, or if there is a mortgagee endorsement, to such payee as the Unit Owner and the mortgagee direct. Nothing contained herein shall be construed to limit or modify the responsibility of the Unit Owner to make such reconstruction.

b. If the amount of the estimated cost of reconstruction is less than $25,000.00, and is the responsibility of the Association: The construction fund shall be disbursed directly to the Association in payment of such costs and upon the Association's order, provided, however, that upon the request of a mortgagee which is a beneficiary of the insurance policy, the construction fund shall be disbursed as the Association and such mortgagee may properly direct.

c. If the amount of the estimated cost of reconstruction is more than $25,000.00, and is the responsibility of the Association, then the reconstruction funds shall be applied by the Insurance Trustee to the payment of such costs and shall be paid for the account of the Association, from time to time, as the work progresses. Said Trustee shall make payments upon the written request of the Association accompanied by an appropriate certificate signed by both an officer of the Association and by the architect or engineer in charge of the work, setting forth:

(1) That the sum then requested either has been paid by the Association or is justly due and certifying that the sum requested does not exceed the value of the services and materials described in the certificate.

(2) That except for the amounts stated in said certificate to be due as aforesaid, there is no outstanding indebtedness known which may become the basis of vendor's, mechanic's or materialman's liens.

(3) That the cost, as estimated, or work remaining to be done subsequent to the date of said certificate, does not exceed the amount of funds remaining in the hands of the Insurance Trustee after the payment of the sum so requested.

d. It shall be presumed that the first monies disbursed in payment of such costs of reconstruction shall be from insurance proceeds and shall first be applied to reconstruction of the Common Elements and then to the Units. If there is a balance in a construction fund after the payment of all costs of reconstruction, said balance shall be distributed to the Association.

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e. Payment for any reconstruction made under Subparagraphs a., b. and c. of this Paragraph shall be made by the Insurance Trustee and the Unit Owner, or the Association, only upon presentation of bills for materials in place, and upon supplying or furnishing labor, services and materials or work covered and included in such statements for which failure to pay might result in a lien on the Common Elements.

14.14 EFFECT OF MORTGAGEE ENDORSEMENTS CONCERNING INSURANCE PROCEEDS. In the event a mortgagee endorsement has been issued relative to any Unit, the share of the Unit Owner shall be held in trust for the mortgagee as heretofore provided; provided, however, that no mortgagee shall have the right to determine or participate in the determination whether the damaged property shall be reconstructed, and no mortgagee shall have the right to apply, or have applied to, the reduction of its mortgage debt any insurance proceeds except distributions of such proceeds made to the Unit Owner and mortgagee where the responsibility for reconstruction is that of the Unit Owner. All mortgagees agree to waive the rights to said proceeds if the same are used pursuant to the provisions of this Declaration to pay for the restoration of such damage. The provisions hereof shall not effect the rights of the mortgagee, if any, to require any surplus proceeds to be distributed to it, over and above the amounts actually used for such restoration. All covenants contained herein for the benefit of any mortgagee may be enforced by such mortgagee. Nothing contained herein, however, shall be construed as relieving the Unit Owner from his duty to reconstruct damage to his Unit as heretofore provided.

14.15 AUTHORITY OF ASSOCIATION. In all instances herein, except when a vote of the membership of the Association or of a particular building is specifically required, all decisions, duties and obligations of the Association hereunder may be made by the Board. The Association and its members shall jointly and severally be bound thereby.

14.16 REPAIR OF LAND. In the event, pursuant to the provisions of Paragraph 14.8.b, the Condominium is not terminated but a building is not to be restored, the remains of said building shall be razed and the land thereunder restored to a landscaped green area at the sole prorata expense of the Unit Owners who own Units in said building. The expense thereof may be deducted from any insurance proceeds payable on account of casualty to said building.

14.17 CONVEYANCE TO ASSOCIATION. In the event, pursuant to the provisions of Paragraph 14.8.b. hereof, the Condominium is not terminated but a building is not to be restored, the payment of any insurance funds to the Unit Owners and/or their Mortgagees of said building on account of casualty to said building, shall be contingent upon such Unit Owners' conveying by Quit-claim Deed, executed in recordable form, all Units in said building to the Association, and further contingent upon the mortgagees thereof executing Deeds of Release, in recordable form, for all mortgages encumbering Units in said building. The share of Common Expenses of said Units conveyed to the Association shall be a Common Expense to be shared by the remaining Unit Owners of the Condominium. Since said remaining Unit Owners will not own one hundred percent (100%) of the Common Elements due to the fact that the Association will own the Units of said building which are not restored, and in order to collect said Common Expenses attributable to the Units owned by the Association, there shall be added as a Common Expense an amount entitled "Common Expenses of Association's Units" which shall be mathematically determined to equal an amount such that when added to the actual expenses and assessments of the Association, the amount to be collected from the remaining Unit Owners according to their percentage of Common Expense equals said actual expenses and assessments.

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15. ASSESSMENTS; LIABILITY, LIEN AND ENFORCEMENT.

15.1 GENERAL AUTHORITY. The Association shall have the power to make, levy and collect regular and special assessments for Common Expenses and such other assessments as are provided for by the Condominium Act and the provisions of this Declaration and all other expenses declared by the Directors of the Association to be Common Expenses from time to time.

15.2 UNIT OWNER'S GENERAL LIABILITY. Except as herein specified to the contrary, all assessments levied against Unit Owners and Units shall be on an equal basis. Should the Association be the owner of any Unit(s), the assessment, which would otherwise be due and payable to the Association by the owner of such Unit(s), shall be a Common Expense.

15.3 WATER AND SEWER ASSESSMENT. James City County and the local Sanitation District will bill the Association for all water and sewer usage of the Condominium. Each Unit will be sub-metered by the Association for water and sewer usage and the Association will bill each Unit Owner directly on a monthly or such other periodic basis as the Association determines for such Unit's actual usage of water and sewer services and for a processing charge. Such billing shall constitute a special assessment against the Unit and Unit Owner and the Unit Owner's obligation for such special assessment shall be the same as the assessment of the Unit Owner for Common Expenses provided herein.

15.4 PAYMENT. The assessment levied against the Unit Owner and his Unit shall be payable in such installments, and at such times, as may be determined by the Board of Directors of the Association.

15.5 EMERGENCIES. If assessments levied are, or may prove to be insufficient to pay the costs of operation and management of the Condominium, or in the event of emergencies, the Board of Directors shall have the authority to levy such additional assessment or assessments as it shall deem necessary.

15.6 RESERVES.

a. RESERVE FUND. The Board of Directors of the Association in assessing for Common Expenses shall include therein a sum to be collected as a reserve fund for replacement of Common Elements for the purpose of enabling the Association to replace structural elements and mechanical equipment for which it has the responsibility to maintain and repair, as well as the replacement of personal property which may be a portion of the Condominium Property.

b. OPERATING RESERVE FUND. The Board of Directors of the Association in assessing for Common Expenses may include therein a sum to be collected and maintained as a general operating reserve which shall be used to provide a measure of financial security during periods of special stress. Such sums may be used to meet deficiencies from time to time existing as a result of delinquent payment of assessment by Unit Owners or as a result of emergencies.

15.7 SEPARATE PROPERTY. All monies collected by the Association shall, unless the same is collected for the benefit of others, be the separate property of the Association. Such monies may be applied by the Association to the payment of any expense of operating and managing the Condominium Property, or to the proper undertaking of all acts and duties imposed upon it by virtue of the provisions of this Declaration. All monies received from assessments may be commingled with other monies held by the Association. All assessments received by the Association shall be for the benefit of the Unit Owners. No Unit Owner shall have the right to assign, hypothecate, pledge or in any manner transfer his interest

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therein, except as an appurtenance to his Unit. Such funds shall not be subject to attachment or levy by a creditor or judgment creditor of a Unit Owner. When the owner of a Unit shall cease to be a member of the Association by the divestment of his ownership of such Unit by whatever means the Association shall not be required to account to such owner for any share of the funds or assets of the Association.

15.8 DEFAULT. The payment of any assessment or installation thereof due to the Association shall be in default if such payment is not paid to the Association when due. In the event that any Unit Owner is in default in payment of any assessments or installments thereof, owed to the Association, said Unit Owner shall be liable for all costs of collecting the same, including reasonable attorney's fees and court costs.

15.9 NO WAIVER. No Unit Owner may exempt himself from liability for any assessment levied by waiver of the use or enjoyment of any of the Common Elements or by abandonment of the Unit for which the assessments are made or in any other manner.

15.10 LIEN. The Association is hereby granted a lien upon each Condominium Unit, together with a lien on all tangible personal property located within said Unit (except that such lien upon the aforesaid tangible personal property shall be subordinate to prior bona fide liens of record), which lien shall secure the payment of monies from each Unit Owner for which he is liable to the Association, including all assessments, interest and expenses provided for in this Declaration and sums advanced on behalf of the Unit Owner in payment of his obligations as set forth in the Condominium Instruments and reasonable attorney's fees incurred as an incident to the enforcement of said lien. The lien granted to the Association may be foreclosed as provided in the Condominium Act. The lien granted to the Association shall further secure such advances for taxes and payments on accounts of Institutional Lenders, liens or encumbrances which may be advanced by the Association in order to preserve and protect its lien. The lien shall be effective, have priority, and be collected as provided by the Condominium Act, unless, by the provisions of this Declaration, such liens would have a greater priority or dignity, in which event, the lien rights in favor of the Association having the highest priority and dignity shall be the lien of the Association.

15.11 LATE CHARGE. If any monies from a Unit Owner, including assessments, are not paid within ten days from their due date there shall automatically be assessed a late charge of $10.00 for each thirty days during which such monies are not paid. Each monthly assessment or other sum due from a Unit Owner shall be considered a different obligation for the purposes of this paragraph.

15.12 PROVISO. In the event that any person or Institutional Lender shall acquire title to any Unit by virtue of either foreclosure of a first mortgage or deed of trust, or a deed in lieu thereof, such acquirer of title, his successors and assigns, shall not be liable for the share of Common Expenses or assessments by the Association pertaining to the Condominium Unit or chargeable to the former Unit Owner to the Unit which became due prior to acquisition of title as a result of the foreclosure, unless the share is secured by a claim of lien for assessments that is recorded prior to the recording of the foreclosed mortgage or deed of trust. Nothing herein contained shall be construed as releasing the party liable for such delinquent assessments from the payment thereof or the enforcement of collection of such payment by means other than foreclosure. Following said acquisition, all Unit Owners of any nature, including, without limitation, a purchaser at a judicial sale or Institutional Lender, shall be liable for all assessments coming due while they are Unit Owners.

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15.13 CERTIFICATE OF STATUS OF ASSESSMENTS. Any Unit Owner, mortgagee or lienor may require the appropriate certificate as set forth in Section 55-79.84(h) of the Condominium Act. The Association may charge a fee for such certificate as allowed by the Condominium Act.

15.14 EVIDENCE OF ASSESSMENTS PAID. Any person who acquires an interest in a Unit, including acquisition through foreclosure of a first mortgage, deed of trust or by deed in lieu thereof, and including without limitation, persons acquiring title by operation of law, may request the certificate as set forth in Section 55-79.84(h) of the Condominium Act as evidence of the status of unpaid assessments levied against the Unit, and such statement shall be binding upon the Association and all Unit Owners. The personal obligation for delinquent assessments shall not pass to successors in title or interest unless assumed by them or required by law.

15.15 NO ELECTION OF REMEDIES. The institution of a suit at law for collection of any delinquent assessment may be maintained without waiving the lien securing the same. Proceeding by foreclosure to attempt to effect such collection shall not be deemed an election precluding the institution of suit at law for collection of the same. All Unit Owners do hereby waive pleading the theory of "elections of remedies" in any such proceedings.

15.16 LIENS--MECHANICS. The creation and enforcement of mechanic's, and other, liens against the Units and Condominium Property, except those created by this Declaration, shall be governed by the provisions of the Condominium Act and the laws of the Commonwealth of Virginia.

16. TERMINATION. The Condominium may be terminated in the following manner:

16.1 DESTRUCTION. If it is determined because of the circumstances and in the manner provided in Paragraph 14 that the Condominium Property shall not be reconstructed, the Condominium will be terminated.

16.2 AGREEMENT. The Condominium may be terminated at any time by the approval in writing of all Unit Owners and all record owners of mortgages on Units.

If the proposed termination is submitted to a meeting of the Association, and if the approval of the owners of not less than eighty percent (80%) of the Common Elements and their Institutional Lenders is obtained, in writing, not later than sixty (60) days from the date of such meeting, then the approving Unit Owners (through the Association), shall have the option to buy all of the Units of the disapproving Unit Owners for the period of one hundred twenty (120) days from the date of such meeting. The vote of those Unit Owners approving the termination shall be irrevocable until the expiration of the option. Any Unit Owner voting against termination, or not voting, may, within fifteen (15) days from the date the vote was taken, change or cast his vote in favor of termination by delivering written notification thereof to the Secretary of the Association. The option shall be upon the following terms:

a. EXERCISE OF OPTION. The option shall be exercised by delivery, or the mailing by registered mail, of an agreement to purchase, signed by the Association, to each of the Unit Owners of the Units voting against termination. The agreement shall be subject to the purchase of all Units owned by Unit Owners not approving the termination.

b. PRICE. The sale price for each Unit shall be the fair market value as determined between the Unit Owner and the Association within thirty (30) days from the delivery of said agreement. In the absence of agreement on the price of any

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Unit, the price shall be determined by an appraiser appointed by the Chairman of the local Board of Realtors. A judgment of specific performance of the sale, at the price determined by the appraiser, may be entered in any court of competent jurisdiction.

c. PAYMENT. The purchase price shall be paid in cash.

d. FORM. The contract shall be in the form of the Contract for Sale and Purchase then in use in Williamsburg, Virginia.

e. CLOSING. The sale of all Units shall be closed simultaneously and within thirty (30) days following the determination of the sale price of the last Unit to be purchased.

16.3 CERTIFICATE. The termination of the Condominium shall be evidenced by a certificate of the Association executed by its President and Secretary certifying the fact of the termination, which shall become effective upon the certificate being recorded in the Public Records.

16.4 SHARES OF OWNERS AFTER TERMINATION. After termination of the Condominium the Unit Owners shall own the Condominium Property and all assets of the Association as tenants in common of undivided shares that shall be equal to the sum of the undivided shares in the Common Elements appurtenant to the Units prior to termination so that the sum total of the ownership shall equal one hundred percent (100%).

16.5 EXCLUSIVE RIGHTS EXTINGUISHED BY TERMINATION. All exclusive rights of use of Common Elements shall be extinguished by virtue of the termination of the Condominium.

16.6 AMENDMENT. This Paragraph 16 concerning termination cannot be amended without written consent of all Unit Owners and all record owners of mortgages upon the Units.

17. AMENDMENTS. Except as herein or elsewhere provided, this Declaration may be amended in the following manner:

17.1 NOTICE. Notice of the subject matter of a proposed amendment shall be included in the notice of any meeting at which a proposed amendment is to be considered.

17.2 PROPOSAL OF AMENDMENT. An amendment may be proposed by either a sixty-six and two thirds percent (66-2/3%) vote of the entire Board of Directors of the Association, or by a sixty-six and two thirds percent (66-2/3%) vote of the members at a duly called and noticed meeting. Directors and members not present in person or by proxy at the meeting considering the amendment may express their approval in writing, provided such approval is delivered to the Secretary within ten (10) days after the meeting. Except as elsewhere provided, a resolution adopting the proposed amendment must be approved by either:

a. Not less than sixty-six and two thirds percent (66-2/3%) of the entire membership of the Board of Directors and by not less than sixty-six and two thirds percent (66-2/3%) of the votes of the entire membership of the Association; or,

b. Not less than ninety percent (90%) of the votes of the entire membership of the Association; or,

c. Until the first election of a majority of the directors by members of the membership other than Declarant, by all of the Directors.

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17.3 OMISSION OR ERROR. Whenever it shall appear that there is an omission or error in the Condominium Instruments the correction of which would not materially or adversely affect the property rights of any Unit Owners, the Condominium Instruments may be amended in the following manner: Such amendment may be proposed by the Board of Directors at any duly called and noticed regular or special meeting of the Board and shall become effective when unanimously approved by the entire Board. In the event the property rights of any Unit Owners are materially or adversely affected, the error or omission may be adopted in this manner if such affected Unit Owner(s) joins in the execution of the Certificate of Amendment to be recorded. In addition, the Condominium Instruments may be amended by the Declarant unilaterally pursuant to and in accordance with Section 55-79.71.F. of the Condominium Act.

17.4 PROVISO.

a. Except as otherwise provided in this document, no amendment shall alter a Unit Owner's percentage in the Common Elements, alter his proportionate share in the Common Expense or Common Surplus, change a Unit Owner's voting rights, or alter the basis for apportionment of assessment which may be levied by the Association against a Unit Owner without the written consent of the Unit Owner.

b. No amendment shall be passed which shall impair or prejudice the rights and priorities of any Institutional Lender without the written consent of the Institutional Lender affected.

c. No material amendment shall be passed without the prior written approval of the Institutional Lender having the maximum number of first mortgages on Condominium Units in the Condominium as provided in Paragraph 14.7 of the By-laws.

18. REMEDIES.

18.1 RELIEF. Each Unit Owner and the Association shall be governed by and shall comply with the provisions of the Condominium Instruments as they may exist from time to time. A violation thereof shall entitle the appropriate party to the following relief: An action to recover sums due for damages, injunctive relief, foreclosure of lien or any combination thereof, or any other action available pursuant to the Condominium Act or law. Suit may be sought by the Association, the managing agent, if any, Declarant, or, if appropriate, by one or more Unit Owners, and the prevailing party shall be entitled to recover reasonable attorney's fees. Each Unit Owners acknowledges that the failure to comply with any of the provisions of the Condominium Instruments shall or may constitute an injury to the Association, the managing agent, if any, Declarant or the other Unit Owners, and that such injury may be irreparable.

18.2 COSTS AND ATTORNEY'S FEES. In any proceeding arising because of an alleged default, act, failure to act, or violation by the Unit Owner or Association, including the enforcement of any lien granted pursuant to this Instrument or its exhibits, the Association, the managing agent, if any, or the Declarant, whichever is appropriate, shall be entitled to recover the costs of the proceedings, including reasonable attorney's fees. In any action by or against Declarant, where Declarant is the prevailing party, arising out of or concerning the Condominium Instruments or Declarant's obligations thereunder, Declarant shall be entitled to recover all costs of the proceedings, including reasonable attorney's fees at all levels including the trial and appellate level.

18.3 NO WAIVER. The failure of Association, the managing agent, if any, a Unit Owner, or the Declarant to enforce any right,

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provision, covenant, or condition created or granted by the Condominium Instruments shall not constitute a waiver of the right of said party to enforce such right, provision, covenant or condition in the future.

18.4 RIGHTS CUMULATIVE. All rights, remedies and privileges granted to Association, the managing agent, if any, Declarant, or Unit Owner pursuant to any of the provisions of this Declaration shall be deemed to be cumulative and the exercise of any one or more shall not be deemed to constitute an election of remedies, nor shall it preclude the party thus exercising the same from exercising such other and additional rights, remedies, or privileges as may be available to such party at law or in equity. Each Unit Owner agrees in any proceeding brought pursuant to the provisions hereof not to plead or defend the same on the theory of "election of remedies".

18.5 VENUE; WAIVER OF TRIAL BY JURY. Every Unit Owner or Occupant and all persons claiming any interest in a Unit does agree that in any suit or proceeding brought pursuant to the provisions of this Declaration, such suit shall be brought in the Circuit Court in and for the City of Virginia Beach, Virginia, as the same is now constituted or any court in the future that may be the successor to the court contemplated herein. All such parties do further waive the right to trial by jury and consent to a trial by the court without a jury.

18.6 APPOINTMENT OF AGENT; PROVISO. Should suit be instituted, the Unit Owners or Occupants do hereby irrevocably appoint the Secretary of the Commonwealth of Virginia as their Agent for the acceptance of service of process should, at the time of such service of process, any such person not be residing in this Condominium and if service cannot be accomplished in any other reasonable fashion. The provisions hereof shall not be applicable to service upon the Declarant.

19. MISCELLANEOUS RIGHTS OF DECLARANT.

19.1 CONFLICT OF INTERESTS. No representatives of the Declarant serving on the Board of Directors of the Association shall be required to disqualify himself upon any vote upon any management contract, lease, or other matter between the Declarant, or managing agent, if any, and the Association where Declarant, or managing agent, if any, may have a pecuniary or other interest. Declarant, as a member of Association, shall not be required to disqualify itself in any vote which may come before the membership of the Association upon any management contract, lease, or other matter where Declarant may have a pecuniary or other interest, nor shall any conflict of interests be a cause of partial or total invalidity of the matter voted upon whether or not such vote was necessary for the adoption, ratification, or execution of the same.

19.2 RIGHT TO USE FACILITIES. Notwithstanding any provisions of this Declaration to the contrary, the Declarant shall have the right to use and occupy any, all, or any number of unsold Units and the Common Elements, the exclusive use of which have not been assigned, for the purpose of a Sales Office, Model Unit, or for any other purpose. Until the Declarant has conveyed the last Unit in the Condominium, or Units in other condominiums in the area developed by Declarant, the Declarant shall not be subject to the use or other restrictions contained in any of the provisions of this Declaration or Exhibits attached hereof. Notwithstanding this paragraph, Declarant must pay assessments on Units owned by Declarant, just like any other Unit Owner.

20. NOTICES. Whenever notices are required to be sent hereunder, the same may be delivered to Unit Owners, either personally or by mail, at their place of residence in the Condominium. Notices to the Association shall be delivered or mailed to the Secretary of

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the Association, or in case of the Secretary's absence, then to the President of the Association.

Notices to the Declarant shall be made by delivery to Declarant at: 620 Village Drive, Suite E, Virginia Beach, Virginia 23454.

21. CONSTRUCTION. All of the provisions of this Declaration shall be construed in accordance with the Laws of the Commonwealth of Virginia.

22. GENDER. Unless the contrary appears to have been intended, words in the plural number shall include the singular and words in the singular shall include the plural, and words of the male gender shall include the female gender and the neuter gender.

23. CAPTIONS. The captions to the paragraphs of this Declaration are intended for convenience only and are not deemed to be all inclusive as to the matters contained in such paragraphs or considered in connection with the construction of any of the provisions of this Declaration.

24. SEVERABILITY. If any term or provision of this Declaration, or the application thereof to any person or circumstance, shall, to any extent, be determined to be invalid or unenforceable, the remainder of this Declaration, or the application of such term or provision to persons or circumstances other than those to which such term may be held invalid or unenforceable, shall not be affected thereby and each term and provision of this Declaration shall be valid and enforceable to the fullest extent permitted by law.

25. ASSIGNMENT. The Declarant may, upon conveyance of all or a portion of the Units it owns and/or all or a portion of the Additional Land, prior or subsequent to any such conveyance, designate the grantee thereof as a successor Declarant or Declarant who shall then be deemed to have all rights granted and reserved to Declarant herein.

26. DECLARANT'S MORTGAGEE. Any person or entity which holds a mortgage executed by Declarant, either prior to or subsequent to the recordation of this Declaration, encumbering any part or all of the Condominium Property, shall be deemed to be an Institutional Lender for the purposes of this Declaration and shall have all rights and privileges appertaining thereto.

IN WITNESS WHEREOF, the Declarant has executed this Declaration on this 20th day of December, 1996.

UNIVERSITY SQUARE ASSOCIATES,
a Virginia general partnership

By: MARKET PLANNERS ASSOCIATES, INC.,
a Virginia corporation,
General Partner

By: _____
Frank R. Spadea, President

By: CENTER DEVELOPMENT OF
WILLIAMSBURG, INC.,
a Virginia corporation,
General Partner

By: _____
Calvin M. Davis, Jr.,
President

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STATE OF VIRGINIA
CITY OF VIRGINIA BEACH, to-wit:

I, TANA H. HOLLAND, a Notary Public in and for the City and State aforesaid, do hereby certify that FRANK R. SPADEA, President of MARKET PLANNERS ASSOCIATES, INC., a Virginia corporation, General Partner of UNIVERSITY SQUARE ASSOCIATES, a Virginia general partnership, whose name as such is signed to the foregoing Declaration bearing date on the 20th day of December, 1996, has acknowledged the same before me in my City and State aforesaid.

GIVEN under my hand this 20th day of December, 1996.

Tana H. Holland
Notary Public

My commission expires: 9/30/99

STATE OF VIRGINIA
CITY OF VIRGINIA BEACH, to-wit:

I, TANA H. HOLLAND, a Notary Public in and for the City and State aforesaid, do hereby certify that CALVIN M. DAVIS, President of CENTER DEVELOPMENT OF WILLIAMSBURG, INC., a Virginia corporation, General Partner of UNIVERSITY SQUARE ASSOCIATES, a Virginia general partnership, whose name as such is signed to the foregoing Declaration bearing date on the 20th day of December, 1996, has acknowledged the same before me in my City and State aforesaid.

GIVEN under my hand this 20th day of December, 1996.

Tana H. Holland
Notary Public

My commission expires: 9/30/99

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EXHIBIT A

SUBMITTED LAND

ALL THAT certain lot, piece, or parcel of land, lying, situate and being in James City County, Virginia, with the improvements thereon and appurtenances thereunto belonging, which said parcel of land is more particularly depicted and described as "PHASE ONE TOTAL AREA = 7.127 AC. or 310,441 SQ. FT." on that certain plat entitled "EXHIBIT #1 PHASE ONE LAFONTAINE CONDIMINIUMS AT WILLIAMSBURG CROSSING PHASE ONE FOR THE FRANCISCUS COMPANY JAMESTOWN DISTRICT JAMES CITY COUNTY, VIRGINIA" which said plat is attached to the Declaration as "Exhibit #1" and is to be recorded herewith and with reference to which said property being more particularly described as follows:

BEGIN at a point in the western line of the right of way of Kings Way, which said point is the intersection of the property line between Parcel 6 (P.B. 52, PG. 78) as shown on the aforesaid plat and the property herein depicted with the western line of the right of way of Kings Way, and from said Point of Beginning thence running S0°14'53"W 177.06 feet; thence N89°45'07"W 94.94 feet; thence S41°21'00"W 110.55 feet; thence S48°39'00"E 60.00 feet; thence S41°21'00"W 116.16 feet; thence S48°39'00"E 111.00 feet; thence S41°21'00"W 150.57 feet; thence along a curve to the right having a radius of 282.00 feet 161.60 feet; thence S18°08'57"E 45.11 feet; thence N71°51'03"E 91.88 feet; thence along a curve to the left having a radius of 50.00 feet 6.66 feet; thence N64°13'04"E 42.16 feet; thence along a curve to the left having a radius of 25.00 feet 5.13 feet; thence along a curve to the left having a radius of 655.00 feet 44.28 feet; thence along a curve to the left having a radius of 25.00 feet 4.86 feet; thence S78°35'34"W 44.75 feet; thence along a curve to the left having a radius of 50.00 feet 5.88 feet; thence S71°51'03"W 92.27 feet; thence S18°08'57"E 118.94 feet; thence N71°51'03"E 117.00 feet; thence N58°11'50"E 47.99 feet; thence along a curve to the left having a radius of 655.00 feet 147.97 feet; thence S50°44'00"W 517.51 feet; thence N48°49'53"W 143.67 feet; thence N48°44'37"W 192.99 feet; thence N48°41'32"W 2.96 feet; thence N41°21'00"E 101.47 feet; thence S48°39'00"E 3.00 feet; thence N41°21'00"E 32.33 feet; thence N48°39'00"W 5.67 feet; thence N41°21'00"E 25.17 feet; thence N48°39'00"W 4.67 feet; thence N48°39'00"W 103.67 feet; thence S41°21'00"W 104.00 feet; thence N48°39'00"W 15.00 feet; thence along a curve to the left having a radius of 3.00 feet 4.71 feet; thence S41°21'00"W 2.06 feet; thence N48°43'28"W 24.00 feet; thence N41°21'00"E 2.09 feet; thence along a curve to the left having a radius of 3.00 feet 4.71 feet; thence N48°39'00"W 15.00 feet; thence N41°21'00"E 108.76 feet; thence N48°39'00"W 99.00 feet; thence N41°21'00"E 15.00 feet; thence along a curve to the left having a radius of 3.00 feet 4.71 feet; thence N48°39'00"W 6.00 feet; thence N41°21'00"E 24.00 feet; thence S48°39'00"E 6.00 feet; thence along a curve to the left having a radius of 3.00 feet 4.71 feet; thence N41°21'00"E 15.00 feet; thence S48°39'00"E 99.00 feet; thence N41°21'00"E 245.00 feet; thence N48°39'00"W 97.00 feet; thence N41°21'00"E 15.00 feet; thence along a curve to the left having a radius of 3.00 feet 4.71 feet; thence N41°21'00"E 24.00 feet; thence S48°39'00"E 88.00 feet; thence along a curve to the left having a radius of 20.00 feet 2.00 feet; thence N41°21'00"E 108.23 feet; thence N48°39'00"W 128.90 feet; thence along a curve to the left having a radius of 20.00 feet 2.00 feet; thence S41°21'00"W 85.78 feet; thence N48°39'00"W 24.21 feet; thence N41°21'00"E 0.41 feet; thence along a curve to the left having a radius of 3.00 feet 4.71 feet; thence N48°39'00"W 14.79 feet; thence N41°21'00"E 93.45 feet; thence N48°39'00"W 126.00 feet; thence N41°21'00"E 15.00 feet; thence along a curve to the left having a radius of 3.00 feet 4.71 feet; thence N48°39'00"W 6.00 feet; thence N41°21'00"E 24.00 feet; thence S48°39'00"E 6.00 feet; thence along a curve to the left having a radius of 3.00 feet 4.71 feet; thence N41°21'00"E 15.00 feet; thence S48°39'00"E 126.00 feet; thence N41°21'00"E 118.00 feet; thence N31°48'58"W 97.42 feet; thence N58°11'02"E 15.00 feet; thence along a curve to the left having a radius of 3.00 feet 4.71 feet; thence N31°48'58"W

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6.00 feet; thence N58°11'02"E 12.00 feet; thence N31°48'58"W 24.97 feet; thence along a curve to the right having a radius of 957.73 feet 165.00 feet; thence along a curve to the right having a radius of 273.50 feet 95.93 feet; thence S45°16'50"E 14.01 feet to a point, the POINT OF BEGINNING.

LESS AND EXCEPT that certain lot, piece or parcel of land included within the bounds of the above described property which is denoted as "Additional Land" on the above referenced plat, which said parcel is shown on sheet number 2 of the above plat, and with reference to which said excepted property being more particularly described as follows:

BEGIN at a point in the southern corner of the intersection of Queens Way and Queens Crossing as shown on the plat, and from said point of beginning thence running along a curve to the right having a radius of 222.00 feet 119.65 feet; thence S18°08'57"E 152.05 feet; thence S7°51'03"W 104.50 feet; thence S18°08'57"E 0.78 feet; thence N61°29'38"W 19.67 feet; thence N18°08'57"W 80.42 feet; thence S41°21'00"W 26.37 feet; thence N48°39'00"W 3.00 feet; thence S41°21'00"W 61.50 feet; thence N48°39'00"W 101.33 feet; thence N41°21'00"E 249.76 feet to a point, the POINT OF BEGINNING.

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EXHIBIT B

ADDITIONAL LAND

All that certain lot, piece or parcel of land, with the easements and appurtenances thereto, situate in James City County, Virginia, designated and shown as "ADDITIONAL LAND AREA = 6.336 AC. or 276,021 SQ. FT." on that certain plat entitled "EXHIBIT #1 PHASE ONE LAFONTAINE CONDIMINIUMS AT WILLIAMSBURG CROSSING PHASE ONE FOR THE FRANCISCUS COMPANY JAMESTOWN DISTRICT JAMES CITY COUNTY, VIRGINIA" which said plat is attached to the Declaration as "Exhibit #1" and is to be recorded herewith and with reference to which said property being more particularly described as follows:

All that certain parcel of land, with the easements and other appurtenances thereto, situate in James City County, Virginia, known and designated as PARCEL 12 on that certain "PLAT OF PARCEL 12 WILLIAMSBURG CROSSING BEING A SUBDIVISION OF THE RESIDUAL PARCEL JAMES CITY COUNTY, VIRGINIA", dated 5/18/93, Scale: 1" = 200', prepared by Langley and McDonald, P.C., duly of record in the Clerk's Office of the Circuit Court of James City County, Virginia in Plat Book 57, page 77, reference to which is hereby made for a more particular description of said property.

LESS AND EXCEPT ALL THAT certain lot, piece, or parcel of land, lying, situate and being in James City County, Virginia, with the improvements thereon and appurtenances thereunto belonging, which said parcel of land is more particularly depicted and described as "PHASE ONE TOTAL AREA = 7.127 AC. or 310,441 SQ. FT." on that certain plat entitled "EXHIBIT #1 PHASE ONE LAFONTAINE CONDIMINIUMS AT WILLIAMSBURG CROSSING PHASE ONE FOR THE FRANCISCUS COMPANY JAMESTOWN DISTRICT JAMES CITY COUNTY, VIRGINIA" which said plat is attached to the Declaration as "Exhibit #1" and is to be recorded herewith and with reference to which said property being more particularly described as follows:

BEGIN at a point in the western line of the right of way of Kings Way, which said point is the intersection of the property line between Parcel 6 (P.B. 52, PG. 78) as shown on the aforesaid plat and the property herein depicted with the western line of the right of way of Kings Way, and from said Point of Beginning thence running S0°14'53"W 177.06 feet; thence N89°45'07"W 94.94 feet; thence S41°21'00"W 110.55 feet; thence S48°39'00"E 60.00 feet; thence S41°21'00"W 116.16 feet; thence S48°39'00"E 111.00 feet; thence S41°21'00"W 150.57 feet; thence along a curve to the right having a radius of 282.00 feet 161.60 feet; thence S18°08'57"E 45.11 feet; thence N71°51'03"E 91.88 feet; thence along a curve to the left having a radius of 50.00 feet 6.66 feet; thence N64°13'04"E 42.16 feet; thence along a curve to the left having a radius of 25.00 feet 5.13 feet; thence along a curve to the left having a radius of 655.00 feet 44.28 feet; thence along a curve to the left having a radius of 25.00 feet 4.86 feet; thence S78°35'34"W 44.75 feet; thence along a curve to the left having a radius of 50.00 feet 5.88 feet; thence S71°51'03"W 92.27 feet; thence S18°08'57"E 118.94 feet; thence N71°51'03"E 117.00 feet; thence N58°11'50"E 47.99 feet; thence along a curve to the left having a radius of 655.00 feet 147.97 feet; thence S50°44'00"W 517.51 feet; thence N48°49'53"W 143.67 feet; thence N48°44'37"W 192.99 feet; thence N48°41'32"W 2.96 feet; thence N41°21'00"E 101.47 feet; thence S48°39'00"E 3.00 feet; thence N41°21'00"E 32.33 feet; thence N48°39'00"W 5.67 feet; thence N41°21'00"E 25.17 feet; thence N48°39'00"W 4.67 feet; thence N48°39'00"W 103.67 feet; thence S41°21'00"W 104.00 feet; thence N48°39'00"W 15.00 feet; thence along a curve to the left having a radius of 3.00 feet 4.71 feet; thence S41°21'00"W 2.06 feet; thence N48°43'28"W 24.00 feet; thence N41°21'00"E 2.09 feet; thence along a curve to the left having a radius of 3.00 feet 4.71 feet; thence N48°39'00"W 15.00 feet; thence N41°21'00"E 108.76 feet; thence N48°39'00"W 99.00 feet; thence N41°21'00"E 15.00 feet; thence along a curve to the left having a radius of 3.00 feet 4.71 feet; thence N48°39'00"W 6.00 feet; thence N41°21'00"E 24.00 feet; thence S48°39'00"E 6.00 feet; thence along a curve to the left having a radius of 3.00 feet

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LESS AND EXCEPT that certain lot, piece or parcel of land included within the bounds of the above described property which is denoted as "Additional Land" on the above referenced plat, which said parcel is shown on sheet number 2 of the above plat, and with reference to which said excepted property being more particularly described as follows:

BEGIN at a point in the southern corner of the intersection of Queens Way and Queens Crossing as shown on the plat, and from said point of beginning thence running along a curve to the right having a radius of 222.00 feet 119.65 feet; thence S18°08'57"E 152.05 feet; thence S7°51'03"W 104.50 feet; thence S18°08'57"E 0.78 feet; thence N61°29'38"W 19.67 feet; thence N18°08'57"W 80.42 feet; thence S41°21'00"W 26.37 feet; thence N48°39'00"W 3.00 feet; thence S41°21'00"W 61.50 feet; thence N48°39'00"W 101.33 feet; thence N41°21'00"E 249.76 feet to a point, the POINT OF BEGINNING.

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BY-LAWS

OF

LA FONTAINE OWNERS ASSOCIATION, INC.

Prepared by:

Elwood C. Isley, Jr.
LIVESAY, McLEMORE & ISLEY, P.C.
301 Columbia Street
Portsmouth, Virginia 23704

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BY-LAWS

OF

LA FONTAINE OWNERS ASSOCIATION, INC.

ARTICLE 1. GENERAL PROVISIONS.

1.1 IDENTITY--PURPOSE. These are the By-laws of La Fontaine Owners Association, Inc., a non-stock, non-profit Virginia corporation (the "Association"). This Association has been organized for the purpose of administering the affairs of La Fontaine, a Condominium.

1.2 BY-LAWS SUBJECT TO OTHER DOCUMENTS. The provisions of these By-laws are applicable to said Condominium and are expressly subject to the terms, provisions and conditions contained in the Articles of Incorporation of said Association, (referred to herein as the "Articles"), and the Declaration of Condominium (referred to herein as "Declaration") which will be recorded in the Clerk's Office of the Circuit Court of James City County, Virginia, at the time said property is submitted to condominium ownership.

1.3 APPLICABILITY. All Unit Owners, tenants and occupants, their agents, servants, invitees, licensees and employees and others that use the Condominium Property, or any part thereof, are subject to these By-laws and the documents referred to in Article 1.2 hereof.

1.4 OFFICE. The office of the Association shall be at the Condominium Property or such other place designated by the Board of Directors of the Association.

1.5 SEAL. The seal of the Association shall bear the name of the Association, the word "Virginia", and the year of incorporation.

1.6 DEFINITIONS. All definitions set forth in the Declaration and Exhibits attached thereto are hereby adopted by reference as though set forth herein verbatim.

ARTICLE 2. MEMBERSHIP, VOTING, QUORUM, PROXIES.

2.1 QUALIFICATION OF MEMBERS, ETC. The qualification of members, the manner of their admission to membership and termination of such membership, and voting by members shall be as set forth in the Declaration, Articles and in these By-laws.

2.2 QUORUM. Persons having more than fifty percent (50%) of the total votes of the Association shall constitute a quorum. The joinder of a member in the action of a meeting by signing and concurring in the minutes thereof, within ten (10) days from the date thereof, shall constitute the presence of such person for the purpose of determining a quorum.

2.3 CORPORATE OR MULTIPLE OWNERSHIP OF A UNIT. The vote of the owners of a Unit owned by more than one person or by a corporation, except Declarant, or other entity shall be cast by the person named in a certificate designating the "Voting Member". Such certificate will be signed by all of the owners of such Unit, or the proper corporate officer, filed with the Secretary of the Association, and shall be valid until revoked by subsequent certificate. Where the ownership of the Unit is in more than one person, if the person designated in such certificate is not present or if such a certificate is not so filed, then any person having an ownership interest in such Unit who is present shall be entitled to cast the vote of such Unit. In such event, if more than one owner is present, then the vote of the Unit shall be cast only in accordance with their unanimous consent.

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2.4 VOTING; PROXY. Votes may be cast in person or by proxy. Proxies shall be valid only for the particular meeting designated thereon, except as provided in Article 3.5 below, and must be filed with the Secretary before the appointed time of the meeting. Where a Unit is owned by more than one person or a corporation or other entity the proxy must be signed by the "Voting Member", or by all the owners of such Unit, or the proper corporate officer. No such proxy shall be revocable except by actual notice to the person presiding over the meeting, by the Unit Owner or by any of such persons, that it be revoked. Any proxy shall be void if it is not dated, if it purports to be revocable without notice as aforesaid, or if the signatures of any of those executing the same has not been witnessed by a person who signed his full name and address. The proxy of any person shall be void if not signed by a person having authority, at the time of the execution thereof, to execute deeds on behalf of that person.

2.5 VOTING. In any meeting, each Unit Owner, including Declarant, subject to the provisions of Article 2.3 hereof, shall be entitled to cast one (1) vote for each Unit owned. The vote of such Unit shall not be divisible.

2.6 MAJORITY. Except where otherwise required by the provisions of the Articles, these By-laws, the Declaration, or where the same may otherwise be required by law, the affirmative vote of the Unit Owners having a majority of the votes represented at any duly called meeting at which a quorum is present shall be binding upon the members.

ARTICLE 3. ANNUAL AND SPECIAL MEETINGS OF MEMBERSHIP.

3.1 ANNUAL MEETING. The annual members' meeting shall be held at least once each calendar year at the office of the Association at the time designated on the notice thereof, for the purpose of electing directors and transacting any other business authorized to be transacted by members. The first annual meeting shall be held within a year after the conveyance of the first Unit by the Declarant.

3.2 SPECIAL MEETING. Special meetings shall be held when called by the President or Vice President or by a majority of the Board of Directors. Special meetings must be called by such officers upon a majority of the votes in the Association. Notices of special meetings shall be given as set forth below except that in the case of an emergency fourteen (14) days notice will be deemed sufficient.

3.3 NOTICE OF MEETING; WAIVER. Notice of all members' meetings shall be given by an appointed officer of the Association, to each member, unless such notice is waived in writing. Such notice will be written and will state the time, place and object for which the meeting is called. Such notice shall be given or mailed to each member not less than twenty-one (21) days nor more than sixty (60) days prior to the date set for such meeting. If hand delivered, receipt of such notice shall be signed by the member. If mailed, such notice shall be deemed to be property given when deposited in the United States mails, postage prepaid, addressed to the member at his post office address as it appears on the records of the Association. The post office certificate of mailing shall be retained as proof of such mailing. Notice shall also be conspicuously posted on the Condominium Property.

3.4 NOTICE TO OTHERS. The Declarant (and Managing Agent, if any) shall forever be entitled to notice of all Association meetings, entitled to attend the Association meetings, and they may designate such persons as they desire to attend such meetings on their behalf and such persons may act with the full authority and power of Declarant.

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3.5 ADJOURNED MEETINGS. If any members' meeting cannot be convened because a quorum has not attended, the members who are present, either in person or by proxy, may adjourn the meeting, from time to time, to a time certain until a quorum is present. Valid proxies for the meeting shall continue to be valid until a quorum is present.

3.6 CHAIRMAN. At meetings of membership, the President shall preside, or in his absence, the Board of Directors shall select a chairman.

3.7 ORDER OF BUSINESS. The order of business at annual members' meetings, and, as far as practical, at any other members' meeting, shall be:

a. Calling of the roll and certifying of proxies;

b. Proof of notice of meeting or waiver of notice;

c. Reading of minutes;

d. Reports of Officers;

e. Reports of Committees;

f. Election of Directors; SUBJECT, HOWEVER, to all provisions of these By-laws, the Articles and the Declaration;

g. Unfinished business;

h. New business;

i. Adjournment.

ARTICLE 4. BOARD OF DIRECTORS.

4.1 MANAGEMENT OF ASSOCIATION. The affairs of the Association shall be managed by a Board of Directors (hereinafter referred to as Board) consisting of not less than three (3) persons and not more than five (5) persons. The number of Directors to serve for the ensuing year shall be established by the Board then serving at the time it causes the notice of the annual members' meeting to be provided to the members. Notwithstanding the foregoing, the Board shall always consist of an odd number of persons.

4.2 FIRST BOARD. The Board shall, during the period of Declarant's control, consist of three (3) persons, none of whom need be members of the Association. The first Board shall consist of persons designated by the Declarant and they shall serve until replaced by Declarant or until their successors are elected.

a. The Declarant shall have the absolute right, at any time, in its sole discretion, to remove any member of the Board designated by Declarant and replace any such person with another person to serve on the Board. Notice of such action shall be given to the Association.

b. "The period of Declarant's control" means the period ending on the earliest of (1) the date when Units to which a total of at least three-fourths of the Common Element Interests are allocated are not owned by Declarant, (2) the fifth anniversary of the date the Declarant ceases to be the only Unit Owner, or (3) the date specified by the Declarant in a notice to each Unit Owner that the Declarant is relinquishing the rights reserved by the Declarant under Section 55-79.74(a) of the Code of Virginia of 1950. For the purpose of the preceding sentence, the calculation of Common Element Interests shall be based, at any given time, on the Common Element Interests to be assigned to all Units then

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registered with the Virginia Real Estate Board, including all Units which can be added to the Condominium pursuant to the Declaration. Notwithstanding the foregoing, the resignation of all of the members of the Board of Directors at a meeting of the Association shall end the period of Declarant's control.

4.3 ELECTION OF DIRECTORS. Except for designation of Directors by Declarant, as hereinbefore provided, election of Directors shall be by the members of the Association and conducted in the following manner:

a. Election of directors shall be held at the annual meeting.

b. A nominating committee of three (3) members shall be appointed by the then existing Board not less than thirty (30) days prior to the annual members' meeting. The Committee shall nominate one for each director then serving. Nominations may be made from the floor.

c. The election shall be by secret ballot (unless dispensed with by unanimous consent) and by a plurality of the votes cast. There shall be no cumulative voting.

d. Except as to vacancies created by removal of directors by members, vacancies in the Board occurring between annual meetings of members shall be filled by the remaining directors.

4.4 ORGANIZATIONAL MEETING. The organizational meeting of a newly elected Board shall be held within ten (10) days of their election, at such time and at such place as shall be fixed by the directors at the meeting at which they were elected and not further notice of the organizational meeting shall be necessary, PROVIDED, a quorum shall be present.

4.5 REGULAR MEETINGS. Regular meetings of the Board may be held at such time and place as shall be determined, from time to time, by a majority of the directors. Notice of the time and purpose of regular meetings shall be given to each director, personally or by mail, telephone or telegram, at least three (3) days prior to the day named for such meeting, unless notice is waived. Meetings shall be open to all Unit Owners except in those circumstances for which the Condominium Act allows meetings of the Board to be closed to the Unit Owners, and notice thereof shall be posted conspicuously on the Condominium Property at least three (3) days in advance, except in an emergency.

4.6 SPECIAL MEETINGS. Special meetings of the Board may be called by the chairman or President. Except in an emergency the notice shall be given as provided in Article 4.5 above and shall state the time, place and purpose of the meeting.

4.7 WAIVER. Any director may waive notice of a meeting before or after the meeting and such waiver shall be deemed equivalent to the giving of notice. Attendance shall be deemed a waiver.

4.8 QUORUM. A quorum at a directors' meeting shall consist of the directors entitled to cast a majority of the votes of the entire Board. The acts of the Board approved by a majority of the votes present at a meeting at which a quorum is present shall constitute the acts of the Board except as specifically otherwise provided for in the Articles, these By-laws or the Declaration. If any directors' meeting cannot be convened because a quorum has not attended, or because the greater percentage of the directors required to constitute a quorum for particular purposes have not attended, (wherever the latter percentage of attendance may be required as set forth in the Articles, these By-laws, or the

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Declaration) the directors who are present may adjourn the meeting, from time to time, until a quorum, or the required percentage of attendance if greater than a quorum, is present. At any adjourned meeting, any business which might have been transacted at the meeting as originally called may be transacted without further notice. The joinder of a director in the action of a meeting by signing and concurring in the minutes thereof shall constitute the presence of such director for all purposes including determining a quorum, provided that the same be accomplished within ten (10) days from the date of the meeting.

4.9 PRESIDING OFFICER. The presiding officer at directors' meetings shall be the Chairman of the Board, if such an officer has been elected; and if not, then the President shall preside. In the absence of the presiding officer, the directors present shall designate one of their number to preside.

4.10 RESIGNATION. A director may resign by giving written notice thereof. A director shall be deemed to have resigned upon his termination of membership in the Association (excepting the first Board) or upon his default for thirty (30) days of any of the provisions or covenants of the Declaration and Exhibits attached thereto.

4.11 POWERS AND DUTIES. The powers and duties of the Association may, subject to the limitations set forth herein and in the Condominium Act, be exercised by the Board, in the Board's sole discretion. Such powers shall include, without limiting the generality of the foregoing, the following:

a. To adopt the budget of the Association upon majority vote of the directors.

b. To make, levy and collect assessments against members and members' Units to defray the costs of the Condominium and Common Expenses, and to use the proceeds of said assessments in the exercise of the powers and duties granted to the Association.

c. To provide for the maintenance, repair, replacement, operation, improvement and management of the Condominium wherever the same is required to be done and accomplished by the Association for the benefit of its members.

d. It is understood that assessments must be sufficient to provide for the payment of all anticipated current operating expenses and for all of the unpaid operating expenses previously incurred. Accordingly, the Board is given the power to adopt special assessments providing for any previously unanticipated expenses. Special assessments shall be limited to those items which are necessary and all other items which can reasonably be deferred to the regular budgetary meeting shall be so deferred.

e. Upon consent of the membership to administer the reconstruction of improvements after casualty and the further improvement of the property, real and personal.

f. To adopt and amend administrative rules and regulations governing the details of the operation and use of the Common Elements, real and personal, in the Condominium, so long as such rules and regulations or amendments thereto do not conflict with the rights, privileges, restrictions and limitations which may be placed upon the use of such property under the terms of the Declaration and Exhibits attached thereto.

g. To acquire, operate, lease, manage and otherwise trade and deal with property, real and personal, including

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Units in the Condominium on behalf of the Association, as may be necessary or convenient in the operation and management of the Condominium and in accomplishing the purposes set forth in the Declaration.

h. To contract on behalf of the Association for the management of the Condominium Property and to delegate to such contractor such powers and duties of the Association as the directors deem fit, to lease or concession such portions thereof and to ratify and confirm any existing leases or concessions of any part of the Condominium Property.

i. To enforce, by legal means, the provisions of the Declaration and any Exhibits attached thereto and the Rules and Regulations promulgated governing the use of the Condominium Property, including, without limitation, the assessment of fines against Unit Owners for violations of the Condominium Instruments and the Rules and Regulations in accordance with the provisions of Section 55-79.80:2.B. of the Condominium Act.

j. To cause the Association to pay all taxes and assessments of any type which affect any part of the Condominium Property, other than Units (unless owned by the Association) and the appurtenances thereto, and to assess the same against the members and their respective Units.

k. To cause the Association to carry insurance for the protection of the members and the Association against casualty and liability as required by the Declaration.

l. To cause the Association to pay all costs of power, water, sewer and other utility services rendered to the Condominium which is not the specific responsibility of the owners of the separate Units.

m. To cause the Association to employ personnel, for reasonable compensation, to perform services required for proper administration of the purposes of the Association, including accountants, attorneys, contractors and other professionals.

n. The Association shall have the right, when determined by the Board of Directors to be in the best interests of the Condominium, to grant exclusive licenses, easements, permits, leases, or privileges to any individual or entity, including Non-Unit Owners, which affect Common Elements and to alter, add to, relocate or improve Common Elements.

4.12 AUTHORITY OF FIRST BOARD. The undertakings and contracts authorized by the first Board, including the first budget, shall be binding upon the Association in the same manner as though such undertakings and contracts had been authorized by a Board duly elected by the membership.

4.13 REMOVAL OF DIRECTORS. Should the members of the Association at any duly convened regular or special meeting convened desire, they may remove any director except directors designated by Declarant with or without cause by the vote or agreement in writing by a majority of all members and a successor may immediately be elected to fill the vacancy thus created. Should the membership fail to elect a successor, the Board may fill the vacancy.

4.14 PROVISO. Notwithstanding anything herein contained to the contrary, the directors shall not have the right or authority to do any act or take any action wherein the same would limit, modify or abridge the rights, privileges and immunities of the

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Declarant as set forth in the Declaration, the Articles and these By-laws.

4.15 COMMITTEES. The Board may delegate portions of its responsibilities to committees established for that purpose.

4.16 MANNER OF COLLECTION OF COMMON EXPENSES. The provisions of Paragraph 15 of the Declaration of Condominium setting forth the manner of collection of Common Expenses and other charges are incorporated herein by reference.

ARTICLE 5. OFFICERS.

5.1 GENERALLY. The officers of the Association shall be a President, one or more Vice Presidents, a Treasurer, a Secretary, and, if desired, one or more Assistant Secretaries, all of whom shall be elected annually by the Board and who may be peremptorily removed by a majority vote of the directors at any meeting. Any person may hold two or more offices, except that the President shall not also be the Secretary or an Assistant Secretary. The Board may, from time to time, elect such other officers and designate to manage the affairs of the Association, as it deems appropriate.

5.2 PRESIDENT. The President shall be the chief executive officer of the Association. He shall have all of the powers and duties which are usually vested in the office of President of an association, including, but not limited to, the power to appoint committees from among the members, from time to time, as he may, in his discretion, determine appropriate to assist in the conduct of the affairs of the Association. The President shall be a member of the Board.

5.3 VICE PRESIDENT. The Vice President shall in the absence or disability of the President, exercise the powers and perform the duties of President. He shall also generally assist the President and exercise such other powers and perform such other duties as shall be prescribed by the directors or President.

5.4 SECRETARY. The Secretary shall keep the minutes of all proceedings of the directors and the members, attend to the giving and serving of all notices to the members and directors, have custody of the seal of the Association and affix the same to instruments requiring a seal when duly signed, keep the nonfinancial records of the Association, and shall perform all other duties incident to the office of Secretary of an association and as may be required by the directors or President. The Assistant Secretary, if any, shall perform the duties of Secretary when the Secretary is absent.

5.5 TREASURER. The Treasurer shall have custody of all of the funds, securities and evidences of indebtedness of the Association. He shall keep the assessment rolls and accounts of the members and the books of the Association in accordance with good accounting practice and shall perform all other duties incident to the office of Treasurer.

ARTICLE 6. FISCAL MANAGEMENT; ASSESSMENTS; LIENS. The provisions for fiscal management of the Association set forth in the Declaration shall be supplemented by the following provisions:

6.1 MANNER AND NOTIFICATION. The Board of Directors shall fix and determine the sums necessary to pay all the Common Expenses, and other fees of the Condominium, including maintenance of proper reserves, pursuant to the provisions of the Declaration, Articles and these By-laws. The same shall be assessed against the Unit Owners as provided in the Declaration and all the Exhibits attached thereto. Assessments for the first year (or prorata portion thereof) of the operation of the Condominium Property shall

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be as set forth in a projected budget established by the Declarant as the same may be amended by the Board from time to time.

6.2 PAYMENTS OF ASSESSMENTS. Except as specified to the contrary, funds for the payment of Common Expenses shall be assessed against the Unit Owners in the proportions provided in the Declaration. Said assessments shall be payable monthly, three months in advance, without notice, unless otherwise required by the Board. Special assessments, should such be required by the Board, shall be levied in the same manner as hereinbefore provided for regular assessments, except notice thereof shall be given, and shall be payable in the manner determined by the Board. FAILURE TO PAY ANY ASSESSMENT WITHIN TEN (10) DAYS FROM THE DATE DUE, SHALL ENTITLE THE ASSOCIATION TO LEVY A LATE CHARGE AGAINST THE DEFAULTING UNIT OWNER OF TEN AND 00/100 DOLLARS ($10.00) AND A LIKE AMOUNT EACH THIRTY DAYS THEREAFTER IF SUCH ASSESSMENT IS NOT PAID. THE PARTIES AGREE THAT THE LATE CHARGE IS NOT A PENALTY BUT IS VALID LIQUIDATED DAMAGES.

6.3 PROPOSED BUDGET. A copy of the proposed one (1) year budget shall be mailed to Unit Owners not less than thirty (30) days prior to the meeting at which the budget will be considered together with a notice of the meeting. If the proposed budget is not adopted prior to the start of the new budget period, an assessment shall be presumed to be made in the amount of the last prior assessment and monthly installments on such assessments shall be due upon each installment payment date until changed by an amended assessment. In the event the assessments prove to be insufficient, the budget and assessments shall be amended at a meeting called for that purpose.

6.4 DEPOSITORY; WITHDRAWALS. The depository of the Association shall be such bank or banks as shall be designated, from time to time, by the directors and in which the monies of the Association shall be deposited. Withdrawal of monies from such accounts shall be only by checks signed by such persons as are authorized by the directors. Should the Association employ a Managing Agent, and should in the course of such employment said Managing Agent be charged with any responsibilities concerning control of any of the funds of the Association, then, and in such event, any Agreement with such Managing Agent pertaining to the deposit and withdrawal of monies shall supersede the provisions hereof during the term of any such agreement.

6.5 RECORDS. The Association shall maintain those records and make available written summaries thereof as required by the Condominium Act and the Declaration. In addition, a financial statement shall be prepared annually and supplied to the membership prior to the adoption of the next ensuring year's budget.

6.6 FIDELITY BONDS; PROVISO. Fidelity bonds shall be obtained by the Board for the Treasurer, Assistant Treasurer, if any, and all officers and employees of the Association handling or responsible for Association's funds, and for any contractor handling or responsible for Association's funds. The amount of such bonds shall be determined by the directors, subject to the minimum requirement of the Declaration. The premiums on such bonds shall be paid by the Association.

6.7 FISCAL YEAR. The fiscal year of the Association shall begin on the first day of January of each year; PROVIDED, HOWEVER, that the Board is expressly authorized to adopt a different fiscal year in accordance with the provisions and regulations from time to time prescribed by the Internal Revenue Code of the United States of America, at such time as the Board deems advisable. The budget year shall begin on January 1st of each year.

6.8 ACCELERATION OF PAYMENT OF INSTALLMENTS OF ASSESSMENTS. If a Unit Owner shall be in default in the payment of an installment upon any assessment, the Board may accelerate the remaining

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installments for, in its discretion, the next twelve-month period. Upon notice thereof to the Unit Owner the accelerated assessment shall immediately become due upon the date stated in the notice, which shall not be less than fifteen (15) days after delivery of or the mailing of such notice to the Unit Owner.

6.9 ACQUISITION OF UNITS. At any foreclosure sale of a Unit, the Association or its designee may acquire the Unit being foreclosed. The term "foreclosure" as used in this Article, shall mean and include any foreclosure of any lien, including a lien for assessments. The power of the Association to acquire a Unit at any foreclose sale shall never be interpreted as a requirement or obligation on the part of the Association to do so at any foreclosure sale--the provisions hereof being permissive in nature and for the purpose of setting forth the power of the Association. The Association may also acquire Units in the event damaged Units are not restored pursuant to the provisions of Paragraph 14 of the Declaration.

6.10 DEFAULT IN PAYMENT OF ANY ASSESSMENT; LIEN. In the event of a default by a Unit Owner in the payment of any assessment, the Association shall have all rights and remedies provided by law, including, but not limited to, those provided by the Condominium Act, and the liability of the owner of the Condominium Unit shall include liability for a reasonable attorneys' fee and for court costs incurred by the Association incident to the collection of such assessment or enforcement of its lien. If the Association elects to enforce its lien by foreclosure, the Unit Owner shall be required to pay a reasonable rental for the Condominium Unit, to be fixed by the Board, and the Association shall be entitled to the appointment of a receiver to collect same. Nothing herein contained shall bar a suit to recover a money judgment for unpaid assessments without waiving the lien securing the same.

ARTICLE 7. COMPLIANCE.

7.1 VIOLATION BY MEMBER; REMEDIES. In the event of a violation (other than the nonpayment of an assessment) by the Unit Owner of any of the provisions of the Declaration, these By-laws, or Rules and Regulations adopted pursuant to any of same, the Association shall notify the Unit Owner by written notice of said breach, transmitted by mail, and if such violation shall continue for a period of ten (10) days from the date of notice, the Association shall have the right to treat such violation as an intentional, inexcusable and material breach thereof, and the Association may then pursue any remedy available. No action taken shall be deemed an "election of remedies". Upon a finding by the Court that the violation complained of has occurred, the offending Unit Owner shall reimburse the Association (or Managing Agent, if any) for all costs and losses including reasonable attorneys' fees and costs incurred in bringing such action. Failure on the part of the Association to maintain such action at law or in equity within thirty (30) days from date of a written request, signed by a Unit Owner and sent to the Association, shall authorize any Unit Owner to bring an action in equity or suit at law, on account of the violation, in the manner provided in the Condominium Act. Any violations which are deemed by the Board to be a hazard to public health or safety may be corrected immediately as an emergency matter by the Association and the cost thereof shall be charged to the Unit Owner as a specific item and shall be a lien against said Unit with the same force and effect as if the charge was a part of the Common Expenses attributable to such Unit Owner. In the event of a noncontinuing default making the notice period impractical, the Association may take such punitive action, including, but not limited to, the suspension of privileges for reasonable periods of time without a corresponding reduction in assessments.

7.2 LIABILITY OF UNIT OWNERS. All Unit Owners shall be liable for the expense of any maintenance, repair or replacement

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rendered necessary by his act, neglect or carelessness, or by that of any member of his family, or his or their guests, employees, agents or lessees, but only to the extent that such expense is not met by the proceeds of insurance carried by the Association. Such liability shall include any increase in insurance rates occasioned by use, misuse, occupancy or abandonment of any Unit or its appurtenances. Nothing herein contained, however, shall be construed so as to modify any waiver by insurance companies of rights of subrogation. The expense of any maintenance, repair or replacement required shall be charged to said Unit Owner as a specific item and shall be a lien against said Unit with the same force and effect as if the charge was a part of the Common Expenses attributable to such Unit Owner's Unit.

7.3 LIABILITY OF UNIT OWNERS TO MANAGING AGENT. Paragraph 6.10 above shall include any assessment due by virtue of a Management Agreement with a Managing Agent (if any) and such Managing Agent shall also have the right to bring such actions and the right to obtain such relief in its own name, including damages, attorneys' fees and costs, to enforce the provisions thereof.

7.4 NO WAIVER. The failure of the Association or of a Unit Owner to enforce any right, provision, covenant or condition which may be granted by any of the provisions of the Declaration shall not constitute a waiver of the right of the Association or Unit Owner to enforce such right, provision, covenant or condition in the future.

7.5 SURVIVING LIABILITY. Termination of membership in the Association shall not relieve said party from any liability, financial or otherwise, incurred by said party while a member and shall in no way impair any rights that the Association has, or may have had, against the terminating member.

7.6 CHARGES FOR VIOLATION OF RULES , ETC. The Association shall have the power, in accordance with the provisions of Section 55-79.80:2.B. of the Condominium Act, as amended from time to time, to assess charges against any Unit Owner for any violation of the Condominium instruments or of the rules and regulations promulgated pursuant thereto for which such Unit Owner or his family members, tenants, guests or other invitees are responsible. Before any such charges may be assessed, the Unit Owner shall be given an opportunity to be heard and to be represented by counsel before the Board. Notice of such hearing shall, at least fourteen days in advance thereof, be hand delivered or mailed by registered or certified United States mail, return receipt requested, to such Unit Owner at the address or addresses required for notices of meetings pursuant to Section 55-79.75 of the Condominium Act. The amount of any charges so assessed shall not exceed fifty dollars for a single offense or ten dollars per diem for any offense of a continuing nature, and shall be treated as an assessment against such Unit Owners' Condominium Unit for the purpose of Section 55-79.84 of the Condominium Act.

ARTICLE 8. LIMITATION OF LIABILITY. Notwithstanding the duty of the Association to maintain and repair the Condominium Property, it shall not be liable for injury or damage caused by a latent condition in the property nor for injury or damage caused by the elements, or by other owners or persons.

ARTICLE 9. PARLIAMENTARY RULES. Roberts Rules of Order (latest edition) shall govern the conduct of Association proceedings when not in conflict with the Declaration, the Articles, these By-laws, or with the Condominium Act.

ARTICLE 10. AMENDMENTS TO BY-LAWS. Amendments to By-laws as hereinafter defined and provided for, shall be proposed and adopted in the following manner:

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10.1 PROPOSAL. Amendments to these By-laws may be proposed by the Board acting upon vote of the majority of the directors or by members of the Association having twenty-five percent (25%) of the votes in the Association, whether meeting as members or by an instrument in writing signed by them.

10.2 CALL FOR MEETING. Upon any amendment or amendments to these By-laws being proposed by said Board or members, such proposed amendment or amendments shall be transmitted to the President of the Association, or other officer of the Association in the absence of the President, who shall thereupon call a Special Joint Meeting of the members of the Board and the membership for a date not sooner than fourteen (14) days or later than sixty (60) days from receipt by such officer of the proposed amendment or amendments. It shall be the duty of the Secretary to give to each member written or printed notice of such meeting in the same form and in the same manner as notice of the call of a special meeting of the membership is required as herein set forth. Notice shall be posted at a conspicuous location on the Condominium Property.

10.3 VOTE NECESSARY; RECORDING. In order for such amendment or amendments to become effective, the same must be approved by an affirmative vote of sixty-six and two thirds percent (66-2/3%) of the entire membership of the Board and by an affirmative vote of the members having sixty-six and two thirds percent (66-2/3%) of the votes in the Association. Thereupon, such amendment or amendments to these By-laws shall be transcribed, certified by the President or a Vice President and Secretary or Assistant Secretary of the Association, and a copy thereof shall be recorded in the Clerk's Office of the Circuit Court of James City County, Virginia, within ten (10) days from the date on which any amendment has been affirmatively approved by the directors and members.

10.4 PROVISO. Notwithstanding the foregoing provisions of this Article 10, no amendment to these By-laws which affects the Declarant may be adopted or become effective without the prior written consent of the Declarant.

ARTICLE 11. BY-LAWS PERTAINING TO USE AND DECORUM.

11.1 DEFINITION. "Use" and "Decorum" as used herein shall refer to matters pertaining to dress, decorum, noise, use of Units and Use of Common Elements.

11.2 SCOPE; REMEDY FOR VIOLATION. These By-laws are reasonably calculated to promote the welfare of the Unit Owners. The violation of such By-laws shall bar any Unit Owner or his family and invitees from the use of the Common Elements, as the Board may deem appropriate, and shall subject any person violating the same to any liability imposed by the Declaration and these By-laws.

11.3 RULES AND REGULATIONS. The Association may promulgate Rules and Regulations concerning the use of the Condominium Property. Said Rules and Regulations shall have effect upon posting in a conspicuous place on the Condominium Property and shall have the dignity of By-laws.

ARTICLE 12. INDEMNIFICATION.

12.1 OFFICERS AND DIRECTORS. The Association shall and does hereby indemnify and hold harmless every director and every officer, including the first officers and directors, his heirs, executors and administrators, against all loss, cost and expenses reasonably incurred by him in connection with any action, suit or proceeding to which he may be made a party by reason of his being or having been a director or officer of the Association, including reasonable counsel fees, except as to matters wherein he shall be finally adjudged in such action, suit or proceeding, to be liable for or guilty of gross negligence or willful misconduct. The

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foregoing rights shall be in addition to, and not exclusive of, all other rights to which such director or officer may be entitled.

12.2 INSURANCE. The Association may, if available, at the Association's expense, purchase officer's and director's liability insurance and shall cause the officers and directors, from time to time serving, to be named insureds.

ARTICLE 13. UNIT OWNERS RESPONSIBILITY CONCERNING LIENS AND TAXES.

13.1 LIENS AND TAXES. All liens against a Condominium Unit, other than for permitted mortgages, taxes or special assessments, shall be satisfied or otherwise removed within ten (10) days of the date the lien attaches. All taxes and special assessments upon a Condominium Unit shall be paid at least thirty (30) days before becoming delinquent or as provided in the Declaration, or these By-laws, whichever is sooner.

13.2 NOTICE TO ASSOCIATION. A Unit Owner shall give notice to the Association of every lien upon his Unit, other than for permitted mortgages, taxes and special assessments, within five (5) days after the attaching of the lien.

ARTICLE 14. MORTGAGES.

14.1 NOTICE TO BOARD OF DIRECTORS. A Unit Owner who mortgages his Unit shall notify the Board of Directors of the name and address of his mortgagee. The Board of Directors shall maintain such information in a book entitled "Mortgagees of Units."

14.2 NOTICE OF UNPAID ASSESSMENTS. The Board of Directors, whenever so requested in writing by an Institutional Lender holding a first mortgage on a Condominium Unit, shall promptly report any then unpaid assessments due from, or any other default by, the owner of the mortgaged Unit.

14.3 EXAMINATION OF BOOKS. Each Unit Owner and each Institutional Lender holding a first mortgage on a Condominium Unit shall be permitted to examine the books of account of the Association at reasonable times and upon reasonable notice, on a business day, but not more often than once a month.

14.4 NOTICE OF TERMINATION OF MANAGEMENT CONTRACTS. The Board of Directors shall notify the Institutional Lender having the maximum number of first mortgages on Condominium Units in the Condominium in writing of the termination of any management contract within ten (10) days of receipt or issuance of any notice of such termination by either the Association or the Managing Agent. Notwithstanding the foregoing, the prior written approval of the Institutional Lender having the maximum number of first mortgages on Condominium Units in the Condominium shall be required to effectuate any decision by the Unit Owners Association to terminate professional management and assume self-management of the Condominium.

14.5 AUDITED FINANCIAL STATEMENT. Every Institutional Lender holding a first mortgage on a Condominium Unit shall be entitled to receive, upon written request, a copy of the annual financial statement within sixty (60) days following the end of the Association's fiscal year.

14.6 OTHER MORTGAGEES RIGHTS. Every Institutional Lender holding a first mortgage on a Condominium Unit or their representatives shall be entitled to attend meetings of the Unit Owners Association and shall have the right to speak thereat. In addition thereto, every Institutional Lender holding a first mortgage on a Condominium Unit shall have the right to examine the books and records of the Condominium and require the submission of annual financial reports and other budgetary information.

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14.7 AMENDMENT TO THE DECLARATION OR TO THE BY-LAWS. Except as otherwise permitted by the Condominium Instruments, the prior written approval of the Institutional Lender having the maximum number of first mortgages on Condominium Units in the Condominium will be required for any material amendment to the Declaration or By-Laws of the Unit Owners Association.

ARTICLE 15. CONFLICT. In the event of any conflict between the By-laws contained herein, or from time to time amended or adopted, and the Declaration, the Declaration shall prevail.

The foregoing were adopted as the By-laws of La Fontaine Owners Association, Inc., a non-stock, non-profit corporation established under the Laws of the Commonwealth of Virginia at the first meeting of the Board of Directors on the 20th day of December, 1996.

LA FONTAINE OWNERS ASSOCIATION, INC.

By _____
Gary L. Werner, President

ATTEST:

By _____
Carol B. McLain, Secretary

VIRGINIA: City of Williamsburg and County of James City, to Wit:
In the Clerk's Office of the Circuit Court of the City of Williamsburg and County of James City the 23rd day of December 1996 This Declaration was presented with certificate annexed and admitted to record at 10:03 o'clock
Teste: Helena S. Ward, Clerk
by _____
Deputy Clerk

PLAT RECORDED IN
P.B. NO. 65 PAGE 59-68

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WAC needs to sign
the AB/CC tracking
form. Then I am ok
with release.

Scott
11-14-12

geed.
11/15/12

RECORD DRAWING
Transmittal

DATE: 11/15/2012

To: James City County Stormwater Division

From: Greg Johnson -Engineering and Resource Protection

Subject: Record Drawing
Williamsburg Crossing Car Wash (Pipe Installation)

Environmental Division

NOV 05 2012

RECEIVED

AES
CONSULTING ENGINEERS

Hampton Roads | Central Virginia | Middle Peninsula
5248 Olde Towne Road, Suite 1, Williamsburg, Virginia 23188
Phone (757) 253-0040 / Fax (757) 220-8994
aesva.com

Environmental Division
NOV 05 2012
RECEIVED

Letter of Transmittal

ATTN: **Bill Cain**

CO.: James City County E&RP

Address: 101-C Mounts Bay Road
Williamsburg, VA 23185

cc:

DATE	JOB NO.
11/5/12	W10172

FROM: Jason Grimes

RE
MEGA Auto Spa (Wburg Car Wash)
Asbuilts (Final Mylar)

WE ARE SENDING YOU THE FOLLOWING ITEMS: ☒ Attached ☐ Under separate cover via

☒ Original(s) ☐ Print(s) ☐ Plan(s) ☐ Specification(s) ☐ Change Order

☐ Copy of letter(s) ☐ Other:

COPIES	DATE	No. of Pages	DESCRIPTION
1			Asbuilt CD Mylar Copy

THESE ARE TRANSMITTED as checked below:

☐ For your approval ☐ For your signature ☐ For review and comment

☐ For your use ☒ As you requested ☐ As requested by:

☐ Other:

REMARKS:

VIA: ☒Hand Deliver ☐UPS Ground ☐UPS Next Day Air ☐USPS Mail ☐ Other:

If enclosures are not as noted, kindly notify us at once.

File name: S:\Jobs\W10172\00-Sonny's Car Wash\Admin\Correspondence\Transmittals\10172-as-built submittal .doc
Form Rev. 7/02

JAMES CITY COUNTY ENVIRONMENTAL DIVISION

Surety Tracking Sheet Date: _____ Due Date: _____

Project Name: Williamsburg Crossing Car Wash

Requested By: _____ Phone #: _____

Date Notified: _____ **Case Number:** SP-122-11

Siltation Surety: Original $_____ Current $ 6,145.00 Needed $ Ø

*maximum reduction of 80% of original bond amount unless project is to be released

☐Calculate ☐Evaluate/Reduce ☐Release

Work to be completed for SILTATION Surety

☐ Stabilization of all disturbed areas

☐ Removal of temporary erosion control measures

☐ Submission of as-built drawings for stormwater management facility

☐ Submission of construction certification for the stormwater management facility

☐ Completion of field-related BMP items

☐ Other –

☒ Comments- Project complete ok to close project and release surety

OUTPARCEL DEV. No onsite. BMP. Drains to MC-039.

Subdivision Surety: Original $_____ Current $_____ Needed$_____

*maximum reduction of 80% of original bond amount unless project is to be released

☐Calculate ☐Evaluate/Reduce ☐Release

Work to be completed for SUBDIVISION Surety

☐ Paving of streets

☐ Dedication of streets to Virginia Dept of Transportation **VDOT** Amount Needed $_____

☐ Completion of water and sewer systems **JCSA** Amount Needed $_____

☐ Completion of water and sewer punchlist items

☐ Submission of as-built drawings for water and sewer systems

☐ Installation of street lights and street signs

☐ Other –

☐ Comments-

INDICATE YOUR APPROVAL BY INITIALING THE APPROPRIATE BLANK:

INSP 10/5/12 INSP SUPV 10/5/12 CHF ENG 10/18/12 WTSHD PLNR 10/8/12 ENV DIR 11-14-12 RELEASE PROJECT

Revised 12/11/08

James City County Engineering and Resource Protection Division
Stormwater Management/BMP Record Drawing and Construction Certification Review Tracking Form

Project Name: WILLIAMSBURG CROSSING CAR WASH
County Plan No. (List any amendments): SP-122-11
Stormwater Management Facility Type: STORM PIPE
BMP Phase #: ☐ I ☐ II ☐ III

- ☐ Information Package Submittal Date:
- ☐ Completeness Check:
  - ☒ Record Drawing CO ✓ Date/By: 9/21/12 Jason Grimes
  - ☒ ✓Construction Certification Date/By: 9/21/12 Christopher Basang
  - ☒ ✓RD/CC Standard Forms (Ensure that all forms for the BMP type are included)
  - ☐ Insp/Maint Agreement # / Date:
  - ☐ BMP Maintenance Plan Location:
  - ☒ Special Considerations: Pipe Only
- ☒ Standard E&SC Notes on Approved Plan Requiring RD/CC or County comment in plan review
  - Location (sheet #): #8 Fig 21
- ☒ **County BMP ID Code #:** MC-039
- ☒ Log into Division's "As-Built Tracking Log"
- N/A ☐ Obtain basic site information (GPIN, Owner, Address, etc.)
- ☐ Log into Access Database (BMP ID #, Plan No., GPIN, Project Name, etc.)
- CO — ☒ Copy from Active Project File (correspondence, H&H, design computations, etc.).
- ☒ Create As-Built File using Project File information (File label, folder, copy plan/details/design information, etc.).
- ☒ Inspector Review of RD/CC (consult with Chief Engineer prior to completion of comments).
- ☒ Record Drawing Review against Approved Plan prior to Field Inspection.
- ☒ Final Site Inspection (FI) Performed Date: 10/5/12
- ☒ Record Drawing (RD) Review Date: 10/5/12
- ☒ Construction Certification (CC) Review Date: 10/5/12
- ☒ Actions:
  - ☒ No comments.
  - ☐ Comments. Letter Forwarded. Date:
  - ☐ Record Drawing (RD)
  - ~~☐ Construction Certification (CC)~~
  - ☐ Construction-Related (CR)
  - ☐ Site Issues (SI)
  - ☐ Other :

No onsite BMP.
DRAINS TO MASTER SWMF.
MC-039.

- ☐ Resubmittal (# and date):
- ☐ Re-inspection (if necessary):
- ☒ Drainage System Information Acceptable (RD/CC/System Info). Ok for bond release.
- ☒ Complete "Surety Request Form".
- ☒ Final Inspection of active file copying any relevant information to "As-Built" file.
- N/A ☐ On County BMP Inventory (Phase I, II or III).
- N/A ☐ Copy Final Inspection Report into County BMP Inspection Program file.
- N/A ☐ Provide Digital Photographs of BMP and save into County BMP Inventory.
- ☒ Request mylar/reproducible from As-Built plan preparer.
- ☒ Complete "As-built Tracking Log".
- ☐ Last check of BMP Access Database (County BMP Inventory).
- ☐ Add BMP to JCC Hydrology & Hydraulic database (optional).
- ☐ Add BMP to Municipal BMP list (if a County-owned facility)
- ☐ Add BMP to PRIDE BMP ratings database.

Final Sign-Off

Inspector: [signature] Date: 10

Chief Engineer: [signature] Date: 11/15/12

*** See separate checklist, if needed.

Project Name: WMBG Crossing Car Wash
Location: 5117 JOHN TYLER HWY
Project Number: SP-122-11
Date of Inspection: 8/6/2012
Inspector(s): G. Johnson

Closed Storm Drain System Construction Inspection Checklist

Development Status (Active, Inactive,): ACTIVE

Stage of Construction Installation, etc): INSTALLATION

	Item	X	Comments
1.	Type of closed pipe system		
	a. Round	X	
	b. Elliptical		
2.	Type of pipe material		
	a. Reinforced concrete pipe (RCP)	X	
	b. HPDE		
	d. Other		

B. Site Preparation

S = Satisfactory U = Unsatisfactory N/A = Not Applicable

	Item	S	U	N/A	Comments
1.	Pipe and structures delivered and inspected prior to construction	X			
	a. Inspect for material, diameter, dimensions and condition	X			

C. Excavation/Grading

S = Satisfactory U = Unsatisfactory N/A = Not Applicable

	Item	S	U	N/A	Comments
1.	Excavation and grading conform to plans				
	a. Trench bottom shaped to permit barrel of pipe to be in direct contact with soil or bedding	X			
	b. Areas excavated below established grade shall be backfilled with VDOT #25 or 26 aggregate (unless water is encountered - then #57 aggregate shall be used)	X			
2.	All earthwork shall be in conformance with VDOT Standard and Specification #303	X			

D. Installation

S = Satisfactory U = Unsatisfactory N/A = Not Applicable

	Item	S	U	N/A	Comments
1.	Bedding per VDOT 302.03(a)2(b)				
	a. Material shall be VDOT #25 or #26 aggregate or as specificied on the approved plans (unless water is encountered - then #57 aggregate shall be used).	X			
	b. Shall be lightly compacted and shaped so pipe is in full contact with bedding	X			
	c. Shall be shaped to accommodate the bell when bell and spigot pipe is used	X			
2.	Placing Pipe per VDOT 302.03(a)2c	X			
	a. Pipe shall be placed beginning at downstream end with bell or groove ends of rigid pipe facing upstream	X			
3.	Joining Pipe per VDOT 302.03(a)2(d)	X			

			a. Rigid pipe sections shall have ends fully entered and inner surfaces flush and even		X						
			b. Joints shall be sealed to form a leak-resistant joint		X						
			c. Flexible pipe sections shall be firmly joined by approved coupling bands to form a leak-resistant joint	–	–	–					
			d. When pipes enter structure, the inside of the pipe/structure joint shall be flush and fully mortared								
			e. Lift holes in rigid pipe shall be plugged with a lift hole plug furnished by the manufacturer (302.03)		X						
		4.	Backfill shall be compacted in horizontal layers not more that six inches in thickness, loose measurement. VDOT 303.04(g)		X						
		5.	Compaction of backfill shall be in accordance with VTM-1 to the following densities:		X						
			a. 95% beneath pavement, walks and road shoulders		X						
			b. 90% in other unpaved areas		X						
		6.	Testing and Inspection								
			a. Each lift shall be tested for compaction on alternating sides of the pipe at intervals not to exceed 300 feet								
			b. Pipe shall be inspected before any backfill is placed. (VDOT 302.03(a)2c)								
		1.	Pipes and structures shall be free of sediment and debris		X						
		2.	All inlet protection measures removed		X						
		3.	All joints sealed		X						
		4.	Outlet protection installed and operational		–						
		5.	Configuration and dimensions of pipe system conforms with approved plans		–						

Additional Comments:

10/5/2012 - Reinspected all items in Compliance and functioning as per plan

Environmental Division

SEP 21 2012

RECEIVED

James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities
Record Drawing and Construction Certification Forms

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

Section 1 - Site Information:

Project Name: Williamsburg Crossing Car Wash
Structure/BMP Name: n/a
Project Location: 5117 John Tyler Highway, Williamsburg, VA.
BMP Location: n/a
County Plan No.: SP - 0067 - 2011

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

Tax Map/Parcel No.: 4121500007
BMP ID Code (if known): DRAINS TO MC 039
Zoning District:: B-1
Land Use: CAR WASH
Site Area (sf or acres): 1.52 acres

Brief Description of Stormwater Management/BMP Facility:

Reinforced concrete storm conveyance pipe and accompanying inlet/manhole

Nearest Visible Landmark to SWM/BMP Facility: Union Bank / Lafontaine Condominiums

Nearest Vertical Ground Control (if known):
☐ JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☐ Arbitrary ☐ Other
Station Number or Name: _____
Datum or Reference Elevation: Horizontal: NAD 83 ; Vertical: NGVD 29
Control Description: _____
Control Location from Subject Facility: _____

Section 2 - Stormwater Management / BMP Facility Construction Information:

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

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

Section 3 - Owner / Designer / Contractor Information:

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

Name: Matt Blanchard
Mailing Address: 3664 Bridgewater Drive
Williamsburg, VA 23188
Business Phone: (757) 645-5342 Fax: _____
Contact Person: _____ Title: _____

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

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road
Williamsburg, VA 23188
Business Phone: (757) 253-0040
Fax: (757) 220-8994
Responsible Plan Preparer: Jason Grimes
Title: Project Manager
Plan Name: Williamsburg Crossing Car Wash
Firm's Project No. W10172
Plan Date: August 18, 2011
Sheet No.'s Applicable to SWM/BMP Facility: ____ / ____ / ____ / ____ / ____

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

Name: CW Davis Construction
Mailing Address: PO Box 625
Hayes, VA 23072
Business Phone: (804) 642-5562
Fax: _____
Contact Person: Brett Davis
Site Foreman/Supervisor: "
Specialty Subcontractors & Purpose (for BMP Construction Only):

Section 4 - Professional Certifications:

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

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road, Suite 1
Williamsburg, VA 23188
Business Phone: (757) 253-0040
Fax: (757) 869-2924

Name: Jason Grimes, P.E.
Title: Project Manager
Signature:
Date: 9/21/12

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

COMMONWEALTH OF VIRGINIA
JASON A. GRIMES
Lic. No. 49170
9/21/12
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: S&ME, Inc.
Mailing Address: 8211 Hermitage Road
Richmond, VA 23228
Business Phone: (804) 266-2199
Fax: (804) 261-5569

Name: Christopher J. Brown, P.E.
Title: Branch Manager
Signature:
Date: 9.21.12

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

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. BROWN
Lic. No. 49840
9.21.12
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer

Section 5 - Record Drawing and Construction Certification Requirements and Instructions:

- ☑ PreConstruction Meeting - Provides an opportunity to review SWM / BMP facility construction, maintenance and operation plans and address any questions regarding construction and/or monitoring of the structure. The design engineer, certifying professionals (if different), Owner/Applicant, Contractor and County representative(s) are encouraged to attend the preconstruction meeting. Advanced notice to the Environmental Division is requested. Usually, this requirement can be met simultaneously with Erosion and Sediment Control preconstruction meetings held for the project.

- ☑ A fully completed ***STORMWATER MANAGEMENT / BMP FACILITIES, RECORD DRAWING and CONSTRUCTION CERTIFICATION FORM*** and ***RECORD DRAWING CHECKLIST***. All applicable sections shall be completed in their entirety and certification statements signed and sealed by the registered professional responsible for individual record drawing and/or construction certification.

- ☑ The Record Drawing shall be prepared by a Registered Professional Engineer or Certified Land Surveyor for the drainage system of the project including any Best Management Practices.

- ☑ Construction Certification. Construction of Stormwater Management / BMP facilities which contain impoundments, embankments and related engineered appurtenances including subgrade preparation, compacted soils, structural fills, liners, geosynthetics, filters, seepage controls, cutoffs, toe drains, hydraulic flow control structures, etc. shall be visually observed and monitored by a Registered Professional Engineer or his/her authorized representative. The Engineer must certify that the structure, embankment and associated appurtenances were built in accordance with the approved design plan, specifications and stormwater management plan and standard accepted construction practice and shall submit a written certification and/or drawings to the Environmental Division as required. Soil and compaction test reports, concrete test reports, inspection reports, logs and other required construction material or installation documentation may be required by the Environmental Division to substantiate the certification, if specifically requested. The Engineer shall have the authority and responsibility to make minor changes to the approved plan, in coordination with the assigned County inspector, in order to compensate for unsafe or unusual conditions encountered during construction such as those related to bedrock, soils, groundwater, topography, etc. as long as changes do not adversely affect the integrity of the structure(s). Major changes to the approved design plan or structure must be reviewed and approved by the original design professional and the James City County Environmental Division.

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

  Dual Purpose Facilities - Completion of construction also includes an interim stage for Stormwater Management / BMP facilities which serve dual purpose as temporary sediment basins during construction and as permanent stormwater management / BMP facilities following construction, once development and stabilization are substantially complete. For these dual purpose facilities, construction certification is required once the temporary sediment basin phase of construction is complete. Final record drawing and construction certification of additional permanent components is required once permanent facility construction is complete.

  Interim Construction Certification is required for those dual purpose embankment-type facilities that are generally ten (10) feet or greater in dam height (*) and may not be converted, modified or begin function as a permanent SWM / BMP structure for a period generally ranging from six (6) to eighteen (18) months or more from issuance of a Land Disturbance permit for construction.

Interim or final record drawing and construction certifications are not required for temporary sediment basins which are designed and constructed in accordance with current minimum standards and specifications for temporary sediment basins per the Virginia Erosion and Sediment Control Handbook (VESCH); have a temporary service life of less than eighteen (18) months; and will be removed completely once associated disturbed areas are stabilized, unless a distinct hazard to the public's health, safety and welfare is determined by the Environmental Division due to the size or presence of the structure or due to evidence of improper construction.

(*Note: Dam Height as referenced above is generally defined as the vertical distance from the natural bed of the stream or waterway at the downstream toe of the embankment to the top of the embankment structure in accordance with 4VAC50-20-30, Virginia Impoundment Structure Regulations and the Virginia Dam Safety Program.)

☑ Record Drawings shall provide, at a minimum, all information as shown within these requirements and the attached **RECORD DRAWING CHECKLIST** specific to the type of SWM/BMP facility being constructed. Other additional record data may be formally requested by the James City County Environmental Division. *(Note: Refer to the current edition of the James City County Guidelines for Design and Construction of Stormwater Management BMP's manual for a complete list of acceptable BMP's. Currently there are over 20 acceptable water quality type BMP's accepted by the County.)*

☑ Record Drawings shall consist of blue/black line prints and a reproducible (mylar, sepia, diazo, etc.) set of the approved stormwater management plan including applicable plan views, profiles, sections, details, maintenance plans, etc. as related to the subject SWM / BMP facility. The set shall indicate **"RECORD DRAWING "** in large text in the lower right hand corner of each sheet with record elevations, dimensions and data drawn in a clearly annotated format and/or boxed beside design values. Approved design plan values, dimensions and data shall not be removed or erased. Drawing sheet revision blocks shall be modified as required to indicate record drawing status. Elevations to the nearest 0.1' are sufficiently accurate except where higher accuracy is needed to show positive drainage. Certification statements as shown in Section 4 of the Record Drawing and Construction Certification Form, ***or similar forms thereof***, and professional signatures and seals, with dates matching that of the record drawing status in the revision or title block, are also required on all associated record drawing plans, prints or reproducibles.

☑ Submission Requirements. Initial and subsequent submissions for review shall consist of a minimum of one (1) blue/black line set for record drawings and one copy of the construction certification documents with appropriate transmittal. Under certain circumstances, it is understood that the record drawing and construction certification submissions may be performed by different professional firms. Therefore, record drawing submission may be in advance of construction certification or vice versa. Upon approval and prior to release of bond/surety, final submission shall include one (1) reproducible set of the record drawings, one (1) blue/black line set of the record drawings and one (1) copy of the construction certification. Also for current and/or future incorporation into the County BMP database and GIS system, it is requested that the record drawings also be submitted to the Environmental Division on a diskette or CD-ROM in an acceptable electronic file format such as *.dxf, *.dwg, etc. or in a standard scanned and readable format. The electronic file requirement can be discussed and coordinated with Environmental Division staff at the time of final submission.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

I. Methods and Presentation: *(Required for all Stormwater Management / BMP facilities.)*

XX 1. All constructed facilities meet approved design plans, unless otherwise shown. Record information or deviations from approved design plan shown in clearly annotated format and/or boxed beside design values.

XX 2. Elevations to the nearest 0.1' unless higher accuracy is needed to show positive drainage.

XX 3. All plan sheets labeled with "RECORD DRAWING" in large text in lower right hand corner (Approved County Plan Number and BMP ID Code can be included if known).

XX 4. All plan sheet revision blocks modified to indicate date and record drawing status.

XX 5. All plan sheets have certification statements and certifying professional's signature and seal.

II. Minimum Standards: *(Required for all Stormwater Management / BMP facilities, as applicable.)*

XX 1. All requirements of Section I (Methods and Presentation) apply to this section.

XX 2. Plan Views: Show general location, arrangement and dimensions. Location and alignment shall generally match approved design plans.

N/A 3. Profile or elevations along top or berm of the facility. At a minimum, elevations are required at each end, at intervals not to exceed 50 feet and where low spots may be present. Top of embankment or berm elevations must be no less than design elevation plus any settlement allowances.

N/A 4. Top widths, berm widths and embankment side slopes.

N/A 5. Show length, width and depth of facility or grading, contours or spot elevations as required to verify permanent pool and design storage volumes were met or were reasonably close to the approved design. Evaluation of as-built grading, contours, spot elevations, or cross-sections, may be necessary by the professional to ensure approved design configurations, depths and volumes were closely maintained. If grading or elevations are significantly different from the approved plan, the Environmental Division shall be contacted immediately to determine whether the variation is acceptable or whether further evidence will be required. Facilities which do not closely resemble approved plan grades, elevations or configurations may require regrading by the Contractor; check volumetric computations; and/or a check hydraulic routing to ensure approved design water surface elevations, discharges or freeboard were closely maintained.

N/A 6. Cross-section of the embankment through the principal spillway or outlet barrel. Must extend at least 100 ft. downstream of the pipe outlet or to recorded site property line, whichever is closer. Proper correlation is required between principal spillway (control structure) crest, emergency spillway crest, orifice and weirs and the top of the dam or facility. All elevations and dimensions must reasonably match the design plan or be sequentially relative to each other and the facility must reflect the required design storage volume(s) and/or design depth.

N/A 7. Profile or elevations along the entire centerline of the emergency spillway. Emergency spillway may be steeper, but no flatter or narrower than design.

N/A 8. Elevation of the principal spillway crest or outlet crest of the structure.

N/A 9. Primary control structure (riser) diameter or dimensions, height, type of material and base size. Indicate provisions for access that are present such as steps, ladders, etc.

N/A 10. Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.

N/A 11. Type and size of anti-vortex and trash rack device. Height, diameter, dimensions, bar spacings (if applicable) and elevations relative to the principal spillway crest. Indicate if lockable hatch is present or not.

N/A 12. Type, location, size and number of anti-seep collars or documentation of other methods utilized for seepage control. **May need to obtain this information during construction.**

N/A 13. Top of impervious core embankment, core trench limits and elevation of cut-off trench bottom. **May need to obtain this information during construction.**

N/A 14. Elevation of the principal spillway barrel (outlet pipe) inlet and outlet invert.

N/A 15. Outlet barrel diameter, length, slope, type and thickness class of material and type of flared end sections, headwall or endwall.

N/A 16. Outfall protection dimension, type and depth of rock and if underlain filter fabric is present.

N/A 17. BMP interior and periphery landscaping zones conform with arrangements and requirements of the approved design plan.

N/A 18. Maintenance plan taken from approved design plan transposed onto record drawing set.

N/A 19. Fencing location and type, if applicable to facility.

N/A 20. BMP vicinity properly cleaned of stockpiles and construction debris.

N/A 21. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

III. Group A - Wet Ponds *(Includes A-1 Small Wet Ponds; A-2 Wet Ponds; A-3 Wet Ext Det Ponds.)*

N/A A1. All requirements of Section II, Minimum Standards, apply to Group A facilities.

N/A A2. Principal spillway consists of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.

N/A A3. Sediment forebays or pretreatment devices provided at inlets to pond. Generally 4 to 6 ft. deep.

N/A A4. Access for maintenance and equipment is provided to the forebay(s). Access corridors are at least 12 ft. wide, have a maximum slope of 15 percent and are adequately stabilized to withstand heavy equipment or vehicle use.

N/A A5. Adequate fixed vertical sediment depth markers installed in the forebay(s) for future sediment monitoring purposes.

N/A A6. Pond liner (if required) provided. Either clay liners, polyliners, bentonite liners or use of chemical soil additives based on requirements of the approved plan.

N/A A7. Minimum 6 percent slope safety bench extending a minimum of 15 feet outward from normal pool edge and/or an aquatic bench extending a minimum of 10 feet inward from the normal shoreline with a maximum depth of 12 inches below the normal pool elevation, if applicable, per the approved design plans. (Note: Safety benches may be waived if pond side slopes are no steeper than 4H:1V).

N/A A8. No trees are present within a zone 15 feet around the embankment toe and 25 feet from the principal spillway structure.

N/A A9. Wet permanent pool, typically 3 to 6 feet deep, is provided and maintains level within facility.

N/A A10. Low flow orifice has a non-clogging mechanism.

N/A A11. A pond drain pipe with valve was provided.

N/A A12. Pond side slopes are not steeper than 3H:1V, unless approved plan allowed for steeper slope.

N/A A13. End walls above barrels (outlet pipe) greater than 48 inch in diameter are fenced to prevent a fall hazard.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

IV. Group B - Wetlands *(Includes B-1 Shallow Marsh; B-2 Ext Det Shallow Wetlands; B-3 Pond Wetland System and B-4 Pocket Wetland)*

N/A B1. Same requirements as Group A Wet Ponds.

N/A B2. Minimum 2:1 length to width flow path provided across the facility.

N/A B3. Micropool provided at or around outlet from BMP (generally 3 to 6 ft. deep).

N/A B4. Wetland type landscaping provided in accordance with approved plan. Includes correct pondscaping zones, plant species, planting arrangements, wetland beds, etc. Wetland plants include 5 to 7 emergent wetland species. Individual plants at 18 inches on center in clumps.

N/A B5. Adequate wetland buffer provided (Typically 25 ft. outward from maximum design water surface elevation and 15 ft. setback to structures).

N/A B6. No more than one-half (½) of the wetland surface area is planted.

N/A B7. Topsoil or wetland mulch provided to support vigorous growth of wetland plants.

N/A B8. Planting zones staked or flagged in field and locations subsequently established by appropriate field surveying methods for record drawing presentation.

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

V. Group C - Infiltration Practices

(Includes C-1 Infiltration Trench; C-2 Infiltration Trench; C-3 Infiltration Basin; and C-4 Infiltration Basin)

N/A C1. All requirements of Section II, Minimum Standards, apply to Group C facilities as applicable.

N/A C2. Facility is not located on fill slopes or on natural ground in excess of six (6) percent.

N/A C3. Pretreatment devices provided prior to entry into the infiltration facility. Acceptable pretreatment devices include sediment forebays, sediment basins, sediment traps, sump pits or inlets, grass channels, plunge pools or other acceptable measures.

N/A C4. Three (3) or more of the following pretreatment devices provided to protect long term integrity of structure: grass channel; grass filter strip; bottom sand layer; upper filter fabric layer; use of washed bank run gravel aggregate.

N/A C5. Sides of infiltration practice lined with filter fabric.

N/A C6. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

N/A C7. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.

N/A C8. Minimum one hundred (100) foot separation horizontally from any known water supply well and minimum one hundred (100) foot separation upslope from any building.

N/A C9. Minimum twenty-five (25) foot separation down gradient from any structure.

N/A C10. Stormwater outfalls provided for overflow associated with larger design storms.

N/A C11. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A C12. Facility does not currently cause any apparent surface or subsurface water problems to downgrade properties.

N/A C13. Observation well provided.

N/A C14. Adequate, direct access provided to the facility for future maintenance, operation and inspection.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VI. Group D - Filtering Systems *(Includes D-1 Bioretention Cells; D-2 Surface Sand Filters; D-3 Underground Sand Filters; D-4 Perimeter Sand Filters; D-5 Organic Filters; and D-6 Pocket Sand Filters)*

N/A D1. All requirements of Section II, Minimum Standards, apply to Group D facilities.

N/A D2. Sediment pretreatment devices provided.

N/A D3. For D-1 BMPs (Bioretention Cells), pretreatment consisting of a grass filter strip below level spreader (deflector); a gravel diaphragm; and mulch and planting soil layers were provided.

N/A D4. For D-1 BMPs (Bioretention Cells), plantings consist of native plant species; vegetation provided was based on zones of hydric tolerances; trees and understory of shrubs and herbaceous materials were provided; woody vegetation is absent from inflow locations; and trees are located around facility perimeter.

N/A D5. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

N/A D6. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed .

____ D7. Filtering system is off-line from storm drainage conveyance system.

N/A D8. Overflow outlet has adequate erosion protection.

N/A D9. Deflector, diversion, flow splitter or regulator structure provided to divert the water quality volume to the filtering structure.

N/A D10. Minimum four (4) inch perforated underdrain provided in a clean aggregate envelope layer beneath the facility.

N/A D11. Minimum fifty (50) foot separation from any slope fifteen (15) percent or greater. Minimum one hundred (100) foot separation horizontally from any known water supply well. Minimum one hundred (100) foot separation upslope and twenty-five (25) foot separation downslope from any building.

N/A D12. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.

N/A D13. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A D14. Adequate, direct access provided to the pretreatment area and/or filter bed for future maintenance.

STORMWATER MANAGEMENT / BMP FACILITIES
AS-BUILT PLAN CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VII. Group E - Open Channel Systems

(Includes E-1 Wet Swales (Check Dams); E-2 Dry Swales;and E-3 Biofilters)

N/A E1. All requirements of Section II, Minimum Standards, apply to Group E facilities as applicable.

N/A E2. Open channel system has constructed longitudinal slope of less than four (4) percent.

N/A E3. No visual signs of erosion in the open channel system's soil and/or vegetative cover.

N/A E4. Open channel side slopes are no steeper than 2H:1V at any location. Preferred channel sideslope is 3H:1V or flatter.

N/A E5. No visual signs of ponding are present at any location in the open channel system, except at rock check dam locations for E-1 systems (Wet Swales).

N/A E6. For E-2 BMPs (Dry Swales), an underdrain system was provided.

N/A E7. Treated timber or rock check dams provided as pretreatment devices for the open channel system.

N/A E8. Gravel diaphragm provided in areas where lateral sheet flow from impervious surfaces are directly connected to the open channel system.

N/A E9. Grass cover/stabilization in the open channel system appears adaptable to the specific soils and hydric conditions for the site and along the channel system.

N/A E10. Open channel system areas with grass covers higher than four (4) to six (6) inches were properly mowed.

N/A E11. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

N/A E12. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

N/A E13. For E-3 BMPs (Biofilters), the bottom width is six (6) feet maximum at any location.

N/A E14. For E-3 BMPs (Biofilters), sideslopes are 3H:1V maximum at any location.

N/A E15. For E-3 BMPs (Biofilters), the constructed channel slope is less than or equal to three (3) percent at any location.

N/A E16. For E-3 BMPs (Biofilters), the constructed grass channel is approximately equivalent to the constructed roadway length.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VIII. Group F - Extended Dry Detention *(Includes F-1 Timber Walls; and F-2 Dry Extended Detention with Forebay)*

N/A F1. All requirements of Section II, Minimum Standards, apply to Group F facilities.

N/A F2. Basin bottom has positive slope and drainage from all basin inflow points to the riser (or outflow) location.

N/A F3. Timber wall BMP used in intermittent stream only. (ie. Prohibited in perennial streams.)

N/A F4. Forebay provided approximately 20 ft. upstream of the facility. Forebays generally 4 to 6 feet in depth.

N/A F5. A reverse slope pipe, vertical stand pipe or mini-barrel and riser was provided to prevent clogging.

N/A F6. Principal spillway and outlet barrel provided consisting of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.

N/A F7. Mini-barrel and riser, if used, contains a removable trash rack to reduce clogging.

N/A F8. Low flow orifice, if used, has a minimum diameter of three (3) inches or two (2) inches if internal orifice control was utilized and a small, cage type external trash rack.

N/A F9. Timbers properly reinforced or concrete footing provided if soil conditions were prohibitive.

N/A F10. Timber wall cross members extended to a minimum depth of two (2) feet below ground elevation.

N/A F11. Protection against erosion and scour from the low flow orifice and weir-flow trajectory provided.

N/A F12. Stilling basin or standard outlet protection provided at principal spillway outlet.

N/A F13. Adequate, direct access provided to the facility. Access corridor to facility is at least ten (10) feet wide, slope is less than twenty (20) percent and appropriate stabilization provided for equipment and vehicle use. Access extends to forebay, standpipe and timber wall, as applicable.

N/A F14. No visual signs of undercutting of timber walls or clogging of the low orifice were present.

N/A F15. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A F16. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

IX. Group G - Open Spaces *(Includes All Open Space Types G-1; G-2; and G-3)*

N/A G1. All requirements of Section II, Minimum Standards, apply to Group G facilities as applicable.

N/A G2. Constructed impervious areas appear to conform with locations indicated on the approved plan and appear less than sixty (60) percent impervious in accordance with the requirements of the James City County Chesapeake Bay Preservation Ordinance.

N/A G3. Dedicated open space areas are in undisturbed common areas, conservation easements or are protected by other enforceable instruments that ensures perpetual protection.

N/A G4. Provisions included to clearly specify how the natural vegetated areas utilized as dedicated open space will be managed and field identified (marked).

N/A G5. Adequate protection measures were implemented during construction to protect the defined dedicated open space areas.

N/A G6. Dedicated open space areas were not disturbed during construction (ie. cleared, grubbed or graded).

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

X. Storm Drainage Systems (Associated with BMP's Only)

(Includes all incidental stormwater drainage conveyance systems associated with SWM/BMP facilities such as onsite or offsite storm drains, open channels, inlets, manholes, junctions, outlet protections, deflectors, etc. These facilities are external to the treatment function of, but are directly associated with drainage to and/or from a constructed SWM/BMP facility. The intent of this portion of the certification is to accurately identify the type and quantity of inflow or outflow points associated with the facility for future reference. The Professional may use his/her own discretion to determine inclusive facilities to meet the intent of this section. As a general rule, storm drainage systems would include incidental facilities to the nearest access structure upslope or downslope from the normal physical limits of the facility or 800 feet of storm drainage conveyance system length, whichever is less.)

N/A SD1. All requirements of Section II, Minimum Standards, apply to Storm Drainage Systems.

N/A SD2. Horizontal location of all pipe and structures relative to the SWM/BMP facility.

N/A SD3. Type, top elevation and invert elevation of all access type structures (inlets, manholes, etc.).

N/A SD4. Material type, size or diameter, class, invert elevations, lengths and slopes for all pipe segments.

N/A SD5. Class, length, width and depth of riprap and outlet protections or dimensions of special energy dissipation structures.

XII. Other Systems

(Includes any non-typical, specialty, manufactured or innovative stormwater management/BMP practices or systems generally accepted for use as or in conjunction with other acceptable stormwater management / BMP practices. Requires evidence of prior satisfactory industry use and prior Environmental Division approval, waiver or exception .)

N/A O1. All requirements of Section II, Minimum Standards, apply to this section.

N/A O2. Certification criteria to be determined on a case-by-case basis by the Environmental Division specific to the proposed SWM/BMP facility.

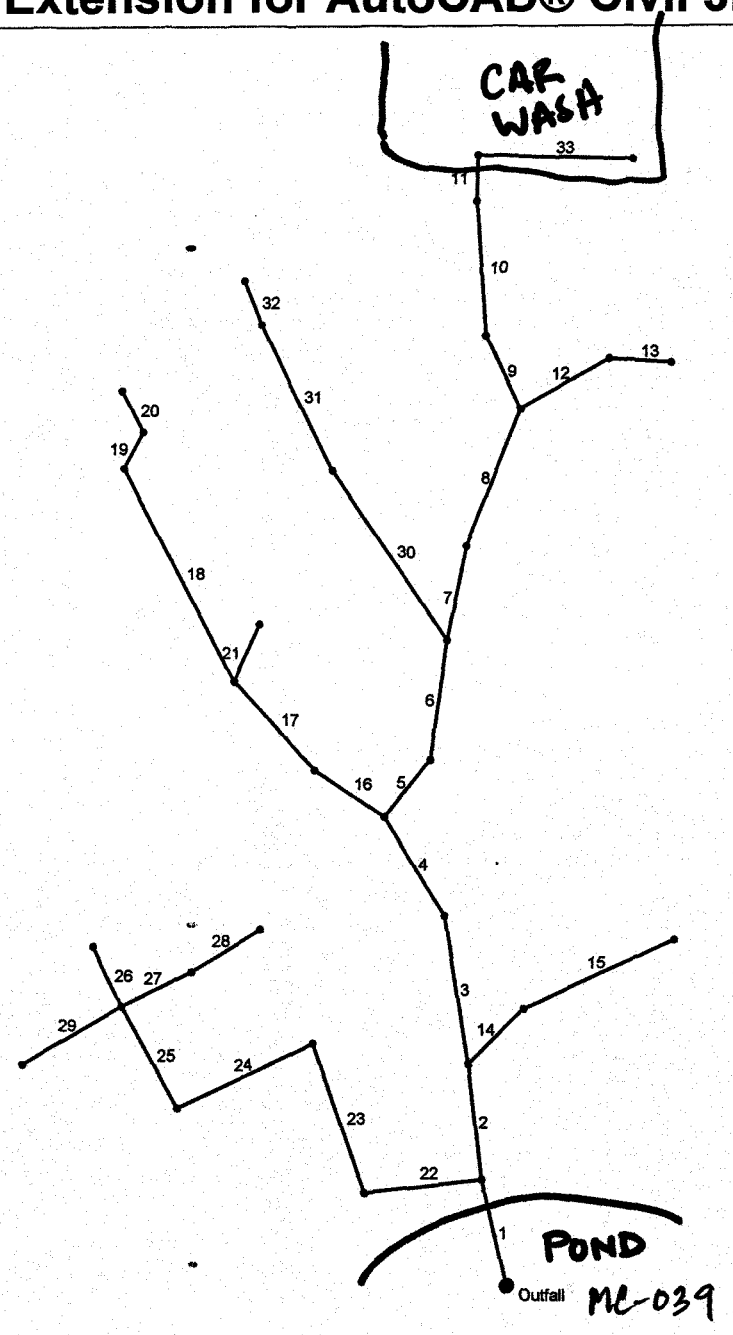
XIII. References

(The James City County Record Drawing and Construction Certification Forms and Checklists for Stormwater Management / BMP facilities were developed using the following sources and references.)

- ☐ Baltimore County, Maryland Soil Conservation District, As-Built Stormwater Management Pond Checklist.
- ☑ James City County, Virginia, Guidelines for Design and Construction of Stormwater Management BMP's (October 1999).
- ☑ James City County, Virginia, Stormwater Detention/Retention Basin Design Checklist and Erosion and Sediment Control and Stormwater Management Design Plan Checklists.
- ☐ James City County Stormwater Policy Framework, Final Report of the James City County BMP Policy Project, October 1998, The Center for Watershed Protection.
- ☐ Prince Georges County, Maryland, As-Built Requirements Retention or Detention Pond/Basin.
- ☐ Prince William County, Virginia, Stormwater Management Fact Sheet.
- ☐ Stafford County, Virginia, As-Built Plan Checklist.
- ☐ Stormwater Management Design Manual, NRCS Maryland Code No. 378, Pond Standards and Specifications.
- ☐ USEPA/Watershed Management Institute, Stormwater Management Inspection Forms.
- ☐ Virginia Impounding Structure Regulations (Dam Safety), Department of Conservation & Recreation, 1997.
- ☑ Virginia Erosion and Sediment Control Handbook, Third Edition 1992, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.
- ☑ Virginia Stormwater Management Handbook, 1999 edition, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.

File: Shared\SWMProg\BMP\Certif\RDCC_fillable.wpd

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



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SEP 21 2012
Environmental Division

Project File: Williamsburg Crossing Storm System.stm	Number of lines: 33	Date: 9/21/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	94.000	0.64	21.75	0.50	0.32	11.25	5.0	7.7	6.4	72.48	219.8	8.06	48	2.34	54.00	56.20	56.90	58.72	0.00	90.00	
2	1	100.000	0.64	15.99	0.50	0.32	8.37	5.0	7.3	6.5	54.74	60.02	9.18	36	0.81	66.60	67.41	68.96	69.77	90.00	90.00	
3	2	130.000	0.64	14.07	0.50	0.32	7.41	5.0	7.1	6.6	48.83	41.64	10.16	30	1.03	69.56	70.90	71.85	73.71	90.00	90.00	
4	3	100.000	0.64	13.43	0.50	0.32	7.09	5.0	6.9	6.6	47.01	41.01	9.82	30	1.00	72.50	73.50	74.76	76.14	90.00	90.00	
5	4	64.000	0.64	8.95	0.50	0.32	4.85	5.0	6.8	6.7	32.31	27.91	8.46	27	0.81	75.55	76.07	77.51	78.31	90.00	90.00	
6	5	104.000	0.64	8.31	0.50	0.32	4.53	5.0	6.6	6.7	30.40	30.52	8.51	27	0.97	77.14	78.15	79.03	80.04	90.00	90.00	
7	6	84.000	0.64	5.74	0.50	0.32	3.10	5.0	6.4	6.8	20.92	38.71	7.44	24	2.93	78.30	80.76	80.04	82.38	90.00	90.00	
8	7	128.000	0.64	5.10	0.50	0.32	2.78	5.0	6.1	6.8	18.94	15.15	8.09	21	0.91	81.51	82.68	83.08	84.92	90.00	90.00	
9	8	70.000	0.64	3.18	0.50	0.32	1.82	5.0	5.9	6.9	12.50	13.39	5.20	21	0.71	82.67	83.17	85.66	86.09	90.00	90.00	
10	9	116.000	0.64	2.54	0.50	0.32	1.50	5.0	5.6	7.0	10.43	11.03	5.90	18	1.10	83.27	84.55	86.27	87.41	90.00	88.20	
11	10	40.000	0.64	1.90	0.50	0.32	1.18	5.0	5.4	7.0	8.24	12.65	4.66	18	1.45	84.55	85.13	87.50	87.74	88.20	89.87	
12	8	88.000	0.64	1.28	0.50	0.32	0.64	5.0	5.5	7.0	4.48	3.83	4.35	15	0.35	85.94	86.25	86.79	87.49	90.00	90.00	
13	12	54.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	2.64	1.86	15	0.17	86.35	86.44	87.62	87.68	90.00	90.00	
14	2	68.000	0.64	1.28	0.50	0.32	0.64	5.0	5.6	7.0	4.46	8.68	4.12	15	1.81	67.86	69.09	69.77	70.01	90.00	90.00	
15	14	144.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	4.79	3.96	12	1.81	69.39	72.00	70.14	72.64	90.00	90.00	
16	4	72.000	0.64	3.84	0.50	0.32	1.92	5.0	6.4	6.7	12.96	13.50	7.33	18	1.65	73.81	75.00	77.50	78.59	90.00	90.00	
17	16	104.000	0.64	3.20	0.50	0.32	1.60	5.0	6.2	6.8	10.91	6.18	6.17	18	0.35	75.10	75.46	78.83	79.95	90.00	90.00	
18	17	208.000	0.64	1.92	0.50	0.32	0.96	5.0	5.5	7.0	6.70	6.91	5.46	15	1.14	75.70	78.08	80.50	82.75	90.00	90.00	
19	18	36.000	0.64	1.28	0.50	0.32	0.64	5.0	5.4	7.0	4.50	4.93	3.67	15	0.58	78.15	78.36	83.14	83.31	90.00	90.00	
20	19	40.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	3.68	1.86	15	0.32	78.46	78.59	83.49	83.54	90.00	90.00	
21	17	54.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	6.11	2.90	12	2.94	76.60	78.19	80.50	80.72	90.00	90.00	
22	1	102.000	0.64	5.12	0.50	0.32	2.56	5.0	7.4	6.5	16.67	12.64	5.45	27	0.17	65.55	65.72	66.95	67.70	90.00	90.00	
23	22	136.000	0.64	4.48	0.50	0.32	2.24	5.0	6.8	6.7	14.91	12.17	3.78	27	0.15	65.86	66.07	68.01	68.30	90.00	90.00	
24	23	130.000	0.64	3.84	0.50	0.32	1.92	5.0	6.2	6.8	13.09	13.02	3.29	27	0.18	66.17	66.40	68.52	68.75	90.00	90.00	
25	24	100.000	0.64	3.20	0.50	0.32	1.60	5.0	5.9	6.9	11.02	10.50	6.23	18	1.00	66.50	67.50	68.92	70.02	90.00	90.00	
26	25	58.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	3.03	3.51	12	0.72	69.70	70.12	70.62	70.80	90.00	90.00	
27	25	68.000	0.64	1.28	0.50	0.32	0.64	5.0	5.3	7.1	4.51	5.04	6.04	12	2.00	69.70	71.06	70.62	71.95	90.00	90.00	
28	27	70.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	5.99	4.29	12	2.83	71.60	73.58	72.24	74.22	90.00	90.00	
29	25	100.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	3.42	1.86	15	0.28	67.72	68.00	70.62	70.75	90.00	90.00	
30	6	178.000	0.64	1.93	0.50	0.32	1.11	5.0	5.8	6.9	7.71	11.33	3.77	21	0.51	78.30	79.21	80.04	80.42	90.00	90.00	
31	30	140.000	0.64	1.29	0.50	0.32	0.79	5.0	5.2	7.1	5.61	7.10	4.19	18	0.46	79.31	79.95	80.47	80.94	90.00	90.00	
32	31	40.000	0.65	0.65	0.73	0.47	0.47	5.0	5.0	7.1	3.38	6.64	3.14	18	0.40	80.05	80.21	80.99	81.04	90.00	90.00	
33	11	134.000	1.26	1.26	0.68	0.86	0.86	5.0	5.0	7.1	6.11	7.10	4.98	15	1.21	85.37	86.99	88.08	89.28	89.87	90.88	

Environmental Division
SEP 21 2012
RECEIVED

Project File: Williamsburg Crossing Storm System.stm

Number of lines: 33

Run Date: 9/21/2012

NOTES:Intensity = 143.72 / (Inlet time + 19.20) ^ 0.94; Return period =Yrs. 10 ; c = cir e = ellip b = box

Environmental Division

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James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities
Record Drawing and Construction Certification Forms

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

Section 1 - Site Information:

Project Name: Williamsburg Crossing Car Wash
Structure/BMP Name: n/a
Project Location: 5117 John Tyler Highway, Williamsburg, VA.
BMP Location: n/a
County Plan No.: SP - 0067 - 2011

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

Tax Map/Parcel No.: 4121500007
BMP ID Code (if known): DRAINS TO MC 039
Zoning District:: B-1
Land Use: CAR WASH
Site Area (sf or acres): 1.52 acres

Brief Description of Stormwater Management/BMP Facility:

Reinforced concrete storm conveyance pipe and accompanying inlet/manhole

Nearest Visible Landmark to SWM/BMP Facility: Union Bank / Lafontaine Condominiums

Nearest Vertical Ground Control (if known):
☐ JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☐ Arbitrary ☐ Other
Station Number or Name: _____
Datum or Reference Elevation: Horizontal: NAD 83 ; Vertical: NGVD 29
Control Description: _____
Control Location from Subject Facility: _____

Section 2 - Stormwater Management / BMP Facility Construction Information:

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

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

Section 3 - Owner / Designer / Contractor Information:

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

Name: Matt Blanchard
Mailing Address: 3664 Bridgewater Drive
Williamsburg, VA 23188
Business Phone: (757) 645-5342 Fax: _____
Contact Person: _____ Title: _____

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

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road
Williamsburg, VA 23188
Business Phone: (757) 253-0040
Fax: (757) 220-8994
Responsible Plan Preparer: Jason Grimes
Title: Project Manager
Plan Name: Williamsburg Crossing Car Wash
Firm's Project No. W10172
Plan Date: August 18, 2011
Sheet No.'s Applicable to SWM/BMP Facility: ____ / ____ / ____ / ____ / ____

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

Name: CW Davis Construction
Mailing Address: PO Box 625
Hayes, VA 23072
Business Phone: (804) 642-5562
Fax: _____
Contact Person: Brett Davis
Site Foreman/Supervisor: _____
Specialty Subcontractors & Purpose (for BMP Construction Only):

Section 4 - Professional Certifications:

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

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road, Suite 1
Williamsburg, VA 23188
Business Phone: (757) 253-0040
Fax: (757) 869-2924

Name: Jason Grimes, P.E.
Title: Project Manager
Signature:
Date: 9/21/12

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

COMMONWEALTH OF VIRGINIA
JASON A. GRIMES
Lic. No. 49170
9/21/12
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: S&ME, Inc.
Mailing Address: 8211 Hermitage Road
Richmond, VA 23228
Business Phone: (804) 266-2199
Fax: (804) 261-5569

Name: Christopher J. Brown, P.E.
Title: Branch Manager
Signature:
Date: 9.21.12

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

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. BROWN
Lic No. 49840
9.21.12
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer

Section 5 - Record Drawing and Construction Certification Requirements and Instructions:

- ☑ PreConstruction Meeting - Provides an opportunity to review SWM / BMP facility construction, maintenance and operation plans and address any questions regarding construction and/or monitoring of the structure. The design engineer, certifying professionals (if different), Owner/Applicant, Contractor and County representative(s) are encouraged to attend the preconstruction meeting. Advanced notice to the Environmental Division is requested. Usually, this requirement can be met simultaneously with Erosion and Sediment Control preconstruction meetings held for the project.

- ☑ A fully completed ***STORMWATER MANAGEMENT / BMP FACILITIES, RECORD DRAWING and CONSTRUCTION CERTIFICATION FORM*** and ***RECORD DRAWING CHECKLIST***. All applicable sections shall be completed in their entirety and certification statements signed and sealed by the registered professional responsible for individual record drawing and/or construction certification.

- ☑ The Record Drawing shall be prepared by a Registered Professional Engineer or Certified Land Surveyor for the drainage system of the project including any Best Management Practices.

- ☑ Construction Certification. Construction of Stormwater Management / BMP facilities which contain impoundments, embankments and related engineered appurtenances including subgrade preparation, compacted soils, structural fills, liners, geosynthetics, filters, seepage controls, cutoffs, toe drains, hydraulic flow control structures, etc. shall be visually observed and monitored by a Registered Professional Engineer or his/her authorized representative. The Engineer must certify that the structure, embankment and associated appurtenances were built in accordance with the approved design plan, specifications and stormwater management plan and standard accepted construction practice and shall submit a written certification and/or drawings to the Environmental Division as required. Soil and compaction test reports, concrete test reports, inspection reports, logs and other required construction material or installation documentation may be required by the Environmental Division to substantiate the certification, if specifically requested. The Engineer shall have the authority and responsibility to make minor changes to the approved plan, in coordination with the assigned County inspector, in order to compensate for unsafe or unusual conditions encountered during construction such as those related to bedrock, soils, groundwater, topography, etc. as long as changes do not adversely affect the integrity of the structure(s). Major changes to the approved design plan or structure must be reviewed and approved by the original design professional and the James City County Environmental Division.

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

  Dual Purpose Facilities - Completion of construction also includes an interim stage for Stormwater Management / BMP facilities which serve dual purpose as temporary sediment basins during construction and as permanent stormwater management / BMP facilities following construction, once development and stabilization are substantially complete. For these dual purpose facilities, construction certification is required once the temporary sediment basin phase of construction is complete. Final record drawing and construction certification of additional permanent components is required once permanent facility construction is complete.

  Interim Construction Certification is required for those dual purpose embankment-type facilities that are generally ten (10) feet or greater in dam height (*) and may not be converted, modified or begin function as a permanent SWM / BMP structure for a period generally ranging from six (6) to eighteen (18) months or more from issuance of a Land Disturbance permit for construction.

Interim or final record drawing and construction certifications are not required for temporary sediment basins which are designed and constructed in accordance with current minimum standards and specifications for temporary sediment basins per the Virginia Erosion and Sediment Control Handbook (VESCH); have a temporary service life of less than eighteen (18) months; and will be removed completely once associated disturbed areas are stabilized, unless a distinct hazard to the public's health, safety and welfare is determined by the Environmental Division due to the size or presence of the structure or due to evidence of improper construction.

(*Note: Dam Height as referenced above is generally defined as the vertical distance from the natural bed of the stream or waterway at the downstream toe of the embankment to the top of the embankment structure in accordance with 4VAC50-20-30, Virginia Impoundment Structure Regulations and the Virginia Dam Safety Program.)

☑ Record Drawings shall provide, at a minimum, all information as shown within these requirements and the attached **RECORD DRAWING CHECKLIST** specific to the type of SWM/BMP facility being constructed. Other additional record data may be formally requested by the James City County Environmental Division. *(Note: Refer to the current edition of the James City County Guidelines for Design and Construction of Stormwater Management BMP's manual for a complete list of acceptable BMP's. Currently there are over 20 acceptable water quality type BMP's accepted by the County.)*

☑ Record Drawings shall consist of blue/black line prints and a reproducible (mylar, sepia, diazo, etc.) set of the approved stormwater management plan including applicable plan views, profiles, sections, details, maintenance plans, etc. as related to the subject SWM / BMP facility. The set shall indicate **"RECORD DRAWING "** in large text in the lower right hand corner of each sheet with record elevations, dimensions and data drawn in a clearly annotated format and/or boxed beside design values. Approved design plan values, dimensions and data shall not be removed or erased. Drawing sheet revision blocks shall be modified as required to indicate record drawing status. Elevations to the nearest 0.1' are sufficiently accurate except where higher accuracy is needed to show positive drainage. Certification statements as shown in Section 4 of the Record Drawing and Construction Certification Form, ***or similar forms thereof***, and professional signatures and seals, with dates matching that of the record drawing status in the revision or title block, are also required on all associated record drawing plans, prints or reproducibles.

☑ Submission Requirements. Initial and subsequent submissions for review shall consist of a minimum of one (1) blue/black line set for record drawings and one copy of the construction certification documents with appropriate transmittal. Under certain circumstances, it is understood that the record drawing and construction certification submissions may be performed by different professional firms. Therefore, record drawing submission may be in advance of construction certification or vice versa. Upon approval and prior to release of bond/surety, final submission shall include one (1) reproducible set of the record drawings, one (1) blue/black line set of the record drawings and one (1) copy of the construction certification. Also for current and/or future incorporation into the County BMP database and GIS system, it is requested that the record drawings also be submitted to the Environmental Division on a diskette or CD-ROM in an acceptable electronic file format such as *.dxf, *.dwg, etc. or in a standard scanned and readable format. The electronic file requirement can be discussed and coordinated with Environmental Division staff at the time of final submission.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

I. Methods and Presentation: *(Required for all Stormwater Management / BMP facilities.)*

XX 1. All constructed facilities meet approved design plans, unless otherwise shown. Record information or deviations from approved design plan shown in clearly annotated format and/or boxed beside design values.

XX 2. Elevations to the nearest 0.1' unless higher accuracy is needed to show positive drainage.

XX 3. All plan sheets labeled with "RECORD DRAWING" in large text in lower right hand corner (Approved County Plan Number and BMP ID Code can be included if known).

XX 4. All plan sheet revision blocks modified to indicate date and record drawing status.

XX 5. All plan sheets have certification statements and certifying professional's signature and seal.

II. Minimum Standards: *(Required for all Stormwater Management / BMP facilities, as applicable.)*

XX 1. All requirements of Section I (Methods and Presentation) apply to this section.

XX 2. Plan Views: Show general location, arrangement and dimensions. Location and alignment shall generally match approved design plans.

N/A 3. Profile or elevations along top or berm of the facility. At a minimum, elevations are required at each end, at intervals not to exceed 50 feet and where low spots may be present. Top of embankment or berm elevations must be no less than design elevation plus any settlement allowances.

N/A 4. Top widths, berm widths and embankment side slopes.

N/A 5. Show length, width and depth of facility or grading, contours or spot elevations as required to verify permanent pool and design storage volumes were met or were reasonably close to the approved design. Evaluation of as-built grading, contours, spot elevations, or cross-sections, may be necessary by the professional to ensure approved design configurations, depths and volumes were closely maintained. If grading or elevations are significantly different from the approved plan, the Environmental Division shall be contacted immediately to determine whether the variation is acceptable or whether further evidence will be required. Facilities which do not closely resemble approved plan grades, elevations or configurations may require regrading by the Contractor; check volumetric computations; and/or a check hydraulic routing to ensure approved design water surface elevations, discharges or freeboard were closely maintained.

N/A 6. Cross-section of the embankment through the principal spillway or outlet barrel. Must extend at least 100 ft. downstream of the pipe outlet or to recorded site property line, whichever is closer. Proper correlation is required between principal spillway (control structure) crest, emergency spillway crest, orifice and weirs and the top of the dam or facility. All elevations and dimensions must reasonably match the design plan or be sequentially relative to each other and the facility must reflect the required design storage volume(s) and/or design depth.

N/A 7. Profile or elevations along the entire centerline of the emergency spillway. Emergency spillway may be steeper, but no flatter or narrower than design.

N/A 8. Elevation of the principal spillway crest or outlet crest of the structure.

N/A 9. Primary control structure (riser) diameter or dimensions, height, type of material and base size. Indicate provisions for access that are present such as steps, ladders, etc.

N/A 10. Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.

N/A 11. Type and size of anti-vortex and trash rack device. Height, diameter, dimensions, bar spacings (if applicable) and elevations relative to the principal spillway crest. Indicate if lockable hatch is present or not.

N/A 12. Type, location, size and number of anti-seep collars or documentation of other methods utilized for seepage control. **May need to obtain this information during construction.**

N/A 13. Top of impervious core embankment, core trench limits and elevation of cut-off trench bottom. **May need to obtain this information during construction.**

N/A 14. Elevation of the principal spillway barrel (outlet pipe) inlet and outlet invert.

N/A 15. Outlet barrel diameter, length, slope, type and thickness class of material and type of flared end sections, headwall or endwall.

N/A 16. Outfall protection dimension, type and depth of rock and if underlain filter fabric is present.

N/A 17. BMP interior and periphery landscaping zones conform with arrangements and requirements of the approved design plan.

N/A 18. Maintenance plan taken from approved design plan transposed onto record drawing set.

N/A 19. Fencing location and type, if applicable to facility.

N/A 20. BMP vicinity properly cleaned of stockpiles and construction debris.

N/A 21. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

III. Group A - Wet Ponds *(Includes A-1 Small Wet Ponds; A-2 Wet Ponds; A-3 Wet Ext Det Ponds.)*

N/A A1. All requirements of Section II, Minimum Standards, apply to Group A facilities.

N/A A2. Principal spillway consists of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.

N/A A3. Sediment forebays or pretreatment devices provided at inlets to pond. Generally 4 to 6 ft. deep.

N/A A4. Access for maintenance and equipment is provided to the forebay(s). Access corridors are at least 12 ft. wide, have a maximum slope of 15 percent and are adequately stabilized to withstand heavy equipment or vehicle use.

N/A A5. Adequate fixed vertical sediment depth markers installed in the forebay(s) for future sediment monitoring purposes.

N/A A6. Pond liner (if required) provided. Either clay liners, polyliners, bentonite liners or use of chemical soil additives based on requirements of the approved plan.

N/A A7. Minimum 6 percent slope safety bench extending a minimum of 15 feet outward from normal pool edge and/or an aquatic bench extending a minimum of 10 feet inward from the normal shoreline with a maximum depth of 12 inches below the normal pool elevation, if applicable, per the approved design plans. (Note: Safety benches may be waived if pond side slopes are no steeper than 4H:1V).

N/A A8. No trees are present within a zone 15 feet around the embankment toe and 25 feet from the principal spillway structure.

N/A A9. Wet permanent pool, typically 3 to 6 feet deep, is provided and maintains level within facility.

N/A A10. Low flow orifice has a non-clogging mechanism.

N/A A11. A pond drain pipe with valve was provided.

N/A A12. Pond side slopes are not steeper than 3H:1V, unless approved plan allowed for steeper slope.

N/A A13. End walls above barrels (outlet pipe) greater than 48 inch in diameter are fenced to prevent a fall hazard.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

IV. Group B - Wetlands *(Includes B-1 Shallow Marsh; B-2 Ext Det Shallow Wetlands; B-3 Pond Wetland System and B-4 Pocket Wetland)*

N/A B1. Same requirements as Group A Wet Ponds.

N/A B2. Minimum 2:1 length to width flow path provided across the facility.

N/A B3. Micropool provided at or around outlet from BMP (generally 3 to 6 ft. deep).

N/A B4. Wetland type landscaping provided in accordance with approved plan. Includes correct pondscaping zones, plant species, planting arrangements, wetland beds, etc. Wetland plants include 5 to 7 emergent wetland species. Individual plants at 18 inches on center in clumps.

N/A B5. Adequate wetland buffer provided (Typically 25 ft. outward from maximum design water surface elevation and 15 ft. setback to structures).

N/A B6. No more than one-half (½) of the wetland surface area is planted.

N/A B7. Topsoil or wetland mulch provided to support vigorous growth of wetland plants.

N/A B8. Planting zones staked or flagged in field and locations subsequently established by appropriate field surveying methods for record drawing presentation.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

V. Group C - Infiltration Practices

(Includes C-1 Infiltration Trench; C-2 Infiltration Trench; C-3 Infiltration Basin; and C-4 Infiltration Basin)

N/A C1. All requirements of Section II, Minimum Standards, apply to Group C facilities as applicable.

N/A C2. Facility is not located on fill slopes or on natural ground in excess of six (6) percent.

N/A C3. Pretreatment devices provided prior to entry into the infiltration facility. Acceptable pretreatment devices include sediment forebays, sediment basins, sediment traps, sump pits or inlets, grass channels, plunge pools or other acceptable measures.

N/A C4. Three (3) or more of the following pretreatment devices provided to protect long term integrity of structure: grass channel; grass filter strip; bottom sand layer; upper filter fabric layer; use of washed bank run gravel aggregate.

N/A C5. Sides of infiltration practice lined with filter fabric.

N/A C6. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

N/A C7. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.

N/A C8. Minimum one hundred (100) foot separation horizontally from any known water supply well and minimum one hundred (100) foot separation upslope from any building.

N/A C9. Minimum twenty-five (25) foot separation down gradient from any structure.

N/A C10. Stormwater outfalls provided for overflow associated with larger design storms.

N/A C11. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A C12. Facility does not currently cause any apparent surface or subsurface water problems to downgrade properties.

N/A C13. Observation well provided.

N/A C14. Adequate, direct access provided to the facility for future maintenance, operation and inspection.

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VI. Group D - Filtering Systems *(Includes D-1 Bioretention Cells; D-2 Surface Sand Filters; D-3 Underground Sand Filters; D-4 Perimeter Sand Filters; D-5 Organic Filters; and D-6 Pocket Sand Filters)*

N/A D1. All requirements of Section II, Minimum Standards, apply to Group D facilities.

N/A D2. Sediment pretreatment devices provided.

N/A D3. For D-1 BMPs (Bioretention Cells), pretreatment consisting of a grass filter strip below level spreader (deflector); a gravel diaphragm; and mulch and planting soil layers were provided.

N/A D4. For D-1 BMPs (Bioretention Cells), plantings consist of native plant species; vegetation provided was based on zones of hydric tolerances; trees and understory of shrubs and herbaceous materials were provided; woody vegetation is absent from inflow locations; and trees are located around facility perimeter.

N/A D5. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

N/A D6. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed .

____ D7. Filtering system is off-line from storm drainage conveyance system.

N/A D8. Overflow outlet has adequate erosion protection.

N/A D9. Deflector, diversion, flow splitter or regulator structure provided to divert the water quality volume to the filtering structure.

N/A D10. Minimum four (4) inch perforated underdrain provided in a clean aggregate envelope layer beneath the facility.

N/A D11. Minimum fifty (50) foot separation from any slope fifteen (15) percent or greater. Minimum one hundred (100) foot separation horizontally from any known water supply well. Minimum one hundred (100) foot separation upslope and twenty-five (25) foot separation downslope from any building.

N/A D12. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.

N/A D13. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A D14. Adequate, direct access provided to the pretreatment area and/or filter bed for future maintenance.

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VII. Group E - Open Channel Systems *(Includes E-1 Wet Swales (Check Dams); E-2 Dry Swales;and E-3 Biofilters)*

N/A E1. All requirements of Section II, Minimum Standards, apply to Group E facilities as applicable.

N/A E2. Open channel system has constructed longitudinal slope of less than four (4) percent.

N/A E3. No visual signs of erosion in the open channel system's soil and/or vegetative cover.

N/A E4. Open channel side slopes are no steeper than 2H:1V at any location. Preferred channel sideslope is 3H:1V or flatter.

N/A E5. No visual signs of ponding are present at any location in the open channel system, except at rock check dam locations for E-1 systems (Wet Swales).

N/A E6. For E-2 BMPs (Dry Swales), an underdrain system was provided.

N/A E7. Treated timber or rock check dams provided as pretreatment devices for the open channel system.

N/A E8. Gravel diaphragm provided in areas where lateral sheet flow from impervious surfaces are directly connected to the open channel system.

N/A E9. Grass cover/stabilization in the open channel system appears adaptable to the specific soils and hydric conditions for the site and along the channel system.

N/A E10. Open channel system areas with grass covers higher than four (4) to six (6) inches were properly mowed.

N/A E11. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

N/A E12. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

N/A E13. For E-3 BMPs (Biofilters), the bottom width is six (6) feet maximum at any location.

N/A E14. For E-3 BMPs (Biofilters), sideslopes are 3H:1V maximum at any location.

N/A E15. For E-3 BMPs (Biofilters), the constructed channel slope is less than or equal to three (3) percent at any location.

N/A E16. For E-3 BMPs (Biofilters), the constructed grass channel is approximately equivalent to the constructed roadway length.

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VIII. Group F - Extended Dry Detention *(Includes F-1 Timber Walls; and F-2 Dry Extended Detention with Forebay)*

N/A F1. All requirements of Section II, Minimum Standards, apply to Group F facilities.

N/A F2. Basin bottom has positive slope and drainage from all basin inflow points to the riser (or outflow) location.

N/A F3. Timber wall BMP used in intermittent stream only. (ie. Prohibited in perennial streams.)

N/A F4. Forebay provided approximately 20 ft. upstream of the facility. Forebays generally 4 to 6 feet in depth.

N/A F5. A reverse slope pipe, vertical stand pipe or mini-barrel and riser was provided to prevent clogging.

N/A F6. Principal spillway and outlet barrel provided consisting of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.

N/A F7. Mini-barrel and riser, if used, contains a removable trash rack to reduce clogging.

N/A F8. Low flow orifice, if used, has a minimum diameter of three (3) inches or two (2) inches if internal orifice control was utilized and a small, cage type external trash rack.

N/A F9. Timbers properly reinforced or concrete footing provided if soil conditions were prohibitive.

N/A F10. Timber wall cross members extended to a minimum depth of two (2) feet below ground elevation.

N/A F11. Protection against erosion and scour from the low flow orifice and weir-flow trajectory provided.

N/A F12. Stilling basin or standard outlet protection provided at principal spillway outlet.

N/A F13. Adequate, direct access provided to the facility. Access corridor to facility is at least ten (10) feet wide, slope is less than twenty (20) percent and appropriate stabilization provided for equipment and vehicle use. Access extends to forebay, standpipe and timber wall, as applicable.

N/A F14. No visual signs of undercutting of timber walls or clogging of the low orifice were present.

N/A F15. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A F16. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

IX. Group G - Open Spaces *(Includes All Open Space Types G-1; G-2; and G-3)*

N/A G1. All requirements of Section II, Minimum Standards, apply to Group G facilities as applicable.

N/A G2. Constructed impervious areas appear to conform with locations indicated on the approved plan and appear less than sixty (60) percent impervious in accordance with the requirements of the James City County Chesapeake Bay Preservation Ordinance.

N/A G3. Dedicated open space areas are in undisturbed common areas, conservation easements or are protected by other enforceable instruments that ensures perpetual protection.

N/A G4. Provisions included to clearly specify how the natural vegetated areas utilized as dedicated open space will be managed and field identified (marked).

N/A G5. Adequate protection measures were implemented during construction to protect the defined dedicated open space areas.

N/A G6. Dedicated open space areas were not disturbed during construction (ie. cleared, grubbed or graded).

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

X. Storm Drainage Systems (Associated with BMP's Only)

(Includes all incidental stormwater drainage conveyance systems associated with SWM/BMP facilities such as onsite or offsite storm drains, open channels, inlets, manholes, junctions, outlet protections, deflectors, etc. These facilities are external to the treatment function of, but are directly associated with drainage to and/or from a constructed SWM/BMP facility. The intent of this portion of the certification is to accurately identify the type and quantity of inflow or outflow points associated with the facility for future reference. The Professional may use his/her own discretion to determine inclusive facilities to meet the intent of this section. As a general rule, storm drainage systems would include incidental facilities to the nearest access structure upslope or downslope from the normal physical limits of the facility or 800 feet of storm drainage conveyance system length, whichever is less.)

N/A SD1. All requirements of Section II, Minimum Standards, apply to Storm Drainage Systems.

N/A SD2. Horizontal location of all pipe and structures relative to the SWM/BMP facility.

N/A SD3. Type, top elevation and invert elevation of all access type structures (inlets, manholes, etc.).

N/A SD4. Material type, size or diameter, class, invert elevations, lengths and slopes for all pipe segments.

N/A SD5. Class, length, width and depth of riprap and outlet protections or dimensions of special energy dissipation structures.

XII. Other Systems

(Includes any non-typical, specialty, manufactured or innovative stormwater management/BMP practices or systems generally accepted for use as or in conjunction with other acceptable stormwater management / BMP practices. Requires evidence of prior satisfactory industry use and prior Environmental Division approval, waiver or exception .)

N/A O1. All requirements of Section II, Minimum Standards, apply to this section.

N/A O2. Certification criteria to be determined on a case-by-case basis by the Environmental Division specific to the proposed SWM/BMP facility.

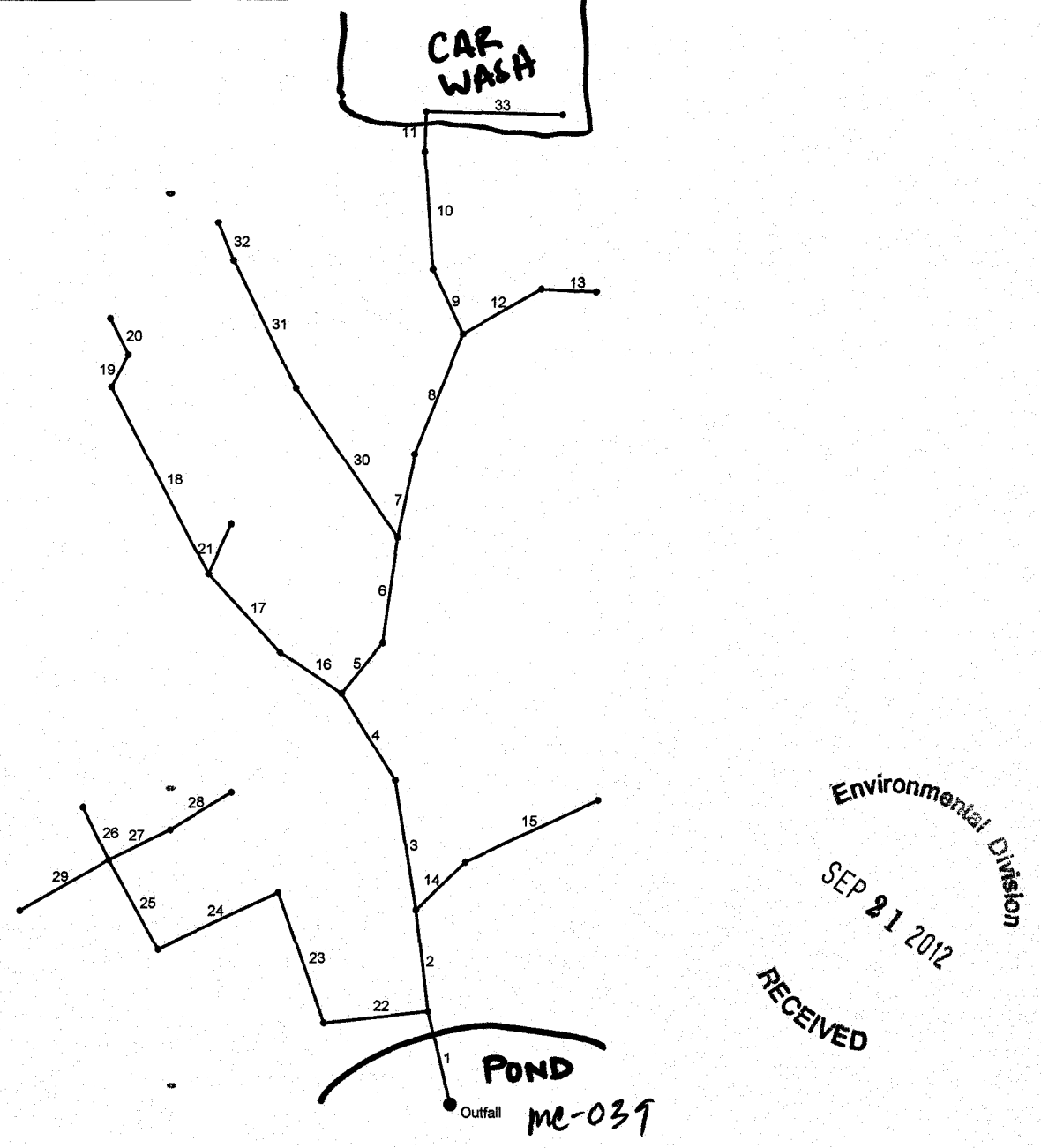
XIII. References

(The James City County Record Drawing and Construction Certification Forms and Checklists for Stormwater Management / BMP facilities were developed using the following sources and references.)

- ☐ Baltimore County, Maryland Soil Conservation District, As-Built Stormwater Management Pond Checklist.
- ☑ James City County, Virginia, Guidelines for Design and Construction of Stormwater Management BMP's (October 1999).
- ☑ James City County, Virginia, Stormwater Detention/Retention Basin Design Checklist and Erosion and Sediment Control and Stormwater Management Design Plan Checklists.
- ☐ James City County Stormwater Policy Framework, Final Report of the James City County BMP Policy Project, October 1998, The Center for Watershed Protection.
- ☐ Prince Georges County, Maryland, As-Built Requirements Retention or Detention Pond/Basin.
- ☐ Prince William County, Virginia, Stormwater Management Fact Sheet.
- ☐ Stafford County, Virginia, As-Built Plan Checklist.
- ☐ Stormwater Management Design Manual, NRCS Maryland Code No. 378, Pond Standards and Specifications.
- ☐ USEPA/Watershed Management Institute, Stormwater Management Inspection Forms.
- ☐ Virginia Impounding Structure Regulations (Dam Safety), Department of Conservation & Recreation, 1997.
- ☑ Virginia Erosion and Sediment Control Handbook, Third Edition 1992, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.
- ☑ Virginia Stormwater Management Handbook, 1999 edition, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.

File: Shared\SWMProg\BMP\Certif\RDCC_fillable.wpd

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Environmental Division
SEP 21 2012
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Project File: Williamsburg Crossing Storm System.stm	Number of lines: 33	Date: 9/21/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	94.000	0.64	21.75	0.50	0.32	11.25	5.0	7.7	6.4	72.48	219.8	8.06	48	2.34	54.00	56.20	56.90	58.72	0.00	90.00	
2	1	100.000	0.64	15.99	0.50	0.32	8.37	5.0	7.3	6.5	54.74	60.02	9.18	36	0.81	66.60	67.41	68.96	69.77	90.00	90.00	
3	2	130.000	0.64	14.07	0.50	0.32	7.41	5.0	7.1	6.6	48.83	41.64	10.16	30	1.03	69.56	70.90	71.85	73.71	90.00	90.00	
4	3	100.000	0.64	13.43	0.50	0.32	7.09	5.0	6.9	6.6	47.01	41.01	9.82	30	1.00	72.50	73.50	74.76	76.14	90.00	90.00	
5	4	64.000	0.64	8.95	0.50	0.32	4.85	5.0	6.8	6.7	32.31	27.91	8.46	27	0.81	75.55	76.07	77.51	78.31	90.00	90.00	
6	5	104.000	0.64	8.31	0.50	0.32	4.53	5.0	6.6	6.7	30.40	30.52	8.51	27	0.97	77.14	78.15	79.03	80.04	90.00	90.00	
7	6	84.000	0.64	5.74	0.50	0.32	3.10	5.0	6.4	6.8	20.92	38.71	7.44	24	2.93	78.30	80.76	80.04	82.38	90.00	90.00	
8	7	128.000	0.64	5.10	0.50	0.32	2.78	5.0	6.1	6.8	18.94	15.15	8.09	21	0.91	81.51	82.68	83.08	84.92	90.00	90.00	
9	8	70.000	0.64	3.18	0.50	0.32	1.82	5.0	5.9	6.9	12.50	13.39	5.20	21	0.71	82.67	83.17	85.66	86.09	90.00	90.00	
10	9	116.000	0.64	2.54	0.50	0.32	1.50	5.0	5.6	7.0	10.43	11.03	5.90	18	1.10	83.27	84.55	86.27	87.41	90.00	88.20	
11	10	40.000	0.64	1.90	0.50	0.32	1.18	5.0	5.4	7.0	8.24	12.65	4.66	18	1.45	84.55	85.13	87.50	87.74	88.20	89.87	
12	8	88.000	0.64	1.28	0.50	0.32	0.64	5.0	5.5	7.0	4.48	3.83	4.35	15	0.35	85.94	86.25	86.79	87.49	90.00	90.00	
13	12	54.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	2.64	1.86	15	0.17	86.35	86.44	87.62	87.68	90.00	90.00	
14	2	68.000	0.64	1.28	0.50	0.32	0.64	5.0	5.6	7.0	4.46	8.68	4.12	15	1.81	67.86	69.09	69.77	70.01	90.00	90.00	
15	14	144.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	4.79	3.96	12	1.81	69.39	72.00	70.14	72.64	90.00	90.00	
16	4	72.000	0.64	3.84	0.50	0.32	1.92	5.0	6.4	6.7	12.96	13.50	7.33	18	1.65	73.81	75.00	77.50	78.59	90.00	90.00	
17	16	104.000	0.64	3.20	0.50	0.32	1.60	5.0	6.2	6.8	10.91	6.18	6.17	18	0.35	75.10	75.46	78.83	79.95	90.00	90.00	
18	17	208.000	0.64	1.92	0.50	0.32	0.96	5.0	5.5	7.0	6.70	6.91	5.46	15	1.14	75.70	78.08	80.50	82.75	90.00	90.00	
19	18	36.000	0.64	1.28	0.50	0.32	0.64	5.0	5.4	7.0	4.50	4.93	3.67	15	0.58	78.15	78.36	83.14	83.31	90.00	90.00	
20	19	40.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	3.68	1.86	15	0.32	78.46	78.59	83.49	83.54	90.00	90.00	
21	17	54.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	6.11	2.90	12	2.94	76.60	78.19	80.50	80.72	90.00	90.00	
22	1	102.000	0.64	5.12	0.50	0.32	2.56	5.0	7.4	6.5	16.67	12.64	5.45	27	0.17	65.55	65.72	66.95	67.70	90.00	90.00	
23	22	136.000	0.64	4.48	0.50	0.32	2.24	5.0	6.8	6.7	14.91	12.17	3.78	27	0.15	65.86	66.07	68.01	68.30	90.00	90.00	
24	23	130.000	0.64	3.84	0.50	0.32	1.92	5.0	6.2	6.8	13.09	13.02	3.29	27	0.18	66.17	66.40	68.52	68.75	90.00	90.00	
25	24	100.000	0.64	3.20	0.50	0.32	1.60	5.0	5.9	6.9	11.02	10.50	6.23	18	1.00	66.50	67.50	68.92	70.02	90.00	90.00	
26	25	58.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	3.03	3.51	12	0.72	69.70	70.12	70.62	70.80	90.00	90.00	
27	25	68.000	0.64	1.28	0.50	0.32	0.64	5.0	5.3	7.1	4.51	5.04	6.04	12	2.00	69.70	71.06	70.62	71.95	90.00	90.00	
28	27	70.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	5.99	4.29	12	2.83	71.60	73.58	72.24	74.22	90.00	90.00	
29	25	100.000	0.64	0.64	0.50	0.32	0.32	5.0	5.0	7.1	2.28	3.42	1.86	15	0.28	67.72	68.00	70.62	70.75	90.00	90.00	
30	6	178.000	0.64	1.93	0.50	0.32	1.11	5.0	5.8	6.9	7.71	11.33	3.77	21	0.51	78.30	79.21	80.04	80.42	90.00	90.00	
31	30	140.000	0.64	1.29	0.50	0.32	0.79	5.0	5.2	7.1	5.61	7.10	4.19	18	0.46	79.31	79.95	80.47	80.94	90.00	90.00	
32	31	40.000	0.65	0.65	0.73	0.47	0.47	5.0	5.0	7.1	3.38	6.64	3.14	18	0.40	80.05	80.21	80.99	81.04	90.00	90.00	
33	11	134.000	1.26	1.26	0.68	0.86	0.86	5.0	5.0	7.1	6.11	7.10	4.98	15	1.21	85.37	86.99	88.08	89.28	89.87	90.88	

Environmental Division
SEP 21 2012
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Project File: Williamsburg Crossing Storm System.stm

Number of lines: 33

Run Date: 9/21/2012

NOTES:Intensity = 143.72 / (Inlet time + 19.20) ^ 0.94; Return period =Yrs. 10 ; c = cir e = ellip b = box

3 SITE PLAN AMENDED FOR RETAINING WALL, ISLAND/IMPERVIOUS COVER, WATER METER SIZE, AND ADDITIONAL UNDERGROUND STORAGE TANK

SITE PLAN
FOR
WILLIAMSBURG CROSSING CAR WASH

SP-0122-2011

JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA

COUNTY OF JAMES CITY
FINAL SITE PLAN

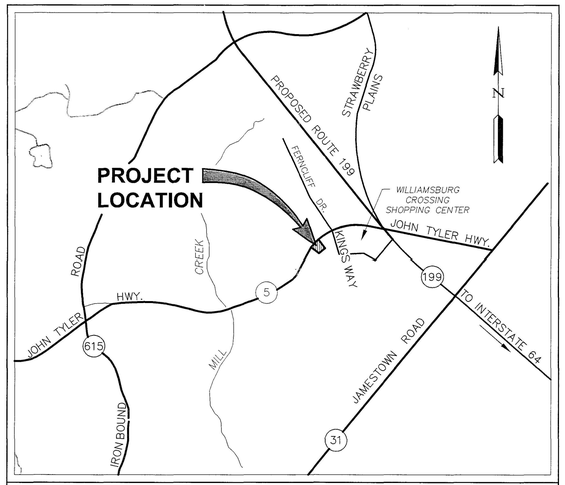
APPROVALS	DATE
Fire Dept. JB/ler	12/28/11
Health Dept.	
VDOT	
Planning CMJ	3/1/12
Environ. SJT/ler	1/9/12
Zoning Adm. MCB	3/1/12
JCSA CLP/ler	2/29/12
County Eng.	
REA	
Other	

RECEIVED FEB 2012 Environment

Environmental Division MAR 02 2012 RECEIVED

GENERAL NOTES:

1. TAX PARCEL ID NO.: 4721500007
2. THIS PROPERTY IS SUBJECT TO CONDITIONS ASSOCIATED WITH SPECIAL USE PERMIT-01-2011
3. SITE TO BE SERVED BY PUBLIC WATER & SEWER OWNED BY THE JAMES CITY COUNTY SERVICE AUTHORITY, J.C.S.A.
4. ALL COMPONENTS OF THE WATER DISTRIBUTION AND SANITARY SEWER SYSTEM SHALL BE INSTALLED AND TESTED IN ACCORDANCE WITH THE LATEST EDITION OF THE JCSA DESIGN AND ACCEPTANCE CRITERIA FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS, THE HRPDC REGIONAL CONSTRUCTION STANDARDS (THIRD EDITION WITH AMENDMENTS DATED JANUARY 2003), AND THE COMMONWEALTH OF VIRGINIA DEPARTMENT OF HEALTH WATERWORKS AND SANITARY SEWERAGE REGULATIONS. THE CONTRACTOR SHALL USE ONLY NEW MATERIALS, PARTS, AND PRODUCTS ON ALL PROJECTS. ALL MATERIALS SHALL BE STORED SO AS TO ASSURE THE PRESERVATION OF THEIR QUALITY AND FITNESS FOR THE WORK. A COPY OF THE JCSA DESIGN AND ACCEPTANCE CRITERIA AND HRPDC REGIONAL CONSTRUCTION STANDARDS MUST BE KEPT ON-SITE BY THE CONTRACTOR DURING TIME OF INSTALLING, TESTING, AND CONVEYING FACILITIES TO JCSA.
5. CONTRACTOR SHALL NOTIFY MISS UTILITY (1-800-552-7001) A MINIMUM 48 HOURS PRIOR TO ANY EXCAVATION OR DEMOLITION.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION OF CONSTRUCTION EFFORTS WITH VIRGINIA NATURAL GAS, VIRGINIA POWER, COX COMMUNICATIONS, JAMES CITY SERVICE AUTHORITY, VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT), AND OTHERS THAT MAY BE REQUIRED.
7. THE CONTRACTOR SHALL SATISFY HIMSELF AS TO ALL SITE CONDITIONS PRIOR TO CONSTRUCTION.
8. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS PRIOR TO COMMENCEMENT OF WORK TO INCLUDE, BUT NOT LIMITED TO JAMES CITY COUNTY LAND DISTURBANCE, BUILDING, UTILITY (JCSA), AND VDOT CE-7 PERMITS.
9. ALL PROPOSED UTILITIES SHALL BE PLACED UNDERGROUND.
10. ALL PARKING SPACES ARE TO BE PROVIDED WITH 4-INCH WHITE PAINTED STRIPING AND HANDICAP ACCESS AISLES WITH 1 FT. WIDE BLUE PAINTED HATCHING.
11. ALL PROPOSED SIGNAGE SHALL BE IN ACCORDANCE WITH ARTICLE II, DIVISION 3 OF THE JAMES CITY COUNTY ZONING ORDINANCE.
12. ANY EXISTING UNUSED WELLS SHALL BE ABANDONED IN ACCORDANCE WITH THE STATE HEALTH DEPARTMENT REGULATIONS AND JAMES CITY COUNTY CODE.
13. EXISTING WATER AND SANITARY SEWER CONNECTIONS SHALL BE ABANDONED IN ACCORDANCE WITH J.C.S.A. STANDARDS.
14. NO WETLANDS EXIST ON THIS SITE.
15. THIS SITE LIES WITHIN THE ROUTE 5 COMMUNITY CHARACTER CORRIDOR.
16. VDOT SHALL BE SAVED HARMLESS FROM THE MAINTENANCE RESPONSIBILITY OR LIABILITY ASSOCIATED WITH ANY FAILURE OF THE STORM WATER MANAGEMENT BASIN AND ITS OUTFLOW STRUCTURES.
17. THE PROFESSIONAL WHOSE SEAL IS AFFIXED HEREON SHALL ACT AS THE "RESPONSIBLE LAND DISTURBER" FOR PURPOSES OF PLAN APPROVAL ONLY. PRIOR TO ISSUANCE OF THE LAND DISTURBING PERMIT, THE CONTRACTOR SHALL PROVIDE THE NAME OF A "RESPONSIBLE LAND DISTURBER" WHO SHALL ASSUME RESPONSIBILITY AS THE "RESPONSIBLE LAND DISTURBER" FOR THE CONSTRUCTION PHASE OF THE PROJECT. THE OWNER OR DEVELOPER SHALL PROVIDE WRITTEN NOTIFICATION SHOULD THE "RESPONSIBLE LAND DISTURBER" CHANGE DURING CONSTRUCTION.
18. THE PLUMBING INSIDE THE BUILDINGS MUST BE INSPECTED BY JCSA OPERATIONS, AT (757)229-7421 FOR POTENTIAL CROSS CONNECTIONS. ANY CROSS CONNECTIONS MUST BE PROTECTED BY THE APPROPRIATE BACKFLOW PREVENTION DEVICES.
19. ALL ROADS SHALL BE PRIVATE RIGHT-OF-WAYS AND SHALL NOT BE MAINTAINED BY THE VIRGINIA DEPARTMENT OF TRANSPORTATION OR JAMES CITY COUNTY.
20. STORM SEWER PIPE SHALL BE RCP CLASS III UNLESS OTHERWISE DESIGNATED.
21. STORM STRUCTURES SHALL CONFORM TO THE VDOT ROAD AND BRIDGE STANDARDS AND VDOT SPECIFICATIONS. ALL MANHOLES SHALL INCLUDE INLET SHAPING (IS-1) AND MANHOLES DEEPER THAN 4 FEET SHALL HAVE STEPS (ST-1). PIPE BEDDING SHALL BE IN ACCORDANCE WITH VDOT PB-1 AND MANUF. SPECS/GUIDELINES.
22. IN ACCORDANCE WITH THE APPROVED PROFFER CONDITION #4 ALL MONUMENT SIGNS WILL BE OF CONSISTENT DESIGN.
23. THERE ARE NO OFFSITE LAND DISTURBING AREAS ANTICIPATED FOR THIS PROJECT.
24. THIS SITE PLAN MEETS THE REQUIREMENTS OF THE 2005 JCSA DESIGN AND ACCEPTANCE CRITERIA FOR WATER AND SANITARY SEWER SYSTEMS AS ADOPTED ON NOVEMBER 8, 2005. THE JCSA CRITERIA FORMALLY ADOPTS THE HRPDC REGIONAL CONSTRUCTION STANDARDS, THIRD EDITION.
25. HORIZONTAL DATUM: JAMES CITY COUNTY GEODETIC CONTROL NETWORK
    VIRGINIA STATE PLANE COORDINATE SYSTEM - SOUTH ZONE
    NAD 83 (1994 VA HARN)
    VERTICAL DATUM: JAMES CITY COUNTY GEODETIC CONTROL NGVD 29



VICINITY MAP
(APPROXIMATE SCALE: 1"=2,000')
COPYRIGHT ADC THE MAP PEOPLE PERMITTED USE NUMBER 21004223

COUNTY PROJECT NO.: SP-067-11
ORIGINAL SUBMITTAL DATE: 6/27/11
APPROVAL DATE: 9/19/11

COMMONWEALTH OF VIRGINIA
JASON A. GRIMES
Lic. No. 40170
1/30/12
PROFESSIONAL ENGINEER

INDEX OF SHEETS:

SHEET NO.	SHEET DESCRIPTION
1	COVER SHEET
~~2~~	~~EROSION & SEDIMENT CONTROL PLAN~~
3	SITE LAYOUT & UTILITES PLAN
4	GRADING & DRAINAGE PLAN
5	LANDSCAPE PLAN
~~6~~	~~LIGHTING PLAN~~
~~7~~	~~NOTES & DETAILS~~
~~8~~	~~NOTES & DETAILS~~
~~9~~	~~LANDSCAPE AND LIGHTING NOTES & DETAILS~~

OWNER/DEVELOPER INFORMATION:

CONTACT: MATT BLANCHARD
3664 BRIDGEWATER DRIVE
WILLIAMSBURG, VA 23188
PHONE NO.: (757) 645-5342

CERTIFIED RESPONSIBLE LAND DISTURBER:

JASON GRIMES, P.E.
AES CONSULTING ENGINEERS
5248 OLDE TOWNE ROAD, SUITE 1
WILLIAMSBURG, VIRGINIA 23188
TELEPHONE: 757-253-0040

* FOR SITE PLAN REVIEW PROCESS ONLY. OWNER OR CONTRACTOR SHALL NAME RESPONSIBLE LAND DISTURBER FOR CONSTRUCTION PROCESS.

SITE DATA:

SITE ADDRESS: 5117 JOHN TYLER HIGHWAY

TOTAL PARCEL AREA: 66,332 S.F.; 1.52 ACRES

ZONING: B-1 (SUP-01-2011)

BUILDING HEIGHT:

HIGH ROOF = 29.125' (1-STORY BUILDING)

BUILDING COVERAGE: 8,315 S.F.

BUILDING FLOOR AREA RATIO: 8,315 S.F. / 66,332 S.F. = 12.5%

PROPOSED IMPERVIOUS COVER: 30,780 S.F.±, 0.71 AC.± (46% OF TOTAL PARCEL; 57% EXCLUDING PILOTS WAY) 3

BUILDING PERIMETER / FOUNDATION AREA: 8,315 S.F.

BUILDING INTERIOR WALL AREA: 7,770 S.F.

DETAIL CENTER AREA: 3,803 S.F.

TOTAL DISTURBED AREA: 40,700 S.F.±, 0.93 AC.±

FLOOD HAZARD MAP: THIS PROPERTY IS IN FLOOD ZONE X AS SHOWN ON MAP NUMBER 51095C, PANEL 0140C, DATED 9/28/2007 OF THE FLOOD INSURANCE RATE MAPS FOR JAMES CITY COUNTY, VIRGINIA. ZONE X IS DEFINED AS OUTSIDE THE 500-YEAR FLOODPLAIN.

PARKING REQUIRED:

RETAIL / OFFICE SPACE (1 SPACE PER 250 S.F.): 1,115 S.F / 250 = 5 SPACES REQUIRED

PARKING PROVIDED:

9 EMPLOYEE SPACES + 1 HANDICAP SPACE; 12 VACUUM STALLS

THIS PROJECT IS LOCATED IN THE MILL CREEK WATERSHED OF JAMES CITY COUNTY.

Rev.	Date	Description	Revised By
3	1/30/12	REVISED RETAINING WALL ADDITION, WM RESIZE, ISLAND, & TANK	JAG
4	11/18/11	REVISED ISLAND AT TUNNEL EXIT	JAG
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1	8/3/11	REVISED PER JCC COMMENTS DATED 7/20/11	JAG

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SITE PLAN
WILLIAMSBURG CROSSING CAR WASH
JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	JAG, AMR
Project Number:	W10172
Scale: AS NOTED	Date: 6/27/11
Sheet Title: COVER SHEET	
Sheet Number	1

SEQUENCE OF CONSTRUCTION

PHASE 1

1. PRIOR TO OBTAINING LAND DISTURBING PERMIT, THE CONTRACTOR SHALL OBTAIN A VSMP PERMIT (VIRGINIA STORMWATER MANAGEMENT PROGRAM) FROM DCR (VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION).
2. THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING WITH THE JAMES CITY COUNTY ENVIRONMENTAL DIVISION INSPECTOR A MINIMUM OF 48 HOURS PRIOR TO BEGINNING ANY WORK AT THE SITE.
3. INSTALL CONSTRUCTION ENTRANCE ALONG PILOTS WAY AND INSTALL PERIMETER EROSION AND SEDIMENT CONTROLS.
4. INSTALL DIVERSION DIKE, INLET, AND CULVERT INLET PROTECTION.
5. ESTABLISH TEMPORARY SOIL STOCKPILE. ESTABLISH ROUGH GRADES ON SITE, ENSURING RUNOFF IS DIRECTED TOWARDS DITCH ALONG PILOTS WAY;
6. ONCE ROUGH GRADES HAVE BEEN ESTABLISHED, INSTALL STORM SEWER AND REMAINING UTILITIES PER PLAN.

FINAL PHASE

7. INSTALL INLET PROTECTION ON ALL STORM SEWER INLETS;
8. ESTABLISH FINAL DRAINAGE PATTERNS, DIRECTING RUNOFF TOWARDS THE SITE INLETS;
9. SEED AND STABILIZE SURROUNDING SLOPES.
10. AT NO POINT DURING CONSTRUCTION SHALL ANY EROSION AND SEDIMENT CONTROL MEASURE BE REMOVED WITHOUT AUTHORIZATION TO DO SO BY THE JAMES CITY COUNTY ENVIRONMENTAL DIVISION.
11. CONTRACTOR SHALL MONITOR DOWNSTREAM BMP AND STORM SYSTEM TO IMPLEMENT ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES SUCH AS PIPE CLEANING OR SEDIMENT REMOVAL WITHIN THE BASIN WHERE THEY MAY BE REQUIRED.
12. SEED AND STABILIZE ANY REMAINING DISTURBED AREAS;
13. AFTER THE COMPLETION OF CONSTRUCTION AND WITH THE WRITTEN APPROVAL OF THE JCC ENVIRONMENTAL INSPECTOR, REMOVE ALL REMAINING SEDIMENT CONTROL MEASURES.
14. APPLY FINAL SURFACE ASPHALT AT THE DIRECTION OF THE OWNER.

NOTE: EASEMENTS DENOTED AS "JCSA UTILITY EASEMENTS" ARE FOR THE EXCLUSIVE USE OF THE JAMES CITY SERVICE AUTHORITY AND THE PROPERTY OWNER. OTHER UTILITY SERVICE PROVIDERS DESIRING TO USE THESE EASEMENTS WITH THE EXCEPTION OF PERPENDICULAR UTILITY CROSSINGS MUST OBTAIN AUTHORIZATION FOR ACCESS AND USE FROM JCSA AND THE PROPERTY OWNER. ADDITIONALLY, JCSA SHALL NOT BE HELD RESPONSIBLE FOR ANY DAMAGE TO IMPROVEMENTS WITHIN THIS EASEMENT, FROM ANY CAUSE.

NOTE: THE PROPOSED OIL/GREASE SEPARATOR MUST BE INSPECTED BY JCSA OPERATIONS AT (757) 229-7421.

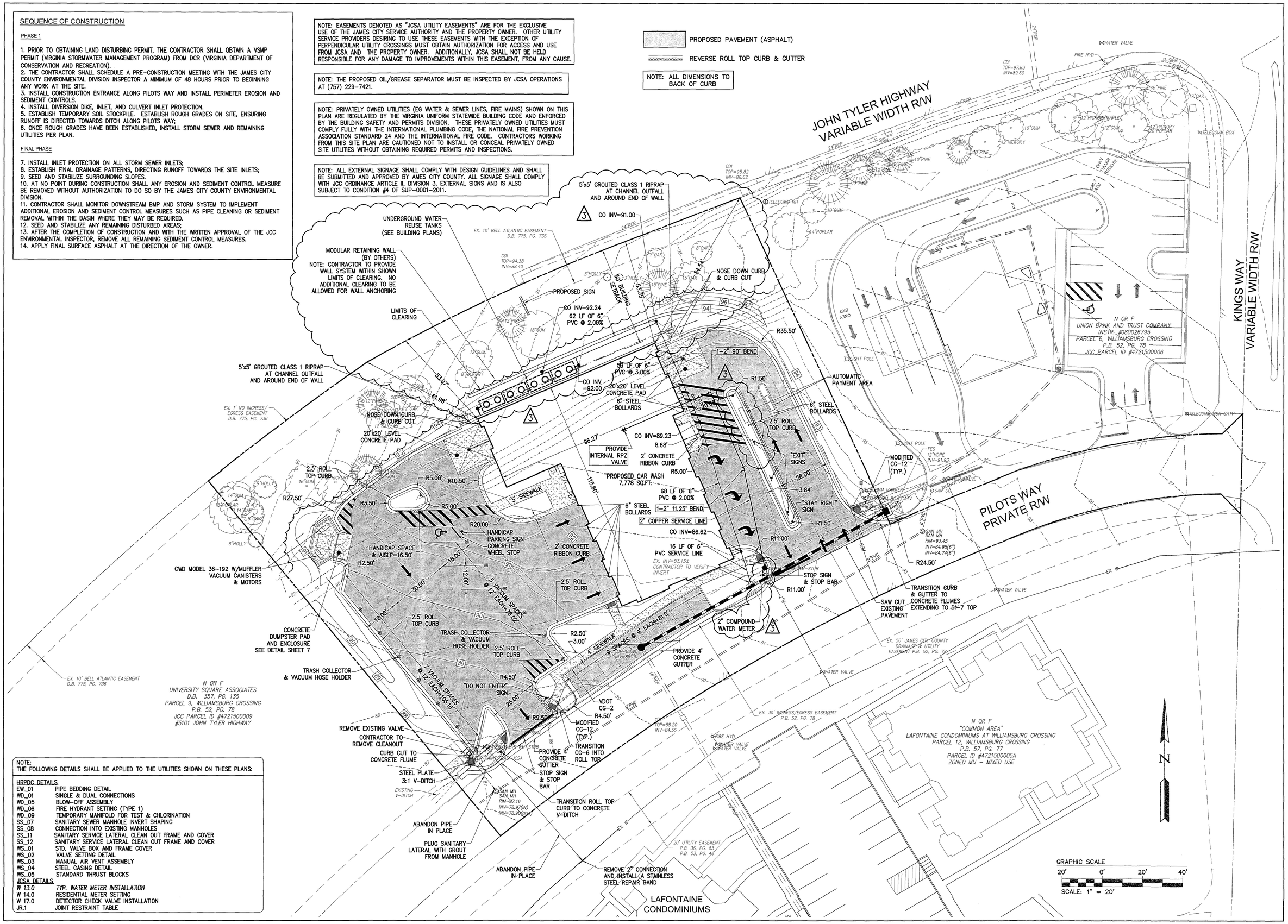
NOTE: PRIVATELY OWNED UTILITIES (EG WATER & SEWER LINES, FIRE MAINS) SHOWN ON THIS PLAN ARE REGULATED BY THE VIRGINIA UNIFORM STATEWIDE BUILDING CODE AND ENFORCED BY THE BUILDING SAFETY AND PERMITS DIVISION. THESE PRIVATELY OWNED UTILITIES MUST COMPLY FULLY WITH THE INTERNATIONAL PLUMBING CODE, THE NATIONAL FIRE PREVENTION ASSOCIATION STANDARD 24 AND THE INTERNATIONAL FIRE CODE. CONTRACTORS WORKING FROM THIS SITE PLAN ARE CAUTIONED NOT TO INSTALL OR CONCEAL PRIVATELY OWNED SITE UTILITIES WITHOUT OBTAINING REQUIRED PERMITS AND INSPECTIONS.

NOTE: ALL EXTERNAL SIGNAGE SHALL COMPLY WITH DESIGN GUIDELINES AND SHALL BE SUBMITTED AND APPROVED BY AMES CITY COUNTY. ALL SIGNAGE SHALL COMPLY WITH JCC ORDINANCE ARTICLE II, DIVISION 3, EXTERNAL SIGNS AND IS ALSO SUBJECT TO CONDITION #4 OF SUP-0001-2011.

PROPOSED PAVEMENT (ASPHALT)

REVERSE ROLL TOP CURB & GUTTER

NOTE: ALL DIMENSIONS TO BACK OF CURB



NOTE:
THE FOLLOWING DETAILS SHALL BE APPLIED TO THE UTILITIES SHOWN ON THESE PLANS:

HRPDC DETAILS	
EW_01	PIPE BEDDING DETAIL
WD_01	SINGLE & DUAL CONNECTIONS
WD_05	BLOW-OFF ASSEMBLY
WD_06	FIRE HYDRANT SETTING (TYPE 1)
WD_09	TEMPORARY MANIFOLD FOR TEST & CHLORINATION
SS_07	SANITARY SEWER MANHOLE INVERT SHAPING
SS_08	CONNECTION INTO EXISTING MANHOLES
SS_11	SANITARY SERVICE LATERAL CLEAN OUT FRAME AND COVER
SS_12	SANITARY SERVICE LATERAL CLEAN OUT FRAME AND COVER
WS_01	STD. VALVE BOX AND FRAME COVER
WS_02	VALVE SETTING DETAIL
WS_03	MANUAL AIR VENT ASSEMBLY
WS_04	STEEL CASING DETAIL
WS_05	STANDARD THRUST BLOCKS
JCSA DETAILS	
W 13.0	TYP. WATER METER INSTALLATION
W 14.0	RESIDENTIAL METER SETTING
W 17.0	DETECTOR CHECK VALVE INSTALLATION
JR.1	JOINT RESTRAINT TABLE

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2	8/18/11	REVISED PER JCC COMMENTS DATED 8/2/011	JAG
1	8/3/11	REVISED PER JCC COMMENTS DATED 7/2/011	JAG

COMMONWEALTH OF VIRGINIA
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LIC. No. 401170
1/30/12
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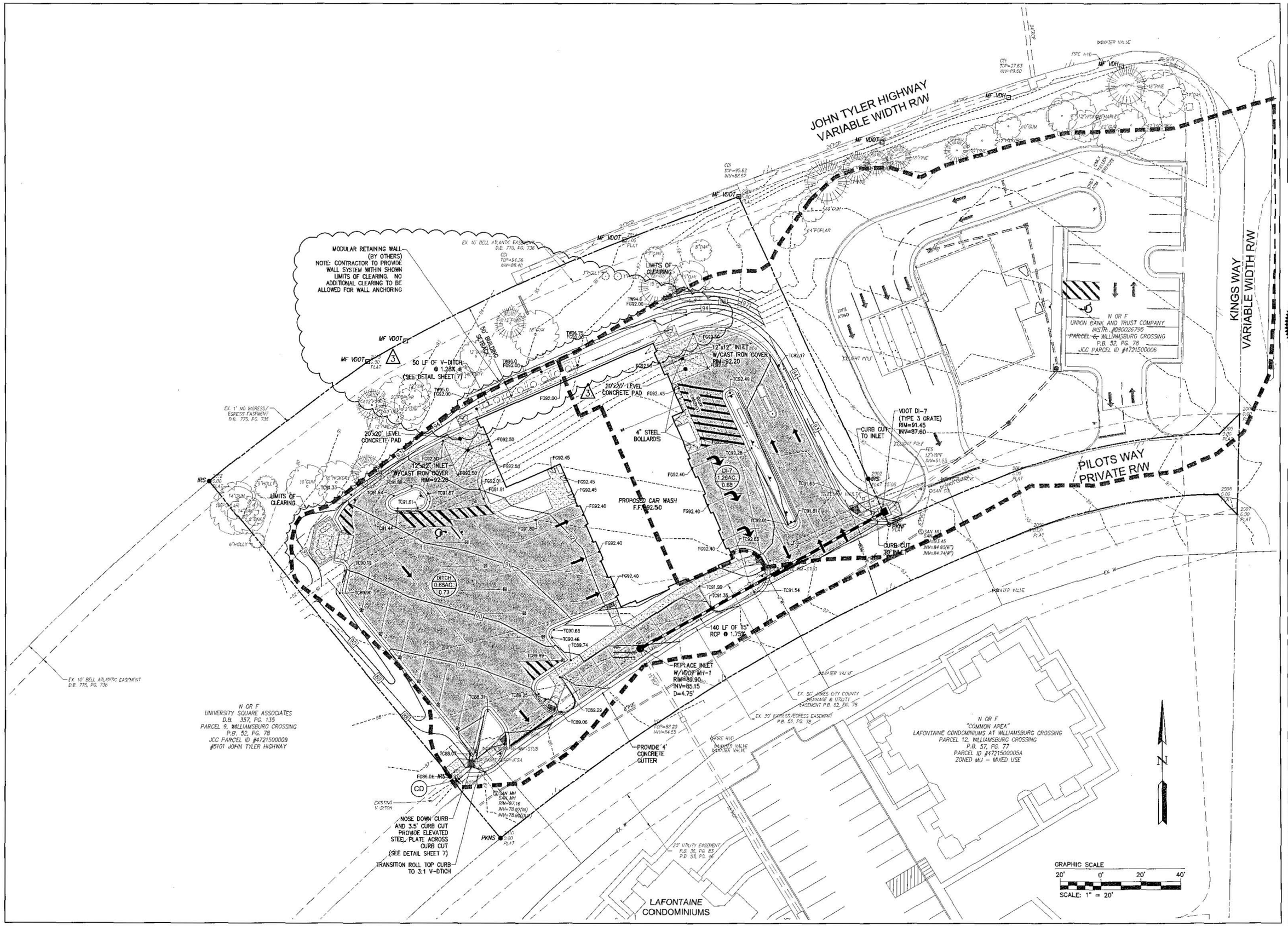
SITE PLAN
WILLIAMSBURG CROSSING CAR WASH
JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	JAG, AMR
Project Number:	W10172
Scale: 1"=20'	Date: 6/27/11
Sheet Title: SITE LAYOUT & UTILITY PLAN	
Sheet Number	3



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4	1/30/12	REVISED RETAINING WALL ADDITION, WH RESIDE, ISLAND, & TANK	JAG
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2	8/16/11	REVISED PER JCC COMMENTS DATED 8/5/11	JAG
1	6/30/11	REVISED PER JCC COMMENTS DATED 7/25/11	JAG

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SITE PLAN
WILLIAMSBURG CROSSING CAR WASH
JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	JAG, AMR
Project Number:	W10172
Scale: 1"=20'	Date: 6/27/11

Sheet Title:
GRADING & DRAINAGE SHEET

Sheet Number
4

PLANT SCHEDULE

DECIDUOUS TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	REMARKS
AR	2	ACER RUBRUM 'RED SUNSET'	RED SUNSET MAPLE	2-1/2" CAL.	B & B	SINGLE STEM
BN	5	BETULA NIGRA 'DURAHEAT'	DURAHEAT RIVER BIRCH	8'-10' HT.	B & B	3-5 CANES
EVERGREEN TREES	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**ROOT**	**REMARKS**
INS	3	ILEX X 'NELLIE R STEVENS'	NELLIE STEVENS HOLLY	8'-10' HT.	B & B	DENSE, FULL
PT	14	PINUS TAEDA	LOBLOLLY PINE	11' HT.	B & B	DENSE, FULL
ORNAMENTAL TREES	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**ROOT**	**REMARKS**
CC	1	CERCIS CANADENSIS	EASTERN REDBUD	2" CAL.	B & B	SINGLE STEM
LIM	5	LAGERSTROEMIA X 'MUSKOGEE'	LAVENDER CRAPE MYRTLE MULTI-TRUNK	8'-10' HT.	B & B	3-5 CANES
MGL	4	MAGNOLIA GRANDIFLORA 'LITTLE GEM'	DWARF SOUTHERN MAGNOLIA	8'-10' HT.	B & B	DENSE, FULL
SHRUBS	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**ROOT**	**REMARKS**
AG	22	ABELIA X GRANDIFLORA	GLOSSY ABELIA	24" HT. / W.	CONT.	DENSE, FULL
DR	28	DANAE RACEMOSA	POET'S LAUREL	24" HT. / W.	CONT.	DENSE, FULL
HQ	16	HYDRANGEA QUERCIFOLIA	OAKLEAF HYDRANGEA	30" HT. / W.	CONT.	DENSE, FULL
IC	41	ILEX CRENATA 'COMPACTA'	DWARF JAPANESE HOLLY	18"-24" HT./W.	CONT.	DENSE, FULL
JC	56	JUNIPERUS CHINENSIS 'PARSONII'	PARSONI JUNIPER	24" HT. / W.	CONT.	DENSE, FULL
MC	48	MYRICA CERIFERA	WAX MYRTLE	24" HT. / W.	CONT.	DENSE, FULL
VAC	2	VITEX AGNUS-CASTUS	CHASTE TREE	4-5' HT.	CONT.	TREE FORM
PERENNIALS	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**ROOT**	**REMARKS**
HG	13	HOSTA X 'GUACAMOLE'	PLANTAIN LILY	1 GAL.	CONT.	DENSE, FULL
GROUND COVERS	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**ROOT**		**REMARKS**
TURF	16,866 SF	— — TURF	SEED OR SOD (SELECTED BY OWNER)	TURF		
LM	194	LIRIOPE MUSCARI 'BIG BLUE'	BIG BLUE LILYTURF	1 GAL@ 18" OC		DENSE, FULL

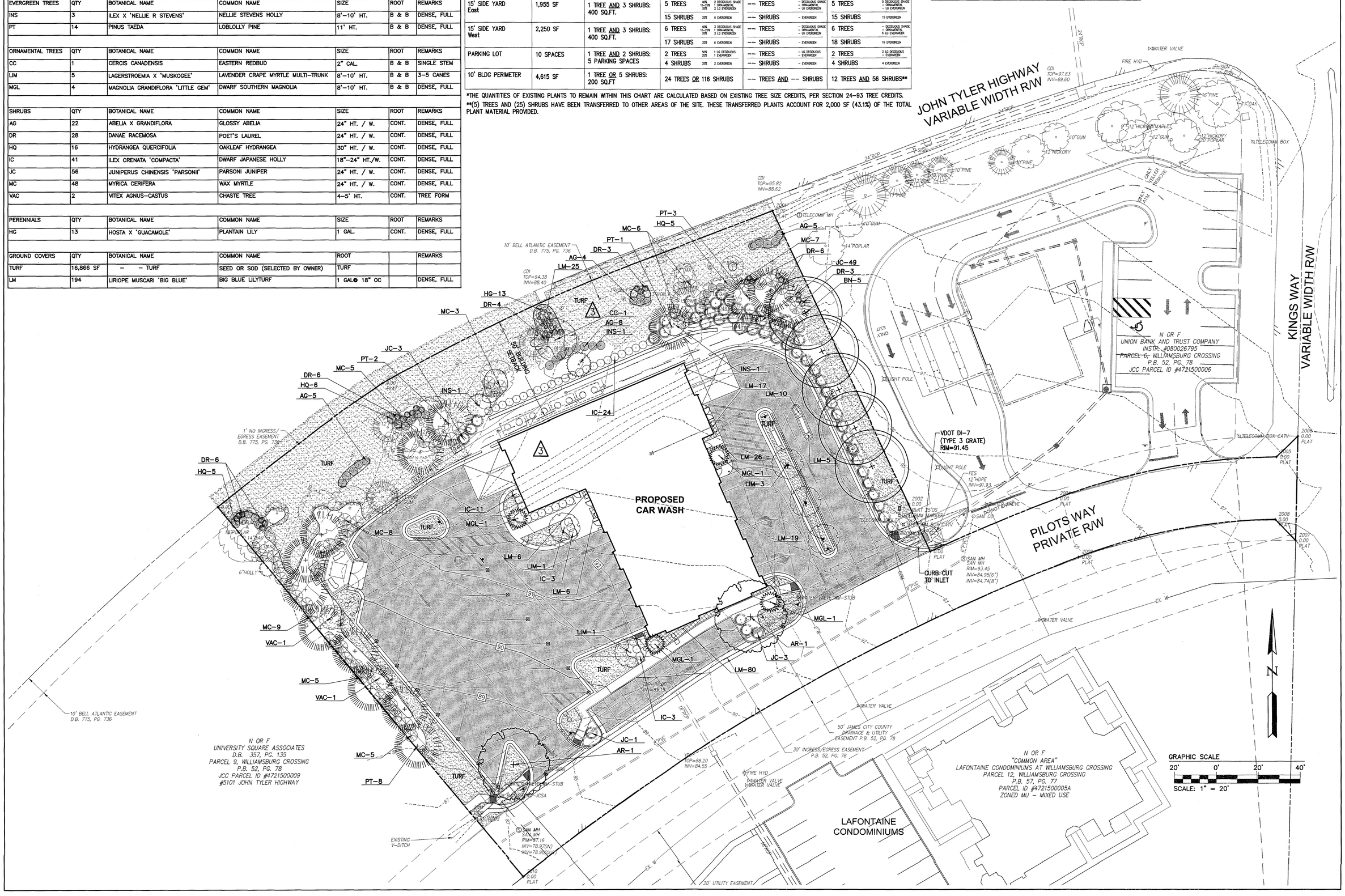
JAMES CITY COUNTY LANDSCAPE REQUIREMENTS

AREAS		TREES AND SHRUBS				
LANDSCAPE YARD	COUNTY REQ.	PLANTING RATIO	PLANTS REQUIRED	EXISTING PLANTS TO REMAIN*	NEW PLANTS PROVIDED
50' R/W BUFFER John Tyler Highway	14,810 SF	1 TREE AND 3 SHRUBS: 400 SQ.FT.	38 TREES (40% 16 DECIDUOUS SHADE; 15-20% 8 ORNAMENTAL; 35% 14 LG EVERGREEN) 112 SHRUBS (35% 40 EVERGREEN)	46 TREES* (35 DECIDUOUS SHADE; 5 ORNAMENTAL; 6 LG EVERGREEN) -- SHRUBS - EVERGREEN	9 TREES - DECIDUOUS SHADE; 1 ORNAMENTAL; 8 LG EVERGREEN 112 SHRUBS 36 EVERGREEN
15' SIDE YARD East	1,955 SF	1 TREE AND 3 SHRUBS: 400 SQ.FT.	5 TREES (40% 2 DECIDUOUS SHADE; 15-20% 1 ORNAMENTAL; 35% 2 LG EVERGREEN) 15 SHRUBS (35% 6 EVERGREEN)	-- TREES - DECIDUOUS SHADE; - ORNAMENTAL; - LG EVERGREEN -- SHRUBS - EVERGREEN	5 TREES 5 DECIDUOUS SHADE; - ORNAMENTAL; - LG EVERGREEN 15 SHRUBS 15 EVERGREEN
15' SIDE YARD West	2,250 SF	1 TREE AND 3 SHRUBS: 400 SQ.FT.	6 TREES (40% 3 DECIDUOUS SHADE; 15-20% 1 ORNAMENTAL; 35% 3 LG EVERGREEN) 17 SHRUBS (35% 6 EVERGREEN)	-- TREES - DECIDUOUS SHADE; - ORNAMENTAL; - LG EVERGREEN -- SHRUBS - EVERGREEN	6 TREES - DECIDUOUS SHADE; - ORNAMENTAL; 6 LG EVERGREEN 18 SHRUBS 18 EVERGREEN
PARKING LOT	10 SPACES	1 TREE AND 2 SHRUBS: 5 PARKING SPACES	2 TREES (50% 1 LG DECIDUOUS; 35% 1 EVERGREEN) 4 SHRUBS (35% 2 EVERGREEN)	-- TREES - LG DECIDUOUS; - EVERGREEN -- SHRUBS - EVERGREEN	2 TREES 2 LG DECIDUOUS; - EVERGREEN 4 SHRUBS 4 EVERGREEN
10' BLDG PERIMETER	4,615 SF	1 TREE OR 5 SHRUBS: 200 SQ.FT	24 TREES OR 116 SHRUBS	-- TREES AND -- SHRUBS	12 TREES AND 56 SHRUBS**

*THE QUANTITIES OF EXISTING PLANTS TO REMAIN WITHIN THIS CHART ARE CALCULATED BASED ON EXISTING TREE SIZE CREDITS, PER SECTION 24-93 TREE CREDITS.

**(5) TREES AND (25) SHRUBS HAVE BEEN TRANSFERRED TO OTHER AREAS OF THE SITE. THESE TRANSFERRED PLANTS ACCOUNT FOR 2,000 SF (43.1%) OF THE TOTAL PLANT MATERIAL PROVIDED.

SEE SHEET 9 FOR LANDSCAPE NOTES AND DETAILS.



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COMMONWEALTH OF VIRGINIA
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5