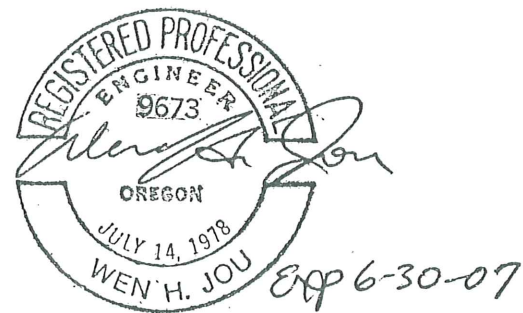


~~CONFIDENTIAL~~



Stormwater Master Plan



April 2005

Produced in Cooperation with the USDA Forest Service

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Chapter I - Executive Summary

Introduction

The City of Madras has not previously had a stormwater master plan prepared and the City has not maintained a complete record of their existing stormwater drainage system. It is estimated that at least 50-percent of the community is without formal stormwater drainage facilities and a large portion of the City, including the downtown core, is prone to flooding.

In recent years the City has experienced significant growth and the absence of a stormwater master plan has limited the planning efforts needed to manage this growth. No broad guidance has been available to evaluate the impacts of growth on the existing drainage system and to coordinate stormwater management requirements for individual development projects.

Given these circumstances, the City has recognized the importance of developing a City-wide, strategic approach to stormwater management and has placed a high priority on the completion of a stormwater master plan. The completed plan will support its land-use planning process and its goal of providing the infrastructure needed for desirable community growth.

The purpose of the Madras Stormwater Master Plan is to address the community's overall stormwater management needs. The fundamental goals of the Plan are to provide recommended major improvements for the stormwater conveyance system and outline a management program that will control stormwater flows and reduce stormwater pollution.

Study Area

The study area for the Stormwater Master Plan corresponds to the current urban growth boundary as shown in Figure III-1. The area includes the land within the current city limits, as well as pieces of land for future growth to the north, the east and the south of the City. The Madras Airport is northwest of the City and outside the Urban Growth Boundary. Therefore, it is not part of the study area.

Existing Storm Drainage System

The existing storm sewer system mostly serves the central part of Madras close to Willow Creek. The downtown area on the south side of the creek has the highest concentration of storm sewers. Several other lines are also located immediately north of the creek, a few lines are located south of the downtown core, and a small network of storm sewers is located east of the City's Golf Course.

The storm sewers in the rights-of-way of U. S. highways 26/97 and Culver Highway are owned by the Oregon Department of Transportation (ODOT). ODOT has recently installed new storm sewers along Culver Highway and will also be installing replacement and new storm drain facilities as part of the North Madras Junction (North Y) project.

The existing storm sewers range in size from 8 inches to 36 inches in diameter, totaling approximately 40,000 feet in length and pipe materials are generally of concrete and PVC. Limited information is available regarding the ages of the pipes.

Many of the existing storm sewer lines are connected to overflow catch basins that are not connected to a storm sewer with an outfall. Instead, these catch basins are used to carry stormwater runoff across an intersection, overflowing onto the next street gutter or into a ditch. Dry wells and drill holes have also been installed as means for stormwater subsurface disposal, but DEQ has banned the use of drill holes and is discouraging the use of dry wells. Experience in Madras has shown that they do not work and the City has recently disallowed their use.

Drainage Basins

To model the existing stormwater system, USGS topographic maps, aerial photographs, and field reconnaissance data were used to delineate the drainage basin boundaries. The seven major drainage basins A to G have been delineated.

1. Drainage Basin A (2,180 acres) – including Downtown, vicinity of Hwy 26/97 and Culver Hwy, north to the Willow Creek and West to the railroad track
2. Drainage Basin B (760 acres) – Area east of Adams Drive and west of Willow Creek
3. Drainage Basin C (220 acres) – Area east of Willow Creek along southern part of City View Street
4. Drainage Basin D (550 acres) – Area east of Willow Creek and 8th Street, north to Shady lane and Begonia and east to the Middle School and City View
5. Drainage Basin E (1,300 acres) – North Y Area, east to Bean Drive
6. Drainage Basin F (280 acres) – Area west of North Y including Hwy 26 and west to the railroad track
7. Drainage Basin G (880 acres) – Airport Industrial Area

Stormwater Runoff Analysis

EPA 2004 SWMM Version 5 program was used to model the existing stormwater drainage system in order to evaluate its capability for the conveyance of runoff under a 25-year return storm and to identify system deficiencies. The modeling was based on a 24-hour 25-year Type II storm event which has a total rainfall of 2.1 inches over a 24-hour period. This storm produces almost 0.8 inches of rainfall in one hour with the remaining 1.3 inches spreading over the remaining hours.

The results of the initial modeling identified the existing pipe segments that are inadequate to handle the design storm event. The model was revised on a trial-and-error basis with larger diameters for the deficient pipe segments and to estimate the pipe sizes required to handle the flows and with future storm sewer extensions to accommodate potential developments.

It is assumed that runoff from any future developments will be controlled to the pre-developed level. Therefore there should be no increase in peak Stormwater flows. The modeling for system improvements was conducted on this basis.

Recommended Stormwater Drainage System Improvements

The following is a summary of the recommended system improvements.

Hwy 97/26 Area

1. Replace existing Commerce Ct. local storm sewer system and construct downstream sewers along 5th Street from I Street to Willow Creek.
2. Construct sewer extensions along Hwy 97 (Bard Lane to I Street) and Adams Street to intercept drainage from the Hwy and the east side. This will relieve the overloading problem at 2nd Street Sewer and alleviate flooding at 2nd Street and J Street area.
3. Construct storm sewer extensions along Hwy 97 from Hall Rd to Bard Lane as development needs arise.

Culver Hwy Area

1. Replace and extend existing 2nd Street storm system from J Street to C Street and construct a storm sewer along C Street with an outfall to Willow Creek. This will reduce the load to the existing ODOT's 24" storm sewer along Hwy 97.
2. Extend storm drains along Culver Hwy from Madison Street to Marshall Street, collecting runoff along Marshall Street area.
3. Extend storm drains along Culver Hwy from Marshall Street to Burns Drive as dictated by the development.
4. Construct a storm sewer along 1st Street and a parallel sewer south of 1st Street through an easement when developments along Culver Hwy occur in the future.

6th Street, 7th Street and 8th Street Area

1. Replace existing undersized storm drains along 8th Street south of D Street.
2. Construct storm drains along A, B, C, and D Street.
3. Construct a storm sewer system along 5th Street with an outfall to Willow Creek.

McTaggart, Buff and 10th Street Area

There are no storm sewers in this basin. Construct a new storm collection system to alleviate potential flooding.

10th & Oak to 9th Street Area

Replace undersized storm drains to alleviate potential flooding.

12th Street between Oak Street and B Street Area

There are no existing storm drains in this area. Install a new storm sewer system with an outfall to Willow Creek as required for proper drainage.

A Street west of Kinkade to C Street Outfall

1. Replace undersized storm drains from A Street and 16th Street to B Street.
2. Extend storm drains along 16th Street and Hillcrest to Begonia.

Ashwood Road, E Street and Grizzly Area

Construct new storm drains along Ashwood Rd, E Street and Grizzly. The need is driven primarily by future developments.

Hwy 97/North Y Area

Construct storm drain extensions to allow for future development east of Hwy 97 south of Loucks Rd. Upsize the existing ODOT storm drains along Hwy 97 as the need arises.

Henry Street and 7th Street

There are no storm drains in this area. Install new storm to improve the drainage in this area.

North Y Hwy 26

Extend storm drains along Hwy 26 to serve future developments as the need arises.

Airport Industrial Area

Install on-site stormwater control system based on the Best Management Practice in accordance with the City's Storm Water Pollution Control Plan currently in effect and the recommended Stormwater Management Program.

Project Costs and Prioritization

Opinions of probable costs are presented in this report to provide guidance in capital improvements project planning. The opinions of probable costs have been developed from information available at the time this study was completed and are current to April 2005.

Project cost for the recommended improvements in the drainage basins studied ranges from \$100,000 to \$1.5 million, but they do not need to be implemented right away. Conveyance system replacement projects and system additions for those areas with histories of flooding such as Hwy 97 and 2nd Street/J Street problem areas should be given a higher priority than those for future developments. Some specific replacement lines may need to be given a higher priority than other replacement lines because of greater flooding hazards resulting from inadequate pipe size. The City will need to identify such higher priority replacement projects based on knowledge of problem areas in the drainage system. Funding certainly plays an important role in prioritizing the recommended improvements.

Stormwater Management Program

Stormwater Management Programs are implemented by municipalities and other entities to address concerns regarding the quantity and quality of stormwater discharges from urbanized areas. The programs support a community's efforts to maintain an adequate stormwater drainage system that reduces flooding hazards, prevents erosion, and protects water quality in streams that receive storm water.

The recommended guidelines are as follow.

1. Any property development or redevelopment shall include stormwater facilities designed to handle runoff from all tributary areas for the 24-hour, 25-year design storm event. The facilities shall limit the peak discharge from the development in a 24-hour, 25-year design storm to the estimated pre-development peak flow rate in a 24-hour, 10-year design storm.
2. New storm sewers in public rights-of-way shall be designed to convey the peak runoff from the 24-hour, 25-year design storm event without overflowing and shall have a minimum diameter of 12 inches.
3. Manholes or catch basins shall be placed at changes in pipe alignment or grade, at locations where three or more pipes meet, at junctions and connections of sewers, and at a maximum spacing of 500 feet.
4. Stormwater inlets shall be designed for the peak runoff from the 24-hour, 25-year design storm event and shall be located to prevent standing water from becoming a safety hazard or encroaching on public roadways.
5. Catch basins shall have a minimum of 18-inch deep sump.
6. Culverts crossing under arterial streets shall be designed to convey the estimated peak flow caused by the 50-year design storm.
7. Development or redevelopment projects shall maintain natural drainage patterns to the maximum extent practicable and shall not reduce the capacity of any upstream stormwater drainage system.
8. A Pollution and Erosion Control Plan (PECP) shall be required for construction projects to prevent soils from being eroded and washed into storm drainage facilities and to receiving streams. The PECP shall include various erosion control and pollution control devices that will be installed to comply with the DEQ's water quality standards.
9. A post-development site pollution control plan shall be prepared for all industrial facilities.
10. All stormwater facilities shall be provided with suitable access for operations and maintenance. Stormwater facilities on private property shall be operated and maintained by the property owner(s). A maintenance schedule shall be prepared and submitted to the City for review and acceptance. The City shall be granted access to stormwater facilities for periodic inspections.
11. Best management practices shall be implemented for the design, construction, operation and maintenance of public and private stormwater handling facilities.

Chapter II - Introduction

A. Background

The City of Madras has not previously had a stormwater master plan prepared and the City has not maintained a complete record of their existing stormwater drainage system. It is estimated that at least 50-percent of the community is without formal stormwater drainage facilities and a large portion of the City, including the downtown core, is prone to flooding.

In recent years the City has experienced significant growth and the absence of a stormwater master plan has limited the planning efforts needed to manage this growth. No broad guidance has been available to evaluate the impacts of growth on the existing drainage system and to coordinate stormwater management requirements for individual development projects.

Given these circumstances, the City has recognized the importance of developing a City-wide, strategic approach to stormwater management and has placed a high priority on the completion of a stormwater master plan. The completed plan will support its land-use planning process and its goal of providing the infrastructure needed for desirable community growth.

B. Purpose and Scope

The purpose of the Madras Stormwater Master Plan is to address the community's overall stormwater management needs. The fundamental goals of the Plan are to provide recommended major improvements for the stormwater conveyance system and outline a management program that will control stormwater flows and reduce stormwater pollution.

More specifically, the Master Plan is to:

1. Estimate stormwater runoff quantities;
2. Evaluate the existing stormwater drainage system;
3. Develop a Conveyance System Improvement Plan to handle stormwater runoff.
4. Recommend major stormwater drainage system improvements;
5. Identify regulatory issues, address water quality control needs and present facility design guidelines for private developments; and
6. Develop a general capital improvements plan.

Chapter III – Study Area Characteristics

A. Planning Area Boundary

The study area for the Stormwater Master Plan corresponds to the current urban growth boundary as shown in Figure III-1. The area includes the land within the current city limits, as well as pieces of land for future growth to the north, the east and the south of the City. The Madras Airport is northwest of the City and outside the Urban Growth Boundary. Therefore, it is not part of the study area.

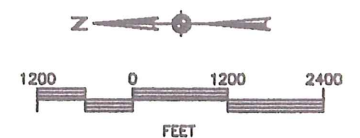
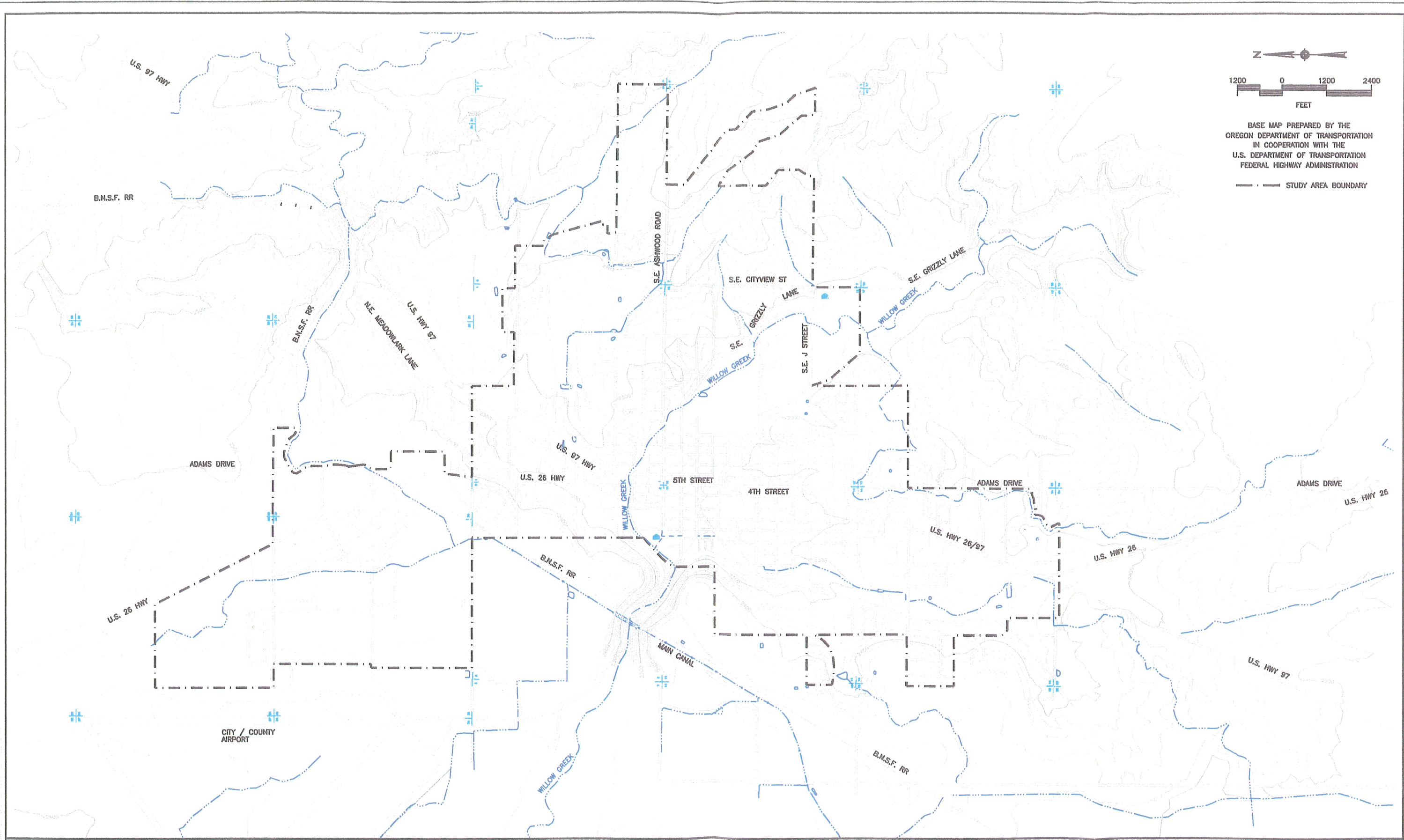
B. Topography and Hydrology

The City is bisected by Willow Creek, which flows from the southeast, through the central part of town, and then in a west-northwest direction to the Deschutes River. Due to the semi-arid climate within the watershed, Willow Creek is an intermittent stream, usually dry in the summer months. During the summer and fall months, irrigation runoff and occasional heavy thunder showers are the only sources of flow to the creek.

The City lies primarily in a small basin located at the upstream end of Willow Creek Canyon which cuts through Agency Plains to the west. The land within the study area is moderately to gently sloping except on the north and west sides where it slopes steeply up to the Agency Plains. Stormwater in the City generally drains into Willow Creek as surface runoff or via several small ditches and the existing storm sewer system. The exception is the Madras Industrial Park, which is located to the north on Agency Plains and tends to slope to the west, away from the creek. The airport is immediately west of the industrial park and does not contribute runoff to the City's stormwater drainage system.

Figure III-1 also shows the local topography based on United States Geological Survey (USGS) maps with contours in 20 foot intervals. The elevation of Willow Creek in Madras varies from a low of about 2,210 feet on the west side up to about 2,270 feet on the southeast side. Elevations within the planning area on the south side of Willow Creek slope up to about 2,420 feet. But the downtown area to the south of the creek lies primarily in a relatively flat, low-lying area situated between elevations 2,220 and 2,240. Most of this low-lying area is in the 100-year floodplain for Willow Creek. Elevations on the north side of the creek generally vary from about 2,240 feet up to about 2,480 feet on Agency Plains.

The groundwater table in the Madras area is generally 300 feet or more below the ground surface. However, perched groundwater can be found in a gravel layer on top of impermeable sandstone in some parts of the City. This perched groundwater may be as shallow as 18 to 20 feet below grade and appears to lie in old stream beds of Willow Creek.



BASE MAP PREPARED BY THE
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 FEDERAL HIGHWAY ADMINISTRATION

--- STUDY AREA BOUNDARY

FIGURE III-1
 CITY OF MADRAS, OREGON
 STORMWATER SYSTEM MASTER PLAN
 STUDY AREA

Drainage Basin E

Subdrainage Basin E (Hwy 97, North Y)

The recommended improvements will allow for future development east of Hwy 97 south of Loucks Rd. When the need arises, the existing ODOT storm drains along Hwy 97 will need to be upsized as shown in Table IV-11.

**TABLE IV - 11
Storm System Improvements - Subdrainage Basin E**

Line Location	Node Location	Storm Sewer Size (in)		Length (ft)
		Exist	New	
Loucks Road	Mt Jefferson Cemetery			
	Kinkade Road		12	1637
	10th St.		15	2363
Chestnut St.	Hwy 97		18	310
	Lakeside Drive			
	10th St.		12	1049
Beverly Drive	Hwy 26		18	426
	Royal Ave			
Hwy 97	Chest Nut St.		12	704
	Meadowlark Lane			
Hwy 26	Loucks Road		15	635
	Chestnut St.		24	1041
	Cedar St.		36	653
	Plum St.	18	36	881
	Poplar St.	24	36	257
	SW To Hwy 26 & Oak St.	36		473
Hwy 26	Oak St.			
	Willow Creek	36		395

Subdrainage Basin EA (Henry Street and 7th Street)

There are no storm drains in this area and the recommended drainage system as shown in Table IV-12 will improve the drainage in this area.

**TABLE IV - 12
Storm System Improvements - Subdrainage Basin EA**

Line Location	Node Location	Storm Sewer Size (in)		Length (ft)
		Exist	New	
Henry St.	10th St.			
	7th St.		12	1033
7th St.	Henry St.			
	Pine St.		12	871
	Willow Creek		12	68

Drainage Basin F (North Y Hwy 26)

The recommended storm system is an extension of the existing Hwy 26 system to serve future developments.

**TABLE IV - 13
Storm System Improvements - Drainage Basin F**

Line Location	Node Location	Storm Sewer Size (in)		Length (ft)
		Exist	New	
Hwy 26	Birch Lane			
	Plum St.		12	4896
	Poplar St.	24		535
	Oak St.	30		375
	Maple St.	60		200
	Willow Creek	27		205

Drainage Basin G (Airport Industrial Area)

Since Drainage Basin G, to the northwest, is relatively flat and does not drain to the main part of the City, extensions or additions to the storm sewer system should not be necessary in that area to serve future developments. Developments in Basin G will need to install on-site stormwater control system based on the Best Management Practice. These requirements should be in accordance with the City's Storm Water Pollution Control Plan currently in effect and the Stormwater Management Program as described in Chapter VI.

The current Airport Stormwater Pollution Control Plan is included in Appendix B for reference.

TABLE IV - 6
Storm System Improvements - Subdrainage Basin AD

Line Location	Node Location	Storm Sewer Size (in)		Length (ft)
		Exist	New	
McTaggart Rd	Buff LearnCenter Access			
	Buff St.		12	580
Buff St.	McTaggart Rd			
	Buff LearnCenter Access		12	547
Madras High School	Romero Court		15	1028
	Buff St.			
	North along HSchool		21	776
10th St.	West along HS to 10th		21	865
	Allen St.			
	F St.		12	1568
	B St.		30	1817
Buff St	Willow Creek		30	172
	8th St			
	10th St		12	525

Drainage Basin B (Majority Area Outside of EGB)

The recently constructed Strawberry Hts Subdivision storm drains are sized for future extension from the area south of the subdivision. The storm drains will need to be designed when the land is platted.

Drainage Basin C

A storm sewer system ranging from 12" to 18" have been proposed as part of J Street-City View Street Improvements.

Drainage Basin D

Subdrainage Basin D (10th & Oak to 9th Street)

The undersized storm drains will need to be replaced as shown in Table IV-7 below to alleviate potential flooding.

TABLE IV - 7
Storm System Improvements - Subdrainage Basin D

Line Location	Node Location	Storm Sewer Size (in)		Length (ft)
		Exist	New	
10th St.	Oak St.			
	Pine St.	8	12	435
Pine St.	10th St.			
	9th St.	8	15	269
9th St.	Pine St.			
	Willow Creek	8	15	398

Subdrainage Basin DA (12th Street between Oak Street and B Street)

There are no existing storm drains in this subdrainage area. A new storm sewer system with an outfall to Willow Creek as shown in Table IV-8 is required for proper drainage.

**TABLE IV - 8
Storm System Improvements - Subdrainage Basin DA**

Line Location	Node Location	Storm Sewer Size (in)		Length (ft)
		Exist	New	
11th St.	Cowden Park			
Oak St.	Oak St.		12	350
	11th St.			
12th St.	12th St.	8	12	165
	Oak St.			
B St.	B St.		12	1292
	12th St.			
	11th St.		12	308
	Willow Creek		15	68

Subdrainage Basin DB (A Street west of Kinkade to C Street Outfall)

The recommended improvements as shown in Table IV-9 include the following.

1. Replace undersized storm drains from A Street and 16th Street to B Street.
2. Extend storm drains along 16th Street and Hillcrest to Begonia.

**TABLE IV - 9
Storm System Improvements - Subdrainage Basin DB**

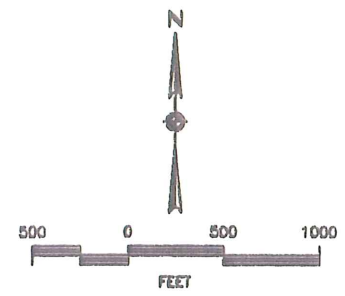
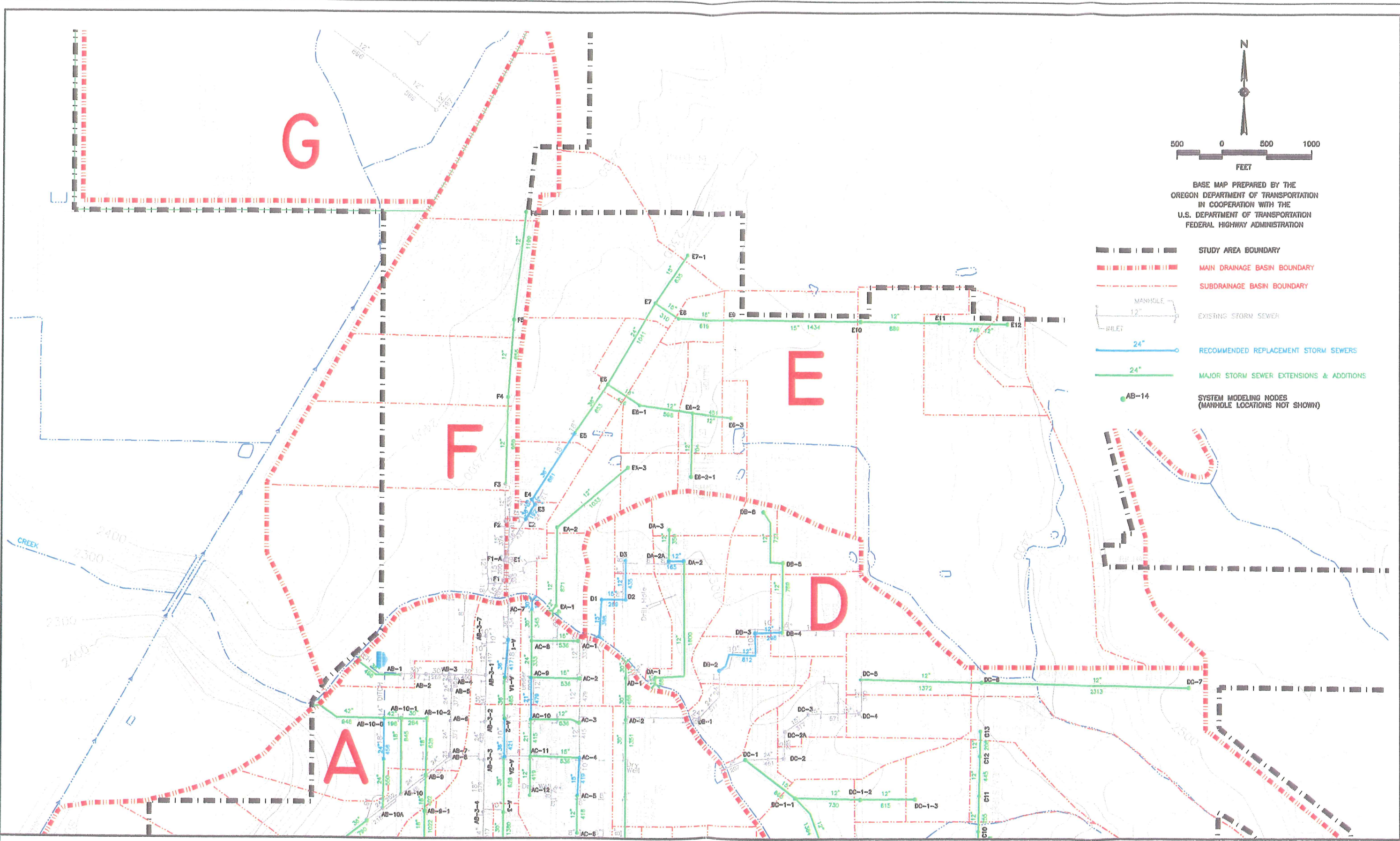
Line Location	Node Location	Storm Sewer Size (in)		Length (ft)
		Exist	New	
Hillcrest St.	Begonia St.			
	Oak St.		12	592
Oak St.	Hillcrest St.			
	16th St.		12	159
16th St.	Oak St.			
	A St.		12	769
A St.	16th St.			
	Hillcrest St.	10	12	298
Hillcrest St.	A St.			
	Betw A & B St.	10	12	257
	South To Nordic Drive	10	12	277
	SW To B St.	10	12	278
Ashwood Drive	South To Ashwood Drive	24		300
	To C St.	24		277
	Willow Creek	24		90

Subdrainage Basin DC

The recommended improvements for this subdrainage as summarized in Table IV-10 consists of constructing new storm drains along Ashwood Rd, E Street and Grizzly. The need is driven primarily by future developments.

**TABLE IV - 10
Storm System Improvements - Subdrainage Basin DC**

Line Location	Node Location	Storm Sewer Size (in)		Length (ft)
		Exist	New	
Ashwood Road	East Of Bean Road			
	Kinkade Road		12	3685
Kinkade Road	Ashwood Road			
	Cross Lane	12		360
Cross Lane	Kinkade Road			
	Revere Avenue	15		571
	SW To 16th St.	15		317
16th St.	C St.			
	D St.	15		285
D St.	16th St.			
	Grizzly Lane	24		461
	Willow Creek	24		207
Grizzly Lane	Kinkade Road			
	E St.		12	1384
	D St.		15	665
E St.	East Of Kinkade Road			
	Grizzly Lane		12	1345



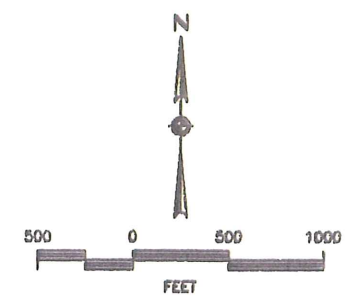
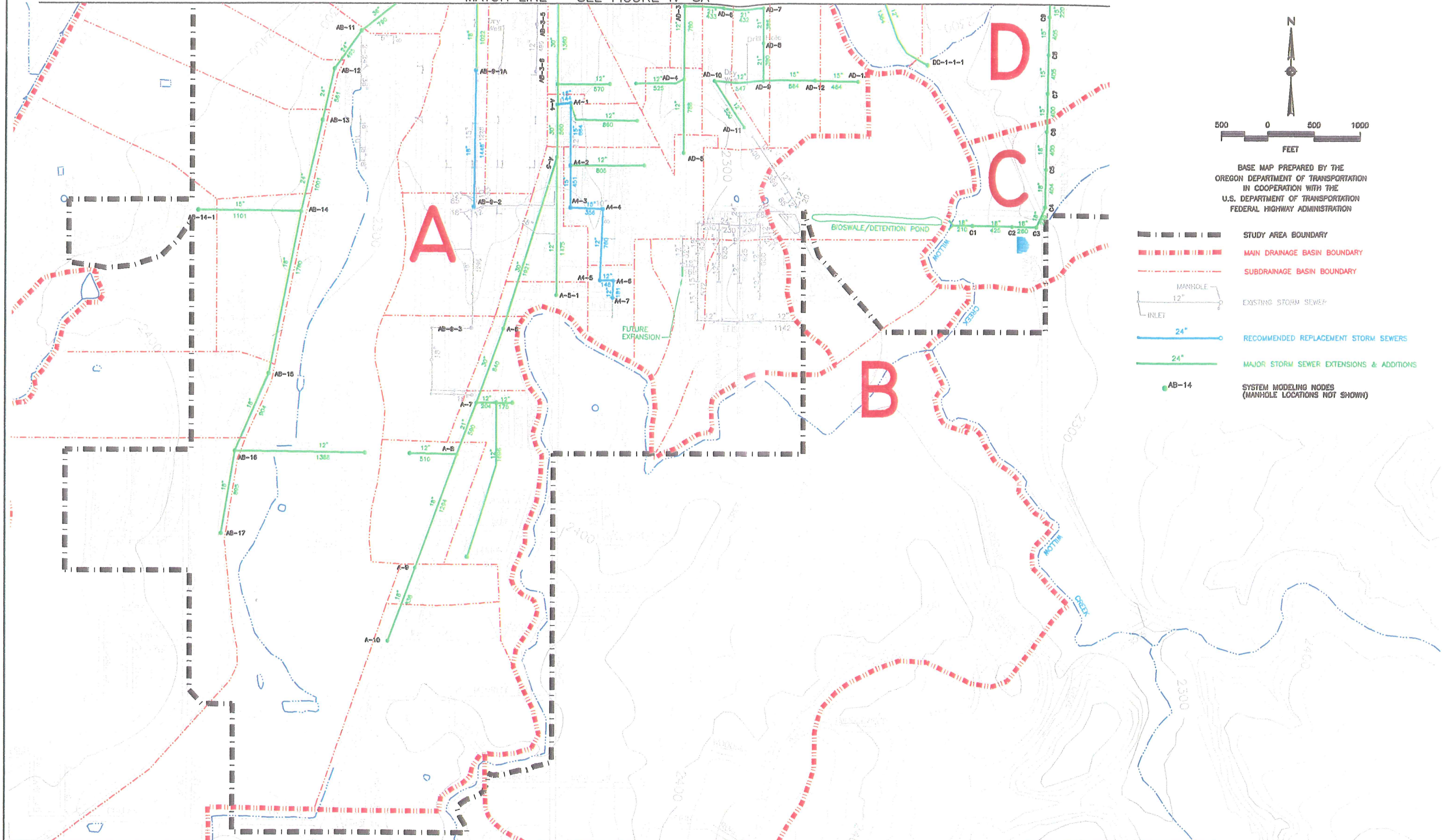
BASE MAP PREPARED BY THE
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 FEDERAL HIGHWAY ADMINISTRATION

- STUDY AREA BOUNDARY
- MAIN DRAINAGE BASIN BOUNDARY
- SUBDRAINAGE BASIN BOUNDARY
- MANHOLE
12" --- EXISTING STORM SEWER
- INLET
- 24" --- RECOMMENDED REPLACEMENT STORM SEWERS
- 24" --- MAJOR STORM SEWER EXTENSIONS & ADDITIONS
- AB-14
SYSTEM MODELING NODES
(MANHOLE LOCATIONS NOT SHOWN)

MATCH LINE - SEE FIGURE IV-3B

FIGURE IV-5
 CITY OF MADRAS, OREGON
 STORMWATER SYSTEM MASTER PLAN
 STORMWATER SYSTEM IMPROVEMENTS - CENTRAL AREA

MATCH LINE - SEE FIGURE IV-3A



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- STUDY AREA BOUNDARY
- MAIN DRAINAGE BASIN BOUNDARY
- SUBDRAINAGE BASIN BOUNDARY
-
- INLET
-
-
- AB-14 SYSTEM MODELING NODES (MANHOLE LOCATIONS NOT SHOWN)

FIGURE IV-6
CITY OF MADRAS, OREGON
STORMWATER SYSTEM MASTER PLAN
STORMWATER SYSTEM IMPROVEMENTS - SOUTH AREA



A. PRELIMINARY OPINIONS OF PROBABLE COSTS

Opinions of probable costs are presented in this report to provide guidance in capital improvements project planning. The opinions of probable costs have been developed from information available at the time this study was completed and are current to April 2005.

The total probable project costs include construction, engineering and administrative components. The estimates for the construction component of the probable costs include allowances for mobilization, contractor overhead and profit, and a 10-percent construction contingency. For master planning, the engineering cost component has been based on a percentage of the probable construction cost. It has been assumed that engineering fees for preliminary design, detailed design, contract bidding and construction administration services will be approximately equal to 15 to 20 percent of the probable construction cost. The engineering component includes allowances for topographical surveys and geotechnical investigations during design and on-site project representation during construction. The total project cost, therefore, includes 25 percent of the probable construction cost as engineering and contingency allowances.

The probable construction costs are based on assumptions for average pipeline, manhole and catch basin depths. Preliminary approximations have also been made regarding the numbers of manholes and catch basins required and the average length of connecting pipe for each catch basin. The probable costs that were developed for this report are budget estimates according to the definition developed by the American Association of Cost Estimating Engineers. Consistent with this definition, the accuracy of the cost estimates is anticipated to be within +30 to -15 percent of the actual cost.

The actual construction costs of the recommended improvements will depend on the labor and material costs and competitive market conditions at the time bids are solicited and accepted. Actual costs will also depend on specific site conditions, the final project scopes and schedules, and other variable factors. As a result, the final project costs will vary from those presented herein. Updated and more detailed estimates for the probable construction costs should be prepared during the detailed design phase of each improvements project.

B. UNIT PRICES

Table V-1 summarizes unit costs used in the preparation of estimated project costs for the proposed Stormwater drainage system improvements.

TABLE V - 1
Stormwater Drainage System Unit Cost Summary

Item No.	Description	Unit	Pipe \$ / Ft	Pipe With MH & CB \$ / Ft	With 25% Eng & Contingency Total \$ / Ft
1	12" PVC Storm Sewer	LF	\$45	\$77	\$96
2	15" PVC Storm Sewer	LF	\$50	\$82	\$103
3	18" PVC Storm Sewer	LF	\$56	\$88	\$110
4	21" PVC Storm Sewer	LF	\$64	\$96	\$120
5	24" PVC Storm Sewer	LF	\$72	\$104	\$130
6	27" PVC Storm Sewer	LF	\$84	\$119	\$149
7	30" PVC Storm Sewer	LF	\$96	\$131	\$164
8	36" PVC Storm Sewer	LF	\$125	\$160	\$200
9	42" PVC Storm Sewer	LF	\$163	\$198	\$248
10	48" Precast Manhole	EA	\$3,500		
11	60" Precast Manhole	EA	\$5,000		
12	Precast Catch Basins w/Pipe	EA	\$2,500		
13	Outfall Structure for 12"	EA	\$10,000		\$12,500
14	Outfall Structure for 15" or 18"	EA	\$15,000		\$18,750
15	Outfall Structure for 30" or 36"	EA	\$20,000		\$25,000
16	Outfall Structure for 42"	EA	\$25,000		\$31,250

C. RECOMMENDED CONVEYANCE SYSTEM IMPROVEMENTS

The recommended stormwater conveyance improvements along with their total project cost are presented in the following tables. The recommended replacements are shown in *bold italic* fonts to differentiate them from those system additions and extensions. Although costs for the proposed storm drainage system improvements along Culver Hwy, Hwy 97 and Hwy 26 have been included in the project list, presumably they should be paid for by ODOT.

TABLE V - 2
Storm System Improvements - Subdrainage Basin A

Location	From	To	Pipe Size (in)	Length (ft)	\$ / ft	Cost
Hwy 97	Hall Rd.	Fairgrounds Rd.	18	2132	56	\$ 119,392
	Fairgrounds Rd.	Bard Ln.	21	590	64	\$ 37,760
	Bard Ln.	E St.	30	4681	96	\$ 449,376
	E St.	D St.	36	628	125	\$ 78,500
	D St.	C St.	36	421	200	\$ 84,200
	C St.	B St.	36	465	125	\$ 58,125
	B St.	A St.	36	417	200	\$ 83,400
Adams St.	L St.	I St.	12	1475	96	\$ 141,969
Celilo St	Benton Ave	Bard Ln	12	1696	45	\$ 76,320
Bard Ln	Murry st	Adrian St	12	175	45	\$ 7,875
	Adrian St	Hwy 97	12	204	45	\$ 9,180
Turner St.	L St. (North)	Betw L St. & Tracie St.	12	181	96	\$ 17,421
	Betw L St. & Tracie St.	West From Turner St.	12	148	96	\$ 14,245
	West From Turner St.	North To J St.	12	760	96	\$ 73,150
J St.	Hull St.	West From Hull St.	15	356	103	\$ 36,490
Commerce Ct	J St.	North To H St.	15	1115	103	\$ 114,288
H St.	Commerce Ct	Hwy 97	15	144	103	\$ 14,760
I St	Glen St	Commerce Ct	12	805	45	\$ 36,225
H St	8th St	Commerce Ct	12	860	45	\$ 38,700
Buff St	7th St	5th St	12	570	45	\$ 25,650

Total Project Cost \$ 1,517,000

TABLE V - 3
Storm System Improvements - Subdrainage Basin AB

Location	From	To	Pipe Size (in)	Length (ft)	\$ / ft	Cost
Culver Hwy	SW Burns Dr	J St.	18	3559	56	\$ 199,304
	J St.	Marshall	24	2057	72	\$ 148,104
	Marshall	Madison	36	790	125	\$ 98,750
B St.	1st St.	Willow Creek	36	498	125	\$ 62,250
2nd St.	J St	G St	18	1446	110	\$ 159,060
2nd St.	G St.	E St.	18	1022	56	\$ 57,232
	E St.	Culver Hwy	18	402	56	\$ 22,512
C St.	Culver Hwy	C St.	18	628	56	\$ 35,168
	2nd	1st	30	284	96	\$ 27,264
	1st	Willow Creek	42	948	163	\$ 154,524
1st St.	Culver Hwy	C St.	18	845	56	\$ 47,320
Belmont Ln	East of Sunrise St.	Culver Hwy	15	1101	50	\$ 55,050
Fairgrounds	Olive Ct	Culvert Hwy	12	1388	45	\$ 62,460
Madison	C St	D St	24	456	130	\$ 59,280
Madison	D St	Culvert Hwy	24	550	72	\$ 39,600
Outfall						\$ 31,250

Total Project Cost \$ 1,259,000

TABLE V - 4
Storm System Improvements - Subdrainage Basin AC

Location	From	To	Pipe Size (in)	Length (ft)	\$ / ft	Cost
8th St.	F St.	E St.	12	416	45	\$ 18,720
8th St.	E St.	D St.	15	419	103	\$ 42,948
6th St.	E St.	D St.	12	419	45	\$ 18,855
	D St.	C St.	21	415	64	\$ 26,560
6th St.	C St.	B St.	21	479	120	\$ 57,480
	B St.	A St.	24	333	72	\$ 23,976
	A St.	Pine St.	30	345	96	\$ 33,120
	Pine St.	Willow Creek	30	101	96	\$ 9,696
D St.	8th St.	6th St.	15	536	50	\$ 26,800
C St.	8th St.	6th St.	12	536	45	\$ 24,120
B St.	8th St.	6th St.	15	536	50	\$ 26,800
A St.	8th St.	6th St.	15	536	50	\$ 26,800
Outfall						\$ 25,000
Total Project Cost						\$ 361,000

TABLE V - 5
Storm System Improvements - Subdrainage Basin AD

Location	From	To	Pipe Size (in)	Length (ft)	\$ / ft	Cost
McTaggart Rd	Buff LearnCenter Access	Buff St.	12	580	45	\$ 26,100
Buff St.	McTaggart Rd	Buff LearnCenter Access	12	547	45	\$ 24,615
	Buff LearnCenter Access	Romero Court	15	1028	50	\$ 51,400
Madras HS	Buff St.	North along HSchool	21	776	64	\$ 49,664
	North along HSchool	West along HS to 10th	21	865	64	\$ 55,360
10th St.	Allen St.	F St.	12	1568	45	\$ 70,560
	F St.	B St.	30	1817	96	\$ 174,432
	B St.	Willow Creek	30	172	96	\$ 16,512
Buff St	8th St	10th St	12	525	45	\$ 23,625
Outfall						\$ 25,000
Total Project Cost						\$ 517,000

TABLE V - 6
Storm System Improvements - Subdrainage Basin D

Location	From	To	Pipe Size (in)	Length (ft)	\$ / ft	Cost
10th St.	Oak St.	Pine St.	12	435	96	\$ 41,869
Pine St.	Pine St.	9th St.	15	269	103	\$ 27,573
9th St.	Pine St.	Willow Creek	15	398	103	\$ 40,795
Outfall						\$ 18,750
Total Project Cost						\$ 129,000

TABLE V - 7
Storm System Improvements - Subdrainage Basin DA

Location			Pipe Size (in)	Length (ft)	\$ / ft	Cost
11th St.	Cowden Park	Oak St.	12	350	45	\$ 15,750
12th St.	Oak St.	B St.	12	1292	45	\$ 58,140
Oak St.	11th St.	12th St.	12	165	96	\$ 15,881
B St.	12th St.	11th St.	12	308	45	\$ 13,860
	11th St.	Willow Creek	15	68	50	\$ 3,400
Outfall						\$ 18,750
Total Project Cost						\$ 126,000

TABLE V - 8
Storm System Improvements - Subdrainage Basin DB

Location	From	To	Pipe Size (in)	Length (ft)	\$ / ft	Cost
Hillcrest St.	Begonia St.	Oak St.	12	592	45	\$ 26,640
Oak St.	Hillcrest St.	16th St.	12	159	45	\$ 7,155
16th St.	Oak St.	A St.	12	769	45	\$ 34,605
A St.	16th St.	Hillcrest St.	12	298	96	\$ 28,683
Hillcrest St.	A St.	Betw A & B St.	12	257	96	\$ 24,736
	Betw A & B St.	South To Nordic Drive	12	277	96	\$ 26,661
	South To Nordic Drive	SW To B St.	12	278	96	\$ 26,758
Total Project Cost						\$ 107,000

TABLE V - 9
Storm System Improvements - Subdrainage Basin DC

Location	From	To	Pipe Size (in)	Length (ft)	\$ / ft	Cost
Ashwood Road	East Of Bean Road	Kinkade Road	12	3685	45	\$ 165,825
Grizzly Lane	Kinkade Road	E St.	12	1384	45	\$ 62,280
	E St.	D St.	15	665	50	\$ 33,250
E St.	East Of Kinkade Road	Grizzly Lane	12	1345	45	\$ 60,525
Total Project Cost						\$ 322,000

9. A post-development site pollution control plan shall be prepared for all industrial facilities.
10. All stormwater facilities shall be provided with suitable access for operations and maintenance. Stormwater facilities on private property shall be operated and maintained by the property owner(s). A maintenance schedule shall be prepared and submitted to the City for review and acceptance. The City shall be granted access to stormwater facilities for periodic inspections.
11. Best management practices shall be implemented for the design, construction, operation and maintenance of public and private stormwater handling facilities.

General Description of BMPs

BMPs have been developed to provide stormwater flow controls, pollution source reduction or treatment of polluted stormwater. BMPs include constructed facilities, maintenance procedures, activity schedules, prohibitions on certain practices and administrative practices that prevent adverse impacts to receiving streams.

Flow controls are generally implemented using constructed infiltration, detention or evaporation facilities designed to limit discharge rates and volumes or to eliminate discharge to receiving streams. Since land development and redevelopment tend to increase stormwater runoff, flow control BMPs are usually necessary to comply with design criteria regarding stormwater discharges to existing storm sewers or receiving streams. Flow control BMPs may also function as treatment facilities.

Source reduction BMPs are aimed to reduce the amount of pollution exposed or introduced to stormwater at sites where potential pollutants are present in significant amounts. In developing BMPs, regulators have recognized the importance of source control as a means for protecting water quality. Thus, an emphasis has been placed on preventing pollutants from getting into stormwater and limiting the amount of runoff that is discharged from sites that handle or store potential contaminants.

Separate stormwater treatment facilities should be provided to augment flow control and source reduction BMPs that are not adequate to maintain compliance with applicable water quality standards. At this time separate treatment facilities will generally only be applicable at a construction or industrial site that must comply with an NPDES permit issued by DEQ.

Reference Manual for BMPs

Washington State Department of Ecology (Ecology) has published the Storm Water Management Manual for Eastern Washington (SWMMEW), a document that includes recommended BMPs for stormwater discharges. Because the SWMMEW addresses conditions specific to arid and semi-arid regions, some guidance on BMPs in the manual is applicable to the Madras Stormwater Management Program. Therefore, this Master Plan makes reference to the SWMMEW in identifying guidelines for BMPs.

Recommended Guidelines for BMPs

The following general guidelines should be following in the selection and implementation of BMPs:

1. Flow control BMPs required to comply with the design criteria of this Stormwater Management Program shall be as described in Chapter 6 of the SWMMEW. Wherever feasible, infiltration BMPs should be used for flow control.
2. BMPs to prevent stormwater pollution from construction sites shall be as described in Chapter 7 of the SWMMEW.
3. Source reduction BMPs as described in Chapter 8 of the SWMMEW shall be implemented to prevent pollutants from being exposed or introduced to stormwater at industrial sites and at commercial or institutional sites where any of the following activities or procedures take place:
 - a. outside storage of materials and products that may release potential pollutants;
 - b. outside waste disposal and container storage;
 - c. loading and unloading of liquid materials;
 - d. liquid storage in aboveground tanks;
 - e. outside manufacturing;
 - f. vehicle or equipment maintenance, repair, washing or fueling;
 - g. sandblasting and painting; and
 - h. other activities that involve handling potential pollutants.
4. Where necessary to meet water quality standards, stormwater runoff treatment BMPs as described in Chapter 5 of the SWMMEW shall be implemented to augment source reduction BMPs.

D. Operation and Maintenance of Facilities

Adequate and continuing operation and maintenance of stormwater facilities is necessary to keep the facilities functioning properly. The following practices should be followed to assure proper function:

1. All stormwater facilities must be provided with suitable access for operations and maintenance.
2. Operating and maintaining stormwater facilities located on private property shall be the responsibility of the property owner(s).
3. A maintenance schedule shall be prepared and implemented for stormwater facilities.

4. The City shall be granted access to stormwater facilities for periodic inspections.

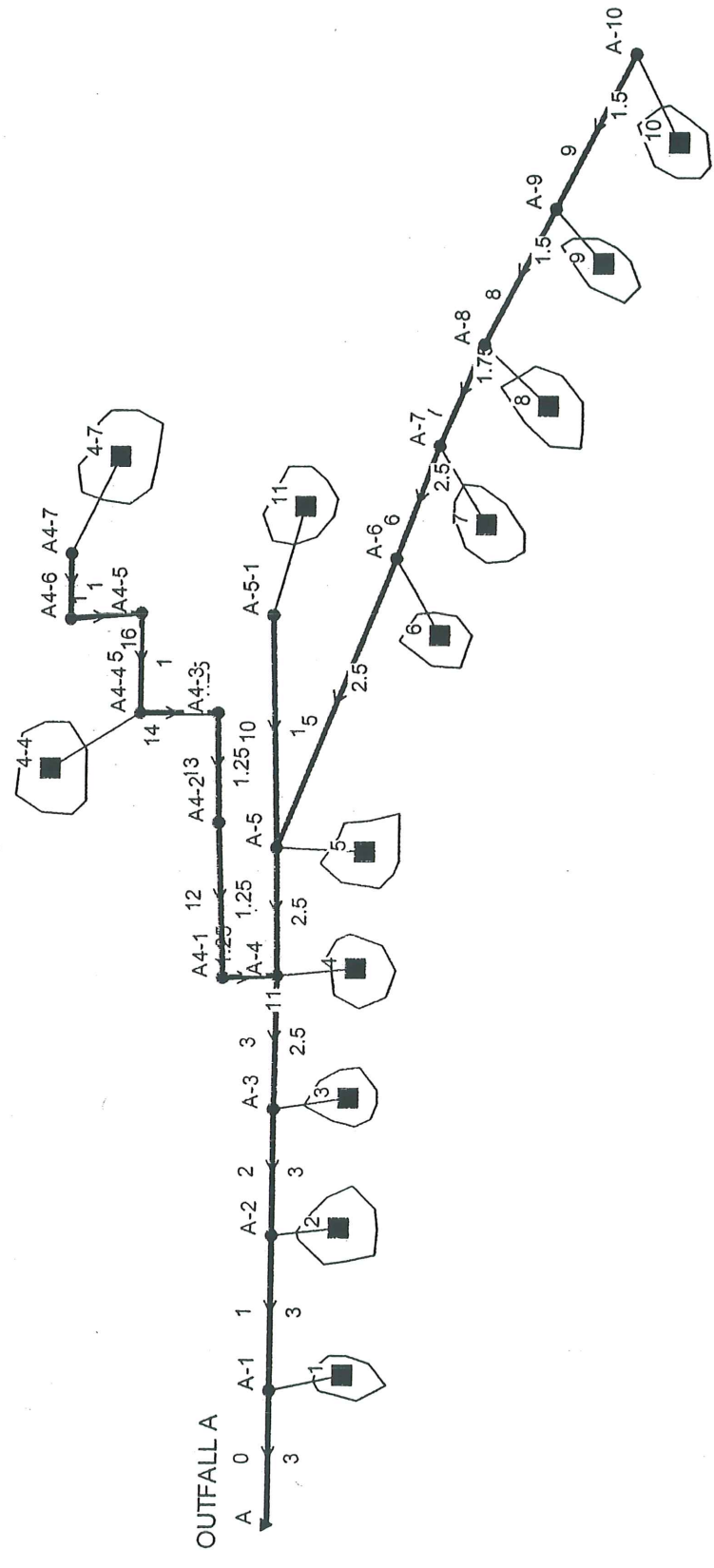
E. Program Implementation

Stormwater Management Program is designed to reduce pollutants and the runoff rates and volumes that are generated from various types of land developments. The City of Madras is currently implementing some of the stormwater control and BMPs discussed above and is requiring new developments to provide flow control facilities. To protect the environment and to avoid having to construct a large stormwater conveyance system, the City of Madras should develop a more detailed guideline to implement the Stormwater Management Program as described and outlined above.

APPENDIX A

SWMM Modeling Results

BASIN A



BASIN A

[TITLE]
BASIN A

[OPTIONS]
 FLOW_UNITS CFS
 INFILTRATION HORTON
 FLOW_ROUTING DYNWAVE
 START_DATE 11/18/1996
 START_TIME 00:01:00
 REPORT_START_DATE 11/18/1996
 REPORT_START_TIME 00:01:00
 END_DATE 11/19/1996
 END_TIME 00:01:00
 SWEEP_START 01/01
 SWEEP_END 12/31
 DRY_DAYS 0
 WET_STEP 00:00:15
 DRY_STEP 00:00:15
 ROUTING_STEP 00:00:15
 REPORT_STEP 00:00:15
 ALLOW_PONDING YES
 INERTIAL_DAMPING PARTIAL
 VARIABLE_STEP 0.75
 LENGTHENING_STEP 0
 MIN_SURFAREA 0
 COMPATIBILITY 5

[RAINGAGES]
 ;;
 ;;Name Rain Type Recd. Freq. Snow Catch Data Source Station Rain Units

 RG1 CUMULATIVE 0:30 1.0 TIMESERIES TS1

[SUBCATCHMENTS]
 ;;
 ;;Name Raingage Outlet Total Area Pcnt. Imperv Width Pcnt. Slope Curb Length Snow Pack

 ;Name Raingage Outlet Total Area Pcnt. Imperv Width Pcnt. Slope Curb Length

 1 RG1 A-1 8 21 790 1 0
 2 RG1 A-2 7.2 41 670 2 0
 3 RG1 A-3 19.3 22 500 5 0
 5 RG1 A-5 17.1 17 1150 3 0
 6 RG1 A-6 9.4 17 800 7 0
 11 RG1 A-5-1 9 23 400 8 0
 7 RG1 A-7 44.2 15 600 2 0
 8 RG1 A-8 29.1 26 900 4 0
 9 RG1 A-9 11.1 8 440 3 0
 10 RG1 A-10 90.6 9 1900 5 0
 4 RG1 A-4 12.7 22 500 3 0
 4-7 RG1 A4-7 10.4 17 500 3 0
 4-4 RG1 A4-4 25.5 17 700 3 0

[SUBAREAS]
 ;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted

 1 .011 0.4 0.05 0.2 25 OUTLET
 2 .011 0.4 0.05 0.2 25 OUTLET
 3 .011 0.4 0.05 0.2 25 OUTLET
 5 .011 0.4 0.05 0.2 25 OUTLET
 6 .011 0.4 0.05 0.2 25 OUTLET
 11 .011 0.4 0.05 0.2 25 OUTLET
 7 .011 0.4 0.05 0.2 25 OUTLET
 8 .011 0.4 0.05 0.2 25 OUTLET
 9 .011 0.4 0.05 0.2 25 OUTLET
 10 .011 0.4 0.05 0.2 25 OUTLET
 4 .011 0.4 0.05 0.2 25 OUTLET
 4-7 .011 0.4 0.05 0.2 25 OUTLET
 4-4 .011 0.4 0.05 0.2 25 OUTLET

[INFILTRATION]
 ;;Subcatchment MaxRate MinRate Decay DryTime MaxInfil

 1 3 0.5 6.5 2 0
 2 3 0.5 6.5 2 0

BASIN A

3	3	0.5	6.5	2	0
5	3	0.5	6.5	2	0
6	3	0.5	6.5	2	0
11	3	0.5	6.5	2	0
7	3	0.5	6.5	2	0
8	3	0.5	6.5	2	0
9	3	0.5	6.5	2	0
10	3	0.5	6.5	2	0
4	3	0.5	6.5	2	0
4-7	3	0.5	6.5	2	0
4-4	3	0.5	6.5	2	0

[JUNCTIONS]

```

;;
;;Name      Invert      Max.      Init.      Surchage      Poned
;;          Elev.       Depth     Depth     Depth         Area
-----
;;Name      Invert      Max.      Init.      Surchage      Poned
;;          Elev.       Depth     Depth     Depth         Area
-----
A-1         2234         5         0         0             0
A-2         2236         4         0         0             0
A-3         2260.3       4         0         0             0
A-4         2282.1       4         0         0             0
A-5         2289         4         0         0             0
A-5-1       2336.4       4         0         0             0
A-6         2317         5         0         0             0
A-7         2320.4       4         0         0             0
A-8         2334         4         0         0             0
A-9         2376         4         0         0             0
A-10        2382         4         0         0             0
A4-1        2286.6       4         0         0             0
A4-2        2291.5       4         0         0             0
A4-3        2301.7       4         0         0             0
A4-4        2305.6       4         0         0             0
A4-5        2313.8       4         0         0             0
A4-6        2315.0       4         0         0             0
A4-7        2316.4       4         0         0             0
    
```

[OUTFALLS]

```

;;
;;Name      Invert      Outfall      Stage/Table      Tide
;;          Elev.       Type         Time Series     Gate
-----
A           2230         FIXED        2239.7 NO
    
```

[CONDUITS]

```

;;
;;Name      Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
;;          Node       Node         Length      N            Height     Height     Flow
-----
;;Name      Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
;;          Node       Node         Length      N            Height     Height     Flow
-----
2           A-3         A-2         1049        0.013        0          0          0
3           A-4         A-3         1360        0.013        0          0          0
4           A-5         A-4         560         0.013        0          0          0
10          A-5-1       A-5         1475        0.013        0          0          0
5           A-6         A-5         1921        0.013        0          0          0
6           A-7         A-6         840         0.013        0          0          0
7           A-8         A-7         590         0.013        0          0          0
8           A-9         A-8         1294        0.013        0          0          0
9           A-10        A-9         838         0.013        0          0          0
0           A-1         A           434         0.013        0          0          0
1           A-2         A-1         872         0.013        0          0          0
11          A4-1        A-4         144         0.013        0          0          0
12          A4-2        A4-1        664         0.013        0          0          0
13          A4-3        A4-2        451         0.013        0          0          0
14          A4-4        A4-3        356         0.013        0          0          0
15          A4-5        A4-4        760         0.013        0          0          0
16          A4-6        A4-5        148         0.013        0          0          0
17          A4-7        A4-6        181         0.013        0          0          0
    
```

[XSECTIONS]

```

;;Link      Type      Geom1      Geom2      Geom3      Geom4      Barrels
-----
2           CIRCULAR  3          0          0          0          1
3           CIRCULAR  2.5        0          0          0          1
4           CIRCULAR  2.5        0          0          0          1
    
```

BASIN A

10	CIRCULAR	1	0	0	0	1
5	CIRCULAR	2.5	0	0	0	1
6	CIRCULAR	2.5	0	0	0	1
7	CIRCULAR	1.75	0	0	0	1
8	CIRCULAR	1.5	0	0	0	1
9	CIRCULAR	1.5	0	0	0	1
0	CIRCULAR	3	0	0	0	1
1	CIRCULAR	3	0	0	0	1
11	CIRCULAR	1.25	0	0	0	1
12	CIRCULAR	1.25	0	0	0	1
13	CIRCULAR	1.25	0	0	0	1
14	CIRCULAR	1.25	0	0	0	1
15	CIRCULAR	1	0	0	0	1
16	CIRCULAR	1	0	0	0	1
17	CIRCULAR	1	0	0	0	1

[LOSSES]

;;Link	Inlet	Outlet	Average	Flap Gate
2	.5	1	0	NO
3	.5	1	0	NO
4	.5	1	0	NO
10	.5	1	0	NO
5	.5	1	0	NO
6	.5	1	0	NO
7	.5	1	0	NO
8	.5	1	0	NO
9	.5	1	0	NO
0	.5	1	0	NO
1	.5	1	0	NO
11	.5	1	0	NO
12	.5	1	0	NO
13	.5	1	0	NO
14	.5	1	0	NO
15	.5	1	0	NO
16	.5	1	0	NO
17	.5	1	0	NO

[TIMESERIES]

;;Name	Date	Time	Value
;;Name	Date	Time	Value-----25 YR 24 HR STOP
TS1		0:30	0.0105
TS1		1:00	0.0210
TS1		1:30	0.0315
TS1		2:00	0.0420
TS1		2:30	0.0630
TS1		3:00	0.0840
TS1		3:30	0.1029
TS1		4:00	0.1218
TS1		4:30	0.1239
TS1		5:00	0.1260
TS1		5:30	0.1470
TS1		6:00	0.1680
TS1		6:30	0.1890
TS1		7:00	0.2100
TS1		7:30	0.2310
TS1		8:00	0.2520
TS1		8:30	0.2888
TS1		9:00	0.3255
TS1		9:30	0.3465
TS1		10:00	0.3675
TS1		10:30	0.4158
TS1		11:00	0.4620
TS1		11:30	0.9030
TS1		12:00	1.3440
TS1		12:30	1.4805
TS1		13:00	1.6170
TS1		13:30	1.6695
TS1		14:00	1.7220
TS1		14:30	1.7598
TS1		15:00	1.7976
TS1		15:30	1.8228
TS1		16:00	1.8480
TS1		16:30	1.8627
TS1		17:00	1.8795

BASIN A

TS1	17:30	1.9068
TS1	18:00	1.9320
TS1	18:30	1.9488
TS1	19:00	1.9656
TS1	19:30	1.9803
TS1	20:00	1.9950
TS1	20:30	2.0160
TS1	21:00	2.0370
TS1	21:30	2.0496
TS1	22:00	2.0622
TS1	22:30	2.0706
TS1	23:00	2.0790
TS1	23:30	2.0895
TS1	24:00	2.1000

BASIN A

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.004)

BASIN A

Analysis Options

Flow Units CFS
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Starting Date NOV-18-1996 00:01:00
 Ending Date NOV-19-1996 00:01:00
 Wet Time Step 00:00:15
 Dry Time Step 00:00:15
 Routing Time Step 00:00:15
 Report Time Step 00:00:15

*****	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Total Precipitation	51.125	2.090
Evaporation Loss	0.000	0.000
Infiltration Loss	42.760	1.748
Surface Runoff	8.185	0.335
Final Surface Storage	0.180	0.007
Continuity Error (%)	0.000	

*****	Volume	Volume
Flow Routing Continuity	acre-feet	Mgallons
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	8.185	2.667
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	43.857	14.291
Internal Flooding	51.731	16.857
External Outflow	0.000	0.000
Evaporation Loss	0.000	0.000
Initial Stored Volume	0.035	0.011
Final Stored Volume	0.332	0.108
Continuity Error (%)	0.025	

Node Depth Summary

-----	Average	Maximum	Maximum	Time of Max	Average	Total
	Depth	Depth	HGL	Occurrence	Depth	Minutes
	Feet	Feet	Feet	days hr:min	Change	Flooded
-----	-----	-----	-----	-----	-----	-----
JUNCTION A-1	4.99	5.00	2239.00	0 00:03	0.0009	1436
JUNCTION A-2	3.09	4.00	2240.00	0 11:43	0.0017	64
JUNCTION A-3	0.33	1.30	2261.60	0 12:30	0.0005	0
JUNCTION A-4	0.39	1.69	2283.79	0 12:30	0.0007	0
JUNCTION A-5	0.35	1.53	2290.53	0 12:30	0.0006	0
JUNCTION A-5-1	0.10	0.39	2336.79	0 12:30	0.0002	0
JUNCTION A-6	0.30	1.20	2318.20	0 12:30	0.0005	0
JUNCTION A-7	0.49	2.46	2322.86	0 12:30	0.0010	0
JUNCTION A-8	0.25	1.03	2335.03	0 12:30	0.0004	0
JUNCTION A-9	0.18	0.71	2376.71	0 12:30	0.0003	0
JUNCTION A-10	0.30	1.71	2383.71	0 12:30	0.0007	0
JUNCTION A4-1	0.16	0.62	2287.22	0 12:32	0.0003	0
JUNCTION A4-2	0.31	2.66	2294.16	0 12:31	0.0010	0
JUNCTION A4-3	0.17	0.69	2302.39	0 12:30	0.0003	0
JUNCTION A4-4	0.23	1.22	2306.82	0 12:30	0.0005	0
JUNCTION A4-5	0.12	0.48	2314.28	0 12:30	0.0002	0
JUNCTION A4-6	0.14	0.64	2315.64	0 12:30	0.0003	0
JUNCTION A4-7	0.13	0.56	2316.96	0 12:29	0.0002	0
OUTFALL A	9.70	9.70	2239.70	0 00:00	0.0000	0

BASIN A

 Conduit Flow Summary

Conduit	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Velocity ft/sec	Length Factor	Maximum /Design Flow	Total Minutes Surcharged
2	3.93e+001	0 12:30	5.96	1.00	0.39	0
3	3.56e+001	0 12:30	11.64	1.00	0.68	0
4	2.77e+001	0 12:30	8.29	1.00	0.61	0
10	2.01e+000	0 12:30	3.97	1.00	0.31	0
5	2.31e+001	0 12:30	8.59	1.00	0.47	0
6	2.15e+001	0 12:30	5.61	1.00	0.82	0
7	1.56e+001	0 12:30	6.51	1.00	0.65	0
8	8.70e+000	0 12:30	8.23	1.00	0.46	0
9	7.86e+000	0 12:30	5.55	1.00	0.88	0
0	4.70e+001	0 00:01	6.65	1.00	0.73	1440
1	2.34e+001	0 00:04	3.32	1.00	0.73	1436
11	5.56e+000	0 12:32	4.89	1.00	0.49	0
12	5.57e+000	0 12:31	4.80	1.00	1.00	28
13	5.69e+000	0 12:30	5.80	1.00	0.59	31
14	5.70e+000	0 12:30	5.78	1.00	0.84	0
15	1.70e+000	0 12:30	2.51	1.00	0.46	0
16	1.71e+000	0 12:30	3.80	1.00	0.53	0
17	1.71e+000	0 12:30	3.48	1.00	0.55	0

 Flow Classification Summary

Conduit	--- Fraction of Time in Flow Class ---							Avg. Froude Number	Avg. Flow Change
	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Down Crit		
2	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.11	0.0001
3	0.02	0.00	0.00	0.05	0.93	0.00	0.00	1.53	0.0003
4	0.02	0.00	0.00	0.06	0.92	0.00	0.00	1.14	0.0002
10	0.02	0.00	0.00	0.94	0.03	0.00	0.00	0.40	0.0001
5	0.02	0.00	0.00	0.04	0.93	0.00	0.00	1.18	0.0002
6	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.83	0.0003
7	0.02	0.00	0.00	0.94	0.03	0.00	0.00	0.86	0.0002
8	0.02	0.00	0.00	0.02	0.96	0.00	0.00	1.32	0.0002
9	0.02	0.00	0.00	0.10	0.88	0.00	0.00	1.09	0.0003
0	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.32	0.0002
1	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.05	0.0009
11	0.02	0.01	0.00	0.95	0.01	0.00	0.00	0.63	0.0002
12	0.03	0.00	0.00	0.09	0.88	0.00	0.00	1.07	0.0004
13	0.03	0.00	0.00	0.16	0.81	0.00	0.00	1.03	0.0002
14	0.02	0.00	0.00	0.02	0.96	0.00	0.00	1.20	0.0003
15	0.02	0.01	0.00	0.97	0.00	0.00	0.00	0.51	0.0002
16	0.03	0.00	0.00	0.92	0.06	0.00	0.00	0.91	0.0002
17	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.83	0.0002

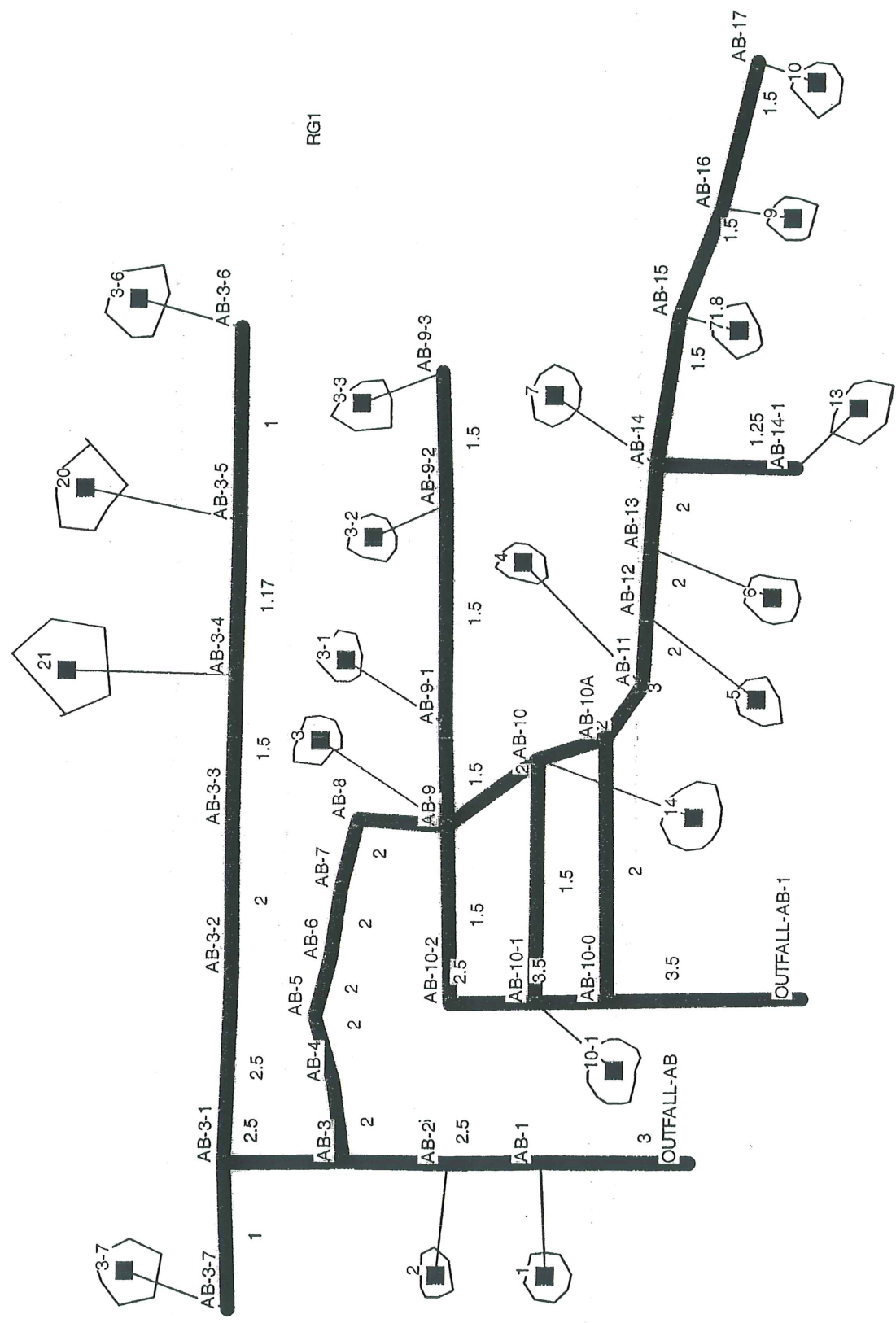
 Highest Continuity Errors

 Node A-2 (1.69%)
 Node A-1 (0.28%)
 Node A-5-1 (0.17%)
 Node A-5 (0.12%)
 Node A4-5 (0.11%)

 Time-Step Critical Elements

 Link 11 (10.33%)
 Link 16 (0.15%)

BASIN AB



BASIN AB

[TITLE]
BASIN AB

[OPTIONS]
 FLOW_UNITS CFS
 INFILTRATION HORTON
 FLOW_ROUTING DYNWAVE
 START_DATE 11/18/1996
 START_TIME 00:01:00
 REPORT_START_DATE 11/18/1996
 REPORT_START_TIME 00:00:00
 END_DATE 11/19/1996
 END_TIME 00:01:00
 SWEEP_START 01/01
 SWEEP_END 12/31
 DRY_DAYS 0
 WET_STEP 00:00:15
 DRY_STEP 00:00:15
 ROUTING_STEP 00:00:15
 REPORT_STEP 00:00:15
 ALLOW_PONDING YES
 INERTIAL_DAMPING PARTIAL
 VARIABLE_STEP 0.75
 LENGTHENING_STEP 0
 MIN_SURFAREA 0
 COMPATIBILITY 5

[RAINGAGES]
 ; ;
 ; ;Name Rain Recd. Snow Data Source Station Rain
 ; ;Type Freq. Catch Source Name ID Units
 ; ;-----
 ; ;
 ; ;Name Timeseries/ Source Format/ RecdFreq/
 ; ;File Name Station RecdIntvl
 ; ;-----
 ; RG1 CUMULATIVE 0:30 1.0 TIMESERIES TS1

[SUBCATCHMENTS]
 ; ;
 ; ;Name Raingage Outlet Total Area Pcnt. Imperv Width Pcnt. Slope Curb Length Snow Pack
 ; ;-----
 ; ;Name Raingage Outlet Total Area Pcnt. Imperv Width Pcnt. Slope Curb Length
 ; ;-----
 ; 1 RG1 AB-1 11.5 15 600 1 0
 ; 2 RG1 AB-2 11.9 18 1200 10 0
 ; 3 RG1 AB-9 3.92 15 600 11 0
 ; 4 RG1 AB-11 570.6 3 4600 4.3 0
 ; 5 RG1 AB-12 46 5 600 8 0
 ; 6 RG1 AB-13 71.6 6 1000 6 0
 ; 7 RG1 AB-14 31.9 5 1700 2 0
 ; 71.8 RG1 AB-15 55.3 6 2150 7 0
 ; 9 RG1 AB-16 57.8 1 3000 7 0
 ; 10 RG1 AB-17 376.6 2 3300 2 0
 ; 3-1 RG1 AB-9-1 34.6 30 400 2 0
 ; 3-2 RG1 AB-9-2 36.8 14 1100 5 0
 ; 3-3 RG1 AB-9-3 30.3 7 900 4 0
 ; 13 RG1 AB-14-1 139.5 5 1850 6 0
 ; 10-1 RG1 AB-10-1 38.6 25 500 1 0
 ; 3-6 RG1 AB-3-6 20.1 25 500 0.005 0
 ; 3-7 RG1 AB-3-7 6.7 25 500 0.005 0
 ; 14 RG1 AB-10 31.6 3 450 6 0
 ; 20 RG1 AB-3-5 12.5 25 500 0.005 0
 ; 21 RG1 AB-3-4 12.5 25 500 0.005 0

[SUBAREAS]
 ; ; Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted
 ; ;-----
 ; 1 0.011 0.4 0.05 0.2 25 OUTLET
 ; 2 0.011 0.4 0.05 0.2 25 OUTLET
 ; 3 0.011 0.4 0.05 0.2 25 OUTLET
 ; 4 0.011 0.4 0.05 0.2 25 OUTLET
 ; 5 0.011 0.4 0.05 0.2 25 OUTLET
 ; 6 0.011 0.4 0.05 0.2 25 OUTLET
 ; 7 0.011 0.4 0.05 0.2 25 OUTLET
 ; 71.8 0.011 0.4 0.05 0.2 25 OUTLET
 ; 9 0.011 0.4 0.05 0.2 25 OUTLET

BASIN AB

10	0.011	0.4	0.05	0.2	25	OUTLET
3-1	0.011	0.4	0.05	0.2	25	OUTLET
3-2	0.011	0.4	0.05	0.2	25	OUTLET
3-3	0.011	0.4	0.05	0.2	25	OUTLET
13	0.011	0.4	0.05	0.2	25	OUTLET
10-1	0.011	0.4	0.05	0.2	25	OUTLET
3-6	0.011	0.4	0.05	0.2	25	OUTLET
3-7	0.011	0.4	0.05	0.2	25	OUTLET
14	0.011	0.4	0.05	0.2	25	OUTLET
20	0.011	0.4	0.05	0.2	25	OUTLET
21	0.011	0.4	0.05	0.2	25	OUTLET

[INFILTRATION]

;;Subcatchment	MaxRate	MinRate	Decay	DryTime	MaxInfil
1	3	0.5	6.5	2	0
2	3	0.5	6.5	2	0
3	3	0.5	6.5	2	0
4	3	0.5	6.5	2	0
5	3	0.5	6.5	2	0
6	3	0.5	6.5	2	0
7	3	0.5	6.5	2	0
71.8	3	0.5	6.5	2	0
9	3	0.5	6.5	2	0
10	3	0.5	6.5	2	0
3-1	3	0.5	6.5	2	0
3-2	3	0.5	6.5	2	0
3-3	3	0.5	6.5	2	0
13	3	0.5	6.5	2	0
10-1	3	0.5	6.5	2	0
3-6	3	0.5	6.5	2	0
3-7	3	0.5	6.5	2	0
14	3	0.5	6.5	2	0
20	3	0.5	6.5	2	0
21	3	0.5	6.5	2	0

[JUNCTIONS]

;;Name	Invert Elev.	Max. Depth	Init. Depth	Surcharge Depth	Ponded Area
AB-1	2228.5	6	0	0	0
AB-2	2227.7	7	0	0	0
AB-9	2240.27	5.64	0	0	0
AB-9-1	2253.4	4	0	0	0
AB-9-2	2281.7	4	0	0	0
AB-9-3	2305.9	4	0	0	0
AB-11	2249.8	8	0	0	0
AB-12	2264	5	0	0	0
AB-13	2288.1	5	0	0	0
AB-14	2296.2	5	0	0	0
AB-14-1	2332	4	0	0	0
AB-15	2319.5	5	0	0	0
AB-16	2327.1	5	0	0	0
AB-17	2340	5	0	0	0
AB-8	2236.4	7.54	0	0	0
AB-7	2236.23	8.77	0	0	0
AB-6	2234.03	5.61	0	0	0
AB-5	2231.77	5.54	0	0	0
AB-4	2231.28	5.54	0	0	0
AB-3	2228	8.33	0	0	0
AB-10	2242.92	5.28	0	0	0
AB-10-1	2233.7	5	0	0	0
AB-10-2	2234	5	0	0	0
AB-10A	2244.59	5	0	0	0
AB-3-1	2229.74	9.4	0	0	0
AB-3-2	2234.5	6	0	0	0
AB-3-3	2237	6	0	0	0
AB-3-4	2249	6.8	0	0	0
AB-3-5	2255.4	9.7	0	0	0
AB-3-6	2270.03	4.57	0	0	0
AB-3-7	2235	4	0	0	0
AB-10-0	2232	6	0	0	0

[OUTFALLS]

;;Name	Invert Elev.	Outfall Type	Stage/Table Time Series	Tide Gate

BASIN AB

```

;-----
;
;Name          Invert      Outfall      Stage/Table
              Elev.       Type         Time Series
;-----
  OUTFALL-AB   2216        FIXED        2235 NO
  OUTFALL-AB-1 2216        FIXED        2234 YES

```

[CONDUITS]

```

;-----
;Name          Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
              Node       Node         Length      N            Height     Height     Flow
;-----
;Name          Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
              Node       Node         Length      N            Height     Height     Flow
;-----
  1            AB-1       OUTFALL-AB  498         0.013        0          0          0
  2            AB-2       AB-1        277         0.013        0          0          0
  19           AB-9-1     AB-9        402         0.013        0          0          0
  20E         AB-9-2     AB-9-1     24643       0.013        0          0          0
  21E         AB-9-3     AB-9-2     1296        0.013        0          0          0
  12          AB-12     AB-11       495         0.013        0          0          0
  13          AB-13     AB-12       561         0.013        0          0          0
  14          AB-14     AB-13       1001        0.013        0          0          0
  15          AB-15     AB-14       1760        0.013        0          0          0
  16          AB-16     AB-15       904         0.013        0          0          0
  17          AB-17     AB-16       895         0.013        0          0          0
  18          AB-14-1   AB-14       1101        0.010        0          0          0
  3           AB-3       AB-2        269         0.013        0          0          0
  4           AB-4       AB-3        60.70       0.013        0          0          0
  5           AB-5       AB-4        85.31       0.013        0          0          0
  6           AB-6       AB-5       377.32      0.013        0          0          0
  7           AB-7       AB-6       370.75      0.013        0          0          0
  8           AB-8       AB-7        22.97       0.013        0          0          0
  9           AB-9       AB-8       324.16      0.013        0          0          0
  10          AB-10     AB-9       347.79      0.013        0          0          0
  30          AB-10-0    OUTFALL-AB-1 748         0.013        0          0          0
  33          AB-9       AB-10-2    628         0.013        0          0          0
  32          AB-10-2   AB-10-1    284         0.013        0          0          0
  11          AB-11     AB-10A     790         0.013        0          0          0
  11E         AB-10A    AB-10      450         0.013        0          0          0
  40          AB-3-6     AB-3-5     490         0.013        0          0          0
  39          AB-3-5     AB-3-4     517         0.013        0          0          0
  38          AB-3-4     AB-3-3     579         0.013        0          0          0
  37          AB-3-3     AB-3-2     428         0.013        0          0          0
  36          AB-3-2     AB-3-1     541         0.013        0          0          0
  34          AB-3-1     AB-3       300         0.013        0          0          0
  35          AB-3-7     AB-3-1     417         0.013        0          0          0
  51          AB-10     AB-10-1    845         0.013        0          0          0
  52          AB-10A    AB-10-0    1200        0.013        0          0          0
  53          AB-10-1   AB-10-0    200         0.013        0          0          0

```

[XSECTIONS]

```

;-----
;Link          Type          Geom1      Geom2      Geom3      Geom4      Barrels
;-----
  1            CIRCULAR      3          0          0          0          1
  2            CIRCULAR      2.5        0          0          0          1
  19           CIRCULAR      1.5        0          0          0          1
  20E         CIRCULAR      1.5        0          0          0          1
  21E         CIRCULAR      1.5        0          0          0          1
  12          CIRCULAR      2          0          0          0          1
  13          CIRCULAR      2          0          0          0          1
  14          CIRCULAR      2          0          0          0          1
  15          CIRCULAR      1.5        0          0          0          1
  16          CIRCULAR      1.5        0          0          0          1
  17          CIRCULAR      1.5        0          0          0          1
  18          CIRCULAR      1.25       0          0          0          1
  3           CIRCULAR      2.5        0          0          0          1
  4           CIRCULAR      2          0          0          0          1
  5           CIRCULAR      2          0          0          0          1
  6           CIRCULAR      2          0          0          0          1
  7           CIRCULAR      2          0          0          0          1
  8           CIRCULAR      2          0          0          0          1
  9           CIRCULAR      2          0          0          0          1
  10          CIRCULAR      2          0          0          0          1
  30          CIRCULAR      3.5        0          0          0          1
  33          CIRCULAR      1.5        0          0          0          1
  32          CIRCULAR      2.5        0          0          0          1

```

BASIN AB

11	CIRCULAR	3	0	0	0	1
11E	CIRCULAR	2	0	0	0	1
40	CIRCULAR	1	0	0	0	1
39	CIRCULAR	1.17	0	0	0	1
38	CIRCULAR	1.5	0	0	0	1
37	CIRCULAR	2	0	0	0	1
36	CIRCULAR	2.5	0	0	0	1
34	CIRCULAR	2.5	0	0	0	1
35	CIRCULAR	1	0	0	0	1
51	CIRCULAR	1.5	0	0	0	1
52	CIRCULAR	2	0	0	0	1
53	CIRCULAR	3.5	0	0	0	1

[LOSSES]

;;Link	Inlet	Outlet	Average	Flap Gate
1	0.5	1	0	NO
2	0.5	1	0	NO
19	0.5	1	0	NO
20E	0.5	1	0	NO
21E	0.5	1	0	NO
12	0.5	1	0	NO
13	0.5	1	0	NO
14	0.5	1	0	NO
15	0.5	1	0	NO
16	0.5	1	0	NO
17	0.5	1	0	NO
18	0.5	1	0	NO
3	0.5	1	0	NO
4	0.5	1	0	NO
5	0.5	1	0	NO
6	0.5	1	0	NO
7	0.5	1	0	NO
8	0.5	1	0	NO
9	0.5	1	0	NO
10	0.5	1	0	NO
30	0.5	1	0	NO
33	0.5	1	0	NO
32	0.5	1	0	NO
11	0.5	1	0	NO
11E	0.5	1	0	NO
40	0.5	1	0	NO
39	0.5	1	0	NO
38	0.5	1	0	NO
37	0.5	1	0	NO
36	0.5	1	0	NO
34	0.5	1	0	NO
35	0.5	1	0	NO
51	0.5	1	0	NO

[TIMESERIES]

;;Name	Date	Time	Value
;25 YR 24 HR STORM SCS Type II			
TS1		0:30	0.0105
TS1		1:00	0.0210
TS1		1:30	0.0315
TS1		2:00	0.0420
TS1		2:30	0.0630
TS1		3:00	0.0840
TS1		3:30	0.1029
TS1		4:00	0.1218
TS1		4:30	0.1239
TS1		5:00	0.1260
TS1		5:30	0.1470
TS1		6:00	0.1680
TS1		6:30	0.1890
TS1		7:00	0.2100
TS1		7:30	0.2310
TS1		8:00	0.2520
TS1		8:30	0.2888
TS1		9:00	0.3255
TS1		9:30	0.3465
TS1		10:00	0.3675

BASIN AB

TS1	10:30	0.4158
TS1	11:00	0.4620
TS1	11:30	0.9030
TS1	12:00	1.3440
TS1	12:30	1.4805
TS1	13:00	1.6170
TS1	13:30	1.6695
TS1	14:00	1.7220
TS1	14:30	1.7598
TS1	15:00	1.7976
TS1	15:30	1.8228
TS1	16:00	1.8480
TS1	16:30	1.8627
TS1	17:00	1.8795
TS1	17:30	1.9068
TS1	18:00	1.9320
TS1	18:30	1.9488
TS1	19:00	1.9656
TS1	19:30	1.9803
TS1	20:00	1.9950
TS1	20:30	2.0160
TS1	21:00	2.0370
TS1	21:30	2.0496
TS1	22:00	2.0622
TS1	22:30	2.0706
TS1	23:00	2.0790
TS1	23:30	2.0895
TS1	24:00	2.1000

[REPORT]
CONTROLS YES

[OPTIONS]
TEMPDIR "C:\DOCUME~1\Wen\LOCALS~1\Temp\"

BASIN AB

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.004)

BASIN AB

Analysis Options

Flow Units CFS
Infiltration Method HORTON
Flow Routing Method DYNWAVE
Starting Date NOV-18-1996 00:01:00
Ending Date NOV-19-1996 00:01:00
Wet Time Step 00:00:15
Dry Time Step 00:00:15
Routing Time Step 00:00:15
Report Time Step 00:00:15

	Volume acre-feet	Depth inches

Runoff Quantity Continuity		

Total Precipitation	278.667	2.090
Evaporation Loss	0.000	0.000
Infiltration Loss	262.886	1.971
Surface Runoff	15.356	0.115
Final Surface Storage	0.414	0.003
Continuity Error (%)	0.004	

	Volume acre-feet	Volume Mgallons

Flow Routing Continuity		

Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	15.355	5.004
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	35.430	11.545
Internal Flooding	40.381	13.159
External Outflow	9.900	3.226
Evaporation Loss	0.000	0.000
Initial Stored Volume	0.123	0.040
Final Stored Volume	0.620	0.202
Continuity Error (%)	0.014	

Node Depth Summary

	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Average Depth Change	Total Minutes Flooded
JUNCTION AB-1	6.00	6.00	2234.50	0 00:06	0.0004	1434
JUNCTION AB-2	6.87	7.00	2234.70	0 11:47	0.0009	112
JUNCTION AB-9	0.42	1.11	2241.38	0 12:33	0.0002	0
JUNCTION AB-9-1	0.41	0.81	2254.21	0 12:32	0.0001	0
JUNCTION AB-9-2	0.65	1.11	2282.81	0 12:37	0.0001	0
JUNCTION AB-9-3	0.15	0.39	2306.29	0 12:30	0.0001	0
JUNCTION AB-11	0.80	2.44	2252.24	0 12:30	0.0004	0
JUNCTION AB-12	0.45	1.20	2265.20	0 12:30	0.0002	0
JUNCTION AB-13	0.39	1.04	2289.14	0 12:30	0.0002	0
JUNCTION AB-14	0.71	2.66	2298.86	0 12:30	0.0004	0
JUNCTION AB-14-1	0.22	0.59	2332.59	0 12:30	0.0001	0
JUNCTION AB-15	0.41	1.23	2320.73	0 12:30	0.0002	0
JUNCTION AB-16	0.38	1.18	2328.28	0 12:30	0.0002	0
JUNCTION AB-17	0.31	0.83	2340.83	0 12:30	0.0001	0
JUNCTION AB-8	0.80	3.21	2239.61	0 12:34	0.0005	0
JUNCTION AB-7	0.63	3.01	2239.24	0 12:34	0.0004	0
JUNCTION AB-6	1.07	3.97	2238.00	0 12:35	0.0008	0
JUNCTION AB-5	3.13	4.97	2236.74	0 12:36	0.0011	0
JUNCTION AB-4	3.54	4.95	2236.23	0 12:36	0.0010	0
JUNCTION AB-3	6.75	7.77	2235.77	0 12:36	0.0010	0

BASIN AB

JUNCTION	AB-10	0.33	1.06	2243.98	0	12:30	0.0002	0
JUNCTION	AB-10-1	0.71	2.68	2236.38	0	12:31	0.0012	0
JUNCTION	AB-10-2	0.81	2.57	2236.57	0	12:31	0.0004	0
JUNCTION	AB-10A	0.88	4.07	2248.66	0	12:31	0.0006	0
JUNCTION	AB-3-1	5.05	6.26	2236.00	0	12:35	0.0010	0
JUNCTION	AB-3-2	0.48	1.75	2236.25	0	12:35	0.0003	0
JUNCTION	AB-3-3	0.47	0.97	2237.97	0	12:31	0.0001	0
JUNCTION	AB-3-4	0.35	0.79	2249.79	0	12:29	0.0001	0
JUNCTION	AB-3-5	0.41	1.26	2256.66	0	12:31	0.0002	0
JUNCTION	AB-3-6	0.25	0.54	2270.57	0	12:30	0.0001	0
JUNCTION	AB-3-7	0.31	1.65	2236.65	0	12:30	0.0002	0
JUNCTION	AB-10-0	2.28	4.30	2236.30	0	12:31	0.0010	0
OUTFALL	OUTFALL-AB	19.00	19.00	2235.00	0	00:00	0.0000	0
OUTFALL	OUTFALL-AB-1	18.00	18.00	2234.00	0	00:00	0.0000	0

 Conduit Flow Summary

Conduit	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Velocity ft/sec	Length Factor	Maximum /Design Flow	Total Minutes Surcharged
1	4.90e+001	0 00:01	6.93	1.00	0.46	1440
2	3.30e+001	0 00:01	6.73	1.00	1.50	1439
19	1.07e+001	0 12:33	9.94	1.00	0.56	0
20E	2.91e+000	0 12:35	2.50	1.00	0.82	0
21E	2.15e+000	0 12:30	4.51	1.00	0.15	0
12	2.57e+001	0 12:30	9.19	1.00	0.67	0
13	2.35e+001	0 12:30	13.04	1.00	0.50	0
14	1.95e+001	0 12:30	6.82	1.00	0.96	0
15	1.20e+001	0 12:30	6.80	1.00	0.99	48
16	8.81e+000	0 12:30	5.81	1.00	0.91	0
17	7.43e+000	0 12:30	6.82	1.00	0.59	0
18	6.95e+000	0 12:30	8.43	1.00	0.46	48
3	2.68e+001	0 00:02	5.45	1.00	1.95	1438
4	1.14e+001	0 12:36	3.62	1.00	0.22	1437
5	1.14e+001	0 12:36	3.62	1.00	0.66	1433
6	1.14e+001	0 12:35	3.62	1.00	0.65	130
7	1.15e+001	0 12:33	3.65	1.00	0.66	38
8	1.16e+001	0 12:32	4.01	1.00	0.59	23
9	1.17e+001	0 12:31	4.61	1.00	0.47	8
10	9.31e+000	0 12:31	7.04	1.00	0.47	0
30	4.82e+001	0 12:31	5.01	1.00	0.33	1440
33	8.54e+000	0 12:34	4.83	1.00	0.81	32
32	8.91e+000	0 12:35	2.65	1.00	0.67	10
11	4.16e+001	0 12:30	26.62	1.00	0.77	7
11E	1.75e+001	0 12:31	5.58	1.00	1.27	33
40	3.50e+000	0 12:30	5.04	1.00	0.57	0
39	5.75e+000	0 12:32	6.28	1.00	0.95	0
38	8.13e+000	0 12:29	7.55	1.00	0.54	0
37	8.12e+000	0 12:32	4.55	1.00	0.47	0
36	7.93e+000	0 12:35	1.61	1.00	0.21	386
34	1.78e+001	0 00:04	3.63	1.00	0.57	1437
35	1.41e+000	0 12:30	1.79	1.00	0.35	1435
51	9.01e+000	0 12:30	5.10	1.00	0.82	42
52	2.38e+001	0 11:46	7.58	1.00	1.03	67
53	2.55e+001	0 12:30	2.75	1.00	0.27	0

 Flow Classification Summary

Conduit	--- Fraction of Time in Flow Class ---							Avg. Froude Number	Avg. Flow Change
	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit		
1	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.26	0.0001
2	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.10	0.0005
19	0.01	0.00	0.00	0.05	0.94	0.00	0.00	1.89	0.0001
20E	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.48	0.0001
21E	0.01	0.00	0.00	0.92	0.07	0.00	0.00	0.31	0.0000

BASIN AB

12	0.01	0.00	0.00	0.07	0.92	0.00	0.00	1.12	0.0001
13	0.01	0.00	0.00	0.01	0.98	0.00	0.00	2.07	0.0001
14	0.01	0.00	0.00	0.15	0.84	0.00	0.00	1.20	0.0002
15	0.01	0.00	0.00	0.97	0.01	0.00	0.00	0.84	0.0002
16	0.01	0.00	0.00	0.67	0.32	0.00	0.00	0.96	0.0001
17	0.01	0.00	0.00	0.05	0.94	0.00	0.00	1.11	0.0001
18	0.01	0.00	0.00	0.93	0.06	0.00	0.00	0.81	0.0001
3	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.13	0.0007
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.12	0.0002
5	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.12	0.0004
6	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.14	0.0003
7	0.00	0.01	0.00	0.98	0.00	0.00	0.00	0.49	0.0001
8	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.64	0.0001
9	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.74	0.0001
10	0.01	0.00	0.00	0.87	0.12	0.00	0.00	0.67	0.0001
30	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.13	0.0001
33	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.66	0.0001
32	0.01	0.00	0.00	0.98	0.00	0.00	0.00	0.36	0.0002
11	0.01	0.00	0.00	0.20	0.78	0.00	0.00	1.01	0.0001
11E	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.71	0.0002
40	0.02	0.00	0.00	0.08	0.90	0.00	0.00	1.12	0.0001
39	0.02	0.00	0.00	0.03	0.95	0.00	0.00	1.22	0.0001
38	0.02	0.00	0.00	0.02	0.96	0.00	0.00	1.21	0.0001
37	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.87	0.0001
36	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.06	0.0000
34	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.06	0.0003
35	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.09	0.0001
51	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.57	0.0001
52	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.36	0.0002
53	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.16	0.0003

Highest Continuity Errors

Node AB-9-2 (5.09%)
Node AB-3-1 (3.61%)
Node AB-3 (1.21%)
Node AB-2 (0.98%)
Node AB-10-0 (0.97%)

Time-Step Critical Elements

Link 8 (68.10%)
Link 4 (0.41%)
Link 2 (0.06%)
Link 5 (0.04%)
Link 3 (0.01%)

Routing Time Step Summary

Total Routing Time : 24.00 hrs
Minimum Time Step : 1.47 sec
Average Time Step : 6.22 sec
Maximum Time Step : 15.00 sec
Fract. of Max. Step: 0-.1 .1-.2 .2-.3 .3-.4 .4-.5 .5-.6 .6-.7 .7-.8 .8-.9 .9-1.

Fract. of All Steps: 0.04 0.64 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

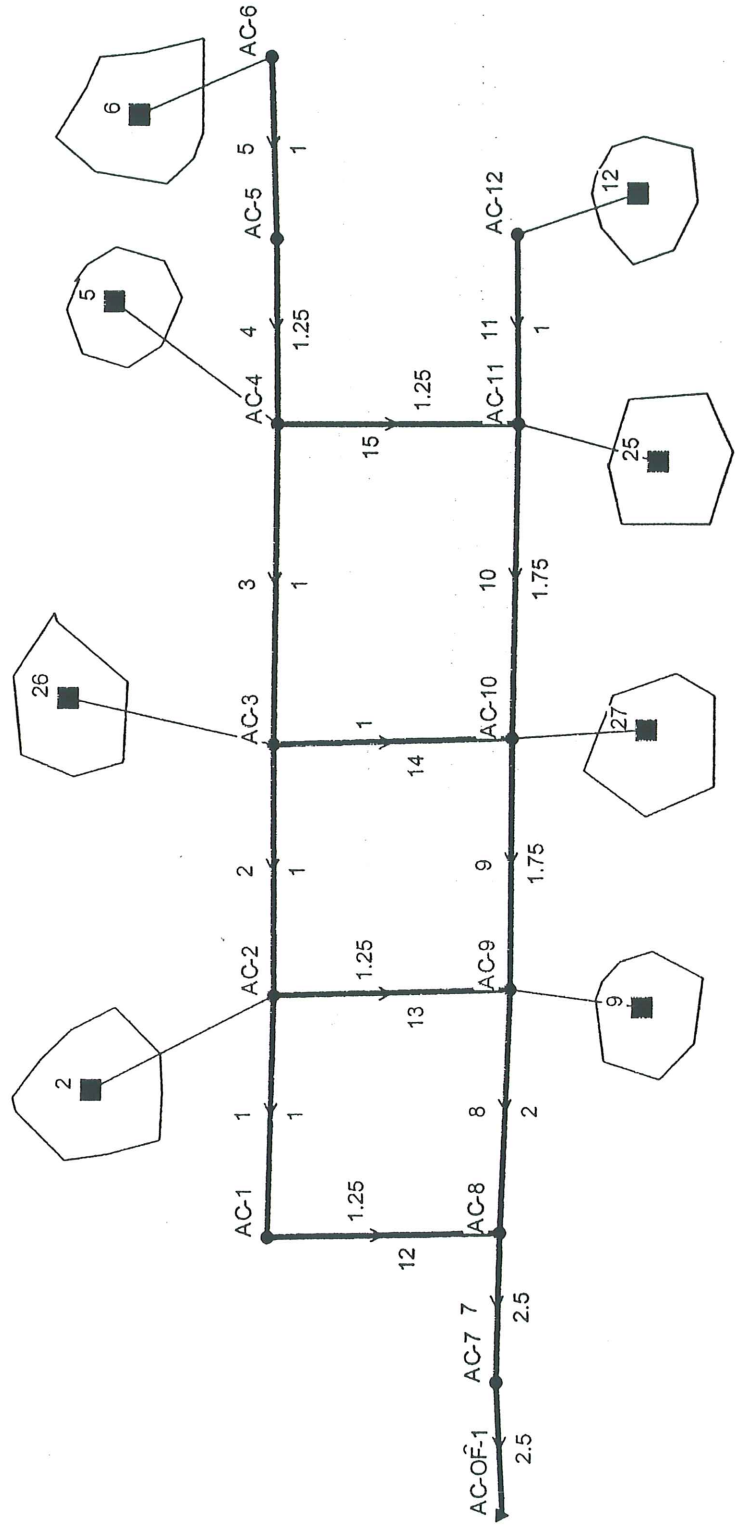
Routing Iterations Summary

Avg. Iterations per Time Step: 2.4
Number of Iterations: 1 2 3 4 5 6 7 8 9 >=10

Fract. of Time Steps: 0.00 0.66 0.26 0.07 0.00 0.00 0.00 0.00 0.00 0.00

Analysis begun on: Tue Jul 19 07:31:18 2005
Total elapsed time: 00:00:03

BASIN AC



BASIN AC

[TITLE]
BASIN AC

[OPTIONS]
 FLOW_UNITS CFS
 INFILTRATION HORTON
 FLOW_ROUTING DYNWAVE
 START_DATE 11/18/1996
 START_TIME 00:01:00
 REPORT_START_DATE 11/18/1996
 REPORT_START_TIME 00:00:00
 END_DATE 11/19/1996
 END_TIME 00:01:00
 SWEEP_START 01/01
 SWEEP_END 12/31
 DRY_DAYS 0
 WET_STEP 00:00:15
 DRY_STEP 00:00:15
 ROUTING_STEP 00:00:15
 REPORT_STEP 00:00:15
 ALLOW_PONDING YES
 INERTIAL_DAMPING PARTIAL
 VARIABLE_STEP 2.00
 LENGTHENING_STEP 0
 MIN_SURFAREA 0
 COMPATIBILITY 5

[RAINGAGES]
 ;;
 ;;Name Rain Recd. Snow Data Source Station Rain
 ;;Type Freq. Catch Source Name ID Units

 ;
 ;Name Timeseries/ Source Format/ RecdFreq/
 ;File Name Station RecdIntvl

 RG1 CUMULATIVE 0:30 1.0 TIMESERIES TS1

[SUBCATCHMENTS]
 ;;
 ;;Name Raingage Outlet Total Area Pcnt. Imperv Width Pcnt. Slope Curb Length Snow Pack

 ;
 ;Name Raingage Outlet Total Area Pcnt. Imperv Width Pcnt. Slope Curb Length

 2 RG1 AC-2 10.6 21 690 1 0
 6 RG1 AC-6 12.1 29 800 2 0
 5 RG1 AC-4 6.1 25 500 0.005 0
 12 RG1 AC-12 12.1 25 500 0.005 0
 9 RG1 AC-9 10.6 25 500 0.005 0
 25 RG1 AC-11 6 25 500 0.005 0
 26 RG1 AC-3 6 25 500 0.005 0
 27 RG1 AC-10 6 25 500 0.005 0

[SUBAREAS]
 ;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted

 ;
 2 .011 0.4 0.05 0.2 25 OUTLET
 6 .011 0.4 0.05 0.2 25 OUTLET
 5 .011 0.4 0.05 0.2 25 OUTLET
 12 .011 0.4 0.05 0.2 25 OUTLET
 9 .011 0.4 0.05 0.2 25 OUTLET
 25 .011 0.4 0.05 0.2 25 OUTLET
 26 .011 0.4 0.05 0.2 25 OUTLET
 27 .011 0.4 0.05 0.2 25 OUTLET

[INFILTRATION]
 ;;Subcatchment MaxRate MinRate Decay DryTime MaxInfil

 ;
 2 3 0.5 6.5 2 0
 6 3 0.5 6.5 2 0
 5 3.0 0.5 6.5 2 0
 12 3.0 0.5 6.5 2 0
 9 3.0 0.5 6.5 2 0
 25 3.0 0.5 6.5 2 0
 26 3.0 0.5 6.5 2 0
 27 3.0 0.5 6.5 2 0

[JUNCTIONS]
 ;;
 ;;Name Invert Elev. Max. Depth Init. Depth Surchage Depth Poned Area

 ;
 AC-5 2237.60 4 0 0 0 0
 AC-2 2238 4 0 0 0 0
 AC-3 2239 5 0 0 0 0

EP 5 SWMM 5

BASIN AC

AC-4	2240.2	4	0	0	0
AC-5	2240.6	4	0	0	0
AC-6	2248.3	4	0	0	0
AC-8	2236	4.5	0	0	0
AC-9	2236.5	4.5	0	0	0
AC-10	2237	4	0	0	0
AC-11	2237.8	4	0	0	0
AC-12	2243.4	4	0	0	0
AC-7	2235.2	5	0	0	0

[OUTFALLS]

;;Name	Invert Elev.	Outfall Type	Stage/Table Time Series	Tide Gate
AC-OF-1	2234	FIXED	2240.35 YES	

[CONDUITS]

;;Name	Inlet Node	Outlet Node	Length	Manning N	Inlet Height	Outlet Height	Init. Flow
2	AC-3	AC-2	479	0.013	0	0	0
3	AC-4	AC-3	415	0.013	0	0	0
4	AC-5	AC-4	419	0.013	0	0	0
1	AC-2	AC-1	333	0.013	0	0	0
5	AC-6	AC-5	416	0.01	0	0	0
10	AC-11	AC-10	415	0.013	0	0	0
8	AC-9	AC-8	333	0.013	0	0	2
12	AC-1	AC-8	536	0.013	0	0	0
14	AC-3	AC-10	536	0.013	0	0	0
15	AC-4	AC-11	536	0.013	0	0	0
13	AC-2	AC-9	536	0.013	0	0	0
11	AC-12	AC-11	419	0.013	0	0	0
9	AC-10	AC-9	479	0.013	0	0	0
7	AC-8	AC-7	345	0.013	0	0	0
6	AC-7	AC-OF-1	101	0.013	0	0	0

[XSECTIONS]

;;Link	Type	Geom1	Geom2	Geom3	Geom4	Barrels
2	CIRCULAR	1	0	0	0	1
3	CIRCULAR	1	0	0	0	1
4	CIRCULAR	1.25	0	0	0	1
1	CIRCULAR	1	0	0	0	1
5	CIRCULAR	1	0	0	0	1
10	CIRCULAR	1.75	0	0	0	1
8	CIRCULAR	2	0	0	0	1
12	CIRCULAR	1.25	0	0	0	1
14	CIRCULAR	1	0	0	0	1
15	CIRCULAR	1.25	0	0	0	1
13	CIRCULAR	1.25	0	0	0	1
11	CIRCULAR	1	0	0	0	1
9	CIRCULAR	1.75	0	0	0	1
7	CIRCULAR	2.5	0	0	0	1
6	CIRCULAR	2.5	0	0	0	1

[LOSSES]

;;Link	Inlet	Outlet	Average	Flap Gate
2	0.5	1	0	NO
3	0.5	1	0	NO
4	0.5	1	0	NO
1	0.5	1	0	NO
5	0.5	1	0	NO
10	0.5	1	0	NO
8	0.5	1	0	NO
12	0.5	1	0	NO
14	0.5	1	0	NO
15	0.5	1	0	NO
13	0.5	1	0	NO
11	0.5	1	0	NO
9	0.5	1	0	NO
7	0.5	1	0	NO
6	0.5	1	0	NO

[TIMESERIES]

;;Name	Date	Time	Value
SWMM 5	Date	Time	Value
TS1		0:30	0.0105
TS1		1:00	0.0210

BASIN AC

TS1	1:30	0.0315
TS1	2:00	0.0420
TS1	2:30	0.0630
TS1	3:00	0.0840
TS1	3:30	0.1029
TS1	4:00	0.1218
TS1	4:30	0.1239
TS1	5:00	0.1260
TS1	5:30	0.1470
TS1	6:00	0.1680
TS1	6:30	0.1890
TS1	7:00	0.2100
TS1	7:30	0.2310
TS1	8:00	0.2520
TS1	8:30	0.2888
TS1	9:00	0.3255
TS1	9:30	0.3465
TS1	10:00	0.3675
TS1	10:30	0.4158
TS1	11:00	0.4620
TS1	11:30	0.9030
TS1	12:00	1.3440
TS1	12:30	1.4805
TS1	13:00	1.6170
TS1	13:30	1.6695
TS1	14:00	1.7220
TS1	14:30	1.7598
TS1	15:00	1.7976
TS1	15:30	1.8228
TS1	16:00	1.8480
TS1	16:30	1.8627
TS1	17:00	1.8795
TS1	17:30	1.9068
TS1	18:00	1.9320
TS1	18:30	1.9488
TS1	19:00	1.9656
TS1	19:30	1.9803
TS1	20:00	1.9950
TS1	20:30	2.0160
TS1	21:00	2.0370
TS1	21:30	2.0496
TS1	22:00	2.0622
TS1	22:30	2.0706
TS1	23:00	2.0790
TS1	23:30	2.0895
TS1	24:00	2.1000

[REPORT]
CONTROLS YES

[OPTIONS]
TEMPDIR "C:\DOCUME-1\Wen\LOCALS-1\Temp\"

BASIN AC

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.004)

BASIN AC

Analysis Options

Flow Units CFS
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Starting Date NOV-18-1996 00:01:00
 Ending Date NOV-19-1996 00:01:00
 Wet Time Step 00:00:15
 Dry Time Step 00:00:15
 Routing Time Step 00:00:15
 Report Time Step 00:00:15

*****	Volume	Depth
*****	acre-feet	inches
Runoff Quantity Continuity		
*****	-----	-----
Total Precipitation	12.102	2.090
Evaporation Loss	0.000	0.000
Infiltration Loss	9.058	1.564
Surface Runoff	2.940	0.508
Final Surface Storage	0.105	0.018
Continuity Error (%)	0.000	

*****	Volume	Volume
*****	acre-feet	Mgallons
Flow Routing Continuity		
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	2.940	0.958
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
Internal Flooding	2.633	0.858
External Outflow	0.000	0.000
Evaporation Loss	0.000	0.000
Initial Stored Volume	0.015	0.005
Final Stored Volume	0.203	0.066
Continuity Error (%)	4.007	

Node Depth Summary

		Average	Maximum	Maximum	Time of Max	Average	Total
		Depth	Depth	HGL	Occurrence	Depth	Minutes
		Feet	Feet	Feet	days hr:min	Change	Flooded
JUNCTION	AC-1	1.75	3.12	2240.72	0 12:30	0.0007	0
JUNCTION	AC-2	1.51	3.36	2241.36	0 12:30	0.0009	0
JUNCTION	AC-3	0.89	3.09	2242.09	0 12:30	0.0009	0
JUNCTION	AC-4	0.26	2.83	2243.03	0 12:30	0.0010	0
JUNCTION	AC-5	0.40	3.64	2244.24	0 12:30	0.0014	0
JUNCTION	AC-6	0.12	0.54	2248.84	0 12:30	0.0002	0
JUNCTION	AC-8	3.04	4.41	2240.41	0 12:30	0.0012	0
JUNCTION	AC-9	2.65	4.32	2240.82	0 12:30	0.0011	0
JUNCTION	AC-10	2.27	4.00	2241.00	0 11:44	0.0009	74
JUNCTION	AC-11	1.71	4.00	2241.80	0 12:20	0.0011	13
JUNCTION	AC-12	0.14	0.71	2244.11	0 12:30	0.0002	0
JUNCTION	AC-7	3.79	5.00	2240.20	0 09:25	0.0009	875
OUTFALL	AC-OF-1	6.35	6.35	2240.35	0 00:00	0.0000	0

Conduit Flow Summary

Conduit	Maximum	Time of Max	Maximum	Length	Maximum	Total
	Flow	Occurrence	Velocity	Factor	/Design	Minutes
	CFS	days hr:min	ft/sec		Flow	Surcharged
EPA SWMM 5	1.44e+000	0 12:33	1.83	1.00	0.88	900
3	1.60e+000	0 12:31	2.04	1.00	0.84	127
4	3.24e+000	0 12:30	2.64	1.00	1.62	63

BASIN AC

1	1.47e+000	0	12:30	1.87	1.00	1.19	939
5	3.30e+000	0	12:30	4.33	1.00	0.52	57
10	6.25e+000	0	12:25	2.60	1.00	0.90	918
8	6.86e+000	0	12:30	3.59	1.00	0.78	992
12	1.47e+000	0	12:31	1.19	1.00	0.42	1013
14	1.55e+000	0	12:30	1.97	1.00	0.71	935
15	2.92e+000	0	12:31	2.38	1.00	0.68	877
13	1.93e+000	0	12:30	1.58	1.00	0.57	965
11	2.40e+000	0	12:30	3.05	1.00	0.58	893
9	3.97e+000	0	12:58	1.65	1.00	0.78	964
7	8.32e+000	0	12:31	1.70	1.00	0.42	1008
6	0.00e+000	0	00:00	0.00	1.00	0.00	1440

Flow Classification Summary

Conduit	--- Fraction of Time in Flow Class ---								Avg. Froude Number	Avg. Flow Change
	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit			
2	0.02	0.02	0.00	0.96	0.00	0.00	0.00	0.13	0.0005	
3	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.23	0.0004	
4	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.35	0.0007	
1	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.13	0.0007	
5	0.02	0.00	0.00	0.96	0.02	0.00	0.00	0.54	0.0002	
10	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.10	0.0004	
8	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.10	0.0008	
12	0.00	0.04	0.00	0.96	0.00	0.00	0.00	0.04	0.0004	
14	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.07	0.0004	
15	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.15	0.0003	
13	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.07	0.0004	
11	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.18	0.0002	
9	0.00	0.04	0.00	0.96	0.00	0.00	0.00	0.07	0.0007	
7	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.03	0.0004	
6	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.0000	

Highest Continuity Errors

Node AC-1 (4.71%)
Node AC-2 (3.11%)
Node AC-10 (2.95%)
Node AC-8 (2.86%)
Node AC-11 (2.84%)

Time-Step Critical Elements

None

Routing Time Step Summary

Total Routing Time : 24.00 hrs
Minimum Time Step : 15.00 sec
Average Time Step : 15.00 sec
Maximum Time Step : 15.00 sec
Fract. of Max. Step: 0-.1 .1-.2 .2-.3 .3-.4 .4-.5 .5-.6 .6-.7 .7-.8 .8-.9 .9-1.

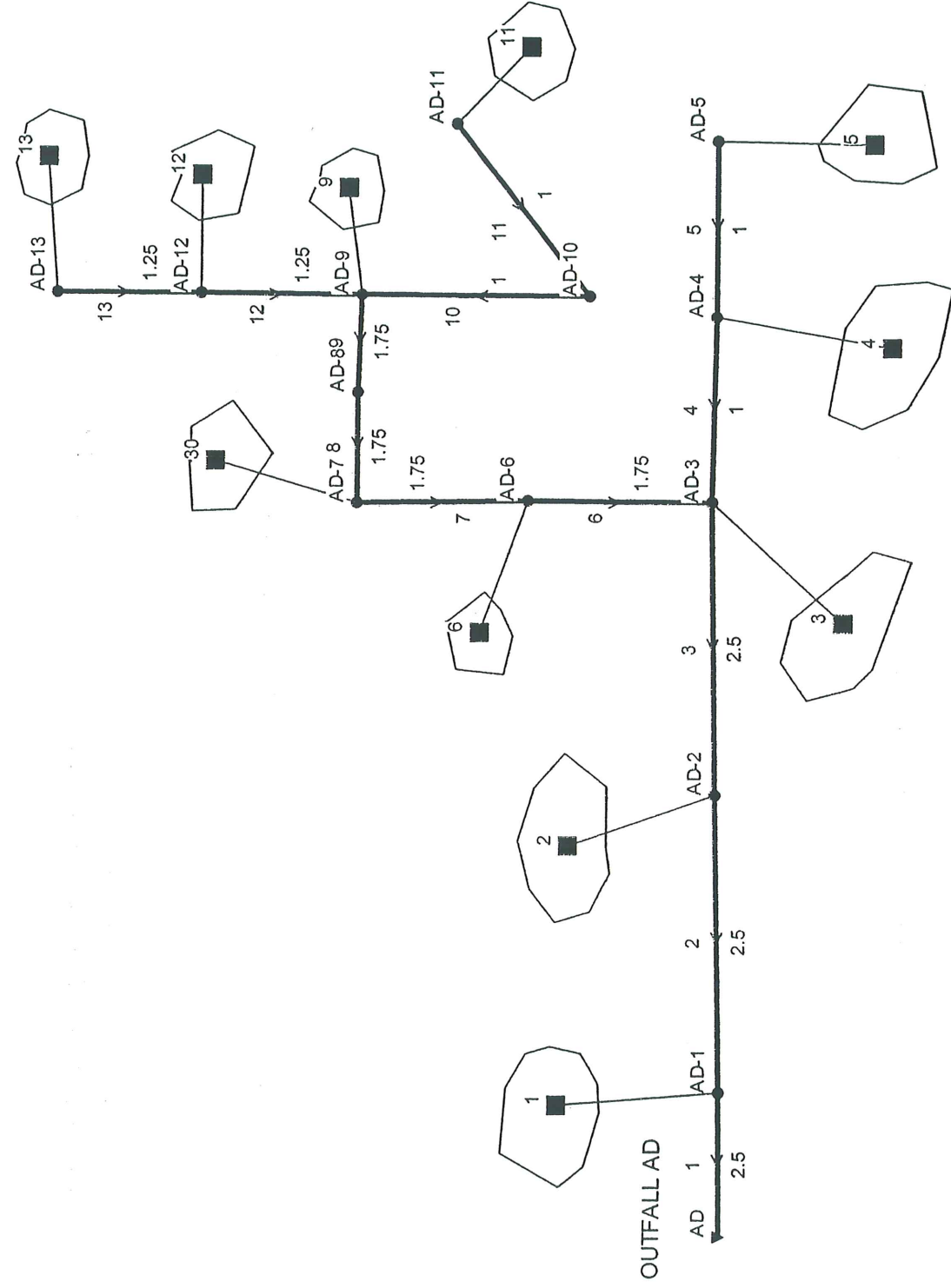
Fract. of All Steps: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

Routing Iterations Summary

Avg. Iterations per Time Step: 2.3
Number of Iterations: 1 2 3 4 5 6 7 8 9 >=10

Fract. of Time Steps: 0.00 0.75 0.20 0.03 0.01 0.01 0.00 0.00 0.00 0.00

BASIN AD



BASIN AD

[TITLE]
BASIN AD

[OPTIONS]
 FLOW_UNITS CFS
 INFILTRATION HORTON
 FLOW_ROUTING DYNWAVE
 START_DATE 11/18/1996
 START_TIME 00:01:00
 REPORT_START_DATE 11/18/1996
 REPORT_START_TIME 00:00:00
 END_DATE 11/19/1996
 END_TIME 00:01:00
 SWEEP_START 01/01
 SWEEP_END 12/31
 DRY_DAYS 0
 WET_STEP 00:00:15
 DRY_STEP 00:00:15
 ROUTING_STEP 00:00:15
 REPORT_STEP 00:00:15
 ALLOW_PONDING YES
 INERTIAL_DAMPING PARTIAL
 VARIABLE_STEP 0.75
 LENGTHENING_STEP 0
 MIN_SURFAREA 0
 COMPATIBILITY 5

[RAINGAGES]
 ;;
 ;;Name Rain Recd. Snow Data Source Station Rain
 ;;Type Freq. Catch Source Name ID Units

 ;;
 ;;Name Timeseries/ Source Format/ RecdFreq/
 ;;File Name Station RecdIntvl

 RGI CUMULATIVE 0:30 1.0 TIMESERIES TS1

[SUBCATCHMENTS]
 ;;
 ;;Name Raingage Outlet Total Area Pcnt. Imperv Width Pcnt. Slope Curb Length Snow Pack

 ;;
 ;;Name Raingage Outlet Total Area Pcnt. Imperv Width Pcnt. Slope Curb Length

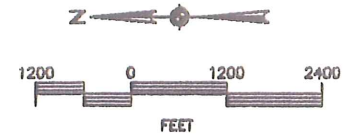
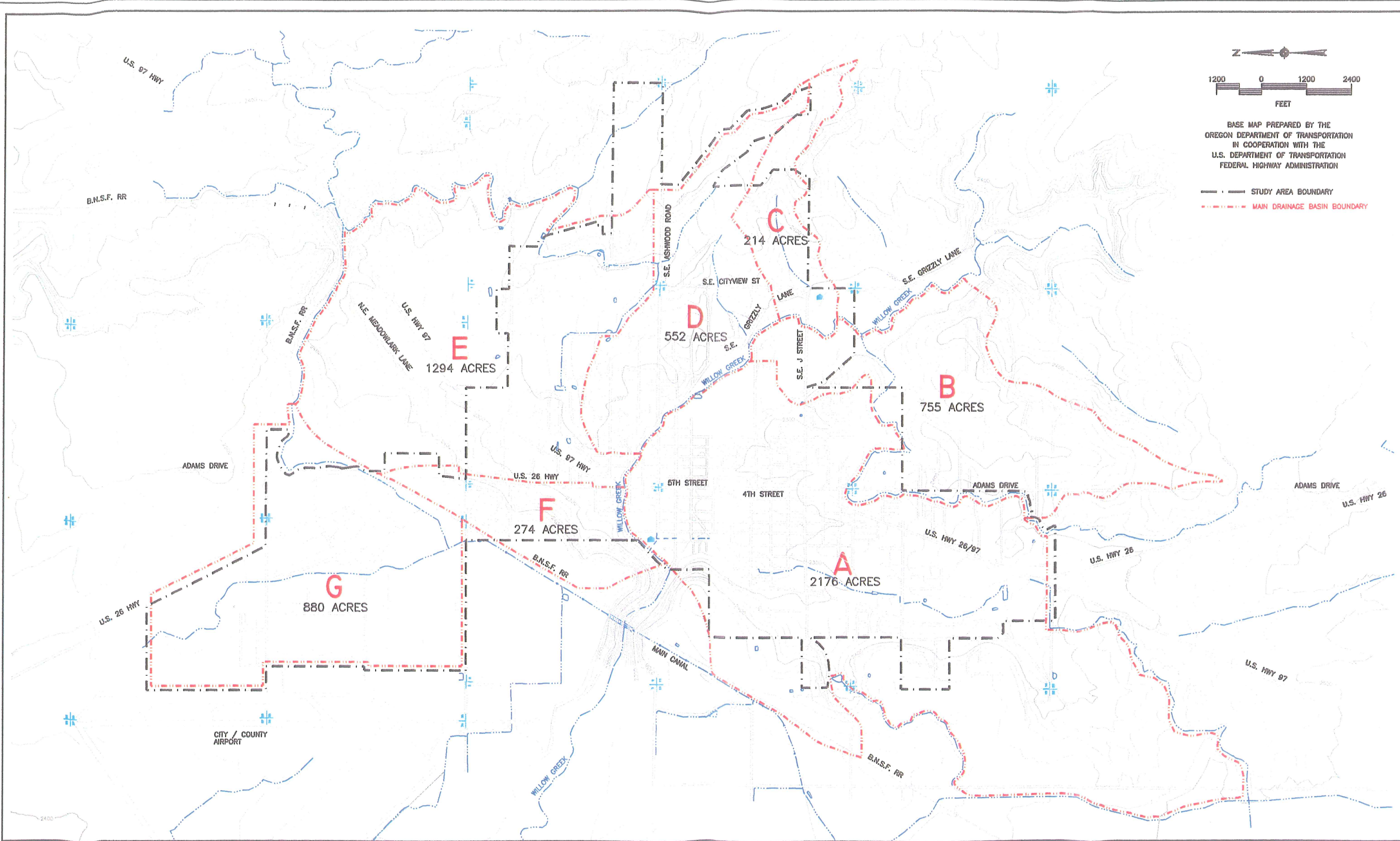
 2 RGI AD-2 10.8 13 1300 1 0
 3 RGI AD-3 5.3 30 300 1 0
 4 RGI AD-4 10.8 22 400 3 0
 5 RGI AD-5 4 20 300 2 0
 1 RGI AD-1 8 13 390 1 0
 6 RGI AD-6 6 25 500 0.005 0
 9 RGI AD-9 12.8 25 500 0.005 0
 12 RGI AD-12 10.3 25 500 0.005 0
 13 RGI AD-13 7.1 25 500 0.005 0
 11 RGI AD-11 7.1 25 500 0.005 0
 30 RGI AD-7 10.3 25 500 0.005 0

[SUBAREAS]
 ;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted

 ;;
 2 .011 0.4 0.05 0.2 25 OUTLET
 3 .011 0.4 0.05 0.2 25 OUTLET
 4 .011 0.4 0.05 0.2 25 OUTLET
 5 .011 0.4 0.05 0.2 25 OUTLET
 1 .011 0.4 0.05 0.2 25 OUTLET
 6 .011 0.4 0.05 0.2 25 OUTLET
 9 .011 0.4 0.05 0.2 25 OUTLET
 12 .011 0.4 0.05 0.2 25 OUTLET
 13 .011 0.4 0.05 0.2 25 OUTLET
 11 .011 0.4 0.05 0.2 25 OUTLET
 30 .011 0.4 0.05 0.2 25 OUTLET

[INFILTRATION]
 ;;Subcatchment MaxRate MinRate Decay DryTime MaxInfil

 ;;
 2 3 .5 6.5 2 0
 3 3 .5 6.5 2 0
 4 3 .5 6.5 2 0



BASE MAP PREPARED BY THE
 OREGON DEPARTMENT OF TRANSPORTATION
 IN COOPERATION WITH THE
 U.S. DEPARTMENT OF TRANSPORTATION
 FEDERAL HIGHWAY ADMINISTRATION

--- STUDY AREA BOUNDARY
 - - - - - MAIN DRAINAGE BASIN BOUNDARY

FIGURE IV-4
 CITY OF MADRAS, OREGON
 STORMWATER SYSTEM MASTER PLAN
 DRAINAGE BASIN DELINEATION

BASIN AD

5	3	.5	6.5	2	0
1	3	.5	6.5	2	0
6	3	0.5	6.5	2	0
9	3	0.5	6.5	2	0
12	3	0.5	6.5	2	0
13	3	0.5	6.5	2	0
11	3	0.5	6.5	2	0
30	3	0.5	6.5	2	0

[JUNCTIONS]

```

;;
;;Name      Invert      Max.      Init.      Surchage      Poned
            Elev.       Depth    Depth     Depth         Area
-----
;Name      Invert      Max.      Init.      Surchage      Poned
            Elev.       Depth    Depth     Depth         Area
-----
AD-2       2242.8      4         0          0             0
AD-3       2244.7      4         0          0             0
AD-4       2269        4         0          0             0
AD-5       2315.6      4         0          0             0
AD-1       2241.1      4         0          0             0
AD-11      2263        4         0          0             0
AD-10      2256.5      4         0          0             0
AD-9       2249.5      5.7       0          0             0
AD-12      2251        9         0          0             0
AD-13      2252        3         0          0             0
AD-8       2249        4.5       0          0             0
AD-7       2248        4         0          0             0
AD-6       2246        4         0          0             0
    
```

[OUTFALLS]

```

;;
;;Name      Invert      Outfall      Stage/Table      Tide
            Elev.       Type         Time Series      Gate
-----
;Name      Invert      Outfall      Stage/Table      Time Series
            Elev.       Type         Time Series
-----
AD         2240        FIXED       2245.6 YES
    
```

[CONDUITS]

```

;;
;;Name      Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
            Node      Node         Length      N            Height     Height     Flow
-----
;Name      Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
            Node      Node         Length      N            Height     Height     Flow
-----
3          AD-3       AD-2        1351        0.013       0          0          0
4          AD-4       AD-3        780         0.013       0          0          0
5          AD-5       AD-4        788         0.013       0          0          0
2          AD-2       AD-1        466         0.013       0          0          0
1          AD-1       AD          172         0.013       0          0          0
11         AD-11      AD-10       580         0.013       0          0          0
10         AD-10      AD-9        547         0.013       0          0          0
9          AD-9       AD-8        390         0.013       0          0          0
8          AD-8       AD-7        386         0.013       0          0          0
7          AD-7       AD-6        432         0.013       0          0          0
6          AD-6       AD-3        433         0.013       0          0          0
13         AD-13      AD-12       464         0.013       0          0          0
12         AD-12      AD-9        564         0.013       0          0          0
    
```

[XSECTIONS]

```

;;
;;Link      Type      Geom1      Geom2      Geom3      Geom4      Barrels
-----
3          CIRCULAR  2.5        0          0          0          1
4          CIRCULAR  1          0          0          0          1
5          CIRCULAR  1          0          0          0          1
2          CIRCULAR  2.5        0          0          0          1
1          CIRCULAR  2.5        0          0          0          1
11         CIRCULAR  1          0          0          0          1
10         CIRCULAR  1          0          0          0          1
9          CIRCULAR  1.75      0          0          0          1
8          CIRCULAR  1.75      0          0          0          1
7          CIRCULAR  1.75      0          0          0          1
6          CIRCULAR  1.75      0          0          0          1
13         CIRCULAR  1.25      0          0          0          1
12         CIRCULAR  1.25      0          0          0          1
    
```


BASIN AD

[LOSSES]

;;Link	Inlet	Outlet	Average	Flap Gate
3	.5	1	0	NO
4	.5	1	0	NO
5	.5	1	0	NO
2	.5	1	0	NO
1	.5	1	0	NO
11	0.5	1	0	NO
10	0.5	1	0	NO
9	0.5	1	0	NO
8	0.5	1	0	NO
7	0.5	1	0	NO
6	0.5	1	0	NO
13	0.5	1	0	NO
12	0.5	1	0	NO

[TIMESERIES]

;;Name	Date	Time	Value
;;Name	Date	Time	Value-----25 YR 24 HR STOR
TS1		0:30	0.0105
TS1		1:00	0.0210
TS1		1:30	0.0315
TS1		2:00	0.0420
TS1		2:30	0.0630
TS1		3:00	0.0840
TS1		3:30	0.1029
TS1		4:00	0.1218
TS1		4:30	0.1239
TS1		5:00	0.1260
TS1		5:30	0.1470
TS1		6:00	0.1680
TS1		6:30	0.1890
TS1		7:00	0.2100
TS1		7:30	0.2310
TS1		8:00	0.2520
TS1		8:30	0.2888
TS1		9:00	0.3255
TS1		9:30	0.3465
TS1		10:00	0.3675
TS1		10:30	0.4158
TS1		11:00	0.4620
TS1		11:30	0.9030
TS1		12:00	1.3440
TS1		12:30	1.4805
TS1		13:00	1.6170
TS1		13:30	1.6695
TS1		14:00	1.7220
TS1		14:30	1.7598
TS1		15:00	1.7976
TS1		15:30	1.8228
TS1		16:00	1.8480
TS1		16:30	1.8627
TS1		17:00	1.8795
TS1		17:30	1.9068
TS1		18:00	1.9320
TS1		18:30	1.9488
TS1		19:00	1.9656
TS1		19:30	1.9803
TS1		20:00	1.9950
TS1		20:30	2.0160
TS1		21:00	2.0370
TS1		21:30	2.0496
TS1		22:00	2.0622
TS1		22:30	2.0706
TS1		23:00	2.0790
TS1		23:30	2.0895
TS1		24:00	2.1000

[REPORT]

CONTROLS YES

[OPTIONS]

TEMPDIR "C:\DOCUME-1\Wen\LOCALS-1\Temp\"

BASIN AD

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.004)

BASIN AD

Analysis Options

```

Flow Units ..... CFS
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Starting Date ..... NOV-18-1996 00:01:00
Ending Date ..... NOV-19-1996 00:01:00
Wet Time Step ..... 00:00:15
Dry Time Step ..... 00:00:15
Routing Time Step ..... 00:00:15
Report Time Step ..... 00:00:15
    
```

```

*****
Volume      Depth
Runoff Quantity Continuity  acre-feet  inches
*****
Total Precipitation ..... 16.107      2.090
Evaporation Loss ..... 0.000      0.000
Infiltration Loss ..... 12.504      1.622
Surface Runoff ..... 3.477      0.451
Final Surface Storage .... 0.126      0.016
Continuity Error (%) ..... 0.000
    
```

```

*****
Volume      Volume
Flow Routing Continuity  acre-feet  Mgallons
*****
Dry Weather Inflow ..... 0.000      0.000
Wet Weather Inflow ..... 3.476      1.133
Groundwater Inflow ..... 0.000      0.000
RDII Inflow ..... 0.000      0.000
External Inflow ..... 0.000      0.000
Internal Flooding ..... 3.305      1.077
External Outflow ..... 0.000      0.000
Evaporation Loss ..... 0.000      0.000
Initial Stored Volume .... 0.010      0.003
Final Stored Volume ..... 0.169      0.055
Continuity Error (%) ..... 0.339
    
```

Node Depth Summary

	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Average Depth Change	Total Minutes Flooded
JUNCTION AD-2	1.80	3.12	2245.92	0 12:30	0.0008	0
JUNCTION AD-3	0.51	2.85	2247.55	0 12:31	0.0010	0
JUNCTION AD-4	0.12	0.49	2269.49	0 12:30	0.0002	0
JUNCTION AD-5	0.05	0.20	2315.80	0 12:30	0.0001	0
JUNCTION AD-1	3.21	4.00	2245.10	0 07:18	0.0008	1002
JUNCTION AD-11	0.11	0.46	2263.46	0 12:30	0.0002	0
JUNCTION AD-10	0.11	0.42	2256.92	0 12:30	0.0002	0
JUNCTION AD-9	0.43	3.20	2252.70	0 12:35	0.0011	0
JUNCTION AD-12	0.27	3.13	2254.13	0 12:34	0.0011	0
JUNCTION AD-13	0.18	2.34	2254.34	0 12:34	0.0008	0
JUNCTION AD-8	0.34	2.83	2251.83	0 12:35	0.0010	0
JUNCTION AD-7	0.33	2.96	2250.96	0 12:34	0.0010	0
JUNCTION AD-6	0.41	3.45	2249.45	0 12:32	0.0012	0
OUTFALL AD	5.60	5.60	2245.60	0 00:00	0.0000	0

Conduit Flow Summary

BASIN AD

Conduit	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Velocity ft/sec	Length Factor	Maximum /Design Flow	Total Minutes Surcharged
3	1.35e+001	0 12:32	2.75	1.00	0.88	35
4	2.99e+000	0 12:30	4.74	1.00	0.48	67
5	7.77e-001	0 12:30	3.46	1.00	0.09	0
2	1.47e+001	0 12:30	3.00	1.00	0.60	1040
1	0.00e+000	0 00:00	0.00	1.00	0.00	1440
11	1.52e+000	0 12:30	4.56	1.00	0.40	0
10	1.52e+000	0 12:31	1.93	1.00	0.38	42
9	6.70e+000	0 12:33	2.92	1.00	1.18	31
8	6.87e+000	0 12:41	3.34	1.00	0.85	32
7	8.74e+000	0 12:40	3.63	1.00	0.81	46
6	9.93e+000	0 12:39	4.13	1.00	1.14	56
13	1.34e+000	0 12:30	1.66	1.00	0.45	33
12	3.10e+000	0 12:32	2.53	1.00	0.93	51

Flow Classification Summary

Conduit	--- Fraction of Time in Flow Class ---							Avg. Froude Number	Avg. Flow Change
	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit		
3	0.02	0.00	0.00	0.97	0.00	0.00	0.00	0.12	0.0004
4	0.02	0.00	0.00	0.91	0.06	0.00	0.00	0.39	0.0002
5	0.02	0.00	0.00	0.96	0.01	0.00	0.00	0.80	0.0000
2	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.05	0.0004
1	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.0000
11	0.04	0.00	0.00	0.08	0.88	0.00	0.00	1.03	0.0001
10	0.04	0.01	0.00	0.95	0.00	0.00	0.00	0.21	0.0001
9	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.39	0.0004
8	0.04	0.01	0.00	0.94	0.00	0.00	0.00	0.51	0.0003
7	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.60	0.0003
6	0.03	0.02	0.00	0.96	0.00	0.00	0.00	0.41	0.0004
13	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.30	0.0002
12	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.30	0.0004

Highest Continuity Errors

Node AD-2 (3.54%)
Node AD-1 (1.52%)
Node AD-4 (0.20%)
Node AD-3 (0.10%)
Node AD-10 (0.08%)

Time-Step Critical Elements

None

Routing Time Step Summary

Total Routing Time :	24.00	hrs
Minimum Time Step :	15.00	sec
Average Time Step :	15.00	sec
Maximum Time Step :	15.00	sec
Fract. of Max. Step:	0-.1	.1-.2
	.2-.3	.3-.4
	.4-.5	.5-.6
	.6-.7	.7-.8
	.8-.9	.9-1.
Fract. of All Steps:	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00

Routing Iterations Summary

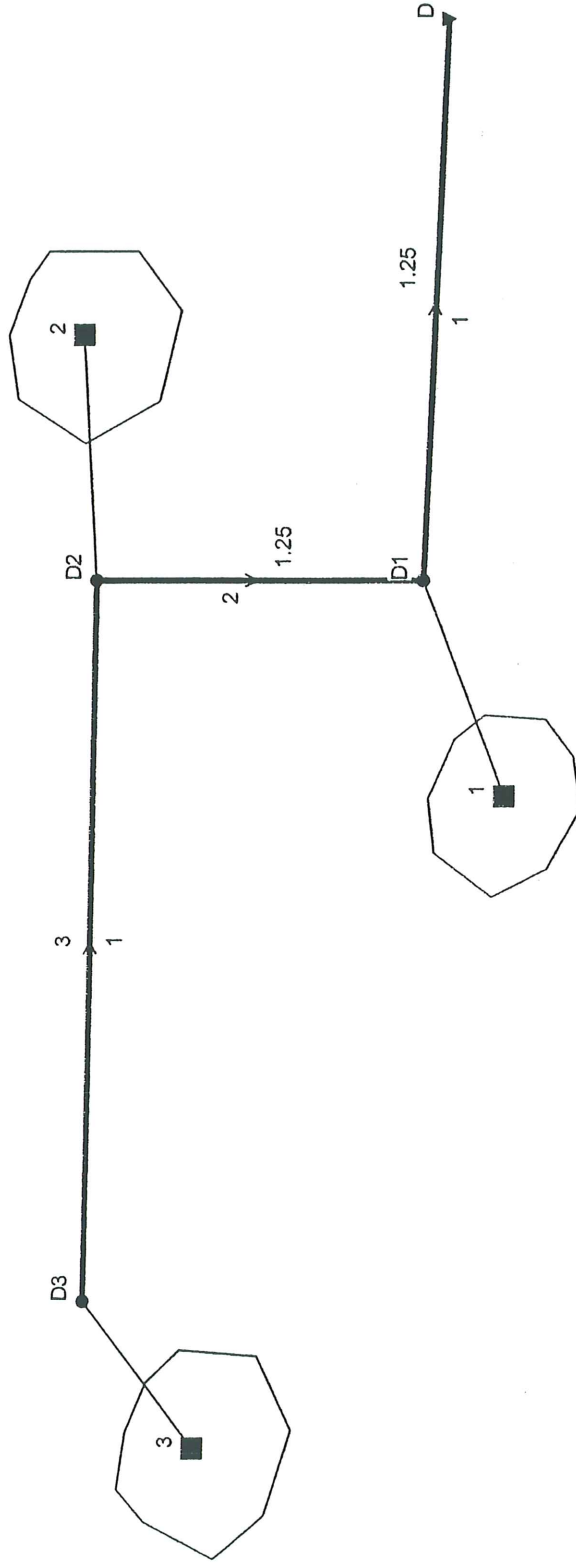
Avg. Iterations per Time Step: 2.3

BASIN AD

Number of Iterations:	1	2	3	4	5	6	7	8	9	>=10
Fract. of Time Steps:	0.00	0.80	0.12	0.04	0.04	0.01	0.00	0.00	0.00	0.00



BASIN D



BASIN D

[TITLE]
BASIN D

[OPTIONS]
 FLOW_UNITS CFS
 INFILTRATION HORTON
 FLOW_ROUTING DYNWAVE
 START_DATE 11/18/1996
 START_TIME 01:00:00
 REPORT_START_DATE 11/18/1996
 REPORT_START_TIME 01:00:00
 END_DATE 11/19/1996
 END_TIME 02:00:00
 SWEEP_START 01/01
 SWEEP_END 12/31
 DRY_DAYS 0
 WET_STEP 00:00:15
 DRY_STEP 00:00:15
 ROUTING_STEP 00:00:15
 REPORT_STEP 00:00:15
 ALLOW_PONDING NO
 INERTIAL_DAMPING PARTIAL
 VARIABLE_STEP 0.00
 LENGTHENING_STEP 0
 MIN_SURFAREA 0
 COMPATIBILITY 5

[RAINGAGES]
 ;;
 ;;Name Rain Recd. Snow Data Source Station Rain
 Type Freq. Catch Source Name ID Units

 ;
 ;Name Timeseries/ Source Format/ RecdFreq/
 File Name Station RecdIntvl

 ;
 ; RG1 CUMULATIVE 0:30 1.0 TIMESERIES TS1

[SUBCATCHMENTS]
 ;;
 ;;Name Raingage Outlet Total Pcnt. Pcnt. Curb Snow
 Area Imperv Width Slope Length Pack

 ;
 ;Name Raingage Outlet Total Pcnt. Pcnt. Curb
 Area Imperv Width Slope Length

 ;
 ; 1 RG1 D1 9.6 40 300 5 0
 ; 2 RG1 D2 13.7 23 800 3 0
 ; 3 RG1 D3 7.4 29 400 10 0

[SUBAREAS]
 ;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted

 ;
 ; 1 0.011 0.4 0.05 .2 25 OUTLET
 ; 2 0.011 0.4 0.05 0.2 25 OUTLET
 ; 3 0.011 0.4 0.05 0.2 25 OUTLET

[INFILTRATION]
 ;;Subcatchment MaxRate MinRate Decay DryTime MaxInfil

 ;
 ; 1 3 0.5 6.5 2 0
 ; 2 3 0.5 6.5 2 0
 ; 3 3 0.5 6.5 2 0

[JUNCTIONS]
 ;;
 ;;Name Invert Max. Init. Surchage Poned
 Elev. Depth Depth Depth Area

 ;
 ;Name Invert Max. Init. Surchage Poned
 Elev. Depth Depth Depth Area

 ;
 ; D1 2255 4 0 0 0
 ; D2 2258 4 0 0 0
 ; D3 2273.5 4 0 0 0

[OUTFALLS]
 ;;
 ;;Name Invert Outfall Stage/Table Tide
 Elev. Type Type Series Gate

 ;

BASIN D

```

;
;Name          Invert      Outfall      Stage/Table
              Elev.       Type         Time Series
-----
D              2235.9     FIXED       2244.9 NO
  
```

[CONDUITS]

```

;;
;;Name          Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
              Node       Node         Length      N            Height     Height     Flow
-----
;Name          Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
              Node       Node         Length      N            Height     Height     Flow
-----
3              D3         D2          435         0.013        0          0          0
2              D2         D1          269         0.013        0          0          0
1              D1         D           398         0.013        0          0          0
  
```

[XSECTIONS]

```

;;Link          Type          Geom1       Geom2       Geom3       Geom4       Barrels
-----
3              CIRCULAR     1           0           0           0           1
2              CIRCULAR     1.25        0           0           0           1
1              CIRCULAR     1.25        0           0           0           1
  
```

[LOSSES]

```

;;Link          Inlet      Outlet      Average      Flap Gate
-----
3              .5         1           0            NO
2              .5         1           0            NO
1              .5         1           0            NO
  
```

[TIMESERIES]

```

;;Name          Date          Time          Value
-----
;Name          Date          Time          Value-----25 YR 24 HR STOR
TS1            0:30         0.0105
TS1            1:00         0.0210
TS1            1:30         0.0315
TS1            2:00         0.0420
TS1            2:30         0.0630
TS1            3:00         0.0840
TS1            3:30         0.1029
TS1            4:00         0.1218
TS1            4:30         0.1239
TS1            5:00         0.1260
TS1            5:30         0.1470
TS1            6:00         0.1680
TS1            6:30         0.1890
TS1            7:00         0.2100
TS1            7:30         0.2310
TS1            8:00         0.2520
TS1            8:30         0.2888
TS1            9:00         0.3255
TS1            9:30         0.3465
TS1            10:00        0.3675
TS1            10:30        0.4158
TS1            11:00        0.4620
TS1            11:30        0.9030
TS1            12:00        1.3440
TS1            12:30        1.4805
TS1            13:00        1.6170
TS1            13:30        1.6695
TS1            14:00        1.7220
TS1            14:30        1.7598
TS1            15:00        1.7976
TS1            15:30        1.8228
TS1            16:00        1.8480
TS1            16:30        1.8627
TS1            17:00        1.8795
TS1            17:30        1.9068
TS1            18:00        1.9320
TS1            18:30        1.9488
TS1            19:00        1.9656
TS1            19:30        1.9803
TS1            20:00        1.9950
TS1            20:30        2.0160
TS1            21:00        2.0370
  
```

BASIN D

TS1	21:30	2.0496
TS1	22:00	2.0622
TS1	22:30	2.0706
TS1	23:00	2.0790
TS1	23:30	2.0895
TS1	24:00	2.1000

[REPORT]
CONTROLS NO

[OPTIONS]
TEMPDIR "C:\DOCUME-1\Wen\LOCALS-1\Temp\"

BASIN D

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.004)

BASIN D

 Analysis Options

Flow Units CFS
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Starting Date NOV-18-1996 01:00:00
 Ending Date NOV-19-1996 02:00:00
 Wet Time Step 00:00:15
 Dry Time Step 00:00:15
 Routing Time Step 00:00:15
 Report Time Step 00:00:15

*****	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Total Precipitation	5.372	2.100
Evaporation Loss	0.000	0.000
Infiltration Loss	3.760	1.470
Surface Runoff	1.581	0.618
Final Surface Storage	0.031	0.012
Continuity Error (%)	0.000	

*****	Volume	Volume
Flow Routing Continuity	acre-feet	Mgallons
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.581	0.515
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
Internal Flooding	0.000	0.000
External Outflow	1.582	0.515
Evaporation Loss	0.000	0.000
Initial Stored Volume	0.006	0.002
Final Stored Volume	0.010	0.003
Continuity Error (%)	-0.268	

 Node Depth Summary

-----	Average	Maximum	Maximum	Time of Max	Average	Total
JUNCTION	Depth	Depth	HGL	Occurrence	Depth	Minutes
-----	Feet	Feet	Feet	days hr:min	Change	Flooded
JUNCTION D1	0.16	0.81	2255.81	0 12:30	0.0003	0
JUNCTION D2	0.19	0.92	2258.92	0 11:38	0.0004	0
JUNCTION D3	0.09	0.38	2273.88	0 12:30	0.0002	0
OUTFALL D	9.00	9.00	2244.90	0 00:00	0.0000	0

 Conduit Flow Summary

-----	Maximum	Time of Max	Maximum	Length	Maximum	Total
Conduit	Flow	Occurrence	Velocity	Factor	/Design	Minutes
-----	CFS	days hr:min	ft/sec	-----	Flow	Surcharged
3	2.11e+000	0 12:30	3.91	1.00	0.31	0
2	5.10e+000	0 12:30	5.69	1.00	0.75	0
1	8.60e+000	0 12:30	7.01	1.00	0.61	1500

BASIN D

 Flow Classification Summary

Conduit	--- Fraction of Time in Flow Class ---							Avg. Froude Number	Avg. Flow Change
	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit			
3	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.81	0.0001
2	0.02	0.00	0.00	0.04	0.94	0.00	0.00	1.14	0.0003
1	0.00	0.02	0.00	0.94	0.04	0.00	0.00	0.11	0.0002

 Highest Continuity Errors

 Node D2 (-0.03%)
 Node D3 (-0.01%)
 Node D1 (0.01%)

 Routing Time Step Summary

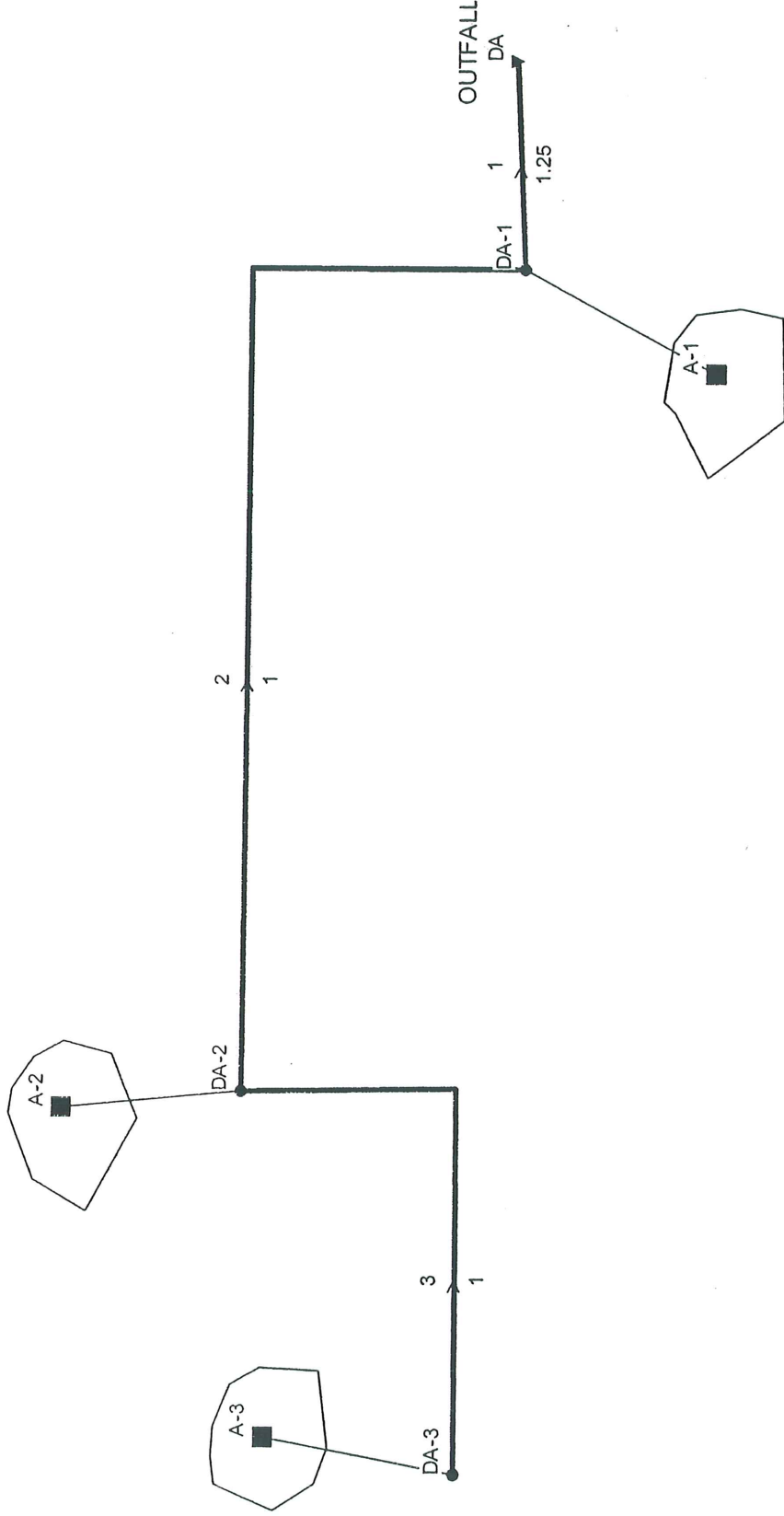
 Total Routing Time : 25.00 hrs
 Minimum Time Step : 15.00 sec
 Average Time Step : 15.00 sec
 Maximum Time Step : 15.00 sec

 Routing Iterations Summary

 Avg. Iterations per Time Step: 2.0
 Number of Iterations: 1 2 3 4 5 6 7 8 9 >=10

 Fract. of Time Steps: 0.00 0.98 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

BASIN DA



BASIN DA

[TITLE]
BASIN DA

[OPTIONS]
 FLOW_UNITS CFS
 INFILTRATION HORTON
 FLOW_ROUTING DYNWAVE
 START_DATE 11/18/1996
 START_TIME 00:01:00
 REPORT_START_DATE 11/18/1996
 REPORT_START_TIME 00:00:00
 END_DATE 11/19/1996
 END_TIME 00:01:00
 SWEEP_START 01/01
 SWEEP_END 12/31
 DRY_DAYS 0
 WET_STEP 00:00:15
 DRY_STEP 00:00:15
 ROUTING_STEP 00:00:15
 REPORT_STEP 00:00:15
 ALLOW_PONDING YES
 INERTIAL_DAMPING PARTIAL
 VARIABLE_STEP 0.75
 LENGTHENING_STEP 0
 MIN_SURFAREA 0
 COMPATIBILITY 5

[RAINGAGES]
 ;; Rain Recd. Snow Data Source Station Rain
 ;;Name Type Freq. Catch Source Name ID Units

 ;; Timeseries/ Source Format/ RecdFreq/
 ;;Name File Name Station RecdIntvl

 RG1 CUMULATIVE 0:30 1.0 TIMESERIES TS1

[SUBCATCHMENTS]
 ;; Total Pcnt. Pcnt. Curb Snow
 ;;Name Raingage Outlet Area Imperv Width Slope Length Pack

 ;; Total Pcnt. Pcnt. Curb
 ;;Name Raingage Outlet Area Imperv Width Slope Length

 A-1 RG1 DA-1 15.6 19 500 3 0
 A-2 RG1 DA-2 8.3 21 400 4 0
 A-3 RG1 DA-3 10.5 11 900 5 0

[SUBAREAS]
 ;; Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted

 A-1 0.011 0.4 0.05 0.2 25 OUTLET
 A-2 0.011 0.4 0.05 0.2 25 OUTLET
 A-3 0.011 0.4 0.05 0.2 25 OUTLET

[INFILTRATION]
 ;; Subcatchment MaxRate MinRate Decay DryTime MaxInfil

 A-1 3 0.5 6.5 2 0
 A-2 3 0.5 6.5 2 0
 A-3 3 0.5 6.5 2 0

[JUNCTIONS]
 ;; Invert Max. Init. Surcharge Poned
 ;;Name Elev. Depth Depth Depth Area

 ;; Invert Max. Init. Surcharge Poned
 ;;Name Elev. Depth Depth Depth Area

 DA-1 2246 4 0 0 0
 DA-2 2293.3 4 0 0 0
 DA-3 2314 4 0 0 0

[OUTFALLS]
 ;; Invert Outfall Stage/Table Tide
 ;;Name Elev. Type Time Series Gate

BASIN DA

```

;
;Name          Invert      Outfall      Stage/Table
              Elev.       Type         Time Series
-----
DA            2239.4      FIXED       2248.4 NO
  
```

[CONDUITS]

```

;;
;;Name          Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
              Node       Node              N           Height      Height      Flow
-----
;Name          Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
              Node       Node              N           Height      Height      Flow
-----
3             DA-3       DA-2         515         0.013        0          0          0
2             DA-2       DA-1         1600        0.013        0          0          0
1             DA-1       DA           68          0.013        0          0          0
  
```

[XSECTIONS]

```

;;Link          Type          Geom1       Geom2       Geom3       Geom4       Barrels
-----
3             CIRCULAR      1           0           0           0           1
2             CIRCULAR      1           0           0           0           1
1             CIRCULAR      1.25        0           0           0           1
  
```

[LOSSES]

```

;;Link          Inlet      Outlet      Average      Flap Gate
-----
3             .5         1           0            NO
2             .5         1           0            NO
1             .5         1           0            NO
  
```

[TIMESERIES]

```

;;Name          Date          Time          Value
-----
;Name          Date          Time          Value-----25 YR 24 HR STOR
TS1           0:30         0.0105
TS1           1:00         0.0210
TS1           1:30         0.0315
TS1           2:00         0.0420
TS1           2:30         0.0630
TS1           3:00         0.0840
TS1           3:30         0.1029
TS1           4:00         0.1218
TS1           4:30         0.1239
TS1           5:00         0.1260
TS1           5:30         0.1470
TS1           6:00         0.1680
TS1           6:30         0.1890
TS1           7:00         0.2100
TS1           7:30         0.2310
TS1           8:00         0.2520
TS1           8:30         0.2888
TS1           9:00         0.3255
TS1           9:30         0.3465
TS1           10:00        0.3675
TS1           10:30        0.4158
TS1           11:00        0.4620
TS1           11:30        0.9030
TS1           12:00        1.3440
TS1           12:30        1.4805
TS1           13:00        1.6170
TS1           13:30        1.6695
TS1           14:00        1.7220
TS1           14:30        1.7598
TS1           15:00        1.7976
TS1           15:30        1.8228
TS1           16:00        1.8480
TS1           16:30        1.8627
TS1           17:00        1.8795
TS1           17:30        1.9068
TS1           18:00        1.9320
TS1           18:30        1.9488
TS1           19:00        1.9656
TS1           19:30        1.9803
TS1           20:00        1.9950
TS1           20:30        2.0160
TS1           21:00        2.0370
  
```

BASIN DA

TS1	21:30	2.0496
TS1	22:00	2.0622
TS1	22:30	2.0706
TS1	23:00	2.0790
TS1	23:30	2.0895
TS1	24:00	2.1000

[REPORT]
CONTROLS YES

[OPTIONS]
TEMPDIR "C:\DOCUME-1\Wen\LOCALS-1\Temp\"

BASIN DA

```

;
;Name          Invert      Outfall      Stage/Table
;              Elev.       Type         Time Series
;-----
;  DA          2239.4     FIXED       2248.4 NO
  
```

[CONDUITS]

```

;;
;;Name          Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
;              Node       Node         Length      N            Height     Height     Flow
;-----
;Name          Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
;              Node       Node         Length      N            Height     Height     Flow
;-----
;  3          DA-3       DA-2        515         0.013        0          0          0
;  2          DA-2       DA-1        1600        0.013        0          0          0
;  1          DA-1       DA          68          0.013        0          0          0
  
```

[XSECTIONS]

```

;;Link          Type          Geom1      Geom2      Geom3      Geom4      Barrels
;-----
;  3          CIRCULAR      1          0          0          0          1
;  2          CIRCULAR      1          0          0          0          1
;  1          CIRCULAR      1.25      0          0          0          1
  
```

[LOSSES]

```

;;Link          Inlet      Outlet      Average      Flap Gate
;-----
;  3          .5          1          0          NO
;  2          .5          1          0          NO
;  1          .5          1          0          NO
  
```

[TIMESERIES]

```

;;Name          Date          Time          Value
;-----
;Name          Date          Time          Value-----25 YR 24 HR STOR
;  TS1          0:30          0.0105
;  TS1          1:00          0.0210
;  TS1          1:30          0.0315
;  TS1          2:00          0.0420
;  TS1          2:30          0.0630
;  TS1          3:00          0.0840
;  TS1          3:30          0.1029
;  TS1          4:00          0.1218
;  TS1          4:30          0.1239
;  TS1          5:00          0.1260
;  TS1          5:30          0.1470
;  TS1          6:00          0.1680
;  TS1          6:30          0.1890
;  TS1          7:00          0.2100
;  TS1          7:30          0.2310
;  TS1          8:00          0.2520
;  TS1          8:30          0.2888
;  TS1          9:00          0.3255
;  TS1          9:30          0.3465
;  TS1          10:00         0.3675
;  TS1          10:30         0.4158
;  TS1          11:00         0.4620
;  TS1          11:30         0.9030
;  TS1          12:00         1.3440
;  TS1          12:30         1.4805
;  TS1          13:00         1.6170
;  TS1          13:30         1.6695
;  TS1          14:00         1.7220
;  TS1          14:30         1.7598
;  TS1          15:00         1.7976
;  TS1          15:30         1.8228
;  TS1          16:00         1.8480
;  TS1          16:30         1.8627
;  TS1          17:00         1.8795
;  TS1          17:30         1.9068
;  TS1          18:00         1.9320
;  TS1          18:30         1.9488
;  TS1          19:00         1.9656
;  TS1          19:30         1.9803
;  TS1          20:00         1.9950
;  TS1          20:30         2.0160
;  TS1          21:00         2.0370
  
```

BASIN DA

TS1	21:30	2.0496
TS1	22:00	2.0622
TS1	22:30	2.0706
TS1	23:00	2.0790
TS1	23:30	2.0895
TS1	24:00	2.1000

[REPORT]
CONTROLS YES

[OPTIONS]
TEMPDIR "C:\DOCUME-1\Wen\LOCALS-1\Temp\"

BASIN DA

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.004)

BASIN DA

Analysis Options

```

Flow Units ..... CFS
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Starting Date ..... NOV-18-1996 00:01:00
Ending Date ..... NOV-19-1996 00:01:00
Wet Time Step ..... 00:00:15
Dry Time Step ..... 00:00:15
Routing Time Step ..... 00:00:15
Report Time Step ..... 00:00:15
    
```

```

*****
Volume      Depth
Runoff Quantity Continuity  acre-feet  inches
*****
Total Precipitation ..... 5.990      2.090
Evaporation Loss ..... 0.000      0.000
Infiltration Loss ..... 4.954      1.728
Surface Runoff ..... 1.014      0.354
Final Surface Storage .... 0.022      0.008
Continuity Error (%) ..... 0.004
    
```

```

*****
Volume      Volume
Flow Routing Continuity    acre-feet  Mgallons
*****
Dry Weather Inflow ..... 0.000      0.000
Wet Weather Inflow ..... 1.014      0.330
Groundwater Inflow ..... 0.000      0.000
RDII Inflow ..... 0.000      0.000
External Inflow ..... 0.033      0.011
Internal Flooding ..... 0.000      0.000
External Outflow ..... 1.018      0.332
Evaporation Loss ..... 0.000      0.000
Initial Stored Volume .... 0.001      0.000
Final Stored Volume ..... 0.026      0.009
Continuity Error (%) ..... 0.366
    
```

Node Depth Summary

	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Average Depth Change	Total Minutes Flooded
JUNCTION DA-1	2.49	3.41	2249.41	0 12:30	0.0010	0
JUNCTION DA-2	0.14	0.49	2293.79	0 12:30	0.0002	0
JUNCTION DA-3	0.09	0.29	2314.29	0 12:30	0.0001	0
OUTFALL DA	9.00	9.00	2248.40	0 00:00	0.0000	0

Conduit Flow Summary

Conduit	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Velocity ft/sec	Length Factor	Maximum /Design Flow	Total Minutes Surcharged
3	1.34e+000	0 12:30	5.44	1.00	0.19	0
2	2.96e+000	0 12:30	3.77	1.00	0.48	1437
1	6.70e+000	0 00:01	5.46	1.00	0.33	1440

BASIN DA

 Flow Classification Summary

Conduit	--- Fraction of Time in Flow Class ---							Avg. Froude Number	Avg. Flow Change
	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit			
3	0.03	0.00	0.00	0.18	0.79	0.00	0.00	1.04	0.0001
2	0.00	0.03	0.00	0.97	0.00	0.00	0.00	0.12	0.0002
1	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.12	0.0004

 Highest Continuity Errors

 Node DA-1 (2.75%)
 Node DA-2 (0.09%)
 Node DA-3 (-0.00%)

 Time-Step Critical Elements

 Link 1 (20.96%)

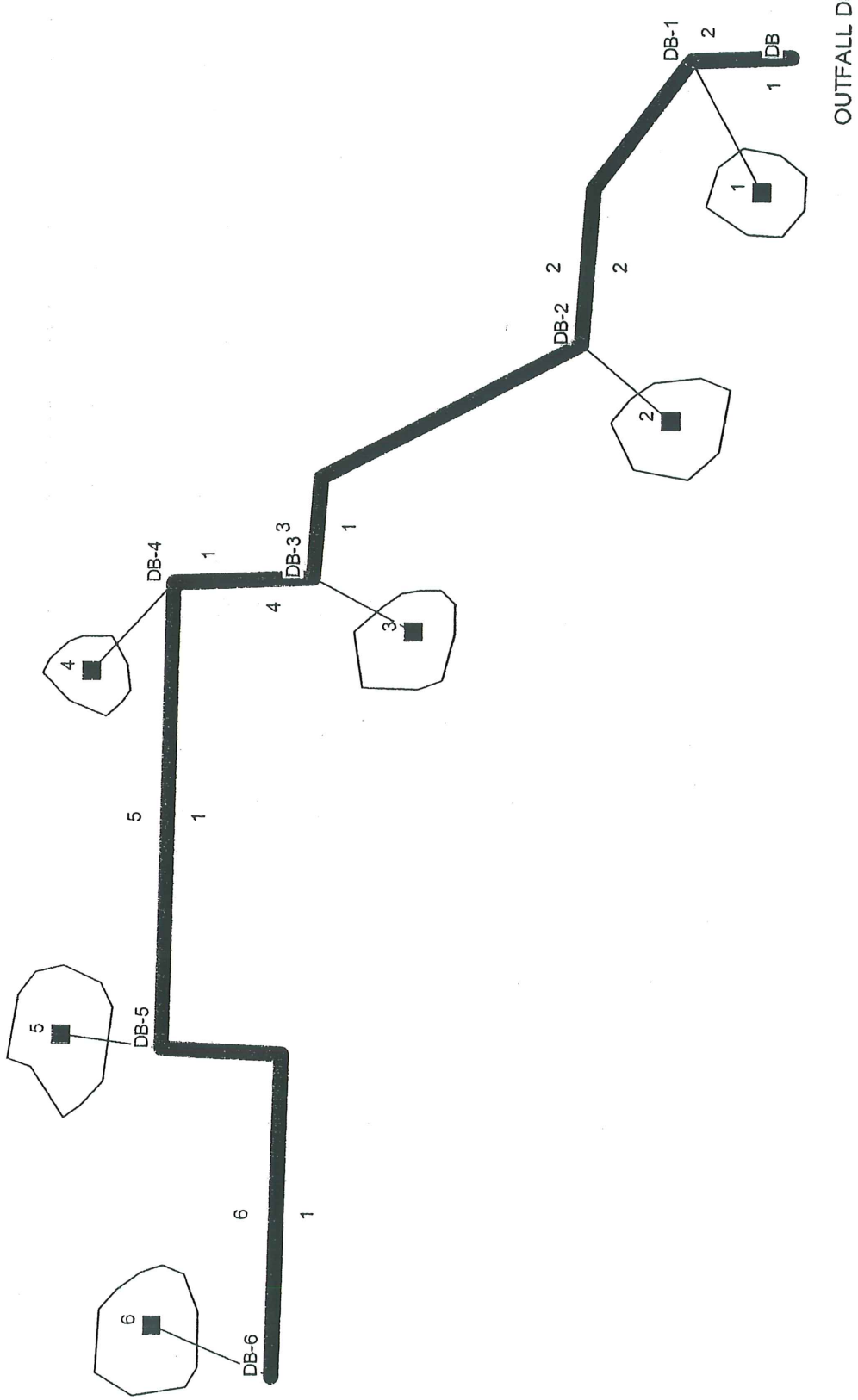
 Routing Time Step Summary

Total Routing Time :	24.00	hrs								
Minimum Time Step :	4.16	sec								
Average Time Step :	13.02	sec								
Maximum Time Step :	15.00	sec								
Fract. of Max. Step:	0-.1	.1-.2	.2-.3	.3-.4	.4-.5	.5-.6	.6-.7	.7-.8	.8-.9	.9-1.
Fract. of All Steps:	0.00	0.00	0.00	0.12	0.08	0.00	0.00	0.00	0.00	0.00

 Routing Iterations Summary

Avg. Iterations per Time Step:	2.1									
Number of Iterations:	1	2	3	4	5	6	7	8	9	>=10
Fract. of Time Steps:	0.00	0.95	0.02	0.02	0.00	0.01	0.00	0.00	0.00	0.00

BASIN DB



BASIN DB

[TITLE]
BASIN DB

[OPTIONS]
 FLOW_UNITS CFS
 INFILTRATION HORTON
 FLOW_ROUTING DYNWAVE
 START_DATE 11/18/1996
 START_TIME 00:01:00
 REPORT_START_DATE 11/18/1996
 REPORT_START_TIME 00:00:00
 END_DATE 11/19/1996
 END_TIME 00:01:00
 SWEEP_START 01/01
 SWEEP_END 12/31
 DRY_DAYS 0
 WET_STEP 00:00:15
 DRY_STEP 00:00:15
 ROUTING_STEP 00:00:15
 REPORT_STEP 00:00:15
 ALLOW_PONDING YES
 INERTIAL_DAMPING PARTIAL
 VARIABLE_STEP 0.75
 LENGTHENING_STEP 0
 MIN_SURFAREA 0
 COMPATIBILITY 5

[RAINGAGES]
 ;;
 ;;Name Rain Recd. Snow Data Source Station Rain
 Type Freq. Catch Source Name ID Units

 ;Name Timeseries/ Source Format/ RecdFreq/
 File Name Station RecdIntvl

 RG1 CUMULATIVE 0:30 1.0 TIMESERIES TS1

[SUBCATCHMENTS]
 ;;
 ;;Name Raingage Outlet Total Pcnt. Pcnt. Curb Snow
 Area Imperv Width Slope Length Pack

 ;Name Raingage Outlet Total Pcnt. Pcnt. Curb
 Area Imperv Width Slope Length

 1 RG1 DB-1 13.7 22 600 10 0
 2 RG1 DB-2 13.6 22 450 4 0
 3 RG1 DB-3 9.3 12 500 4 0
 4 RG1 DB-4 26.9 8 800 6 0
 5 RG1 DB-5 17.4 7 700 10 0
 6 RG1 DB-6 3.5 17 400 1 0

[SUBAREAS]
 ;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted

 1 0.011 0.4 0.05 0.2 25 OUTLET
 2 0.011 0.4 0.05 0.2 25 OUTLET
 3 0.011 0.4 0.05 0.2 25 OUTLET
 4 0.011 0.4 0.05 0.2 25 OUTLET
 5 0.011 0.4 0.05 0.2 25 OUTLET
 6 0.011 0.4 0.05 0.2 25 OUTLET

[INFILTRATION]
 ;;Subcatchment MaxRate MinRate Decay DryTime MaxInfil

 1 3 0.5 6.5 2 0
 2 3 0.5 6.5 2 0
 3 3 0.5 6.5 2 0
 4 3 0.5 6.5 2 0
 5 3 0.5 6.5 2 0
 6 3 0.5 6.5 2 0

[JUNCTIONS]
 ;;
 ;;Name Invert Max. Init. Surcharge Poned
 Elev. Depth Depth Depth Area

 ;Name Invert Max. Init. Surcharge Poned
 Elev. Depth Depth Depth Area

BASIN DB

```

-----
DB-1      2244.2  4      0      0      0
DB-2      2259.3  4      0      0      0
DB-3      2281     4      0      0      0
DB-4      2291     4      0      0      0
DB-5      2329.6  4      0      0      0
DB-6      2351     4      0      0      0
  
```

[OUTFALLS]

```

;;
;;Name      Invert      Outfall      Stage/Table      Tide
            Elev.       Type         Time Series      Gate
-----
;Name      Invert      Outfall      Stage/Table
            Elev.       Type         Time Series
-----
DB          2242         FIXED        2248.9 NO
  
```

[CONDUITS]

```

;;
;;Name      Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
            Node       Node         Length      N            Height     Height     Flow
-----
;Name      Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
            Node       Node         Length      N            Height     Height     Flow
-----
5          DB-5       DB-4        769         0.013        0          0          0
4          DB-4       DB-3        298         0.013        0          0          0
2          DB-2       DB-1        577         0.013        0          0          0
1          DB-1       DB          90          0.013        0          0          0
6          DB-6       DB-5        721         0.013        0          0          0
3          DB-3       DB-2        812         0.013        0          0          0
  
```

[XSECTIONS]

```

;;Link      Type      Geom1      Geom2      Geom3      Geom4      Barrels
-----
5          CIRCULAR  1          0          0          0          1
4          CIRCULAR  1          0          0          0          1
2          CIRCULAR  2          0          0          0          1
1          CIRCULAR  2          0          0          0          1
6          CIRCULAR  1          0          0          0          1
3          CIRCULAR  1          0          0          0          1
  
```

[LOSSES]

```

;;Link      Inlet      Outlet      Average      Flap Gate
-----
5          .5         1          0            NO
4          .5         1          0            NO
2          .5         1          0            NO
1          .5         1          0            NO
6          .5         1          0            NO
3          .5         1          0            NO
  
```

[TIMESERIES]

```

;;Name      Date      Time      Value
-----
;Name      Date      Time      Value-----25 YR 24 HR STOR
TS1        0:30     0.0105
TS1        1:00     0.0210
TS1        1:30     0.0315
TS1        2:00     0.0420
TS1        2:30     0.0630
TS1        3:00     0.0840
TS1        3:30     0.1029
TS1        4:00     0.1218
TS1        4:30     0.1239
TS1        5:00     0.1260
TS1        5:30     0.1470
TS1        6:00     0.1680
TS1        6:30     0.1890
TS1        7:00     0.2100
TS1        7:30     0.2310
TS1        8:00     0.2520
TS1        8:30     0.2888
TS1        9:00     0.3255
TS1        9:30     0.3465
TS1        10:00    0.3675
TS1        10:30    0.4158
  
```

BASIN DB

TS1	11:00	0.4620
TS1	11:30	0.9030
TS1	12:00	1.3440
TS1	12:30	1.4805
TS1	13:00	1.6170
TS1	13:30	1.6695
TS1	14:00	1.7220
TS1	14:30	1.7598
TS1	15:00	1.7976
TS1	15:30	1.8228
TS1	16:00	1.8480
TS1	16:30	1.8627
TS1	17:00	1.8795
TS1	17:30	1.9068
TS1	18:00	1.9320
TS1	18:30	1.9488
TS1	19:00	1.9656
TS1	19:30	1.9803
TS1	20:00	1.9950
TS1	20:30	2.0160
TS1	21:00	2.0370
TS1	21:30	2.0496
TS1	22:00	2.0622
TS1	22:30	2.0706
TS1	23:00	2.0790
TS1	23:30	2.0895
TS1	24:00	2.1000

[REPORT]
CONTROLS YES

[OPTIONS]
TEMPDIR "C:\DOCUME-1\Wen\LOCALS-1\Temp\"

BASIN DB

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.004)

BASIN DB

Analysis Options

```

Flow Units ..... CFS
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Starting Date ..... NOV-18-1996 00:01:00
Ending Date ..... NOV-19-1996 00:01:00
Wet Time Step ..... 00:00:15
Dry Time Step ..... 00:00:15
Routing Time Step ..... 00:00:15
Report Time Step ..... 00:00:15
    
```

```

*****
Runoff Quantity Continuity
*****
Volume      Depth
acre-feet   inches
-----
Total Precipitation ..... 14.697    2.090
Evaporation Loss ..... 0.000    0.000
Infiltration Loss ..... 12.731    1.810
Surface Runoff ..... 1.926    0.274
Final Surface Storage .... 0.040    0.006
Continuity Error (%) ..... 0.002
    
```

```

*****
Flow Routing Continuity
*****
Volume      Volume
acre-feet   Mgallons
-----
Dry Weather Inflow ..... 0.000    0.000
Wet Weather Inflow ..... 1.925    0.627
Groundwater Inflow ..... 0.000    0.000
RDII Inflow ..... 0.000    0.000
External Inflow ..... 25.926    8.449
Internal Flooding ..... 27.811    9.063
External Outflow ..... 0.000    0.000
Evaporation Loss ..... 0.000    0.000
Initial Stored Volume .... 0.003    0.001
Final Stored Volume ..... 0.043    0.014
Continuity Error (%) ..... 0.005
    
```

Node Depth Summary

	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Average Depth Change	Total Minutes Flooded
JUNCTION DB-1	4.00	4.00	2248.20	0 00:01	0.0003	1439
JUNCTION DB-2	0.15	0.63	2259.93	0 12:30	0.0001	0
JUNCTION DB-3	0.15	0.81	2281.81	0 12:30	0.0001	0
JUNCTION DB-4	0.13	0.58	2291.58	0 12:30	0.0001	0
JUNCTION DB-5	0.08	0.34	2329.94	0 12:30	0.0001	0
JUNCTION DB-6	0.05	0.21	2351.21	0 12:30	0.0000	0
OUTFALL DB	6.90	6.90	2248.90	0 00:00	0.0000	0

Conduit Flow Summary

Conduit	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Velocity ft/sec	Length Factor	Maximum /Design Flow	Total Minutes Surcharged
5	1.99e+000	0 12:30	5.63	1.00	0.25	0
4	4.17e+000	0 12:30	7.16	1.00	0.64	0

BASIN DB

2	7.96e+000	0	12:30	2.53	1.00	0.22	1439
1	2.66e+001	0	00:00	8.48	1.00	0.75	1440
6	5.89e-001	0	12:30	3.42	1.00	0.10	0
3	5.21e+000	0	12:30	8.63	1.00	0.89	0

 Flow Classification Summary

Conduit	--- Fraction of Time in Flow Class ---								Avg. Froude Number	Avg. Flow Change
	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Crit		
5	0.02	0.00	0.00	0.07	0.91	0.00	0.00	0.00	1.22	0.0000
4	0.02	0.00	0.00	0.01	0.97	0.00	0.00	0.00	1.51	0.0001
2	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.00	0.03	0.0000
1	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.52	0.0001
6	0.02	0.00	0.00	0.40	0.57	0.00	0.00	0.00	0.95	0.0000
3	0.02	0.00	0.00	0.01	0.96	0.00	0.00	0.00	1.59	0.0001

 Highest Continuity Errors

 Node DB-1 (0.14%)
 Node DB-6 (0.06%)
 Node DB-5 (0.05%)
 Node DB-2 (0.03%)
 Node DB-3 (0.02%)

 Time-Step Critical Elements

 Link 1 (99.99%)

 Routing Time Step Summary

 Total Routing Time : 24.00 hrs
 Minimum Time Step : 4.02 sec
 Average Time Step : 5.53 sec
 Maximum Time Step : 15.00 sec
 Fract. of Max. Step: 0-.1 .1-.2 .2-.3 .3-.4 .4-.5 .5-.6 .6-.7 .7-.8 .8-.9 .9-1.

 Fract. of All Steps: 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

 Routing Iterations Summary

 Avg. Iterations per Time Step: 2.0
 Number of Iterations: 1 2 3 4 5 6 7 8 9 >=10

 Fract. of Time Steps: 0.00 0.99 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00

BASIN DB

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.004)

BASIN DB

 Analysis Options

Flow Units CFS
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Starting Date NOV-18-1996 00:01:00
 Ending Date NOV-19-1996 00:01:00
 Wet Time Step 00:00:15
 Dry Time Step 00:00:15
 Routing Time Step 00:00:15
 Report Time Step 00:00:15

*****	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Total Precipitation	14.697	2.090
Evaporation Loss	0.000	0.000
Infiltration Loss	12.731	1.810
Surface Runoff	1.926	0.274
Final Surface Storage	0.040	0.006
Continuity Error (%)	0.002	

*****	Volume	Volume
Flow Routing Continuity	acre-feet	Mgallons
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.925	0.627
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	25.926	8.449
Internal Flooding	27.811	9.063
External Outflow	0.000	0.000
Evaporation Loss	0.000	0.000
Initial Stored Volume	0.003	0.001
Final Stored Volume	0.043	0.014
Continuity Error (%)	0.005	

 Node Depth Summary

		Average	Maximum	Maximum	Time of Max	Average	Total
		Depth	Depth	HGL	Occurrence	Depth	Minutes
		Feet	Feet	Feet	days hr:min	Change	Flooded
		-----	-----	-----	-----	-----	-----
JUNCTION	DB-1	4.00	4.00	2248.20	0 00:01	0.0003	1439
JUNCTION	DB-2	0.15	0.63	2259.93	0 12:30	0.0001	0
JUNCTION	DB-3	0.15	0.81	2281.81	0 12:30	0.0001	0
JUNCTION	DB-4	0.13	0.58	2291.58	0 12:30	0.0001	0
JUNCTION	DB-5	0.08	0.34	2329.94	0 12:30	0.0001	0
JUNCTION	DB-6	0.05	0.21	2351.21	0 12:30	0.0000	0
OUTFALL	DB	6.90	6.90	2248.90	0 00:00	0.0000	0

 Conduit Flow Summary

		Maximum	Time of Max	Maximum	Length	Maximum	Total
		Flow	Occurrence	Velocity	Factor	/Design	Minutes
		CFS	days hr:min	ft/sec			Surcharged
		-----	-----	-----			-----
5		1.99e+000	0 12:30	5.63	1.00	0.25	0
4		4.17e+000	0 12:30	7.16	1.00	0.64	0

BASIN DB

2	7.96e+000	0	12:30	2.53	1.00	0.22	1439
1	2.66e+001	0	00:00	8.48	1.00	0.75	1440
6	5.89e-001	0	12:30	3.42	1.00	0.10	0
3	5.21e+000	0	12:30	8.63	1.00	0.89	0

 Flow Classification Summary

Conduit	--- Fraction of Time in Flow Class ---								Avg. Froude Number	Avg. Flow Change
	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Crit		
5	0.02	0.00	0.00	0.07	0.91	0.00	0.00	0.00	1.22	0.0000
4	0.02	0.00	0.00	0.01	0.97	0.00	0.00	0.00	1.51	0.0001
2	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.00	0.03	0.0000
1	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.52	0.0001
6	0.02	0.00	0.00	0.40	0.57	0.00	0.00	0.00	0.95	0.0000
3	0.02	0.00	0.00	0.01	0.96	0.00	0.00	0.00	1.59	0.0001

 Highest Continuity Errors

 Node DB-1 (0.14%)
 Node DB-6 (0.06%)
 Node DB-5 (0.05%)
 Node DB-2 (0.03%)
 Node DB-3 (0.02%)

 Time-Step Critical Elements

 Link 1 (99.99%)

 Routing Time Step Summary

Total Routing Time :	24.00	hrs								
Minimum Time Step :	4.02	sec								
Average Time Step :	5.53	sec								
Maximum Time Step :	15.00	sec								
Fract. of Max. Step:	0-.1	.1-.2	.2-.3	.3-.4	.4-.5	.5-.6	.6-.7	.7-.8	.8-.9	.9-1.
Fract. of All Steps:	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00

 Routing Iterations Summary

Avg. Iterations per Time Step:	2.0									
Number of Iterations:	1	2	3	4	5	6	7	8	9	>=10
Fract. of Time Steps:	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00

BASIN DB

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.004)

BASIN DB

Analysis Options

Flow Units CFS
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Starting Date NOV-18-1996 00:01:00
 Ending Date NOV-19-1996 00:01:00
 Wet Time Step 00:00:15
 Dry Time Step 00:00:15
 Routing Time Step 00:00:15
 Report Time Step 00:00:15

*****	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Total Precipitation	14.697	2.090
Evaporation Loss	0.000	0.000
Infiltration Loss	12.731	1.810
Surface Runoff	1.926	0.274
Final Surface Storage	0.040	0.006
Continuity Error (%)	0.002	

*****	Volume	Volume
Flow Routing Continuity	acre-feet	Mgallons
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.925	0.627
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	25.926	8.449
Internal Flooding	27.811	9.063
External Outflow	0.000	0.000
Evaporation Loss	0.000	0.000
Initial Stored Volume	0.003	0.001
Final Stored Volume	0.043	0.014
Continuity Error (%)	0.005	

Node Depth Summary

-----	Average	Maximum	Maximum	Time of Max	Average	Total
	Depth	Depth	HGL	Occurrence	Depth	Minutes
	Feet	Feet	Feet	days hr:min	Change	Flooded
-----	-----	-----	-----	-----	-----	-----
JUNCTION DB-1	4.00	4.00	2248.20	0 00:01	0.0003	1439
JUNCTION DB-2	0.15	0.63	2259.93	0 12:30	0.0001	0
JUNCTION DB-3	0.15	0.81	2281.81	0 12:30	0.0001	0
JUNCTION DB-4	0.13	0.58	2291.58	0 12:30	0.0001	0
JUNCTION DB-5	0.08	0.34	2329.94	0 12:30	0.0001	0
JUNCTION DB-6	0.05	0.21	2351.21	0 12:30	0.0000	0
OUTFALL DB	6.90	6.90	2248.90	0 00:00	0.0000	0

Conduit Flow Summary

-----	Maximum	Time of Max	Maximum	Length	Maximum	Total
Conduit	Flow	Occurrence	Velocity	Factor	/Design	Minutes
	CFS	days hr:min	ft/sec		Flow	Surcharged
-----	-----	-----	-----	-----	-----	-----
5	1.99e+000	0 12:30	5.63	1.00	0.25	0
4	4.17e+000	0 12:30	7.16	1.00	0.64	0

BASIN DB

2	7.96e+000	0	12:30	2.53	1.00	0.22	1439
1	2.66e+001	0	00:00	8.48	1.00	0.75	1440
6	5.89e-001	0	12:30	3.42	1.00	0.10	0
3	5.21e+000	0	12:30	8.63	1.00	0.89	0

Flow Classification Summary

Conduit	--- Fraction of Time in Flow Class ---								Avg. Froude Number	Avg. Flow Change
	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Down Crit		
5	0.02	0.00	0.00	0.07	0.91	0.00	0.00	1.22	0.0000	
4	0.02	0.00	0.00	0.01	0.97	0.00	0.00	1.51	0.0001	
2	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.03	0.0000	
1	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.52	0.0001	
6	0.02	0.00	0.00	0.40	0.57	0.00	0.00	0.95	0.0000	
3	0.02	0.00	0.00	0.01	0.96	0.00	0.00	1.59	0.0001	

Highest Continuity Errors

Node DB-1 (0.14%)
Node DB-6 (0.06%)
Node DB-5 (0.05%)
Node DB-2 (0.03%)
Node DB-3 (0.02%)

Time-Step Critical Elements

Link 1 (99.99%)

Routing Time Step Summary

Total Routing Time : 24.00 hrs
Minimum Time Step : 4.02 sec
Average Time Step : 5.53 sec
Maximum Time Step : 15.00 sec
Fract. of Max. Step: 0-.1 .1-.2 .2-.3 .3-.4 .4-.5 .5-.6 .6-.7 .7-.8 .8-.9 .9-1.

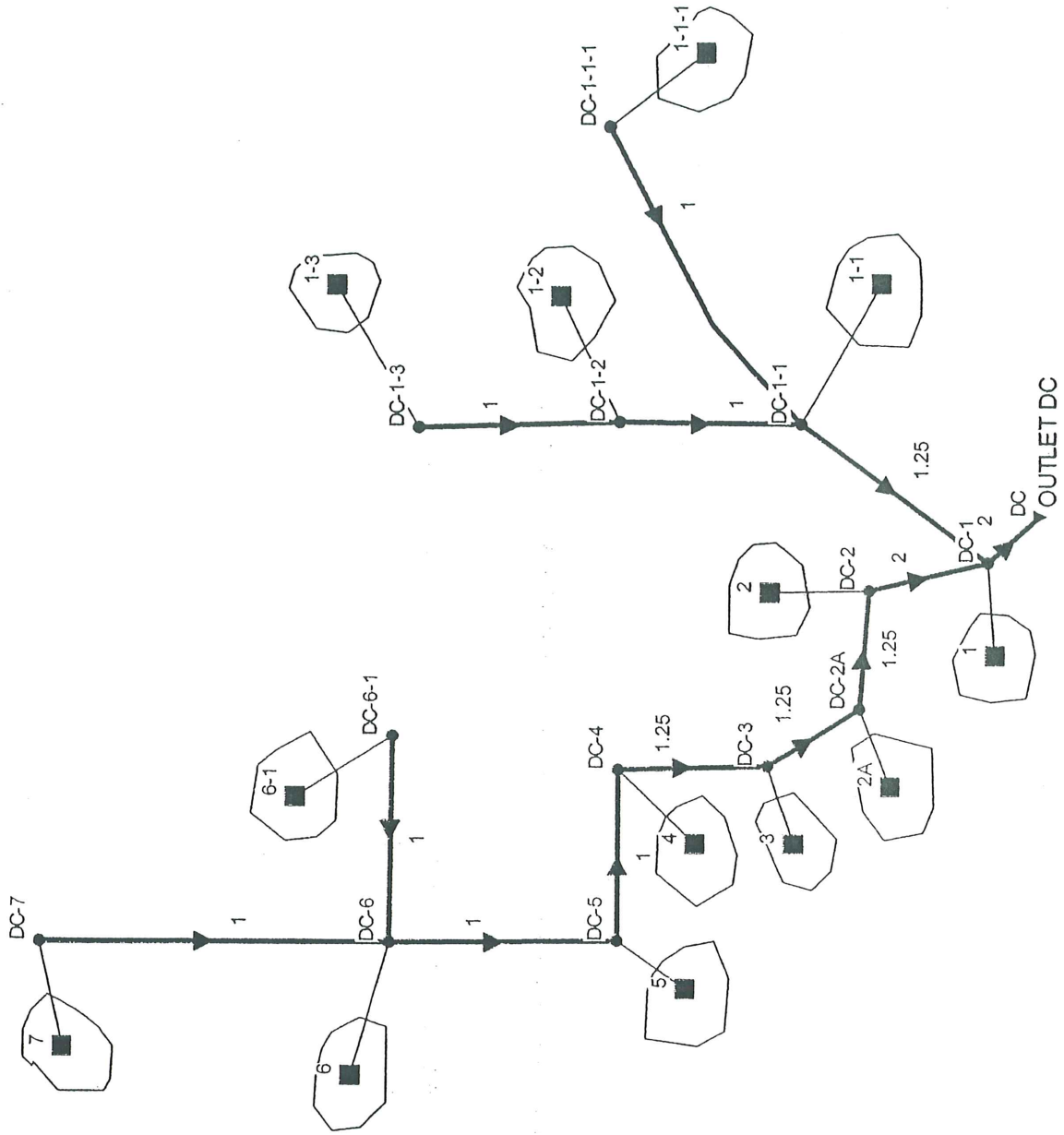
Fract. of All Steps: 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00

Routing Iterations Summary

Avg. Iterations per Time Step: 2.0
Number of Iterations: 1 2 3 4 5 6 7 8 9 >=10

Fract. of Time Steps: 0.00 0.99 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00

BASIN DC



BASIN DC

[TITLE]

BASIN DC

[OPTIONS]

```

FLOW_UNITS          CFS
INFILTRATION        HORTON
FLOW_ROUTING        DYNWAVE
START_DATE           11/18/1996
START_TIME           00:01:00
REPORT_START_DATE    11/18/1996
REPORT_START_TIME    00:00:00
END_DATE             11/19/1996
END_TIME             00:01:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
WET_STEP             00:00:15
DRY_STEP             00:00:15
ROUTING_STEP         00:00:15
REPORT_STEP          00:00:15
ALLOW_PONDING       YES
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP    0
MIN_SURFAREA        0
COMPATIBILITY        5
    
```

[RAINGAGES]

```

;;
;;Name                Rain      Recd.  Snow  Data      Source      Station  Rain
;;                   Type      Freq.  Catch Source  Name        ID       Units
-----
;;                   Timeseries/ Source      Format/   RecdFreq/
;;Name                File        Name      Station  RecdIntvl
-----
RG1                   CUMULATIVE 0:30   1.0     TIMESERIES TS1
    
```

[SUBCATCHMENTS]

```

;;
;;Name                Raingage      Outlet      Total  Pcnt.  Pcnt.  Curb  Snow
;;                   Raingage      Outlet      Area  Imperv Width  Slope Length Pack
-----
;;Name                Raingage      Outlet      Total  Pcnt.  Pcnt.  Curb  Snow
;;                   Raingage      Outlet      Area  Imperv Width  Slope Length
-----
1                    RG1           DC-1        10.6   27     800    8     0
2                    RG1           DC-2        14.8   9      350    4     0
2A                   RG1           DC-2A       3.4    27     350    5     0
3                    RG1           DC-3        9.6    12     700    5     0
4                    RG1           DC-4        15.2   4      400    6     0
5                    RG1           DC-5        19.8   9      550    6     0
6                    RG1           DC-6        35.9   2      500    3     0
6-1                  RG1           DC-6-1     110.2  2      750    3     0
7                    RG1           DC-7        47.2   2      550    3     0
1-1                  RG1           DC-1-1     25.3   11     650    4     0
1-1-1                RG1           DC-1-1-1   41.6   2      1100   6     0
1-2                  RG1           DC-1-2     7.9    7      500    5     0
1-3                  RG1           DC-1-3     13.7   3      600    1     0
    
```

[SUBAREAS]

```

;;Subcatchment      N-Imperv  N-Perv  S-Imperv  S-Perv  PctZero  RouteTo  PctRouted
-----
1                    0.011    0.4     0.05     0.2     25       OUTLET
2                    0.011    0.4     0.05     0.2     25       OUTLET
2A                   0.011    0.4     0.05     0.2     25       OUTLET
3                    0.011    0.4     0.05     0.2     25       OUTLET
4                    0.011    0.4     0.05     0.2     25       OUTLET
5                    0.011    0.4     0.05     0.2     25       OUTLET
6                    0.011    0.4     0.05     0.2     25       OUTLET
6-1                  0.011    0.4     0.05     0.2     25       OUTLET
7                    0.011    0.4     0.05     0.2     25       OUTLET
1-1                  0.011    0.4     0.05     0.2     25       OUTLET
1-1-1                0.011    0.4     0.05     0.2     25       OUTLET
1-2                  0.011    0.4     0.05     0.2     25       OUTLET
1-3                  0.011    0.4     0.05     0.2     25       OUTLET
    
```

[INFILTRATION]

```

;;Subcatchment      MaxRate  MinRate  Decay  DryTime  MaxInfil
    
```

BASIN DC

```

-----
1      3      0.5      6.5      2      0
2      3      0.5      6.5      2      0
2A     3      0.5      6.5      2      0
3      3      0.5      6.5      2      0
4      3      0.5      6.5      2      0
5      3      0.5      6.5      2      0
6      3      0.5      6.5      2      0
6-1    3      0.5      6.5      2      0
7      3      0.5      6.5      2      0
1-1    3      0.5      6.5      2      0
1-1-1  3      0.5      6.5      2      0
1-2    3      0.5      6.5      2      0
1-3    3      0.5      6.5      2      0

```

[JUNCTIONS]

```

-----
;;
;;Name      Invert      Max.      Init.      SurchARGE      Poned
            Elev.      Depth     Depth     Depth          Area
-----
;;
;;Name      Invert      Max.      Init.      SurchARGE      Poned
            Elev.      Depth     Depth     Depth          Area
-----
DC-1        2247.9      4         0         0              0
DC-2        2262.9      4         0         0              0
DC-2A       2275        4         0         0              0
DC-3        2277        4         0         0              0
DC-4        2299.2      4         0         0              0
DC-5        2315        4         0         0              0
DC-6        2388        4         0         0              0
DC-7        2499.5      4         0         0              0
DC-1-1     2255        4         0         0              0
DC-1-2     2291.5      4         0         0              0
DC-1-3     2321        4         0         0              0
DC-1-1-1   2261        4         0         0              0
DC-6-1     2391.8      4         0         0              0

```

[OUTFALLS]

```

-----
;;
;;Name      Invert      Outfall      Stage/Table      Tide
            Elev.      Type         Time Series      Gate
-----
;;
;;Name      Invert      Outfall      Stage/Table      Tide
            Elev.      Type         Time Series      Gate
-----
DC          2245        FIXED       2249.4 YES

```

[CONDUITS]

```

-----
;;
;;Name      Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
            Node      Node         Length      N            Height     Height     Flow
-----
;;
;;Name      Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
            Node      Node         Length      N            Height     Height     Flow
-----
6          DC-5       DC-4        380         0.013       0          0          0
5          DC-4       DC-3        571         0.013       0          0          0
4          DC-3       DC-2A       317         0.013       0          0          0
3          DC-2A     DC-2        285         0.013       0          0          0
2          DC-2       DC-1        461         0.013       0          0          0
1          DC-1       DC          207         0.013       0          0          0
7          DC-6       DC-5        1372        0.013       0          0          0
8          DC-7       DC-6        2313        0.013       0          0          0
10         DC-1-1    DC-1        665         0.013       0          0          0
11         DC-1-2    DC-1-1     730         0.013       0          0          0
12         DC-1-3    DC-1-2     615         0.013       0          0          0
13         DC-1-1-1  DC-1-1     1384        0.013       0          0          0
9          DC-6-1    DC-6        587         0.013       0          0          0

```

[XSECTIONS]

```

-----
;;Link      Type      Geom1      Geom2      Geom3      Geom4      Barrels
-----
6          CIRCULAR  1          0          0          0          1
5          CIRCULAR  1.25      0          0          0          1
4          CIRCULAR  1.25      0          0          0          1
3          CIRCULAR  1.25      0          0          0          1
2          CIRCULAR  2          0          0          0          1
1          CIRCULAR  2          0          0          0          1
7          CIRCULAR  1          0          0          0          1

```

BASIN DC

8	CIRCULAR	1	0	0	0	1
10	CIRCULAR	1.25	0	0	0	1
11	CIRCULAR	1	0	0	0	1
12	CIRCULAR	1	0	0	0	1
13	CIRCULAR	1	0	0	0	1
9	CIRCULAR	1	0	0	0	1

[LOSSES]

;;Link	Inlet	Outlet	Average	Flap Gate
6	.5	1	0	NO
5	.5	1	0	NO
4	.5	1	0	NO
3	.5	1	0	NO
2	.5	1	0	NO
1	.5	1	0	NO
7	.5	1	0	NO
8	.5	1	0	NO
10	.5	1	0	NO
11	.5	1	0	NO
12	.5	1	0	NO
13	.5	1	0	NO
9	.5	1	0	NO

[TIMESERIES]

;;Name	Date	Time	Value
;;Name	Date	Time	Value
TS1		0:30	0.0105
TS1		1:00	0.0210
TS1		1:30	0.0315
TS1		2:00	0.0420
TS1		2:30	0.0630
TS1		3:00	0.0840
TS1		3:30	0.1029
TS1		4:00	0.1218
TS1		4:30	0.1239
TS1		5:00	0.1260
TS1		5:30	0.1470
TS1		6:00	0.1680
TS1		6:30	0.1890
TS1		7:00	0.2100
TS1		7:30	0.2310
TS1		8:00	0.2520
TS1		8:30	0.2888
TS1		9:00	0.3255
TS1		9:30	0.3465
TS1		10:00	0.3675
TS1		10:30	0.4158
TS1		11:00	0.4620
TS1		11:30	0.9030
TS1		12:00	1.3440
TS1		12:30	1.4805
TS1		13:00	1.6170
TS1		13:30	1.6695
TS1		14:00	1.7220
TS1		14:30	1.7598
TS1		15:00	1.7976
TS1		15:30	1.8228
TS1		16:00	1.8480
TS1		16:30	1.8627
TS1		17:00	1.8795
TS1		17:30	1.9068
TS1		18:00	1.9320
TS1		18:30	1.9488
TS1		19:00	1.9656
TS1		19:30	1.9803
TS1		20:00	1.9950
TS1		20:30	2.0160
TS1		21:00	2.0370
TS1		21:30	2.0496
TS1		22:00	2.0622
TS1		22:30	2.0706
TS1		23:00	2.0790
TS1		23:30	2.0895
TS1		24:00	2.1000

BASIN DC

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.004)

BASIN DC

 Analysis Options

Flow Units CFS
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Starting Date NOV-18-1996 00:01:00
 Ending Date NOV-19-1996 00:01:00
 Wet Time Step 00:00:15
 Dry Time Step 00:00:15
 Routing Time Step 00:00:15
 Report Time Step 00:00:15

*****	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Total Precipitation	61.852	2.090
Evaporation Loss	0.000	0.000
Infiltration Loss	58.805	1.987
Surface Runoff	2.986	0.101
Final Surface Storage	0.060	0.002
Continuity Error (%)	0.001	

*****	Volume	Volume
Flow Routing Continuity	acre-feet	Mgallons
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	2.986	0.973
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
Internal Flooding	0.001	0.000
External Outflow	2.948	0.961
Evaporation Loss	0.000	0.000
Initial Stored Volume	0.007	0.002
Final Stored Volume	0.045	0.015
Continuity Error (%)	-0.024	

 Node Depth Summary

		Average	Maximum	Maximum	Time of Max	Average	Total
		Depth	Depth	HGL	Occurrence	Depth	Minutes
		Feet	Feet	Feet	days hr:min	Change	Flooded
-----		-----					
JUNCTION	DC-1	1.42	3.27	2251.17	0 12:30	0.0009	0
JUNCTION	DC-2	0.16	0.65	2263.55	0 12:29	0.0003	0
JUNCTION	DC-2A	0.17	0.78	2275.78	0 12:29	0.0003	0
JUNCTION	DC-3	0.41	4.00	2281.00	0 12:27	0.0015	4
JUNCTION	DC-4	0.15	0.62	2299.82	0 12:30	0.0003	0
JUNCTION	DC-5	0.15	0.71	2315.71	0 12:30	0.0003	0
JUNCTION	DC-6	0.11	0.48	2388.48	0 12:30	0.0002	0
JUNCTION	DC-7	0.06	0.24	2499.74	0 12:30	0.0001	0
JUNCTION	DC-1-1	0.17	0.81	2255.81	0 12:30	0.0003	0
JUNCTION	DC-1-2	0.06	0.25	2291.75	0 12:30	0.0001	0
JUNCTION	DC-1-3	0.04	0.16	2321.16	0 12:29	0.0001	0
JUNCTION	DC-1-1-1	0.10	0.48	2261.48	0 12:30	0.0002	0
JUNCTION	DC-6-1	0.16	0.85	2392.65	0 11:39	0.0004	0
OUTFALL	DC	4.40	4.40	2249.40	0 00:00	0.0000	0

 Conduit Flow Summary

BASIN DC

Conduit	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Velocity ft/sec	Length Factor	Maximum /Design Flow	Total Minutes Surcharged
6	5.52e+000	0 12:30	10.01	1.00	0.76	0
5	6.19e+000	0 12:30	5.05	1.00	0.49	55
4	7.04e+000	0 12:29	5.73	1.00	1.37	56
3	7.97e+000	0 12:29	10.97	1.00	0.60	0
2	9.27e+000	0 12:29	2.97	1.00	0.23	0
1	1.66e+001	0 12:30	5.29	1.00	0.62	1440
7	3.80e+000	0 12:30	7.91	1.00	0.46	0
8	9.71e-001	0 12:30	4.24	1.00	0.12	0
10	4.60e+000	0 12:30	3.75	1.00	0.69	64
11	1.11e+000	0 12:30	3.32	1.00	0.14	0
12	4.61e-001	0 12:30	3.88	1.00	0.06	0
13	1.09e+000	0 12:30	2.03	1.00	0.46	0
9	2.14e+000	0 12:30	4.07	1.00	0.75	0

Flow Classification Summary

Conduit	--- Fraction of Time in Flow Class ---							Avg. Froude Number	Avg. Flow Change
	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit		
6	0.02	0.00	0.00	0.01	0.96	0.00	0.00	2.01	0.0003
5	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.87	0.0002
4	0.02	0.00	0.00	0.38	0.59	0.00	0.00	0.95	0.0005
3	0.02	0.00	0.00	0.01	0.96	0.00	0.00	2.06	0.0002
2	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.11	0.0001
1	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.06	0.0003
7	0.02	0.00	0.00	0.03	0.94	0.00	0.00	1.69	0.0002
8	0.02	0.00	0.00	0.75	0.23	0.00	0.00	0.92	0.0001
10	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.09	0.0003
11	0.02	0.00	0.00	0.97	0.00	0.00	0.00	0.54	0.0001
12	0.02	0.00	0.00	0.17	0.81	0.00	0.00	1.15	0.0000
13	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.34	0.0002
9	0.02	0.00	0.00	0.73	0.24	0.00	0.00	0.93	0.0003

Highest Continuity Errors

Node DC-1 (1.10%)
Node DC-6 (0.14%)
Node DC-1-1 (0.13%)
Node DC-7 (0.10%)
Node DC-1-2 (0.09%)

Time-Step Critical Elements

Link 1 (5.71%)

Routing Time Step Summary

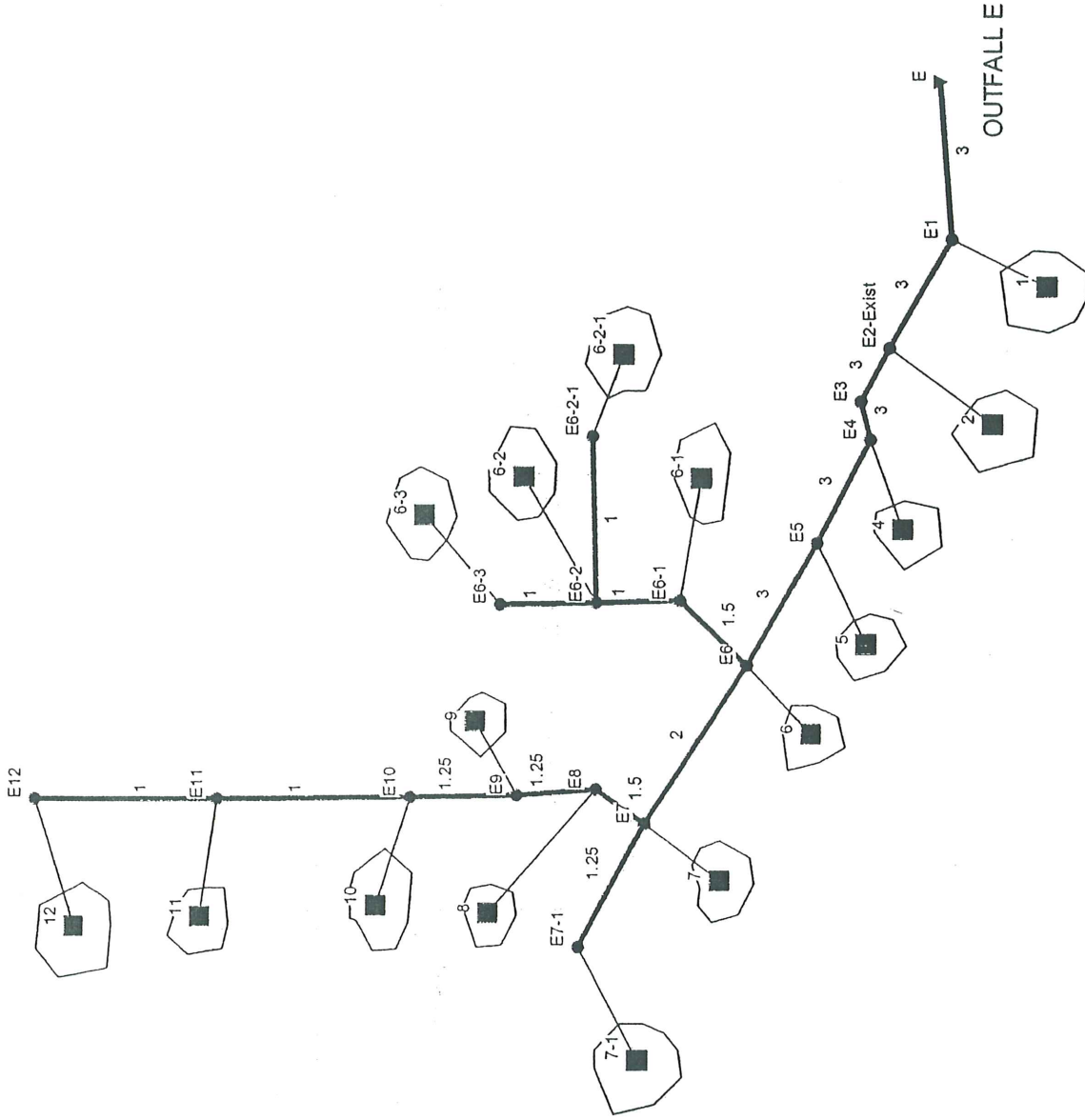
Total Routing Time : 24.00 hrs
Minimum Time Step : 11.65 sec
Average Time Step : 14.85 sec
Maximum Time Step : 15.00 sec
Fract. of Max. Step: 0-.1 .1-.2 .2-.3 .3-.4 .4-.5 .5-.6 .6-.7 .7-.8 .8-.9 .9-1.

Fract. of All Steps: 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.01 0.04 0.01

Routing Iterations Summary

Avg. Iterations per Time Step: 2.2

BASIN E



BASIN E

[TITLE]
BASIN E

[OPTIONS]
 FLOW_UNITS CFS
 INFILTRATION HORTON
 FLOW_ROUTING DYNWAVE
 START_DATE 11/18/1996
 START_TIME 00:01:00
 REPORT_START_DATE 11/18/1996
 REPORT_START_TIME 00:00:00
 END_DATE 11/19/1996
 END_TIME 00:01:00
 SWEEP_START 01/01
 SWEEP_END 12/31
 DRY_DAYS 0
 WET_STEP 00:00:15
 DRY_STEP 00:00:15
 ROUTING_STEP 00:00:15
 REPORT_STEP 00:00:15
 ALLOW_PONDING YES
 INERTIAL_DAMPING PARTIAL
 VARIABLE_STEP 0.75
 LENGTHENING_STEP 0
 MIN_SURFAREA 0
 COMPATIBILITY 5

[RAINGAGES]
 ;;
 ;;Name Rain Recd. Snow Data Source Station Rain
 ;;Type Freq. Catch Source Name ID Units

 ;
 ;Name Timeseries/ Source Format/ RecdFreq/
 ;File Name Station RecdIntvl

 RG1 CUMULATIVE 0:30 1.0 TIMESERIES TS1

[SUBCATCHMENTS]
 ;;
 ;;Name Raingage Outlet Total Pcnt. Pcnt. Curb Snow
 ;;Area Imperv Width Slope Length Pack

 ;Name Raingage Outlet Total Pcnt. Pcnt. Curb
 ;Area Imperv Width Slope Length

 2 RG1 E2-Exist 2.9 17 400 1 0
 4 RG1 E4 10.4 17 600 1 0
 5 RG1 E5 31.8 5 500 7 0
 6 RG1 E6 9.5 8 250 1 0
 7 RG1 E7 57.4 6 700 1 0
 8 RG1 E8 6.8 7 400 3 0
 9 RG1 E9 76.7 3 1200 3 0
 10 RG1 E10 175.3 4 1200 3 0
 11 RG1 E11 23.3 2 500 3 0
 6-1 RG1 E6-1 15.6 19 500 4 0
 6-2-1 RG1 E6-2-1 8.1 17 400 10 0
 6-3 RG1 E6-3 5.2 20 800 4 0
 6-2 RG1 E6-2 12.8 16 1200 4 0
 7-1 RG1 E7-1 828 1 4900 4 0
 12 RG1 E12 9.1 2 500 3 0
 1 RG1 E1 6.6 17 400 1 0

[SUBAREAS]
 ;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted

 2 0.011 0.4 0.05 0.2 25 OUTLET
 4 0.011 0.4 0.05 0.2 25 OUTLET
 5 0.011 0.4 0.05 0.2 25 OUTLET
 6 0.011 0.4 0.05 0.2 25 OUTLET
 7 0.011 0.4 0.05 0.2 25 OUTLET
 8 0.011 0.4 0.05 0.2 25 OUTLET
 9 0.011 0.4 0.05 0.2 25 OUTLET
 10 0.011 0.4 0.05 0.2 25 OUTLET
 11 0.011 0.4 0.05 0.2 25 OUTLET
 6-1 0.011 0.4 0.05 0.2 25 OUTLET
 6-2-1 0.011 0.4 0.05 0.2 25 OUTLET
 6-3 0.011 0.4 0.05 0.2 25 OUTLET
 6-2 0.011 0.4 0.05 0.2 25 OUTLET

BASIN E

7-1	0.011	0.4	0.05	0.2	25	OUTLET
12	0.011	0.4	0.05	0.2	25	OUTLET
1	0.011	0.4	0.05	0.2	25	OUTLET

[INFILTRATION]

Subcatchment	MaxRate	MinRate	Decay	DryTime	MaxInfil
2	3	0.5	6.5	2	0
4	3	0.5	6.5	2	0
5	3	0.5	6.5	2	0
6	3	0.5	6.5	2	0
7	3	0.5	6.5	2	0
8	3	0.5	6.5	2	0
9	3	0.5	2.6	2	0
10	3	0.5	6.5	2	0
11	3	0.5	6.5	2	0
6-1	3	0.5	6.5	2	0
6-2-1	3	0.5	6.5	2	0
6-3	3	0.5	6.5	2	0
6-2	3	0.5	6.5	2	0
7-1	3	0.5	6.5	2	0
12	3	0.5	6.5	2	0
1	3	0.5	6.5	2	0

[JUNCTIONS]

Name	Invert Elev.	Max. Depth	Init. Depth	Surcharge Depth	Ponded Area
E2-Exist	2246	4	0	0	0
E4	2249.9	4	0	0	0
E5	2261	5	0	0	0
E6	2263	4	0	0	0
E7	2271.5	7.5	0	0	0
E8	2275	4	0	0	0
E9	2286	4	0	0	0
E10	2315	4	0	0	0
E11	2346	4	0	0	0
E6-1	2266	4	0	0	0
E6-2	2288	4	0	0	0
E6-3	2306	4	0	0	0
E6-2-1	2318	4	0	0	0
E7-1	2292	4	0	0	0
E12	2401	4	0	0	0
E3	2249.4	4.5	0	0	0
E1	2242.8	4	0	0	0

[OUTFALLS]

Name	Invert Elev.	Outfall Type	Stage/Table Time Series	Tide Gate
E	2233	FIXED	2239.7 YES	

[CONDUITS]

Name	Inlet Node	Outlet Node	Length	Manning N	Inlet Height	Outlet Height	Init. Flow
11	E11	E10	889	0.013	0	0	0
10	E10	E9	1434	0.013	0	0	0
9	E9	E8	619	0.013	0	0	0
8	E8	E7	310	0.013	0	0	0
7	E7	E6	1041	0.013	0	0	0
6	E6	E5	653	0.013	0	0	0
5	E5	E4	881	0.013	0	0	0
15	E6-3	E6-2	451	0.013	0	0	0
14	E6-2	E6-1	598	0.013	0	0	0
13	E6-1	E6	426	0.013	0	0	0
16	E6-2-1	E6-2	704	0.013	0	0	0

BASIN E

17	E7-1	E7	635	0.013	0	0	0
12	E12	E11	748	0.013	0	0	0
4	E4	E3	65	0.013	0	0	0
3	E3	E2-Exist	192	0.013	0	0	0
2	E2-Exist	E1	473	0.013	0	0	0
1	E1	E	395	0.013	0	0	0

[XSECTIONS]

;;Link	Type	Geom1	Geom2	Geom3	Geom4	Barrels
11	CIRCULAR	1	0	0	0	1
10	CIRCULAR	1.25	0	0	0	1
9	CIRCULAR	1.25	0	0	0	1
8	CIRCULAR	1.5	0	0	0	1
7	CIRCULAR	2	0	0	0	1
6	CIRCULAR	3	0	0	0	1
5	CIRCULAR	3	0	0	0	1
15	CIRCULAR	1	0	0	0	1
14	CIRCULAR	1	0	0	0	1
13	CIRCULAR	1.5	0	0	0	1
16	CIRCULAR	1	0	0	0	1
17	CIRCULAR	1.25	0	0	0	1
12	CIRCULAR	1	0	0	0	1
4	CIRCULAR	3	0	0	0	1
3	CIRCULAR	3	0	0	0	1
2	CIRCULAR	3	0	0	0	1
1	CIRCULAR	3	0	0	0	1

[LOSSES]

;;Link	Inlet	Outlet	Average	Flap Gate
11	.5	1	0	NO
10	.5	1	0	NO
9	.5	1	0	NO
8	.5	1	0	NO
7	.5	1	0	NO
6	.5	1	0	NO
5	.5	1	0	NO
15	.5	1	0	NO
14	.5	1	0	NO
13	.5	1	0	NO
16	.5	1	0	NO
17	.5	1	0	NO
12	.5	1	0	NO
4	.5	1	0	NO
3	.5	1	0	NO
2	.5	1	0	NO
1	.5	1	0	NO

[TIMESERIES]

;;Name	Date	Time	Value
;;Name	Date	Time	Value
TS1		0:30	0.0105
TS1		1:00	0.0210
TS1		1:30	0.0315
TS1		2:00	0.0420
TS1		2:30	0.0630
TS1		3:00	0.0840
TS1		3:30	0.1029
TS1		4:00	0.1218
TS1		4:30	0.1239
TS1		5:00	0.1260
TS1		5:30	0.1470
TS1		6:00	0.1680
TS1		6:30	0.1890
TS1		7:00	0.2100
TS1		7:30	0.2310
TS1		8:00	0.2520
TS1		8:30	0.2888
TS1		9:00	0.3255
TS1		9:30	0.3465
TS1		10:00	0.3675
TS1		10:30	0.4158
TS1		11:00	0.4620
TS1		11:30	0.9030

-----25 YR 24 HR STOP

BASIN E

TS1	12:00	1.3440
TS1	12:30	1.4805
TS1	13:00	1.6170
TS1	13:30	1.6695
TS1	14:00	1.7220
TS1	14:30	1.7598
TS1	15:00	1.7976
TS1	15:30	1.8228
TS1	16:00	1.8480
TS1	16:30	1.8627
TS1	17:00	1.8795
TS1	17:30	1.9068
TS1	18:00	1.9320
TS1	18:30	1.9488
TS1	19:00	1.9656
TS1	19:30	1.9803
TS1	20:00	1.9950
TS1	20:30	2.0160
TS1	21:00	2.0370
TS1	21:30	2.0496
TS1	22:00	2.0622
TS1	22:30	2.0706
TS1	23:00	2.0790
TS1	23:30	2.0895
TS1	24:00	2.1000

[REPORT]

CONTROLS YES

[OPTIONS]

TEMPDIR "C:\DOCUME-1\Wen\LOCALS-1\Temp\"

BASIN E

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.004)

BASIN E

Analysis Options

```

Flow Units ..... CFS
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Starting Date ..... NOV-18-1996 00:01:00
Ending Date ..... NOV-19-1996 00:01:00
Wet Time Step ..... 00:00:15
Dry Time Step ..... 00:00:15
Routing Time Step ..... 00:00:15
Report Time Step ..... 00:00:15
    
```

```

*****
Volume      Depth
Runoff Quantity Continuity  acre-feet  inches
*****
Total Precipitation ..... 222.802      2.090
Evaporation Loss ..... 0.000      0.000
Infiltration Loss ..... 216.548      2.031
Surface Runoff ..... 6.127      0.057
Final Surface Storage .... 0.128      0.001
Continuity Error (%) ..... 0.000
    
```

```

*****
Volume      Volume
Flow Routing Continuity  acre-feet  Mgallons
*****
Dry Weather Inflow ..... 0.000      0.000
Wet Weather Inflow ..... 6.126      1.996
Groundwater Inflow ..... 0.000      0.000
RDII Inflow ..... 0.000      0.000
External Inflow ..... 0.000      0.000
Internal Flooding ..... 0.000      0.000
External Outflow ..... 6.128      1.997
Evaporation Loss ..... 0.000      0.000
Initial Stored Volume .... 0.032      0.010
Final Stored Volume ..... 0.081      0.026
Continuity Error (%) ..... -0.831
    
```

Node Depth Summary

	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Average Depth Change	Total Minutes Flooded
JUNCTION E2-Exist	0.72	2.30	2248.30	0 12:27	0.0007	0
JUNCTION E4	0.81	2.60	2252.50	0 12:26	0.0008	0
JUNCTION E5	0.45	1.29	2262.29	0 12:25	0.0004	0
JUNCTION E6	0.85	2.68	2265.68	0 12:31	0.0009	0
JUNCTION E7	0.54	2.85	2274.35	0 12:30	0.0008	0
JUNCTION E8	0.37	2.02	2277.02	0 12:31	0.0006	0
JUNCTION E9	0.41	2.90	2288.90	0 12:30	0.0008	0
JUNCTION E10	0.27	0.84	2315.84	0 12:30	0.0003	0
JUNCTION E11	0.07	0.24	2346.24	0 12:30	0.0001	0
JUNCTION E6-1	0.39	2.16	2268.16	0 12:30	0.0006	0
JUNCTION E6-2	0.19	0.61	2288.61	0 12:30	0.0002	0
JUNCTION E6-3	0.09	0.27	2306.27	0 12:30	0.0001	0
JUNCTION E6-2-1	0.10	0.30	2318.30	0 12:30	0.0001	0
JUNCTION E7-1	0.25	0.83	2292.83	0 12:29	0.0003	0
JUNCTION E12	0.03	0.12	2401.12	0 12:30	0.0000	0
JUNCTION E3	0.45	1.41	2250.81	0 12:26	0.0004	0
JUNCTION E1	0.40	1.17	2243.97	0 12:28	0.0004	0
OUTFALL E	6.70	6.70	2239.70	0 00:00	0.0000	0

BASIN E

 Conduit Flow Summary

Conduit	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Velocity ft/sec	Length Factor	Maximum /Design Flow	Total Minutes Surcharged
11	8.15e-001	0 12:30	1.89	1.00	0.12	0
10	7.34e+000	0 12:30	6.92	1.00	0.80	24
9	8.73e+000	0 11:56	7.51	1.00	1.01	31
8	1.01e+001	0 12:34	5.84	1.00	0.90	13
7	1.98e+001	0 12:23	6.32	1.00	0.97	51
6	2.73e+001	0 12:31	5.51	1.00	0.74	0
5	2.87e+001	0 12:25	5.93	1.00	0.38	0
15	1.16e+000	0 12:30	4.04	1.00	0.16	0
14	4.72e+000	0 12:30	6.43	1.00	0.69	13
13	7.34e+000	0 12:30	4.15	1.00	0.83	58
16	1.42e+000	0 12:30	4.17	1.00	0.19	0
17	9.00e+000	0 12:30	8.83	1.00	0.78	14
12	2.96e-001	0 12:30	3.12	1.00	0.03	0
4	3.03e+001	0 12:26	6.04	1.00	0.52	0
3	3.03e+001	0 12:26	6.61	1.00	0.34	0
2	3.08e+001	0 12:27	7.29	1.00	0.56	0
1	3.19e+001	0 12:28	4.51	1.00	0.30	1440

 Flow Classification Summary

Conduit	--- Fraction of Time in Flow Class ---							Avg. Froude Number	Avg. Flow Change
	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit		
11	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.33	0.0000
10	0.02	0.00	0.00	0.08	0.90	0.00	0.00	1.25	0.0002
9	0.02	0.00	0.00	0.02	0.97	0.00	0.00	1.30	0.0003
8	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.79	0.0003
7	0.02	0.00	0.00	0.97	0.01	0.00	0.00	0.64	0.0003
6	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.68	0.0002
5	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.78	0.0001
15	0.02	0.00	0.00	0.97	0.02	0.00	0.00	0.80	0.0001
14	0.02	0.00	0.00	0.15	0.83	0.00	0.00	1.07	0.0002
13	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.36	0.0002
16	0.02	0.00	0.00	0.47	0.51	0.00	0.00	0.99	0.0001
17	0.02	0.00	0.00	0.77	0.21	0.00	0.00	0.92	0.0002
12	0.02	0.06	0.00	0.74	0.18	0.00	0.00	0.79	0.0000
4	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.84	0.0001
3	0.02	0.00	0.00	0.34	0.64	0.00	0.00	0.97	0.0001
2	0.02	0.00	0.00	0.18	0.80	0.00	0.00	1.04	0.0002
1	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.11	0.0001

 Highest Continuity Errors

 Node E10 (0.14%)
 Node E6-1 (0.10%)
 Node E9 (0.10%)
 Node E11 (0.08%)
 Node E12 (0.08%)

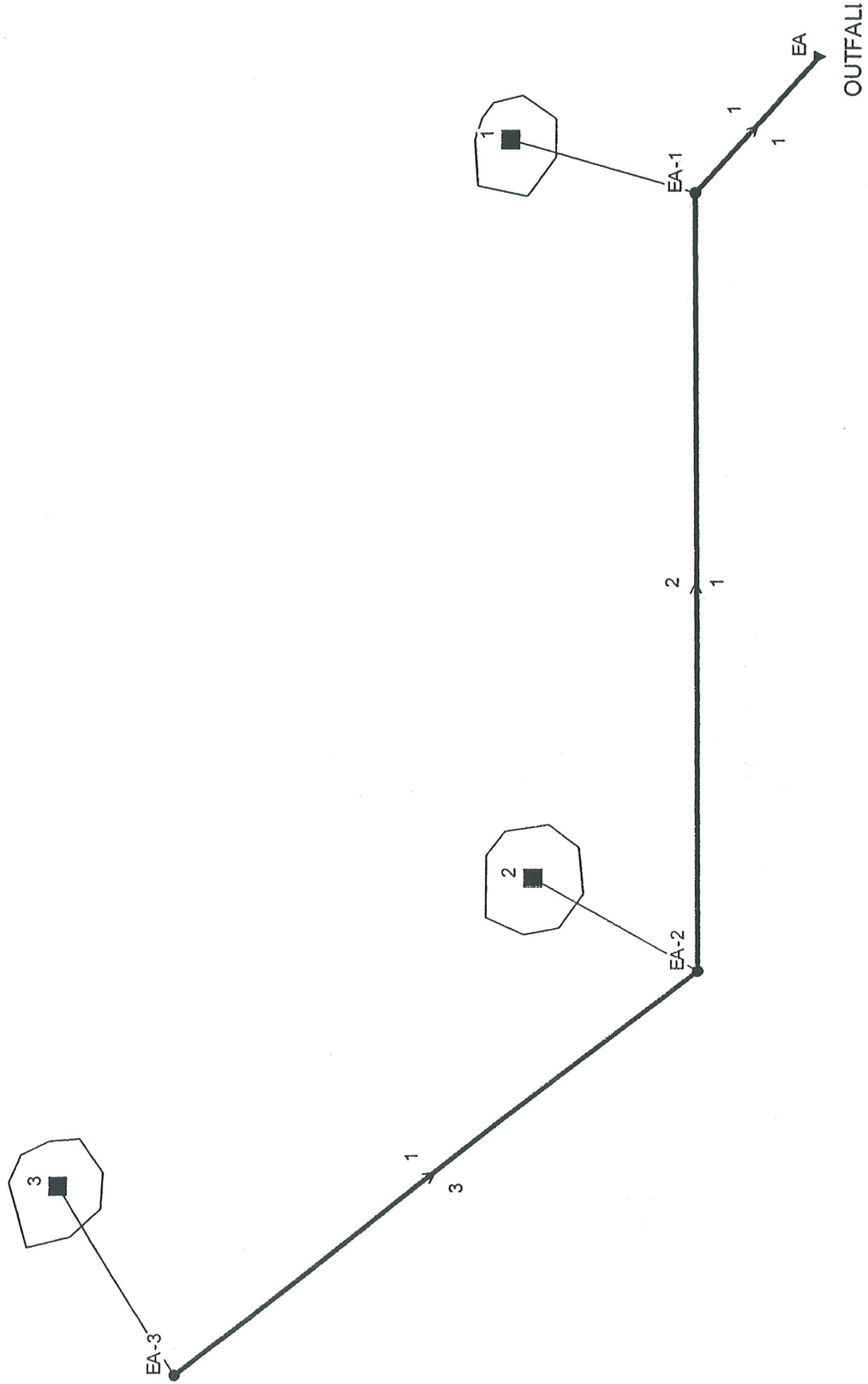
 Time-Step Critical Elements

 Link 4 (37.85%)

 Routing Time Step Summary

 Total Routing Time : 24.00 hrs

BASIN EA



BASIN EA

[TITLE]
BASIN EA

[OPTIONS]
 FLOW_UNITS CFS
 INFILTRATION HORTON
 FLOW_ROUTING DYNWAVE
 START_DATE 11/18/1996
 START_TIME 01:00:00
 REPORT_START_DATE 11/18/1996
 REPORT_START_TIME 01:00:00
 END_DATE 11/19/1996
 END_TIME 02:00:00
 SWEEP_START 01/01
 SWEEP_END 12/31
 DRY_DAYS 0
 WET_STEP 00:00:15
 DRY_STEP 00:00:15
 ROUTING_STEP 00:00:15
 REPORT_STEP 00:00:15
 ALLOW_PONDING NO
 INERTIAL_DAMPING PARTIAL
 VARIABLE_STEP 0.75
 LENGTHENING_STEP 0
 MIN_SURFAREA 0
 COMPATIBILITY 5

[RAINGAGES]
 ;;
 ;;Name Rain Recd. Snow Data Source Station Rain
 Type Freq. Catch Source Name ID Units

 ;
 ;Name Timeseries/ Source Format/ RecdFreq/
 File Name Station RecdIntvl

 ;
 RG1 CUMULATIVE 0:30 1.0 TIMESERIES TS1

[SUBCATCHMENTS]
 ;;
 ;;Name Raingage Outlet Total Pcnt. Pcnt. Curb Snow
 Area Imperv Width Slope Length Pack

 ;
 ;Name Raingage Outlet Total Pcnt. Pcnt. Curb
 Area Imperv Width Slope Length

 ;
 1 RG1 EA-1 11.2 24 500 8 0
 2 RG1 EA-2 13.3 13 500 5 0
 3 RG1 EA-3 7.5 17 400 5 0

[SUBAREAS]
 ;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted

 ;
 1 0.011 0.4 0.05 0.2 25 OUTLET
 2 0.011 0.4 0.05 0.2 25 OUTLET
 3 0.011 0.4 0.05 0.2 25 OUTLET

[INFILTRATION]
 ;;Subcatchment MaxRate MinRate Decay DryTime MaxInfil

 ;
 1 3 0.5 6.5 2 0
 2 3 0.5 6.5 2 0
 3 3 0.5 2.6 2 0

[JUNCTIONS]
 ;;
 ;;Name Invert Max. Init. Surchage Poned
 Elev. Depth Depth Depth Area

 ;
 ;Name Invert Max. Init. Surchage Poned
 Elev. Depth Depth Depth Area

 ;
 EA-1 2246.8 4 0 0 0
 EA-2 2275 4 0 0 0
 EA-3 2285.5 4 0 0 0

[OUTFALLS]
 ;;
 ;;Name Invert Outfall Stage/Table Tide
 Elev. Type Type Series Gate

 ;

BASIN EA

```

;
;Name          Invert      Outfall      Stage/Table
;              Elev.       Type         Time Series
-----
EA             2237        FIXED        2242.3 NO
  
```

[CONDUITS]

```

;;
;;Name          Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
;              Node       Node        ;           N           Height     Height     Flow
-----
;              Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
;Name          Node       Node        ;           N           Height     Height     Flow
-----
1             EA-1        EA          68          0.013        0          0          0
2             EA-2        EA-1       871         0.013        0          0          0
3             EA-3        EA-2      1033         0.013        0          0          0
  
```

[XSECTIONS]

```

;;Link          Type          Geom1      Geom2      Geom3      Geom4      Barrels
-----
1             CIRCULAR      1          0          0          0          1
2             CIRCULAR      1          0          0          0          1
3             CIRCULAR      1          0          0          0          1
  
```

[LOSSES]

```

;;Link          Inlet      Outlet      Average      Flap Gate
-----
1             .5          1          0            NO
2             .5          1          0            NO
3             .5          1          0            NO
  
```

[TIMESERIES]

```

;;Name          Date          Time          Value
-----
;Name          Date          Time          Value-----25 YR 24 HR STOR
TS1            0:30          0.0105
TS1            1:00          0.0210
TS1            1:30          0.0315
TS1            2:00          0.0420
TS1            2:30          0.0630
TS1            3:00          0.0840
TS1            3:30          0.1029
TS1            4:00          0.1218
TS1            4:30          0.1239
TS1            5:00          0.1260
TS1            5:30          0.1470
TS1            6:00          0.1680
TS1            6:30          0.1890
TS1            7:00          0.2100
TS1            7:30          0.2310
TS1            8:00          0.2520
TS1            8:30          0.2888
TS1            9:00          0.3255
TS1            9:30          0.3465
TS1           10:00          0.3675
TS1           10:30          0.4158
TS1           11:00          0.4620
TS1           11:30          0.9030
TS1           12:00          1.3440
TS1           12:30          1.4805
TS1           13:00          1.6170
TS1           13:30          1.6695
TS1           14:00          1.7220
TS1           14:30          1.7598
TS1           15:00          1.7976
TS1           15:30          1.8228
TS1           16:00          1.8480
TS1           16:30          1.8627
TS1           17:00          1.8795
TS1           17:30          1.9068
TS1           18:00          1.9320
TS1           18:30          1.9488
TS1           19:00          1.9656
TS1           19:30          1.9803
TS1           20:00          1.9950
TS1           20:30          2.0160
TS1           21:00          2.0370
  
```

BASIN EA

TS1	21:30	2.0496
TS1	22:00	2.0622
TS1	22:30	2.0706
TS1	23:00	2.0790
TS1	23:30	2.0895
TS1	24:00	2.1000

[REPORT]
CONTROLS NO

[OPTIONS]
TEMPDIR "C:\DOCUME-1\Wen\LOCALS-1\Temp\"

BASIN EA

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.004)

BASIN EA

 Analysis Options

```

Flow Units ..... CFS
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Starting Date ..... NOV-18-1996 01:00:00
Ending Date ..... NOV-19-1996 02:00:00
Wet Time Step ..... 00:00:15
Dry Time Step ..... 00:00:15
Routing Time Step ..... 00:00:15
Report Time Step ..... 00:00:15
  
```

```

*****
Runoff Quantity Continuity      Volume      Depth
                                acre-feet   inches
*****
Total Precipitation .....      5.600      2.100
Evaporation Loss .....          0.000      0.000
Infiltration Loss .....         4.593      1.723
Surface Runoff .....            0.988      0.371
Final Surface Storage .....      0.019      0.007
Continuity Error (%) .....       0.000
  
```

```

*****
Flow Routing Continuity      Volume      Volume
                                acre-feet   Mgallons
*****
Dry Weather Inflow .....        0.000      0.000
Wet Weather Inflow .....        0.988      0.322
Groundwater Inflow .....        0.000      0.000
RDII Inflow .....               0.000      0.000
External Inflow .....           0.000      0.000
Internal Flooding .....          0.000      0.000
External Outflow .....           0.988      0.322
Evaporation Loss .....           0.000      0.000
Initial Stored Volume .....      0.001      0.000
Final Stored Volume .....        0.001      0.000
Continuity Error (%) .....      -0.028
  
```

 Node Depth Summary

	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Average Depth Change	Total Minutes Flooded
JUNCTION EA-1	0.15	0.56	2247.36	0 12:30	0.0002	0
JUNCTION EA-2	0.15	0.47	2275.47	0 12:30	0.0002	0
JUNCTION EA-3	0.13	0.39	2285.89	0 11:59	0.0001	0
OUTFALL EA	5.30	5.30	2242.30	0 00:00	0.0000	0

 Conduit Flow Summary

Conduit	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Velocity ft/sec	Length Factor	Maximum /Design Flow	Total Minutes Surcharged
1	5.42e+000	0 12:30	6.90	1.00	0.40	1500
2	2.83e+000	0 12:30	7.12	1.00	0.44	0
3	1.13e+000	0 11:59	3.66	1.00	0.32	0

BASIN EA

 Flow Classification Summary

Conduit	--- Fraction of Time in Flow Class ---							Avg. Froude Number	Avg. Flow Change
	Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Down Crit		
1	0.00	0.02	0.00	0.86	0.12	0.00	0.00	0.24	0.0001
2	0.02	0.00	0.00	0.02	0.96	0.00	0.00	1.80	0.0001
3	0.02	0.00	0.00	0.96	0.02	0.00	0.00	0.84	0.0001

 Highest Continuity Errors

 Node EA-2 (0.07%)
 Node EA-1 (0.02%)
 Node EA-3 (-0.01%)

 Time-Step Critical Elements

 Link 1 (22.55%)

 Routing Time Step Summary

 Total Routing Time : 25.00 hrs
 Minimum Time Step : 3.90 sec
 Average Time Step : 12.77 sec
 Maximum Time Step : 15.00 sec
 Fract. of Max. Step: 0-.1 .1-.2 .2-.3 .3-.4 .4-.5 .5-.6 .6-.7 .7-.8 .8-.9 .9-1.

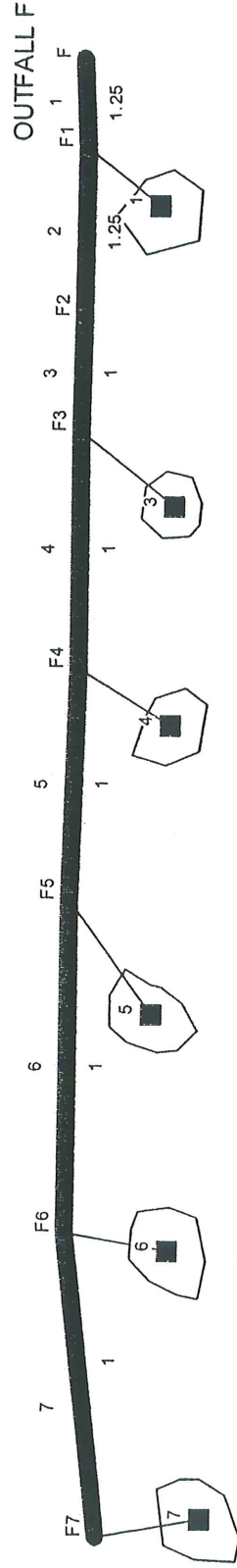
 Fract. of All Steps: 0.00 0.00 0.12 0.02 0.08 0.00 0.00 0.00 0.00 0.00 0.00

 Routing Iterations Summary

 Avg. Iterations per Time Step: 2.0
 Number of Iterations: 1 2 3 4 5 6 7 8 9 >=10

 Fract. of Time Steps: 0.00 0.99 0.01 0.00 0.00 0.00 0.00 0.00 0.00 0.00

BASIN F



BASIN F

[TITLE]
BASIN F

[OPTIONS]
 FLOW_UNITS CFS
 INFILTRATION HORTON
 FLOW_ROUTING DYNWAVE
 START_DATE 11/18/1996
 START_TIME 00:01:00
 REPORT_START_DATE 11/18/1996
 REPORT_START_TIME 00:00:00
 END_DATE 11/20/1996
 END_TIME 00:01:00
 SWEEP_START 01/01
 SWEEP_END 12/31
 DRY_DAYS 0
 WET_STEP 00:00:15
 DRY_STEP 00:00:15
 ROUTING_STEP 00:00:15
 REPORT_STEP 00:00:15
 ALLOW_PONDING YES
 INERTIAL_DAMPING PARTIAL
 VARIABLE_STEP 0.75
 LENGTHENING_STEP 0
 MIN_SURFAREA 0
 COMPATIBILITY 5

[RAINGAGES]
 ;;
 ;;Name Rain Recd. Snow Data Source Station Rain
 Type Freq. Catch Source Name ID Units

 ;;
 ;;Name Timeseries/ Source Format/ RecdFreq/
 File Name Station RecdIntvl

 RG1 INTENSITY 1:00 1.0 TIMESERIES TS1

[SUBCATCHMENTS]
 ;;
 ;;Name Raingage Outlet Total Area Pcnt. Pcnt. Curb Snow
 Imperv Width Slope Length Pack

 ;;
 ;;Name Raingage Outlet Total Area Pcnt. Pcnt. Curb
 Imperv Width Slope Length

 1 RG1 F1 89.6 10 1000 1 0
 3 RG1 F3 54.8 1 900 6 0
 4 RG1 F4 36.2 1 700 6 0
 5 RG1 F5 47.1 21 1200 4 0
 6 RG1 F6 40.6 4 1500 1 0
 7 RG1 F7 2.9 6 200 1 0

[SUBAREAS]
 ;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted

 ;;
 1 0.011 0.4 0.05 0.2 25 OUTLET
 3 0.011 0.4 0.05 0.2 25 OUTLET
 4 0.011 0.4 0.05 0.2 25 OUTLET
 5 0.011 0.4 0.05 0.2 25 OUTLET
 6 0.011 0.4 0.05 0.2 25 OUTLET
 7 0.011 0.4 0.05 0.2 25 OUTLET

[INFILTRATION]
 ;;Subcatchment MaxRate MinRate Decay DryTime MaxInfil

 ;;
 1 3 0.5 6.5 2 0
 3 3 0.5 6.5 2 0
 4 3 0.5 6.5 2 0
 5 3 0.5 6.5 2 0
 6 3 0.5 6.5 2 0
 7 3 0.5 6.5 2 0

[JUNCTIONS]
 ;;
 ;;Name Invert Max. Init. Surcharge Ponded
 Elev. Depth Depth Depth Area

 ;;
 ;;Name Invert Max. Init. Surcharge Ponded
 Elev. Depth Depth Depth Area

BASIN F

F1	2238	4	0	0	0
F2	2251	4	0	0	0
F3	2266	4	0	0	0
F4	2306	4	0	0	0
F5	2336	4	0	0	0
F6	2406	4	0	0	0
F7	2451	4	0	0	0

[OUTFALLS]

```

;;
;;Name          Invert      Outfall      Stage/Table      Tide
                Elev.        Type         Time Series      Gate
-----
;
;Name          Invert      Outfall      Stage/Table
                Elev.        Type         Time Series
-----
F              2233          FIXED        2239.7 NO
    
```

[CONDUITS]

```

;;
;;Name          Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
                Node        Node         Length      N            Height     Height     Flow
-----
;Name          Inlet      Outlet      Length      Manning      Inlet      Outlet      Init.
                Node        Node         Length      N            Height     Height     Flow
-----
2              F2         F1          698         0.013        0          0          0
1              F1         F           95          0.013        0          0          0
7              F7         F6          1883        0.013        0          0          0
5              F5         F4          855         0.013        0          0          0
4              F4         F3          959         0.013        0          0          0
3              F3         F2          418         0.013        0          0          0
6              F6         F5          1199        0.013        0          0          0
    
```

[XSECTIONS]

```

;;Link          Type          Geom1      Geom2      Geom3      Geom4      Barrels
-----
2              CIRCULAR     1.25       0          0          0          1
1              CIRCULAR     1.25       0          0          0          1
7              CIRCULAR     1          0          0          0          1
5              CIRCULAR     1          0          0          0          1
4              CIRCULAR     1          0          0          0          1
3              CIRCULAR     1          0          0          0          1
6              CIRCULAR     1          0          0          0          1
    
```

[LOSSES]

```

;;Link          Inlet      Outlet      Average      Flap Gate
-----
2              .5         1          0            NO
1              .5         1          0            NO
7              .5         1          0            NO
5              .5         1          0            NO
4              .5         1          0            NO
3              .5         1          0            NO
6              .5         1          0            NO
    
```

[TIMESERIES]

```

;;Name          Date      Time      Value
-----
;Name          Date      Time      Value
-----
;25 YR 24 HR STORM
TS1              1:00      0
TS1              2:00      0
TS1              3:00      .04
TS1              4:00      .06
TS1              5:00      .03
TS1              6:00      .07
TS1              7:00      .04
TS1              8:00      .07
TS1              9:00      .13
TS1              10:00     .13
TS1              11        .17
TS1              12        .16
TS1              13        .19
TS1              14        .15
TS1              15        .15
    
```

BASIN F

TS1	16	.16
TS1	17	.22
TS1	18	.19
TS1	19	.15
TS1	20	.21
TS1	21	.23
TS1	22	.13
TS1	23	.08
TS1	24	.05
TS1	25	.03
TS1	26	.05
TS1	27	.06
TS1	28	.06
TS1	29	.06
TS1	30	.06
TS1	31	.06
TS1	32	.31
TS1	33	0
TS1	34	.01
TS1	35	0
TS1	36	0
TS1	37	.01
TS1	38	0
TS1	39	.01
TS1	40	.13
TS1	41	0
TS1	42	.01
TS1	43	.06
TS1	44	0
TS1	45	0
TS1	46	0
TS1	47	.01
TS1	48	0
TS1	49	0
TS1	50	0

[REPORT]
CONTROLS YES

[OPTIONS]
TEMPDIR "C:\DOCUME-1\Wen\LOCALS-1\Temp\"

BASIN F

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.004)

BASIN F

Analysis Options

Flow Units CFS
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Starting Date NOV-18-1996 00:01:00
 Ending Date NOV-20-1996 00:01:00
 Wet Time Step 00:00:15
 Dry Time Step 00:00:15
 Routing Time Step 00:00:15
 Report Time Step 00:00:15

*****	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Total Precipitation	84.524	3.740
Evaporation Loss	0.000	0.000
Infiltration Loss	77.805	3.443
Surface Runoff	6.636	0.294
Final Surface Storage	0.078	0.003
Continuity Error (%)	0.006	

*****	Volume	Volume
Flow Routing Continuity	acre-feet	Mgallons
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	6.636	2.162
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.023	0.007
Internal Flooding	0.000	0.000
External Outflow	6.638	2.163
Evaporation Loss	0.000	0.000
Initial Stored Volume	0.001	0.000
Final Stored Volume	0.018	0.006
Continuity Error (%)	0.056	

Node Depth Summary

		Average	Maximum	Maximum	Time of Max	Average	Total
		Depth	Depth	HGL	Occurrence	Depth	Minutes
		Feet	Feet	Feet	days hr:min	Change	Flooded
		-----	-----	-----	-----	-----	-----
JUNCTION	F1	1.98	3.42	2241.42	1 08:59	0.0007	0
JUNCTION	F2	0.28	0.59	2251.59	1 09:00	0.0002	0
JUNCTION	F3	0.26	0.57	2266.57	1 08:59	0.0002	0
JUNCTION	F4	0.24	0.51	2306.51	1 08:46	0.0002	0
JUNCTION	F5	0.25	0.54	2336.54	1 08:59	0.0002	0
JUNCTION	F6	0.09	0.17	2406.17	1 08:36	0.0001	0
JUNCTION	F7	0.04	0.07	2451.07	1 08:45	0.0000	0
OUTFALL	F	6.70	6.70	2239.70	0 00:00	0.0000	0

Conduit Flow Summary

		Maximum	Time of Max	Maximum	Length	Maximum	Total
		Flow	Occurrence	Velocity	Factor	/Design	Minutes
		CFS	days hr:min	ft/sec	-----	Flow	Surcharged
		-----	-----	-----	-----	-----	-----
Conduit	2	3.94e+000	1 08:48	3.21	1.00	0.45	636

BASIN F

1	6.73e+000	1	08:59	5.49	1.00	0.45	2880
7	5.45e-002	1	08:45	1.00	1.00	0.01	0
5	3.65e+000	1	08:46	8.70	1.00	0.55	0
4	3.77e+000	1	08:46	8.74	1.00	0.52	0
3	3.94e+000	1	08:48	8.41	1.00	0.58	0
6	5.62e-001	1	08:45	2.24	1.00	0.07	0

 Flow Classification Summary

Conduit	--- Fraction of Time in Flow Class ---							Avg. Froude Number	Avg. Flow Change
	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit			
2	0.00	0.04	0.00	0.96	0.00	0.00	0.00	0.19	0.0002
1	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.27	0.0003
7	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.41	0.0000
5	0.04	0.00	0.00	0.02	0.94	0.00	0.00	1.95	0.0002
4	0.04	0.00	0.00	0.01	0.94	0.00	0.00	1.97	0.0002
3	0.04	0.00	0.00	0.01	0.94	0.00	0.00	1.79	0.0002
6	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.59	0.0000

 Highest Continuity Errors

 Node F7 (0.31%)
 Node F1 (0.23%)
 Node F6 (0.11%)
 Node F5 (0.04%)
 Node F4 (0.03%)

 Time-Step Critical Elements

 Link 1 (74.27%)

 Routing Time Step Summary

Total Routing Time : 48.00 hrs
 Minimum Time Step : 6.01 sec
 Average Time Step : 10.09 sec
 Maximum Time Step : 15.00 sec
 Fract. of Max. Step: 0-.1 .1-.2 .2-.3 .3-.4 .4-.5 .5-.6 .6-.7 .7-.8 .8-.9 .9-1.

 Fract. of All Steps: 0.00 0.00 0.00 0.00 0.18 0.27 0.29 0.00 0.00 0.00

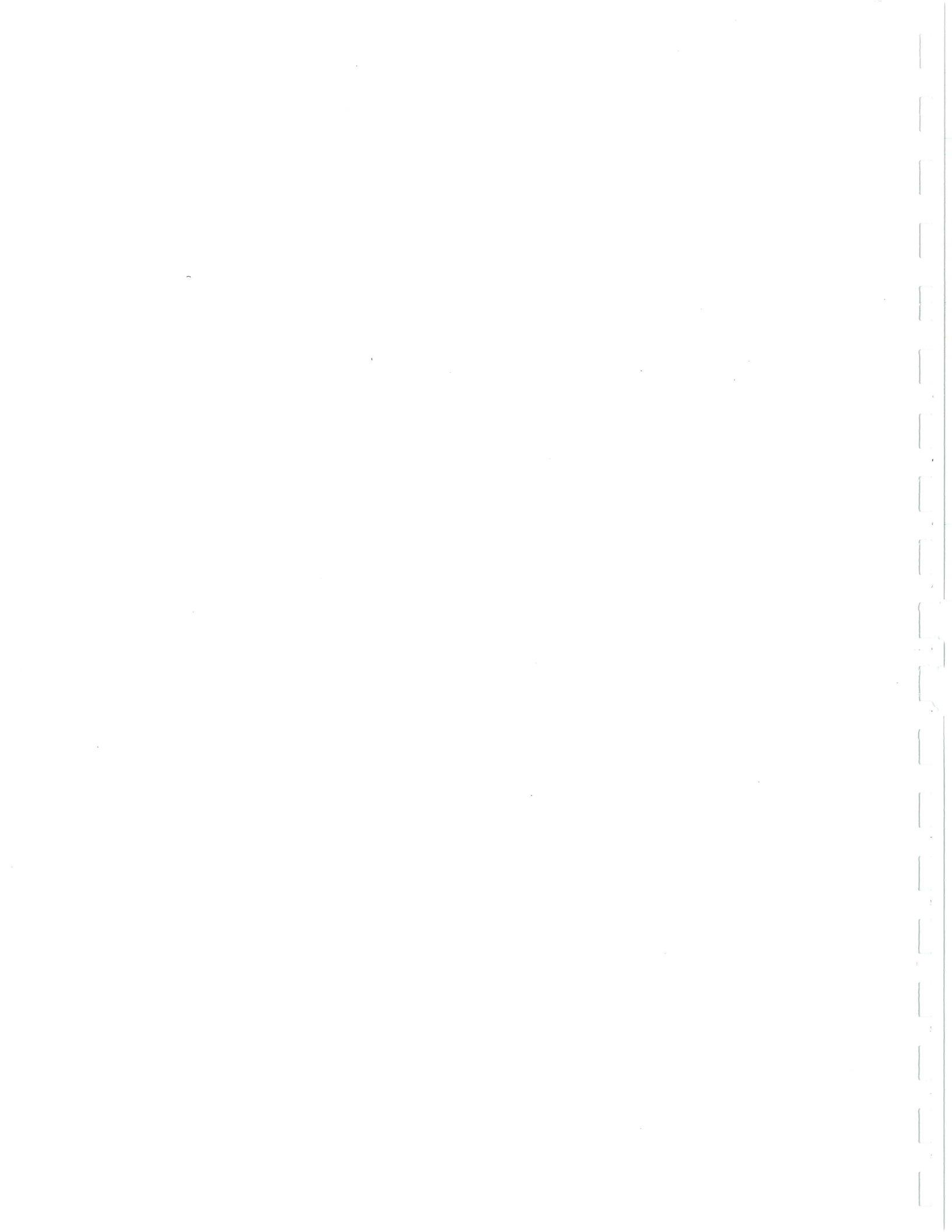
 Routing Iterations Summary

Avg. Iterations per Time Step: 2.1
 Number of Iterations: 1 2 3 4 5 6 7 8 9 >=10

 Fract. of Time Steps: 0.00 0.97 0.02 0.01 0.00 0.00 0.00 0.00 0.00 0.00

APPENDIX B

Airport Stormwater Pollution Control Plan



**STORM WATER
POLLUTION CONTROL PLAN**

City of Madras-Jefferson County Airport

1998

**NPDES GENERAL PERMIT 1200-Z/FILE NO. 107571
Approved 9/20/96
Revised 2/04/98**

STORM WATER POLLUTION CONTROL PLAN CITY OF MADRAS-JEFFERSON COUNTY AIRPORT

SITE DESCRIPTION:

- (1) The City of Madras-Jefferson County Airport is a general aviation facility. Activities conducted upon the site are a fixed base operator with aircraft fueling capabilities, an aircraft maintenance shop employing two mechanics, two aerial spray applicator operations, a municipal wastewater treatment plant, and a facility occupied by Freightliner for truck testing.

Significant materials stored or used on the site consist of aviation fuel in three tanks; Jet Fuel A contained in a 20,000 gallon tank, 100 octane aviation gasoline and 80 octane aviation gasoline. The capacity of the two gasoline tanks are 10,000 gallons each. There is also a mobile fuel truck stationed at the Airport to dispense Jet A Fuel.

The two aerial applicators, Precision Applications and Jim Demers Flying Service, use and store agricultural chemicals on-site. All chemicals used or stored are contained upon a concrete facility which drains to a holding basin. All operations are conducted upon this concrete pad. The concrete is underlined with a plastic membrane for secondary containment should the primary containment facility develop a leak.

- (2) A general location map and site map is included as Exhibit 1 indicating all significant structures, drainage facilities, etc. The total amount of impervious surface area is estimated to be 5 million square feet. There is only one outfall from the Airport grounds.
- (3) Indicated on the map in Exhibit 2 are the locations where a potential exists for contributing pollutants to storm water run-off. Noted is the fuel farm, which could possibly contribute petroleum distillants should a leak occur, however containment is provided on-site. Pollutants resultant from a spill at either of the pesticide applicators which are indicated on the map should be completely contained within the catchment facility provided. However should a spill occur outside of the loading areas, it is theoretically possible for

agricultural chemicals to enter the storm waters. Chemicals present could be insecticides, herbicides, fungicides, etc.

- (4) The receiving water from the run-off of the Airport would be Cambell Creek. However there is no clear channel from the outfall at the airport facility to Cambell Creek. On the maps found in Exhibit 2, the point of storm water monitoring is noted.

CONTROLS:

The following controls are in place for the site:

(1) STORM WATER MANAGEMENT

Best management practices are to be employed at the Airport to minimize significant materials contacting storm water run-off. There is no direct release of pollution or contaminated storm water permitted into the storm drainage system.

A. Containment

All hazardous chemicals are stored within berms or other secondary containment devices to prevent leaks and spills from entering storm water run-off.

B. Oil and Grease Separation

There is no present need for oil and grease separation. There is no exposure of storm waters with direct contact with oil and grease.

C. Waste Chemical Disposal

There is no de-icing operations conducted on-site. Any degreasers or used oils are recycled according to Department of

Environmental Quality (DEQ) regulations. Pesticide residuals from operations would be captured in the containment basin and recycled with new pesticides where appropriate.

D. Debris and Sediment Control

At present there is no need for debris and sediment control at this facility. The primary drainage consists of a vegetated ditch. There are agricultural fields on the site, but water born soil erosion has not been a problem.

E. Storm Water Diversion

There is no direct channel at present through or upon any materials, manufacturing, storage or potential water contamination areas.

F. Covered Storage and Manufactured Areas

Storage areas for agricultural chemicals are provided in covered containers on top of the spill control pad. The aircraft maintenance operation is contained within the hangar building and it is not practical to cover the fueling facilities at this time.

G. Housekeeping

Areas that may contribute storm water pollutants to storm water shall be kept clean. Sweeping, prompt clean up of spills and leaks, and proper maintenance of vehicles shall be employed to eliminate or minimize exposure of storm water to pollutants.

(2) SPILL PREVENTION AND RESPONSE PROCEDURES

The City is presently working on the development of a SPCC Plan for the aircraft fueling operation. The two pesticide applicators are to have and maintain a SPCC plan. A copy of the lease agreements for Precision

Applications and Jim Demers Flying Service have been included as Exhibits 3 and 4. It is the duty of the lease holders to maintain their own SPCC plans.

(3) PREVENTATIVE MAINTENANCE

Because all significant materials are isolated from potential storm water run-off, no significant exposure to contamination is present. Best management practices in fueling aircraft will continue to ensure that there is not contamination from the fuel facility. There are no storm water control structures or treatment facilities present on the Airport storm drainage system. Airport employees have received a copy of the storm water management plan and have been instructed in the goals and operations to prevent contamination of storm water.

The Fixed Base Operator shall conduct monthly inspections of areas where potential spills of significant materials or industrial activities could impact storm water runoff.

The Madras Public Works Department will conduct monthly inspections of storm water catch basins and structures.

Routine maintenance and cleaning of major storm water structures will be conducted by City of Madras Public Works personnel. Maintenance and cleaning of fueling facilities, and surrounding grounds will be the responsibility of the Fixed Base Operator. Maintenance of material handling areas of leased properties will be the responsibility of the lessee.

(4) EMPLOYEE EDUCATION

The Fixed Base Operator will be provided training in the goals and components of the SWPCP. The Fixed Base Operator will provide training for all personnel who will be dispensing fuel.

City of Madras Public Works personnel who will be doing monitoring of the storm drainage system will receive training in the SWPCP and storm water best management practices.

(5) RECORD KEEPING AND INTERNAL REPORTING PROCEDURES

There have been no incidents of spills or leaks which would contaminate storm water run-off; however employees are instructed to keep records should a spill occur and these records would be submitted to the Department of Environmental Quality and this office. Clean up activities following any spill will be recorded along with any corrective measures to prevent future occurrence. Any work conducted on the storm water system will be recorded and documented and become part of the official records of the City of Madras.

Records will be kept of monitoring activities, inspections, and education activities.

(6) NPDES PERMIT CONDITIONS

The City of Madras has an NPDES Permit for storm water discharge from the Madras/Jefferson County Airport. A copy of this permit is attached and is a part of this document. It is the duty of all users of the Airport and the Airport Storm Drainage System to ensure that the City of Madras maintains compliance with this permit.

(7) ANNUAL REVIEW

Near the end of October of each year, City employees will make an inspection of any potential areas for contamination of storm water from materials on the airport. A record will be kept of the inspections conducted on the site.