APPENDIX B -

SENSITIVITY ANALYSIS # 1

Basin Hydrograph Comparison Between AHYMO_97 & SWMM (4 Basin Types)

Table FR – Sensitivity Analysis # 1
Table FIC – Sensitivity Analysis # 1
Table SR – Sensitivity Analysis # 1
Table SIC – Sensitivity Analysis # 1

AHYMO_97 SUMMARY TABLE (a) (100-yr. 24-hour storm)
for:
Runoff Curve Number Method

(a) For 4 Generic Basin Types as follows:

1. Flat 100% Residential
2. Flat 50% commercial / 50% industrial
3. Steep 100% Residential
4. Steep 50% commercial / 50% industrial

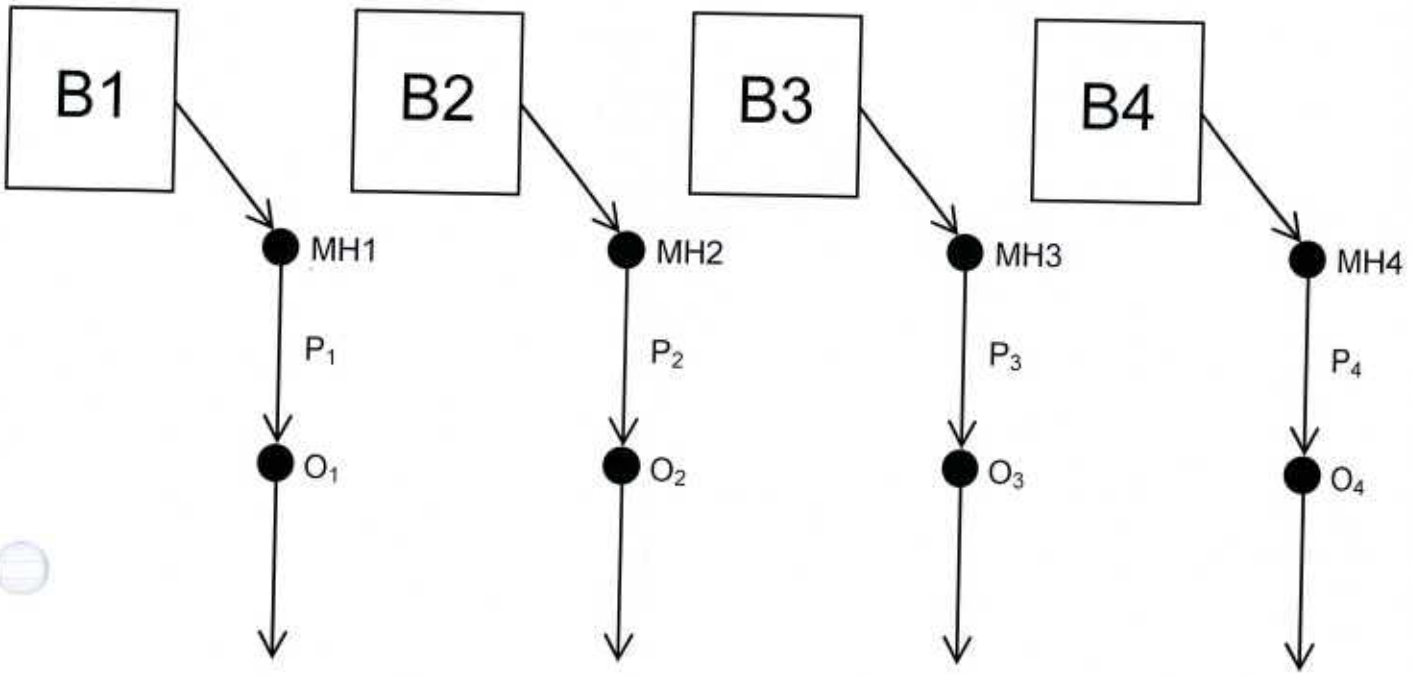
SWMM SUMMARY TABLES (a) (100-yr. 24-hour storm)
for:
Runoff Curve Number Method
"Initial Run" and Runs 1 - 10

(a) For 4 Generic Basin Types as follows:

1. Flat 100% Residential
2. Flat 50% commercial / 50% industrial
3. Steep 100% Residential
4. Steep 50% commercial / 50% industrial

APPENDIX B -

SWMM SCHEMATIC



Subcatchment B1 = Subcatchment FR

Subcatchment B2 = Subcatchment FIC

Subcatchment B3 = Subcatchment SR

Subcatchment B4 = Subcatchment SIC

TABLE FR - SENSITIVITY ANALYSIS #1

BASIN DESCRIPTION AND MODEL INPUT DATA

basin slope - flat (approximately flat)
basin development - 100% residential - Assume 56 % Impreviousness) 100 % of Bas. Hyd. Soil Gr. B
basin shape - square (approx. 6 blocks by 6 blocks)

Rainfall Data - Generated Hyetograph in AHYMO_97 and input into SWMM
Time Increment - 0.05 hours = 3 min - for AHYMO_97 and SWMM

------ dash indicates a data item specified in one program in another location within model setup or computed by user external to program
NA = Not Applicable in one program or the other
Light Red = all data items changed relative to initial run
Yellow = data items with same definition between programs

AHYMO_97 Subcatchment Properties (a)			SWMM Subcatchment Property Assumptions (b)		Initial Run	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7	Run #8	Run #9	Run #10	Run #11	Run #12	
Data Element	Data Element Description	INITIAL Data Element Value Assumed	Data Element	Data Element Description	INITIAL Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	% oF Initial Value Run #12
ID	Internal storage location	1	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HYD NUMBER	Hydrograph identification number	FR	Name	User-assigned subcatchment name.	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	FR	-
DT	Incremental time (hours)	0.05	Time Steps	Simulation Options - Time Steps - Reporting	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	-
NA	-	-	X-Coordinate	Horizontal location of the subcatchment centroid	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Y-Coordinate	Vertical location of the subcatchment centroid	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Description	Optional description of the subcatchment.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Tag	Optional label used to categorize or classify the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Rain Gage	Name of the rain gage associated with subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Outlet	Name of the node or subcatchment which receives the subcatchment's runoff	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DA	Drainage area (sq mi)	0.16046875	Area	Area of the subcatchment (acres)	102.7	102.7	102.7	102.7	102.7	102.7	102.7	102.7	102.7	102.7	102.7	102.7	102.7	
NA	-	-	Width	Characteristic width of the overland flow path for sheet flow runoff (ft) (c)	2060	2060	2060	2060	2060	750	750	750	750	750	750	400	400	19%
-----	-	-	% Slope	Average percent slope of the subcatchment	0.09576	0.09576	0.09576	0.09576	0.09576	0.09576	0.09576	0.09576	0.09576	0.09576	0.09576	0.09576	0.09576	-
-----	-	-	% Imperv	Percent of land area that is impervious	0	0	56	56	56	56	56	56	56	56	56	56	56	-
NA	-	-	N- Imperv	Manning's n for overland flow over the impervious portions of subcatchment	0.015	0.015	0.015	0.015	0.024	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	-
NA	-	-	N- Perv	Manning's n for overland flow over the pervious portions of subcatchment	0.24	0.24	0.24	0.24	0.41	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	-
NA	-	-	Dstore-Imperv	Depth of depression storage on the impervious portion of the subcatchment (in.)	0	0.1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-
NA	-	-	Dstore-Perv	Depth of depression storage on the pervious portion of the subcatchment (in.)	0	0.65	0	0	0	0	0	0	0	0	0	0	0	-
NA	-	-	% Zero-Imperv	Percent of the impervious area with no depression storage	99	99	99	99	99	99	99	99	99	99	99	99	0	-
NA	-	-	Subarea - Routing	Choice of internal routing of runoff between pervious and impervious areas: (d)	outlet	outlet	outlet	outlet	outlet	outlet	outlet	impervious	impervious	pervious	pervious	outlet	outlet	-
NA	-	-	Percent Routed	Percent of runoff routed between subareas	100	100	100	100	100	100	0	100	0	100	0	100	100	-
NA	-	-	Infiltration :	Click ellipsis to edit infiltration parameters for the subcatchment.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CN	SCS Curve Number	85	CN	SCS Curve Number	85	85	51	51	51	51	51	51	51	51	51	51	51	-
NA	-	-	Conductivity	This property has been deprecated and its value is ignored	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Drying Time	Time for a fully saturated soil to completely dry	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	Recession Constant for unit hydrograph computation . (Input K =0.0 to use an SCS dimensionless unit hydrograph)	0	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
tp or tc	Time to peak (e)	0.93	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mass Rainfall	Use RAINFALL command - Input a value - "-1"	-1	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	LID Controls	Click ellipsis to edit the use of the low impact development controls in the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Groundwater	Click ellipsis to edit groundwater flow parameters for the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Snow pack	Name of snow pack parameter set assigned to the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Land Uses	Click ellipsis to assign land uses to the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Initial Buildup	Click ellipsis to specify initial quantities of pollutant buildup over the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Curb Length	total lengths of curbs. Used only when pollutant buildup is normalized to curb length	-	-	-	-	-	-	-	-	-	-	-	-	-	-

RESULTS		
Peak Discharge	cfs	60
Runoff Volume	ac-ft	10.77
Time to Peak	hours	2.50
Total Hydrograph Time	hours	1d0h27m

RESULTS	Initial Run	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7	Run #8	Run #9	Run #10	Run #11	Run #12
Peak Discharge (cfs)	7	2	109	109	83	60	60	60	60	4	60	41	39
Runoff Volume (ac-ft)	11.71	6.19	14.1	14.1	13.86	13.61	13.61	13.61	13.61	8	13.61	13.28	10.29
Time to Peak (hrs)	3.42	6.17	1.58	1.58	1.67	1.83	1.83	1.83	1.83	6.50	1.83	2	2
Total Hydrograph Time (hrs)	1d13h55m	1d8h35m	1d0h30m	1d0h30m	1d0h45m	1d1h05m	1d1h05m	1d1h10m	1d1h05m	1d10h10m	1d1h05m	1d1h35m	1d1h35m

a - Note - The COMPUTE HYD command was adopted to compute a basin runoff hydrograph

b - Note - A "SUBCATCHMENT" is the only SWMM Command available to compute a basin runoff hydrograph

c -characteristic width of the overland flow path for sheet flow runoff (ft). An initial estimate of the characteristic width is give by the subcatchment area divided by the average maximum overland flow length. The maximum overland flow length is the length of the flow path from the furthest drainage point of the subcatchment before the flow becomes channelized. Maximum lengths from several different possible flow paths should be averaged. These paths should reflect slow flow, such as over pervious surfaces, more than rapid flow over pavement, for example. Adjustments should be made to the width parameter to produce good fits to measured runoff hydrographs.

d- **IMPERV:** runoff from pervious area flows to impervious area. **PERV:** runoff from impervious area flows to pervious area. **OUTLET:** runoff from both areas flow directly to outlet

e - Time to peak (tp) in hours (input as a negative number to specify the time to peak value), or time of concentration (tc) in hours (input as a positive number to specify the time of concentration). The time of concentration must only be used with the SCS dimensionless unti hydrograph (K=0.0 or -999) and with CN infiltration. Input as 0.0 to use a previously computed value from the COMPUTE LT TP command.

TABLE FIC - SENSITIVITY ANALYSIS #1

BASIN DESCRIPTION AND MODEL INPUT DATA

basin slope - flat (approximately flat)
basin development - 50% commercial & 50% industrial (Assume 80% Impervious) 100% of Bas. Hyd.Soil Gr. B
basin shape - square (approx. 6 blocks by 6 blocks)

Rainfall Data - Generated Hyetograph in AHYMO_97 and input into SWMM
Time Increment - 0.05 hours = 3 min - for AHYMO_97 and SWMM

----- dash indicates a data item specified in one program in another location within model setup or computed by user external to program
NA = Not Applicable in one program or the other
Light Red = all data items changed relative to initial run
Yellow = data items with same definition between programs

AHYMO_97 Subcatchment Properties (a)			SWMM Subcatchment Property Assumptions (b)		Initial Run	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7	Run #8	Run #9	Run #10	Run #11	Run #12	
Data Element	Data Element Description	INITIAL Data Element Value Assumed	Data Element	Data Element Description	INITIAL Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	% oF Initial Value Run #12
ID	Internal storage location	1	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HYD NUMBER	Hydrograph identification number	FIC	Name	User-assigned subcatchment name.	FIC	FIC	FIC	FIC	FIC	FIC	FIC	FIC	FIC	FIC	FIC	FIC	FIC	-
DT	Incremental time (hours)	0.05	Time Steps	Simulation Options - Time Steps - Reporting	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	4 min.	-
NA	-	-	X-Coordinate	Horizontal location of the subcatchment centroid	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Y-Coordinate	Vertical location of the subcatchment centroid	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Description	Optional description of the subcatchment.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Tag	Optional label used to categorize or classify the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Rain Gage	Name of the rain gage associated with subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Outlet	Name of the node or subcatchment which receives the subcatchment's runoff	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DA	Drainage area (sq mi)	0.16484375	Area	Area of the subcatchment (acres)	105.5	105.5	105.5	105.5	105.5	105.5	105.5	105.5	105.5	105.5	105.5	105.5	105.5	-
NA	-	-	Width	Characteristic width of the overland flow path for sheet flow runoff (ft) (c)	2150	2150	2150	2150	2150	1050	1050	1050	1050	1050	1050	400	400	19%
-----	-	-	% Slope	Average percent slope of the subcatchment	0.117841	0.117841	0.117841	0.117841	0.117841	0.117841	0.117841	0.117841	0.117841	0.117841	0.117841	0.117841	0.117841	-
-----	-	-	% Imperv	Percent of land area that is impervious	0	0	80	80	80	80	80	80	80	80	80	80	80	-
NA	-	-	N- Imperv	Manning's n for overland flow over the impervious portions of subcatchment	0.015	0.015	0.015	0.015	0.024	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	-
NA	-	-	N- Perv	Manning's n for overland flow over the pervious portions of subcatchment	0.15	0.15	0.15	0.15	0.41	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
NA	-	-	Dstore-Imperv	Depth of depression storage on the impervious portion of the subcatchment (in.)	0	0.1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-
NA	-	-	Dstore-Perv	Depth of depression storage on the pervious portion of the subcatchment (in.)	0	0.78	0	0	0	0	0	0	0	0	0	0	0	-
NA	-	-	% Zero-Imperv	Percent of the impervious area with no depression storage	99	99	99	99	99	99	99	99	99	99	99	99	0	-
NA	-	-	Subarea - Routing	Choice of internal routing of runoff between pervious and impervious areas: (d)	outlet	outlet	outlet	outlet	outlet	outlet	outlet	impervious	impervious	pervious	pervious	outlet	outlet	-
NA	-	-	Percent Routed	Percent of runoff routed between subareas	100	100	100	100	100	100	0	100	0	100	0	100	101	-
NA	-	-	Infiltration :	Click ellipsis to edit infiltration parameters for the subcatchment.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CN	SCS Curve Number	90	CN	SCS Curve Number	90	90	51	51	51	51	51	51	51	51	51	51	52	-
NA	-	-	Conductivity	This property has been deprecated and its value is ignored	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Drying Time	Time for a fully saturated soil to completely dry	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	Recession Constant for unit hydrograph computation . (Input K =0.0 to use an SCS dimensionless unit hydrograph)	0	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
tp or tc	Time to peak (e)	0.83	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mass Rainfall	Use RAINFALL command - Input a value - "-1"	-1	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	LID Controls	Click ellipsis to edit the use of the low impact development controls in the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Groundwater	Click ellipsis to edit groundwater flow parameters for the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Snow pack	Name of snow pack parameter set assigned to the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Land Uses	Click ellipsis to assign land uses to the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Initial Buildup	Click ellipsis to specify initial quantities of pollutant buildup over the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Curb Length	total lengths of curbs. Used only when pollutant buildup is normalized to curb length	-	-	-	-	-	-	-	-	-	-	-	-	-	-

RESULTS		
Peak Discharge	cfs	92
Runoff Volume	ac-ft	14.25
Time to Peak	hours	2.40
Total Hydrograph Time	hours	1d0h33m

RESULTS	Initial Run	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7	Run #8	Run #9	Run #10	Run #11	Run #12
Peak Discharge (cfs)	15	5	136	136	103	92	92	91	92	23	92	50	47
Runoff Volume (ac-ft)	15.21	8.31	19.23	19.19	19.07	19.13	19.13	19.13	19.13	13.06	19.13	18.89	14.63
Time to Peak (hrs)	2.17	6.00	1.58	1.67	1.75	1.83	1.83	1.83	1.83	3.33	1.83	2	2.08
Total Hydrograph Time (hrs)	1d10h45m	1d8h25m	1d0h40m	1d0h40m	1d1h15m	1d1h25m	1d1h25m	1d1h30m	1d1h25m	1d3h25m	1d1h25m	1d4h15m	1d4h15m

a - Note - The COMPUTE HYD command was adopted to compute a basin runoff hydrograph

b - Note - A "SUBCATCHMENT" is the only SWMM Command available to compute a basin runoff hydrograph

c -characteristic width of the overland flow path for sheet flow runoff (ft). An initial estimate of the characteristic width is give by the subcatchment area divided by the average maximum overland flow length. The maximum overland flow length is the length of the flow path from the furthest drainage point of the subcatchment before the flow becomes channelized. Maximum lengths from several different possible flow paths should be averaged. These paths should reflect slow flow, such as over pervious surfaces, more than rapid flow over pavement, for example. Adjustments should be made to the width parameter to produce good fits to measured runoff hydrographs.

d- **IMPERV:** runoff from pervious area flows to impervious area. **PERV:** runoff from impervious area flows to pervious area. **OUTLET:** runoff from both areas flow directly to outlet

e - Time to peak (tp) in hours (input as a negative number to specify the time to peak value), or time of concentration (tc) in hours (input as a positive number to specify the time of concentration). The time of concentration must only be used with the SCS dimensionless unti hydrograph (K=0.0 or -999) and with CN infiltration. Input as 0.0 to use a previously computed value from the COMPUTE LT TP command.

TABLE SR - SENSITIVITY ANALYSIS #1

BASIN DESCRIPTION AND MODEL INPUT DATA

basin slope - steep
basin development - 100% residential (Assume 56% Impervious) 65% of Bas.Hyd. Soil Gr.A, 35% of Bas, Hyd. Soil Gr. B
basin shape - square (approx. 6 blocks by 6 blocks)

Rainfall Data - Generated Hyetograph in AHYMO_97 and input into SWMM
Time Increment - 0.05 hours = 3 min - for AHYMO_97 and SWMM

----- dash indicates a data item specified in one program in another location within model setup or computed by user external to program
NA = Not Applicable in one program or the other
Light Red = all data items changed relative to initial run
Yellow = data items with same definition between programs

AHYMO_97 Subcatchment Properties (a)			SWMM Subcatchment Property Assumptions (b)		Initial Run	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7	Run #8	Run #9	Run #10	Run #11	Run #12	
Data Element	Data Element Description	INITIAL Data Element Value Assumed	Data Element	Data Element Description	INITIAL Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	% oF Initial Value Run #12
ID	Internal storage location	1	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HYD NUMBER	Hydrograph identification number	SR	Name	User-assigned subcatchment name.	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	-
DT	Incremental time (hours)	0.05	Time Steps	Simulation Options - Time Steps - Reporting	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	4 min.	-
NA	-	-	X-Coordinate	Horizontal location of the subcatchment centroid	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Y-Coordinate	Vertical location of the subcatchment centroid	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Description	Optional description of the subcatchment.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Tag	Optional label used to categorize or classify the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Rain Gage	Name of the rain gage associated with subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Outlet	Name of the node or subcatchment which receives the subcatchment's runoff	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DA	Drainage area (sq mi)	0.14953125	Area	Area of the subcatchment (acres)	95.7	95.7	95.7	95.7	95.7	95.7	95.7	95.7	95.7	95.7	95.7	95.7	95.7	-
NA	-	-	Width	Characteristic width of the overland flow path for sheet flow runoff (ft) (c)	2020	2020	2020	2020	2020	315	315	315	315	315	315	400	400	20%
-----	-	-	% Slope	Average percent slope of the subcatchment	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	-
NA	-	-	% Imperv	Percent of land area that is impervious	0	0	56	56	56	56	56	56	56	56	56	56	56	-
NA	-	-	N- Imperv	Manning's n for overland flow over the impervious portions of subcatchment	0.015	0.015	0.015	0.015	0.024	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	-
NA	-	-	N- Perv	Manning's n for overland flow over the pervious portions of subcatchment	0.24	0.24	0.24	0.24	0.41	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	-
NA	-	-	Dstore-Imperv	Depth of depression storage on the impervious portion of the subcatchment (in.)	0	0.1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-
NA	-	-	Dstore-Perv	Depth of depression storage on the pervious portion of the subcatchment (in.)	0	0.5	0	0	0	0	0	0	0	0	0	0	0	-
NA	-	-	% Zero-Imperv	Percent of the impervious area with no depression storage	99	99	99	99	99	99	99	99	99	99	99	99	0	-
NA	-	-	Subarea - Routing	Choice of internal routing of runoff between pervious and impervious areas: (d)	outlet	outlet	outlet	outlet	outlet	outlet	outlet	impervious	impervious	pervious	pervious	outlet	outlet	-
NA	-	-	Percent Routed	Percent of runoff routed between subareas	100	100	100	100	100	100	0	100	0	100	0	100	101	-
NA	-	-	Infiltration :	Click ellipsis to edit infiltration parameters for the subcatchment.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CN	SCS Curve Number	80	CN	SCS Curve Number	80	80	52	52	52	52	52	52	52	52	52	52	53	-
NA	-	-	Conductivity	This property has been deprecated and its value is ignored	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Drying Time	Time for a fully saturated soil to completely dry	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	Recession Constant for unit hydrograph computation . (Input K =0.0 to use an SCS dimensionless unit hydrograph)	0	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
tp or tc	Time to peak (e)	0.24	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mass Rainfall	Use RAINFALL command - Input a value - "-1"	-1	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	LID Controls	Click ellipsis to edit the use of the low impact development controls in the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Groundwater	Click ellipsis to edit groundwater flow parameters for the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Snow pack	Name of snow pack parameter set assigned to the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Land Uses	Click ellipsis to assign land uses to the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Initial Buildup	Click ellipsis to specify initial quantities of pollutant buildup over the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Curb Length	total lengths of curbs. Used only when pollutant buildup is normalized to curb length	-	-	-	-	-	-	-	-	-	-	-	-	-	-

RESULTS

Peak Discharge	cfs	80
Runoff Volume	ac-ft	7.56
Time to Peak	hours	1.70
Total Hydrograph Time	hours	0d18h33m

RESULTS

	Initial Run	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7	Run #8	Run #9	Run #10	Run #11	Run #12
Peak Discharge (cfs)	17	5	213	213	177	80	80	80	80	6	80	92	87
Runoff Volume (ac-ft)	10.15	5.92	13.58	13.58	13.49	13.03	13.03	13.03	13.03	7.88	13.03	13.15	10.19
Time to Peak (hrs)	2.08	3.67	1.50	1.50	1.50	1.67	1.67	1.67	1.67	4.50	1.67	1.58	1.58
Total Hydrograph Time (hrs)	1d1h55m	1d1h35m	0d21h55m	0d21h55m	0d23h30m	1d0h30m	1d0h30m	1d0h35m	1d0h30m	1d4h55m	1d0h30m	1d00h25m	1d00h25m

a - Note - The COMPUTE HYD command was adopted to compute a basin runoff hydrograph

b - Note - A "SUBCATCHMENT" is the only SWMM Command available to compute a basin runoff hydrograph

c -characteristic width of the overland flow path for sheet flow runoff (ft). An initial estimate of the characteristic width is give by the subcatchment area divided by the average maximum overland flow length. The maximum overland flow length is the length of the flow path from the furthest drainage point of the subcatchment before the flow becomes channelized. Maximum lengths from several different possible flow paths should be averaged. These paths should reflect slow flow, such as over pervious surfaces, more than rapid flow over pavement, for example. Adjustments should be made to the width parameter to produce good fits to measured runoff hydrographs.

d- **IMPERV:** runoff from pervious area flows to impervious area. **PERV:** runoff from impervious area flows to pervious area. **OUTLET:** runoff from both areas flow directly to outlet

e - Time to peak (tp) in hours (input as a negative number to specify the time to peak value), or time of concentration (tc) in hours (input as a positive number to specify the time of concentration). The time of concentration must only be used with the SCS dimensionless unti hydrograph (K=0.0 or -999) and with CN infiltration. Input as 0.0 to use a previously computed value from the COMPUTE LT TP command.

Smith Engineering Company

5/29/2011

TABLE SIC - SENSITIVITY ANALYSIS #1

BASIN DESCRIPTION AND MODEL INPUT DATA

basin slope - steep

basin development - 50% commercial & 50% industrial (Assume 80% Impervious) 65% of Bas. Hyd. Soil Gr. A, 35% of Bas. Hyd. Soil Gr. B

basin shape - square (approx. 6 blocks by 6 blocks)

Rainfall Data - Generated Hyetograph in AHYMO_97 and input into SWMM

Time Increment - 0.05 hours = 3 min - for AHYMO_97 and SWMM

------ dash indicates a data item specified in one program in another location within model setup or computed by user external to program

NA = Not Applicable in one program or the other Light Red = all data items changed relative to initial run

Yellow = data items with same definition between programs

AHYMO_97 Subcatchment Properties (a)			SWMM Subcatchment Property Assumptions (b)		Initial Run	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7	Run #8	Run #9	Run #10	Run #11	Run #12	
Data Element	Data Element Description	INITIAL Data Element Value Assumed	Data Element	Data Element Description	INITIAL Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	ADJUSTED Data Element Value Assumed	% oF Initial Value Run #12
ID	Internal storage location	1	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HYD NUMBER	Hydrograph identification number	SIC	Name	User-assigned subcatchment name.	SIC	SIC	SIC	SIC	SIC	SIC	SIC	SIC	SIC	SIC	SIC	SIC	SIC	-
DT	Incremental time (hours)	0.05	Time Steps	Simulation Options - Time Steps - Reporting	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	3 min.	4 min.	-
NA	-	-	X-Coordinate	Horizontal location of the subcatchment centroid	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Y-Coordinate	Vertical location of the subcatchment centroid	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Description	Optional description of the subcatchment.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Tag	Optional label used to categorize or classify the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Rain Gage	Name of the rain gage associated with subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Outlet	Name of the node or subcatchment which receives the subcatchment's runoff	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DA	Drainage area (sq mi)	0.14953125	Area	Area of the subcatchment (acres)	95.7	95.7	95.7	95.7	95.7	95.7	95.7	95.7	95.7	95.7	95.7	95.7	95.7	-
NA	-	-	Width	Characteristic width of the overland flow path for sheet flow runoff (ft) (c)	2020	2020	2020	2020	2020	670	670	670	670	670	670	400	400	20%
-----	-	-	% Slope	Average percent slope of the subcatchment	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	1.576872	-
-----	-	-	% Imperv	Percent of land area that is impervious	0	0	80	80	80	80	80	80	80	80	80	80	80	-
NA	-	-	N- Imperv	Manning's n for overland flow over the impervious portions of subcatchment	0.015	0.015	0.015	0.015	0.024	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	-
NA	-	-	N- Perv	Manning's n for overland flow over the pervious portions of subcatchment	0.15	0.15	0.15	0.15	0.41	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-
NA	-	-	Dstore-Imperv	Depth of depression storage on the impervious portion of the subcatchment (in.)	0	0.1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-
NA	-	-	Dstore-Perv	Depth of depression storage on the pervious portion of the subcatchment (in.)	0	0.7	0	0	0	0	0	0	0	0	0	0	0	-
NA	-	-	% Zero-Imperv	Percent of the impervious area with no depression storage	99	99	99	99	99	99	99	99	99	99	99	99	0	-
NA	-	-	Subarea - Routing	Choice of internal routing of runoff between pervious and impervious areas: (d)	outlet	outlet	outlet	outlet	outlet	outlet	outlet	impervious	impervious	pervious	pervious	outlet	outlet	-
NA	-	-	Percent Routed	Percent of runoff routed between subareas	100	100	100	100	100	100	0	100	0	100	0	100	101	-
NA	-	-	Infiltration :	Click ellipsis to edit infiltration parameters for the subcatchment.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CN	SCS Curve Number	87	CN	SCS Curve Number	87	87	52	52	52	52	52	52	52	52	52	52	53	-
NA	-	-	Conductivity	This property has been deprecated and its value is ignored	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Drying Time	Time for a fully saturated soil to completely dry	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	Recession Constant for unit hydrograph computation . (Input K =0.0 to use an SCS dimensionless unit hydrograph)	0	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
tp or tc	Time to peak (e)	0.22	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mass Rainfall	Use RAINFALL command - Input a value - "-1"	-1	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	LID Controls	Click ellipsis to edit the use of the low impact development controls in the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Groundwater	Click ellipsis to edit groundwater flow parameters for the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Snow pack	Name of snow pack parameter set assigned to the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Land Uses	Click ellipsis to assign land uses to the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Initial Buildup	Click ellipsis to specify initial quantities of pollutant buildup over the subcatchment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NA	-	-	Curb Length	total lengths of curbs. Used only when pollutant buildup is normalized to curb length	-	-	-	-	-	-	-	-	-	-	-	-	-	-

RESULTS			RESULTS	Initial Run	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7	Run #8	Run #9	Run #10	Run #11	Run #12
Peak Discharge	cfs	145	Peak Discharge (cfs)	36	9	267	267	211	145	145	144	145	47	145	107	101
Runoff Volume	ac-ft	10.99	Runoff Volume (ac-ft)	13	7.21	17.51	17.51	17.48	17.48	17.48	17.48	17.48	12.11	17.48	17.41	13.49
Time to Peak	hours	1.65	Time to Peak (hrs)	2.08	2.67	1.50	1.50	1.50	1.58	1.58	1.58	1.58	2.25	1.58	1.67	1.75
Total Hydrograph Time	hours	0d23h51m	Total Hydrograph Time (hrs)	1d1h25m	1d1h20m	1d0h05m	1d0h05m	1d0h10m	1d0h15m	1d0h15m	1d0h20m	1d0h15m	1d0h40m	1d0h15m	1d00h30m	1d00h30m

a - Note - The COMPUTE HYD command was adopted to compute a basin runoff hydrograph

b - Note - A "SUBCATCHMENT" is the only SWMM Command available to compute a basin runoff hydrograph

c -characteristic width of the overland flow path for sheet flow runoff (ft). An initial estimate of the characteristic width is give by the subcatchment area divided by the average maximum overland flow length. The maximum overland flow length is the length of the flow path from the furthest drainage point of the subcatchment before the flow becomes channelized. Maximum lengths from several different possible flow paths should be averaged. These paths should reflect slow flow, such as over pervious surfaces, more than rapid flow over pavement, for example. Adjustments should be made to the width parameter to produce good fits to measured runoff hydrographs.

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AHYMO_97 SUMMARY TABLE (a)

(100-yr. 24-hour storm)

for:

Runoff Curve Number Method

(a) For 4 Generic Basin Types as follows:

1. FR - Flat 100% Residential
2. FIC - Flat 50% commercial / 50% industrial
3. SR - Steep 100% Residential
4. SIC - Steep 50% commercial / 50% industrial

```
      AHYMO PROGRAM (AHYMO_97) -
           RUN DATE (MON/DAY/YR) = 12/21/2010              - Version:  1997.02c
           START TIME (HR:MIN:SEC) = 08:28:21      USER NO.= AHYMO-S-9702c01SEC01A-AH
           INPUT FILE = Q:\SEOCVM-P\2FKWN6-Q\13AYKU-8\DDRU2O-D\ABIJZX-P\AIQZF9-Z\AP3KME-G.TXT
 START
 *S                    TIME=0.0  PUNCH CODE=0 PRINT CODE=0
 *S PROJECT NAME - MID VALLEY DRAINAGE MANAGEMENT PLAN
 *S
 *S   MODEL PURPOSE - TO COMPARE AHYMO_97 BASIN HYDROGRAPH RESULTS
 *S                   TO SWMM V.0.021      BASIN HYDROGRAPH RESULTS
 *S
 *S  MODEL DEVELOPMENT CONDITIONS AND ASSUMPTIONS
 *S
 *S         MODEL DESCRIPTION -
 *S
 *S   1.    EXISTING BASIN DEVELOPMENT CONDITIONS -
 *S
 *S   2.    NO SEDIMENT BULKING APPLIED
 *S
 *S   3.    USE PROCEDURES FROM City of Albuquerque
 *S         Development Process Manual DPM SECTION 22
 *S PREPARED BY :  Pat Stovall, PE, CFM,      Felix Carles, PE, CFM
 *S
   *S  input file name :              ahymo97test1.txt          100-YR. 24-HR. STORM
   *S  summary table file name :     ahymo97test1sm.doc         "
   *S  output file name :            ahymo97test1ot.doc         "                    "
 *S
 *S Prepared for  :   City of Albuquerque                       "                    "
 *S
 *S
 *S  NOAA ATLAS 14 Rainfall Data for various return period
 *S                 24-hour storms follows:
 *S    return period   1-hr. depth(in.)   6-hr. depth(in.)   24-hr. depth(in.)
 *S       100-yr.            1.79              2.29               2.60
 *S       500-yr.            2.31              2.92               3.21
 *S        50-yr.            1.57              2.04               2.34
 *S        10-yr.            1.12              1.49               1.76
 *S         2-yr.            0.70              0.98               1.22
 *S 100-yr. 24-hr. rainfall   (DT = 0.05 hours = 3 minutes as time interval)
 *S
RAINFALL
                    TYPE=2 RAIN QUARTER=0.0 ONE=1.79 IN
                    SIX=2.29 IN DAY=2.60 IN  DT=0.05 HOURS

           COMPUTED 24-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40 HR.
```

DT = .050000 HOURS END TIME = 24.000000 HOURS

.0000	.0057	.0116	.0177	.0240	.0305	.0373
.0443	.0515	.0590	.0669	.0751	.0837	.0927
.1022	.1122	.1227	.1340	.1460	.1590	.1730
.1805	.1889	.2130	.2701	.3683	.5201	.7387
1.0376	1.2733	1.3798	1.4688	1.5467	1.6163	1.6794
1.7369	1.7897	1.8383	1.8832	1.9246	1.9630	1.9726
1.9816	1.9902	1.9982	2.0059	2.0133	2.0203	2.0271
2.0336	2.0399	2.0460	2.0519	2.0577	2.0633	2.0687
2.0740	2.0792	2.0842	2.0892	2.0940	2.0987	2.1034
2.1079	2.1124	2.1168	2.1211	2.1253	2.1295	2.1335
2.1376	2.1415	2.1454	2.1493	2.1531	2.1568	2.1605
2.1642	2.1678	2.1713	2.1748	2.1783	2.1817	2.1851
2.1884	2.1917	2.1950	2.1982	2.2014	2.2046	2.2077
2.2108	2.2139	2.2170	2.2200	2.2230	2.2259	2.2288
2.2317	2.2346	2.2375	2.2403	2.2431	2.2459	2.2486
2.2514	2.2541	2.2568	2.2594	2.2621	2.2647	2.2673
2.2699	2.2725	2.2751	2.2776	2.2801	2.2826	2.2851
2.2876	2.2900	2.2913	2.2927	2.2940	2.2954	2.2967
2.2980	2.2993	2.3007	2.3020	2.3033	2.3046	2.3059
2.3071	2.3084	2.3097	2.3110	2.3123	2.3135	2.3148
2.3161	2.3173	2.3186	2.3198	2.3210	2.3223	2.3235
2.3247	2.3260	2.3272	2.3284	2.3296	2.3308	2.3320
2.3332	2.3344	2.3356	2.3368	2.3380	2.3392	2.3403
2.3415	2.3427	2.3439	2.3450	2.3462	2.3473	2.3485
2.3496	2.3508	2.3519	2.3530	2.3542	2.3553	2.3564
2.3576	2.3587	2.3598	2.3609	2.3620	2.3631	2.3642
2.3653	2.3664	2.3675	2.3686	2.3697	2.3708	2.3718
2.3729	2.3740	2.3751	2.3761	2.3772	2.3782	2.3793
2.3804	2.3814	2.3825	2.3835	2.3845	2.3856	2.3866
2.3877	2.3887	2.3897	2.3907	2.3918	2.3928	2.3938
2.3948	2.3958	2.3968	2.3978	2.3988	2.3998	2.4008
2.4018	2.4028	2.4038	2.4048	2.4058	2.4067	2.4077
2.4087	2.4097	2.4106	2.4116	2.4126	2.4135	2.4145
2.4155	2.4164	2.4174	2.4183	2.4193	2.4202	2.4212
2.4221	2.4230	2.4240	2.4249	2.4258	2.4268	2.4277
2.4286	2.4295	2.4305	2.4314	2.4323	2.4332	2.4341
2.4350	2.4359	2.4368	2.4377	2.4386	2.4395	2.4404
2.4413	2.4422	2.4431	2.4440	2.4449	2.4458	2.4466
2.4475	2.4484	2.4493	2.4501	2.4510	2.4519	2.4527
2.4536	2.4545	2.4553	2.4562	2.4571	2.4579	2.4588
2.4596	2.4605	2.4613	2.4621	2.4630	2.4638	2.4647
2.4655	2.4663	2.4672	2.4680	2.4688	2.4697	2.4705
2.4713	2.4721	2.4730	2.4738	2.4746	2.4754	2.4762
2.4770	2.4779	2.4787	2.4795	2.4803	2.4811	2.4819
2.4827	2.4835	2.4843	2.4851	2.4859	2.4866	2.4874
2.4882	2.4890	2.4898	2.4906	2.4914	2.4921	2.4929
2.4937	2.4945	2.4952	2.4960	2.4968	2.4976	2.4983
2.4991	2.4999	2.5006	2.5014	2.5021	2.5029	2.5037

2.5044	2.5052	2.5059	2.5067	2.5074	2.5082	2.5089
2.5097	2.5104	2.5111	2.5119	2.5126	2.5134	2.5141
2.5148	2.5156	2.5163	2.5170	2.5177	2.5185	2.5192
2.5199	2.5207	2.5214	2.5221	2.5228	2.5235	2.5242
2.5250	2.5257	2.5264	2.5271	2.5278	2.5285	2.5292
2.5299	2.5306	2.5313	2.5320	2.5327	2.5334	2.5341
2.5348	2.5355	2.5362	2.5369	2.5376	2.5383	2.5390
2.5397	2.5404	2.5411	2.5417	2.5424	2.5431	2.5438
2.5445	2.5451	2.5458	2.5465	2.5472	2.5478	2.5485
2.5492	2.5499	2.5505	2.5512	2.5519	2.5525	2.5532
2.5539	2.5545	2.5552	2.5558	2.5565	2.5571	2.5578
2.5585	2.5591	2.5598	2.5604	2.5611	2.5617	2.5624
2.5630	2.5637	2.5643	2.5650	2.5656	2.5662	2.5669
2.5675	2.5682	2.5688	2.5694	2.5701	2.5707	2.5713
2.5720	2.5726	2.5732	2.5739	2.5745	2.5751	2.5757
2.5764	2.5770	2.5776	2.5782	2.5789	2.5795	2.5801
2.5807	2.5813	2.5820	2.5826	2.5832	2.5838	2.5844
2.5850	2.5856	2.5862	2.5868	2.5875	2.5881	2.5887
2.5893	2.5899	2.5905	2.5911	2.5917	2.5923	2.5929
2.5935	2.5941	2.5947	2.5953	2.5959	2.5965	2.5970
2.5976	2.5982	2.5988	2.5994	2.6000		

```
*S
*S  $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
*S
*S BEGIN TEST 1 - BASIN T1
*S
COMPUTE HYD          ID=1    HYD NO=FR    DT=0.0 DA=0.160468 SQ MI CN=85
                     K=0.0   TP=-0.93    MASSRAIN=-1

     SCS Dimensionless unit hydrograph - TP =    .930000 Hours
     Runoff computed by SCS Curve Number Method - DT =    .050000

PRINT HYD            ID=1    CODE=0
```

HYDROGRAPH FROM AREA FR

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
.000	.0	5.650	5.4	11.300	1.7	16.950	1.3	22.600	1.1
.050	.0	5.700	5.3	11.350	1.7	17.000	1.3	22.650	1.1
.100	.0	5.750	5.3	11.400	1.7	17.050	1.3	22.700	1.1
.150	.0	5.800	5.2	11.450	1.7	17.100	1.3	22.750	1.1
.200	.0	5.850	5.1	11.500	1.7	17.150	1.3	22.800	1.1
.250	.0	5.900	5.0	11.550	1.7	17.200	1.3	22.850	1.1
.300	.0	5.950	4.9	11.600	1.7	17.250	1.3	22.900	1.1
.350	.0	6.000	4.9	11.650	1.6	17.300	1.3	22.950	1.1
.400	.0	6.050	4.8	11.700	1.6	17.350	1.3	23.000	1.0
.450	.0	6.100	4.7	11.750	1.6	17.400	1.3	23.050	1.0

.500	.0
.550	.0
.600	.0
.650	.0
.700	.0
.750	.0
.800	.0
.850	.0
.900	.0
.950	.0
1.000	.0
1.050	.0
1.100	.0
1.150	.0
1.200	.0
1.250	.0
1.300	.0
1.350	.1
1.400	.4
1.450	1.0
1.500	1.9
1.550	3.2
1.600	4.8
1.650	6.7
1.700	9.1
1.750	12.0
1.800	15.5
1.850	19.4
1.900	23.7
1.950	28.3
2.000	32.9
2.050	37.4
2.100	41.6
2.150	45.6
2.200	49.1
2.250	52.2
2.300	54.8
2.350	56.9
2.400	58.5
2.450	59.6
2.500	60.0
2.550	60.0
2.600	59.5
2.650	58.6
2.700	57.2
2.750	55.4
2.800	53.2
2.850	50.8
2.900	48.2

6.150	4.7
6.200	4.6
6.250	4.5
6.300	4.5
6.350	4.4
6.400	4.4
6.450	4.3
6.500	4.2
6.550	4.1
6.600	4.0
6.650	4.0
6.700	3.9
6.750	3.8
6.800	3.7
6.850	3.6
6.900	3.5
6.950	3.4
7.000	3.3
7.050	3.2
7.100	3.1
7.150	3.0
7.200	3.0
7.250	2.9
7.300	2.8
7.350	2.8
7.400	2.7
7.450	2.6
7.500	2.6
7.550	2.5
7.600	2.5
7.650	2.5
7.700	2.4
7.750	2.4
7.800	2.3
7.850	2.3
7.900	2.3
7.950	2.3
8.000	2.2
8.050	2.2
8.100	2.2
8.150	2.2
8.200	2.2
8.250	2.1
8.300	2.1
8.350	2.1
8.400	2.1
8.450	2.1
8.500	2.1
8.550	2.0

11.800	1.6
11.850	1.6
11.900	1.6
11.950	1.6
12.000	1.6
12.050	1.6
12.100	1.6
12.150	1.6
12.200	1.6
12.250	1.6
12.300	1.6
12.350	1.6
12.400	1.6
12.450	1.6
12.500	1.6
12.550	1.6
12.600	1.6
12.650	1.6
12.700	1.6
12.750	1.6
12.800	1.6
12.850	1.6
12.900	1.5
12.950	1.5
13.000	1.5
13.050	1.5
13.100	1.5
13.150	1.5
13.200	1.5
13.250	1.5
13.300	1.5
13.350	1.5
13.400	1.5
13.450	1.5
13.500	1.5
13.550	1.5
13.600	1.5
13.650	1.5
13.700	1.5
13.750	1.5
13.800	1.5
13.850	1.5
13.900	1.5
13.950	1.5
14.000	1.5
14.050	1.5
14.100	1.5
14.150	1.5
14.200	1.5

17.450	1.3
17.500	1.3
17.550	1.3
17.600	1.3
17.650	1.3
17.700	1.3
17.750	1.3
17.800	1.3
17.850	1.3
17.900	1.2
17.950	1.2
18.000	1.2
18.050	1.2
18.100	1.2
18.150	1.2
18.200	1.2
18.250	1.2
18.300	1.2
18.350	1.2
18.400	1.2
18.450	1.2
18.500	1.2
18.550	1.2
18.600	1.2
18.650	1.2
18.700	1.2
18.750	1.2
18.800	1.2
18.850	1.2
18.900	1.2
18.950	1.2
19.000	1.2
19.050	1.2
19.100	1.2
19.150	1.2
19.200	1.2
19.250	1.2
19.300	1.2
19.350	1.2
19.400	1.2
19.450	1.2
19.500	1.2
19.550	1.2
19.600	1.2
19.650	1.2
19.700	1.2
19.750	1.2
19.800	1.2
19.850	1.2

23.100	1.0
23.150	1.0
23.200	1.0
23.250	1.0
23.300	1.0
23.350	1.0
23.400	1.0
23.450	1.0
23.500	1.0
23.550	1.0
23.600	1.0
23.650	1.0
23.700	1.0
23.750	1.0
23.800	1.0
23.850	1.0
23.900	1.0
23.950	1.0
24.000	1.0
24.050	1.0
24.100	1.0
24.150	1.0
24.200	1.0
24.250	1.0
24.300	1.0
24.350	1.0
24.400	1.0
24.450	.9
24.500	.9
24.550	.9
24.600	.9
24.650	.8
24.700	.8
24.750	.7
24.800	.7
24.850	.7
24.900	.6
24.950	.6
25.000	.5
25.050	.5
25.100	.5
25.150	.4
25.200	.4
25.250	.4
25.300	.3
25.350	.3
25.400	.3
25.450	.3
25.500	.2

2.950	45.7	8.600	2.0	14.250	1.5	19.900	1.2	25.550	.2
3.000	43.2	8.650	2.0	14.300	1.5	19.950	1.2	25.600	.2
3.050	40.7	8.700	2.0	14.350	1.4	20.000	1.2	25.650	.2
3.100	38.3	8.750	2.0	14.400	1.4	20.050	1.2	25.700	.2
3.150	36.1	8.800	2.0	14.450	1.4	20.100	1.2	25.750	.1
3.200	33.9	8.850	2.0	14.500	1.4	20.150	1.2	25.800	.1
3.250	31.8	8.900	2.0	14.550	1.4	20.200	1.2	25.850	.1
3.300	29.9	8.950	2.0	14.600	1.4	20.250	1.1	25.900	.1
3.350	28.1	9.000	1.9	14.650	1.4	20.300	1.1	25.950	.1
3.400	26.4	9.050	1.9	14.700	1.4	20.350	1.1	26.000	.1
3.450	24.8	9.100	1.9	14.750	1.4	20.400	1.1	26.050	.1
3.500	23.4	9.150	1.9	14.800	1.4	20.450	1.1	26.100	.1
3.550	22.1	9.200	1.9	14.850	1.4	20.500	1.1	26.150	.1
3.600	20.8	9.250	1.9	14.900	1.4	20.550	1.1	26.200	.1
3.650	19.7	9.300	1.9	14.950	1.4	20.600	1.1	26.250	.1
3.700	18.7	9.350	1.9	15.000	1.4	20.650	1.1	26.300	.1
3.750	17.7	9.400	1.9	15.050	1.4	20.700	1.1	26.350	.1
3.800	16.8	9.450	1.9	15.100	1.4	20.750	1.1	26.400	.0
3.850	16.0	9.500	1.9	15.150	1.4	20.800	1.1	26.450	.0
3.900	15.2	9.550	1.9	15.200	1.4	20.850	1.1	26.500	.0
3.950	14.5	9.600	1.9	15.250	1.4	20.900	1.1	26.550	.0
4.000	13.8	9.650	1.9	15.300	1.4	20.950	1.1	26.600	.0
4.050	13.2	9.700	1.8	15.350	1.4	21.000	1.1	26.650	.0
4.100	12.6	9.750	1.8	15.400	1.4	21.050	1.1	26.700	.0
4.150	12.1	9.800	1.8	15.450	1.4	21.100	1.1	26.750	.0
4.200	11.5	9.850	1.8	15.500	1.4	21.150	1.1	26.800	.0
4.250	11.1	9.900	1.8	15.550	1.4	21.200	1.1	26.850	.0
4.300	10.7	9.950	1.8	15.600	1.4	21.250	1.1	26.900	.0
4.350	10.3	10.000	1.8	15.650	1.4	21.300	1.1	26.950	.0
4.400	9.9	10.050	1.8	15.700	1.4	21.350	1.1	27.000	.0
4.450	9.5	10.100	1.8	15.750	1.4	21.400	1.1	27.050	.0
4.500	9.2	10.150	1.8	15.800	1.4	21.450	1.1	27.100	.0
4.550	8.9	10.200	1.8	15.850	1.4	21.500	1.1	27.150	.0
4.600	8.6	10.250	1.8	15.900	1.4	21.550	1.1	27.200	.0
4.650	8.4	10.300	1.8	15.950	1.4	21.600	1.1	27.250	.0
4.700	8.1	10.350	1.8	16.000	1.3	21.650	1.1	27.300	.0
4.750	7.9	10.400	1.8	16.050	1.3	21.700	1.1	27.350	.0
4.800	7.7	10.450	1.8	16.100	1.3	21.750	1.1	27.400	.0
4.850	7.5	10.500	1.8	16.150	1.3	21.800	1.1	27.450	.0
4.900	7.3	10.550	1.8	16.200	1.3	21.850	1.1	27.500	.0
4.950	7.1	10.600	1.7	16.250	1.3	21.900	1.1	27.550	.0
5.000	6.9	10.650	1.7	16.300	1.3	21.950	1.1	27.600	.0
5.050	6.8	10.700	1.7	16.350	1.3	22.000	1.1	27.650	.0
5.100	6.6	10.750	1.7	16.400	1.3	22.050	1.1	27.700	.0
5.150	6.5	10.800	1.7	16.450	1.3	22.100	1.1	27.750	.0
5.200	6.3	10.850	1.7	16.500	1.3	22.150	1.1	27.800	.0
5.250	6.2	10.900	1.7	16.550	1.3	22.200	1.1	27.850	.0
5.300	6.1	10.950	1.7	16.600	1.3	22.250	1.1	27.900	.0
5.350	6.0	11.000	1.7	16.650	1.3	22.300	1.1	27.950	.0

5.400	5.9	11.050	1.7	16.700	1.3	22.350	1.1	28.000	.0
5.450	5.8	11.100	1.7	16.750	1.3	22.400	1.1	28.050	.0
5.500	5.7	11.150	1.7	16.800	1.3	22.450	1.1	28.100	.0
5.550	5.6	11.200	1.7	16.850	1.3	22.500	1.1		
5.600	5.5	11.250	1.7	16.900	1.3	22.550	1.1		

RUNOFF VOLUME = 1.25862 INCHES = 10.7715 ACRE-FEET
PEAK DISCHARGE RATE = 60.02 CFS AT 2.500 HOURS BASIN AREA = .1605 SQ. MI.

*S
*S END TEST 1 – BASIN T1 RESULTS
*S

*S $$
*S
*S BEGIN TEST 2 - BASIN T2
*S
COMPUTE HYD ID=2 HYD NO=FIC DT=0.0 DA=0.164844 SQ MI CN=90
K=0.0 TP=-0.83 MASSRAIN=-1

SCS Dimensionless unit hydrograph - TP = .830000 Hours
Runoff computed by SCS Curve Number Method - DT = .050000

PRINT HYD ID=2 CODE=0

HYDROGRAPH FROM AREA FIC

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
.000	.0	5.550	6.0	11.100	2.0	16.650	1.5	22.200	1.2
.050	.0	5.600	6.0	11.150	1.9	16.700	1.5	22.250	1.2
.100	.0	5.650	5.9	11.200	1.9	16.750	1.5	22.300	1.2
.150	.0	5.700	5.8	11.250	1.9	16.800	1.5	22.350	1.2
.200	.0	5.750	5.7	11.300	1.9	16.850	1.5	22.400	1.2
.250	.0	5.800	5.7	11.350	1.9	16.900	1.5	22.450	1.2
.300	.0	5.850	5.6	11.400	1.9	16.950	1.5	22.500	1.2
.350	.0	5.900	5.5	11.450	1.9	17.000	1.5	22.550	1.2
.400	.0	5.950	5.5	11.500	1.9	17.050	1.5	22.600	1.2
.450	.0	6.000	5.4	11.550	1.9	17.100	1.5	22.650	1.2
.500	.0	6.050	5.4	11.600	1.9	17.150	1.5	22.700	1.2
.550	.0	6.100	5.3	11.650	1.9	17.200	1.5	22.750	1.2
.600	.0	6.150	5.3	11.700	1.9	17.250	1.5	22.800	1.2
.650	.0	6.200	5.2	11.750	1.9	17.300	1.5	22.850	1.2
.700	.0	6.250	5.1	11.800	1.9	17.350	1.5	22.900	1.2
.750	.0	6.300	5.1	11.850	1.9	17.400	1.5	22.950	1.2
.800	.0	6.350	5.0	11.900	1.9	17.450	1.5	23.000	1.2
.850	.0	6.400	4.9	11.950	1.9	17.500	1.5	23.050	1.2

.900	.0
.950	.0
1.000	.0
1.050	.0
1.100	.0
1.150	.0
1.200	.0
1.250	.0
1.300	.2
1.350	.5
1.400	1.4
1.450	2.8
1.500	5.0
1.550	7.8
1.600	11.4
1.650	15.8
1.700	21.2
1.750	27.5
1.800	34.7
1.850	42.5
1.900	50.3
1.950	57.9
2.000	65.1
2.050	71.6
2.100	77.3
2.150	82.2
2.200	86.1
2.250	89.1
2.300	91.1
2.350	92.0
2.400	92.1
2.450	91.3
2.500	89.7
2.550	87.2
2.600	83.9
2.650	79.9
2.700	75.6
2.750	71.2
2.800	66.8
2.850	62.6
2.900	58.5
2.950	54.6
3.000	50.8
3.050	47.3
3.100	44.1
3.150	41.0
3.200	38.1
3.250	35.4
3.300	33.0

6.450	4.8
6.500	4.7
6.550	4.6
6.600	4.5
6.650	4.4
6.700	4.3
6.750	4.2
6.800	4.0
6.850	3.9
6.900	3.8
6.950	3.7
7.000	3.6
7.050	3.5
7.100	3.4
7.150	3.3
7.200	3.2
7.250	3.1
7.300	3.1
7.350	3.0
7.400	2.9
7.450	2.9
7.500	2.8
7.550	2.8
7.600	2.7
7.650	2.7
7.700	2.7
7.750	2.6
7.800	2.6
7.850	2.6
7.900	2.5
7.950	2.5
8.000	2.5
8.050	2.5
8.100	2.5
8.150	2.4
8.200	2.4
8.250	2.4
8.300	2.4
8.350	2.4
8.400	2.4
8.450	2.3
8.500	2.3
8.550	2.3
8.600	2.3
8.650	2.3
8.700	2.3
8.750	2.3
8.800	2.3
8.850	2.3

12.000	1.9
12.050	1.9
12.100	1.9
12.150	1.8
12.200	1.8
12.250	1.8
12.300	1.8
12.350	1.8
12.400	1.8
12.450	1.8
12.500	1.8
12.550	1.8
12.600	1.8
12.650	1.8
12.700	1.8
12.750	1.8
12.800	1.8
12.850	1.8
12.900	1.8
12.950	1.8
13.000	1.8
13.050	1.8
13.100	1.8
13.150	1.8
13.200	1.8
13.250	1.7
13.300	1.7
13.350	1.7
13.400	1.7
13.450	1.7
13.500	1.7
13.550	1.7
13.600	1.7
13.650	1.7
13.700	1.7
13.750	1.7
13.800	1.7
13.850	1.7
13.900	1.7
13.950	1.7
14.000	1.7
14.050	1.7
14.100	1.7
14.150	1.7
14.200	1.7
14.250	1.7
14.300	1.7
14.350	1.7
14.400	1.7

17.550	1.5
17.600	1.4
17.650	1.4
17.700	1.4
17.750	1.4
17.800	1.4
17.850	1.4
17.900	1.4
17.950	1.4
18.000	1.4
18.050	1.4
18.100	1.4
18.150	1.4
18.200	1.4
18.250	1.4
18.300	1.4
18.350	1.4
18.400	1.4
18.450	1.4
18.500	1.4
18.550	1.4
18.600	1.4
18.650	1.4
18.700	1.4
18.750	1.4
18.800	1.4
18.850	1.4
18.900	1.4
18.950	1.4
19.000	1.4
19.050	1.4
19.100	1.4
19.150	1.4
19.200	1.4
19.250	1.4
19.300	1.4
19.350	1.4
19.400	1.4
19.450	1.3
19.500	1.3
19.550	1.3
19.600	1.3
19.650	1.3
19.700	1.3
19.750	1.3
19.800	1.3
19.850	1.3
19.900	1.3
19.950	1.3

23.100	1.2
23.150	1.2
23.200	1.2
23.250	1.2
23.300	1.2
23.350	1.2
23.400	1.2
23.450	1.2
23.500	1.2
23.550	1.2
23.600	1.2
23.650	1.2
23.700	1.2
23.750	1.2
23.800	1.2
23.850	1.2
23.900	1.2
23.950	1.2
24.000	1.2
24.050	1.2
24.100	1.2
24.150	1.1
24.200	1.1
24.250	1.1
24.300	1.1
24.350	1.1
24.400	1.1
24.450	1.0
24.500	1.0
24.550	1.0
24.600	.9
24.650	.9
24.700	.8
24.750	.8
24.800	.7
24.850	.7
24.900	.6
24.950	.6
25.000	.5
25.050	.5
25.100	.4
25.150	.4
25.200	.4
25.250	.3
25.300	.3
25.350	.3
25.400	.2
25.450	.2
25.500	.2

3.350	30.8	8.900	2.2	14.450	1.7	20.000	1.3	25.550	.2
3.400	28.8	8.950	2.2	14.500	1.7	20.050	1.3	25.600	.2
3.450	27.0	9.000	2.2	14.550	1.6	20.100	1.3	25.650	.1
3.500	25.3	9.050	2.2	14.600	1.6	20.150	1.3	25.700	.1
3.550	23.8	9.100	2.2	14.650	1.6	20.200	1.3	25.750	.1
3.600	22.4	9.150	2.2	14.700	1.6	20.250	1.3	25.800	.1
3.650	21.1	9.200	2.2	14.750	1.6	20.300	1.3	25.850	.1
3.700	19.9	9.250	2.2	14.800	1.6	20.350	1.3	25.900	.1
3.750	18.8	9.300	2.2	14.850	1.6	20.400	1.3	25.950	.1
3.800	17.7	9.350	2.2	14.900	1.6	20.450	1.3	26.000	.1
3.850	16.8	9.400	2.2	14.950	1.6	20.500	1.3	26.050	.1
3.900	16.0	9.450	2.2	15.000	1.6	20.550	1.3	26.100	.1
3.950	15.2	9.500	2.1	15.050	1.6	20.600	1.3	26.150	.1
4.000	14.5	9.550	2.1	15.100	1.6	20.650	1.3	26.200	.0
4.050	13.8	9.600	2.1	15.150	1.6	20.700	1.3	26.250	.0
4.100	13.2	9.650	2.1	15.200	1.6	20.750	1.3	26.300	.0
4.150	12.6	9.700	2.1	15.250	1.6	20.800	1.3	26.350	.0
4.200	12.1	9.750	2.1	15.300	1.6	20.850	1.3	26.400	.0
4.250	11.7	9.800	2.1	15.350	1.6	20.900	1.3	26.450	.0
4.300	11.2	9.850	2.1	15.400	1.6	20.950	1.3	26.500	.0
4.350	10.8	9.900	2.1	15.450	1.6	21.000	1.3	26.550	.0
4.400	10.4	9.950	2.1	15.500	1.6	21.050	1.3	26.600	.0
4.450	10.1	10.000	2.1	15.550	1.6	21.100	1.3	26.650	.0
4.500	9.7	10.050	2.1	15.600	1.6	21.150	1.3	26.700	.0
4.550	9.4	10.100	2.1	15.650	1.6	21.200	1.3	26.750	.0
4.600	9.2	10.150	2.1	15.700	1.6	21.250	1.3	26.800	.0
4.650	8.9	10.200	2.1	15.750	1.6	21.300	1.3	26.850	.0
4.700	8.7	10.250	2.1	15.800	1.6	21.350	1.3	26.900	.0
4.750	8.4	10.300	2.0	15.850	1.6	21.400	1.3	26.950	.0
4.800	8.2	10.350	2.0	15.900	1.6	21.450	1.3	27.000	.0
4.850	8.0	10.400	2.0	15.950	1.5	21.500	1.3	27.050	.0
4.900	7.8	10.450	2.0	16.000	1.5	21.550	1.3	27.100	.0
4.950	7.7	10.500	2.0	16.050	1.5	21.600	1.3	27.150	.0
5.000	7.5	10.550	2.0	16.100	1.5	21.650	1.3	27.200	.0
5.050	7.3	10.600	2.0	16.150	1.5	21.700	1.2	27.250	.0
5.100	7.2	10.650	2.0	16.200	1.5	21.750	1.2	27.300	.0
5.150	7.1	10.700	2.0	16.250	1.5	21.800	1.2	27.350	.0
5.200	6.9	10.750	2.0	16.300	1.5	21.850	1.2	27.400	.0
5.250	6.8	10.800	2.0	16.350	1.5	21.900	1.2	27.450	.0
5.300	6.6	10.850	2.0	16.400	1.5	21.950	1.2	27.500	.0
5.350	6.5	10.900	2.0	16.450	1.5	22.000	1.2	27.550	.0
5.400	6.4	10.950	2.0	16.500	1.5	22.050	1.2	27.600	.0
5.450	6.3	11.000	2.0	16.550	1.5	22.100	1.2	27.650	.0
5.500	6.1	11.050	2.0	16.600	1.5	22.150	1.2	27.700	.0

RUNOFF VOLUME = 1.62052 INCHES = 14.2470 ACRE-FEET
PEAK DISCHARGE RATE = 92.12 CFS AT 2.400 HOURS BASIN AREA = .1648 SQ. MI.

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*S
*S END TEST 2 — BASIN T2 RESULTS
*S

*S  $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
*S
*S BEGIN TEST 3 - BASIN T3
*S
COMPUTE HYD          ID=3  HYD NO=SR  DT=0.0  DA=0.149531 SQ MI CN=79.8
                     K=0.0  TP=-0.24    MASSRAIN=-1

    SCS Dimensionless unit hydrograph - TP =   .240000 Hours
    Runoff computed by SCS Curve Number Method - DT =   .050000

PRINT HYD            ID=3   CODE=0
```

HYDROGRAPH FROM AREA SR

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
.000	.0	5.050	3.7	10.100	1.4	15.150	1.1	20.200	.9
.050	.0	5.100	3.7	10.150	1.4	15.200	1.1	20.250	.9
.100	.0	5.150	3.6	10.200	1.4	15.250	1.1	20.300	.9
.150	.0	5.200	3.6	10.250	1.4	15.300	1.1	20.350	.9
.200	.0	5.250	3.6	10.300	1.3	15.350	1.1	20.400	.9
.250	.0	5.300	3.5	10.350	1.3	15.400	1.1	20.450	.9
.300	.0	5.350	3.5	10.400	1.3	15.450	1.1	20.500	.9
.350	.0	5.400	3.5	10.450	1.3	15.500	1.1	20.550	.9
.400	.0	5.450	3.5	10.500	1.3	15.550	1.1	20.600	.9
.450	.0	5.500	3.4	10.550	1.3	15.600	1.1	20.650	.9
.500	.0	5.550	3.4	10.600	1.3	15.650	1.1	20.700	.9
.550	.0	5.600	3.4	10.650	1.3	15.700	1.1	20.750	.9
.600	.0	5.650	3.4	10.700	1.3	15.750	1.0	20.800	.9
.650	.0	5.700	3.3	10.750	1.3	15.800	1.0	20.850	.9
.700	.0	5.750	3.3	10.800	1.3	15.850	1.0	20.900	.9
.750	.0	5.800	3.3	10.850	1.3	15.900	1.0	20.950	.9
.800	.0	5.850	3.3	10.900	1.3	15.950	1.0	21.000	.9
.850	.0	5.900	3.3	10.950	1.3	16.000	1.0	21.050	.9
.900	.0	5.950	3.2	11.000	1.3	16.050	1.0	21.100	.9
.950	.0	6.000	3.2	11.050	1.3	16.100	1.0	21.150	.9
1.000	.0	6.050	3.2	11.100	1.3	16.150	1.0	21.200	.9
1.050	.0	6.100	3.1	11.150	1.3	16.200	1.0	21.250	.9
1.100	.0	6.150	2.9	11.200	1.3	16.250	1.0	21.300	.9
1.150	.0	6.200	2.7	11.250	1.3	16.300	1.0	21.350	.9
1.200	.0	6.250	2.4	11.300	1.3	16.350	1.0	21.400	.9
1.250	.0	6.300	2.2	11.350	1.3	16.400	1.0	21.450	.9
1.300	.0	6.350	2.1	11.400	1.3	16.450	1.0	21.500	.9
1.350	.6	6.400	2.0	11.450	1.3	16.500	1.0	21.550	.9

1.400	4.4	6.450	1.9	11.500	1.3	16.550	1.0	21.600	.9
1.450	14.3	6.500	1.8	11.550	1.3	16.600	1.0	21.650	.9
1.500	31.2	6.550	1.8	11.600	1.3	16.650	1.0	21.700	.9
1.550	50.9	6.600	1.7	11.650	1.3	16.700	1.0	21.750	.9
1.600	66.9	6.650	1.7	11.700	1.3	16.750	1.0	21.800	.9
1.650	76.6	6.700	1.7	11.750	1.3	16.800	1.0	21.850	.9
1.700	80.3	6.750	1.7	11.800	1.3	16.850	1.0	21.900	.9
1.750	79.1	6.800	1.7	11.850	1.2	16.900	1.0	21.950	.9
1.800	75.6	6.850	1.6	11.900	1.2	16.950	1.0	22.000	.9
1.850	72.0	6.900	1.6	11.950	1.2	17.000	1.0	22.050	.8
1.900	68.4	6.950	1.6	12.000	1.2	17.050	1.0	22.100	.8
1.950	64.8	7.000	1.6	12.050	1.2	17.100	1.0	22.150	.8
2.000	61.2	7.050	1.6	12.100	1.2	17.150	1.0	22.200	.8
2.050	57.2	7.100	1.6	12.150	1.2	17.200	1.0	22.250	.8
2.100	52.3	7.150	1.6	12.200	1.2	17.250	1.0	22.300	.8
2.150	46.0	7.200	1.6	12.250	1.2	17.300	1.0	22.350	.8
2.200	38.9	7.250	1.6	12.300	1.2	17.350	1.0	22.400	.8
2.250	31.9	7.300	1.6	12.350	1.2	17.400	1.0	22.450	.8
2.300	25.8	7.350	1.6	12.400	1.2	17.450	1.0	22.500	.8
2.350	20.9	7.400	1.6	12.450	1.2	17.500	1.0	22.550	.8
2.400	17.5	7.450	1.6	12.500	1.2	17.550	1.0	22.600	.8
2.450	14.9	7.500	1.6	12.550	1.2	17.600	1.0	22.650	.8
2.500	12.9	7.550	1.6	12.600	1.2	17.650	1.0	22.700	.8
2.550	11.4	7.600	1.6	12.650	1.2	17.700	1.0	22.750	.8
2.600	10.3	7.650	1.6	12.700	1.2	17.750	1.0	22.800	.8
2.650	9.4	7.700	1.6	12.750	1.2	17.800	1.0	22.850	.8
2.700	8.8	7.750	1.5	12.800	1.2	17.850	1.0	22.900	.8
2.750	8.2	7.800	1.5	12.850	1.2	17.900	1.0	22.950	.8
2.800	7.8	7.850	1.5	12.900	1.2	17.950	1.0	23.000	.8
2.850	7.4	7.900	1.5	12.950	1.2	18.000	1.0	23.050	.8
2.900	7.1	7.950	1.5	13.000	1.2	18.050	1.0	23.100	.8
2.950	6.9	8.000	1.5	13.050	1.2	18.100	1.0	23.150	.8
3.000	6.6	8.050	1.5	13.100	1.2	18.150	1.0	23.200	.8
3.050	6.4	8.100	1.5	13.150	1.2	18.200	1.0	23.250	.8
3.100	6.3	8.150	1.5	13.200	1.2	18.250	1.0	23.300	.8
3.150	6.1	8.200	1.5	13.250	1.2	18.300	1.0	23.350	.8
3.200	6.0	8.250	1.5	13.300	1.2	18.350	1.0	23.400	.8
3.250	5.9	8.300	1.5	13.350	1.2	18.400	1.0	23.450	.8
3.300	5.7	8.350	1.5	13.400	1.2	18.450	1.0	23.500	.8
3.350	5.6	8.400	1.5	13.450	1.2	18.500	1.0	23.550	.8
3.400	5.5	8.450	1.5	13.500	1.2	18.550	.9	23.600	.8
3.450	5.4	8.500	1.5	13.550	1.2	18.600	.9	23.650	.8
3.500	5.3	8.550	1.5	13.600	1.1	18.650	.9	23.700	.8
3.550	5.2	8.600	1.5	13.650	1.1	18.700	.9	23.750	.8
3.600	5.2	8.650	1.5	13.700	1.1	18.750	.9	23.800	.8
3.650	5.1	8.700	1.5	13.750	1.1	18.800	.9	23.850	.8
3.700	5.0	8.750	1.5	13.800	1.1	18.850	.9	23.900	.8
3.750	4.9	8.800	1.5	13.850	1.1	18.900	.9	23.950	.8
3.800	4.9	8.850	1.5	13.900	1.1	18.950	.9	24.000	.8

3.850	4.8	8.900	1.5	13.950	1.1	19.000	.9	24.050	.8
3.900	4.7	8.950	1.5	14.000	1.1	19.050	.9	24.100	.7
3.950	4.7	9.000	1.4	14.050	1.1	19.100	.9	24.150	.7
4.000	4.6	9.050	1.4	14.100	1.1	19.150	.9	24.200	.5
4.050	4.5	9.100	1.4	14.150	1.1	19.200	.9	24.250	.4
4.100	4.5	9.150	1.4	14.200	1.1	19.250	.9	24.300	.3
4.150	4.4	9.200	1.4	14.250	1.1	19.300	.9	24.350	.2
4.200	4.4	9.250	1.4	14.300	1.1	19.350	.9	24.400	.1
4.250	4.3	9.300	1.4	14.350	1.1	19.400	.9	24.450	.1
4.300	4.3	9.350	1.4	14.400	1.1	19.450	.9	24.500	.1
4.350	4.2	9.400	1.4	14.450	1.1	19.500	.9	24.550	.1
4.400	4.2	9.450	1.4	14.500	1.1	19.550	.9	24.600	.0
4.450	4.1	9.500	1.4	14.550	1.1	19.600	.9	24.650	.0
4.500	4.1	9.550	1.4	14.600	1.1	19.650	.9	24.700	.0
4.550	4.0	9.600	1.4	14.650	1.1	19.700	.9	24.750	.0
4.600	4.0	9.650	1.4	14.700	1.1	19.750	.9	24.800	.0
4.650	4.0	9.700	1.4	14.750	1.1	19.800	.9	24.850	.0
4.700	3.9	9.750	1.4	14.800	1.1	19.850	.9	24.900	.0
4.750	3.9	9.800	1.4	14.850	1.1	19.900	.9	24.950	.0
4.800	3.9	9.850	1.4	14.900	1.1	19.950	.9	25.000	.0
4.850	3.8	9.900	1.4	14.950	1.1	20.000	.9		
4.900	3.8	9.950	1.4	15.000	1.1	20.050	.9		
4.950	3.8	10.000	1.4	15.050	1.1	20.100	.9		
5.000	3.7	10.050	1.4	15.100	1.1	20.150	.9		

```
RUNOFF VOLUME =        .94782 INCHES     =       7.5588 ACRE-FEET
PEAK DISCHARGE RATE =       80.27 CFS  AT     1.700 HOURS    BASIN AREA =    .1495 SQ. MI.


*S
*S END TEST 3 - BASIN T3 RESULTS
*S

*S  $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
*S
*S BEGIN TEST 4 - BASIN T4
*S
COMPUTE HYD            ID=4  HYD NO=SIC  DT=0.0  DA=0.149531 SQ MI CN=86.75
                       K=0.0  TP=-0.22   MASSRAIN=-1

     SCS Dimensionless unit hydrograph - TP =    .220000 Hours
     Runoff computed by SCS Curve Number Method - DT =    .050000

PRINT HYD              ID=4    CODE=0
```

HYDROGRAPH FROM AREA SIC

TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW

HRS	CFS
.000	.0
.050	.0
.100	.0
.150	.0
.200	.0
.250	.0
.300	.0
.350	.0
.400	.0
.450	.0
.500	.0
.550	.0
.600	.0
.650	.0
.700	.0
.750	.0
.800	.0
.850	.0
.900	.0
.950	.0
1.000	.0
1.050	.0
1.100	.0
1.150	.0
1.200	.0
1.250	.1
1.300	1.3
1.350	6.6
1.400	21.9
1.450	50.8
1.500	88.5
1.550	122.3
1.600	141.0
1.650	144.5
1.700	137.4
1.750	125.9
1.800	115.0
1.850	105.6
1.900	97.2
1.950	89.6
2.000	82.9
2.050	75.9
2.100	67.9
2.150	57.9
2.200	47.3
2.250	37.7
2.300	29.9
2.350	24.2

HRS	CFS
5.000	4.6
5.050	4.6
5.100	4.5
5.150	4.5
5.200	4.5
5.250	4.4
5.300	4.4
5.350	4.4
5.400	4.3
5.450	4.3
5.500	4.2
5.550	4.2
5.600	4.2
5.650	4.1
5.700	4.1
5.750	4.1
5.800	4.1
5.850	4.0
5.900	4.0
5.950	4.0
6.000	4.0
6.050	3.9
6.100	3.7
6.150	3.5
6.200	3.2
6.250	2.9
6.300	2.6
6.350	2.5
6.400	2.3
6.450	2.3
6.500	2.2
6.550	2.2
6.600	2.1
6.650	2.1
6.700	2.1
6.750	2.0
6.800	2.0
6.850	2.0
6.900	2.0
6.950	2.0
7.000	2.0
7.050	2.0
7.100	2.0
7.150	2.0
7.200	2.0
7.250	2.0
7.300	2.0
7.350	2.0

HRS	CFS
10.000	1.7
10.050	1.7
10.100	1.7
10.150	1.7
10.200	1.7
10.250	1.7
10.300	1.6
10.350	1.6
10.400	1.6
10.450	1.6
10.500	1.6
10.550	1.6
10.600	1.6
10.650	1.6
10.700	1.6
10.750	1.6
10.800	1.6
10.850	1.6
10.900	1.6
10.950	1.6
11.000	1.6
11.050	1.6
11.100	1.6
11.150	1.6
11.200	1.6
11.250	1.6
11.300	1.6
11.350	1.6
11.400	1.6
11.450	1.5
11.500	1.5
11.550	1.5
11.600	1.5
11.650	1.5
11.700	1.5
11.750	1.5
11.800	1.5
11.850	1.5
11.900	1.5
11.950	1.5
12.000	1.5
12.050	1.5
12.100	1.5
12.150	1.5
12.200	1.5
12.250	1.5
12.300	1.5
12.350	1.5

HRS	CFS
15.000	1.3
15.050	1.3
15.100	1.3
15.150	1.3
15.200	1.3
15.250	1.3
15.300	1.3
15.350	1.3
15.400	1.3
15.450	1.3
15.500	1.3
15.550	1.3
15.600	1.3
15.650	1.3
15.700	1.3
15.750	1.3
15.800	1.3
15.850	1.3
15.900	1.3
15.950	1.3
16.000	1.3
16.050	1.3
16.100	1.3
16.150	1.3
16.200	1.3
16.250	1.2
16.300	1.2
16.350	1.2
16.400	1.2
16.450	1.2
16.500	1.2
16.550	1.2
16.600	1.2
16.650	1.2
16.700	1.2
16.750	1.2
16.800	1.2
16.850	1.2
16.900	1.2
16.950	1.2
17.000	1.2
17.050	1.2
17.100	1.2
17.150	1.2
17.200	1.2
17.250	1.2
17.300	1.2
17.350	1.2

HRS	CFS
20.000	1.1
20.050	1.1
20.100	1.1
20.150	1.1
20.200	1.1
20.250	1.1
20.300	1.1
20.350	1.1
20.400	1.1
20.450	1.1
20.500	1.1
20.550	1.1
20.600	1.1
20.650	1.1
20.700	1.1
20.750	1.1
20.800	1.1
20.850	1.1
20.900	1.1
20.950	1.1
21.000	1.1
21.050	1.1
21.100	1.1
21.150	1.1
21.200	1.1
21.250	1.0
21.300	1.0
21.350	1.0
21.400	1.0
21.450	1.0
21.500	1.0
21.550	1.0
21.600	1.0
21.650	1.0
21.700	1.0
21.750	1.0
21.800	1.0
21.850	1.0
21.900	1.0
21.950	1.0
22.000	1.0
22.050	1.0
22.100	1.0
22.150	1.0
22.200	1.0
22.250	1.0
22.300	1.0
22.350	1.0

2.400	20.1	7.400	1.9	12.400	1.5	17.400	1.2	22.400	1.0
2.450	17.1	7.450	1.9	12.450	1.5	17.450	1.2	22.450	1.0
2.500	14.9	7.500	1.9	12.500	1.5	17.500	1.2	22.500	1.0
2.550	13.4	7.550	1.9	12.550	1.5	17.550	1.2	22.550	1.0
2.600	12.2	7.600	1.9	12.600	1.5	17.600	1.2	22.600	1.0
2.650	11.3	7.650	1.9	12.650	1.5	17.650	1.2	22.650	1.0
2.700	10.6	7.700	1.9	12.700	1.4	17.700	1.2	22.700	1.0
2.750	10.0	7.750	1.9	12.750	1.4	17.750	1.2	22.750	1.0
2.800	9.5	7.800	1.9	12.800	1.4	17.800	1.2	22.800	1.0
2.850	9.1	7.850	1.9	12.850	1.4	17.850	1.2	22.850	1.0
2.900	8.8	7.900	1.9	12.900	1.4	17.900	1.2	22.900	1.0
2.950	8.5	7.950	1.9	12.950	1.4	17.950	1.2	22.950	1.0
3.000	8.3	8.000	1.9	13.000	1.4	18.000	1.2	23.000	1.0
3.050	8.0	8.050	1.9	13.050	1.4	18.050	1.2	23.050	1.0
3.100	7.8	8.100	1.9	13.100	1.4	18.100	1.2	23.100	1.0
3.150	7.7	8.150	1.9	13.150	1.4	18.150	1.2	23.150	1.0
3.200	7.5	8.200	1.9	13.200	1.4	18.200	1.2	23.200	1.0
3.250	7.3	8.250	1.9	13.250	1.4	18.250	1.2	23.250	1.0
3.300	7.2	8.300	1.9	13.300	1.4	18.300	1.2	23.300	1.0
3.350	7.1	8.350	1.8	13.350	1.4	18.350	1.2	23.350	1.0
3.400	6.9	8.400	1.8	13.400	1.4	18.400	1.2	23.400	1.0
3.450	6.8	8.450	1.8	13.450	1.4	18.450	1.2	23.450	1.0
3.500	6.7	8.500	1.8	13.500	1.4	18.500	1.1	23.500	1.0
3.550	6.6	8.550	1.8	13.550	1.4	18.550	1.1	23.550	1.0
3.600	6.4	8.600	1.8	13.600	1.4	18.600	1.1	23.600	1.0
3.650	6.3	8.650	1.8	13.650	1.4	18.650	1.1	23.650	1.0
3.700	6.2	8.700	1.8	13.700	1.4	18.700	1.1	23.700	1.0
3.750	6.1	8.750	1.8	13.750	1.4	18.750	1.1	23.750	1.0
3.800	6.1	8.800	1.8	13.800	1.4	18.800	1.1	23.800	1.0
3.850	6.0	8.850	1.8	13.850	1.4	18.850	1.1	23.850	1.0
3.900	5.9	8.900	1.8	13.900	1.4	18.900	1.1	23.900	.9
3.950	5.8	8.950	1.8	13.950	1.4	18.950	1.1	23.950	.9
4.000	5.7	9.000	1.8	14.000	1.4	19.000	1.1	24.000	1.0
4.050	5.7	9.050	1.8	14.050	1.4	19.050	1.1	24.050	.9
4.100	5.6	9.100	1.8	14.100	1.4	19.100	1.1	24.100	.9
4.150	5.5	9.150	1.7	14.150	1.4	19.150	1.1	24.150	.7
4.200	5.4	9.200	1.7	14.200	1.4	19.200	1.1	24.200	.6
4.250	5.4	9.250	1.7	14.250	1.3	19.250	1.1	24.250	.4
4.300	5.3	9.300	1.7	14.300	1.3	19.300	1.1	24.300	.3
4.350	5.3	9.350	1.7	14.350	1.3	19.350	1.1	24.350	.2
4.400	5.2	9.400	1.7	14.400	1.3	19.400	1.1	24.400	.1
4.450	5.1	9.450	1.7	14.450	1.3	19.450	1.1	24.450	.1
4.500	5.1	9.500	1.7	14.500	1.3	19.500	1.1	24.500	.1
4.550	5.0	9.550	1.7	14.550	1.3	19.550	1.1	24.550	.0
4.600	5.0	9.600	1.7	14.600	1.3	19.600	1.1	24.600	.0
4.650	4.9	9.650	1.7	14.650	1.3	19.650	1.1	24.650	.0
4.700	4.9	9.700	1.7	14.700	1.3	19.700	1.1	24.700	.0
4.750	4.9	9.750	1.7	14.750	1.3	19.750	1.1	24.750	.0
4.800	4.8	9.800	1.7	14.800	1.3	19.800	1.1	24.800	.0

4.850	4.8	9.850	1.7	14.850	1.3	19.850	1.1	24.850	.0
4.900	4.7	9.900	1.7	14.900	1.3	19.900	1.1	24.900	.0
4.950	4.7	9.950	1.7	14.950	1.3	19.950	1.1	24.950	.0

RUNOFF VOLUME = 1.37754 INCHES = 10.9858 ACRE-FEET
PEAK DISCHARGE RATE = 144.52 CFS AT 1.650 HOURS BASIN AREA = .1495 SQ. MI.

*S
*S END TEST 4 – BASIN T4 RESULTS
*S
FINISH

NORMAL PROGRAM FINISH END TIME (HR:MIN:SEC) = 08:28:21

SWMM SUMMARY TABLES (a)

(100-yr. 24-hour storm)

for:

Runoff Curve Number Method

"Initial Run" and Runs 1 – 10

(a) For 4 Generic Basin Types as follows:

1. Flat 100% Residential
2. Flat 50% commercial / 50% industrial
3. Steep 100% Residential
4. Steep 50% commercial / 50% industrial

INITIAL RUN

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

INITIAL RUN (IR)

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)
--------------------------------------------------------------

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011
Results printed on 2-3-2011  %IMP=0 D-IMP and D-PER=0
Rain Time Interval adjusted at 0:03

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ..............  CFS
Process Models:
  Rainfall/Runoff .......  YES
  Snowmelt ..............  NO
  Groundwater ...........  NO
  Flow Routing ..........  YES
  Ponding Allowed .......  YES
  Water Quality .........  NO
Infiltration Method .....  CURVE_NUMBER
Flow Routing Method .....  DYNWAVE
Starting Date ...........  DEC-24-2010 00:00:00
Ending Date .............  DEC-28-2010 23:00:00
Antecedent Dry Days .....  0.0
Report Time Step ........  00:05:00
Wet Time Step ...........  00:03:00
Dry Time Step ...........  01:00:00
Routing Time Step .......  5.00 sec


*************
Element Count
*************
Number of rain gages ......  1
Number of subcatchments ...  4
Number of nodes ...........  8
Number of links ...........  4
Number of pollutants ......  0
Number of land uses .......  0


****************
Raingage Summary
****************

Name                 Data Source          Data Type       Recording Interval
-------------------------------------------------------------------------
R1                   Rain                 CUMULATIVE      3 min.


******************
Subcatchment Summary
******************
Name                            Area     Width     %Imperv     %Slope     Rain Gage            Outlet
-------------------------------------------------------------------------------------------------------
B1                            102.70   2060.00        0.00      0.0958     R1                   MH1
B2                            105.50   2050.00        0.00      0.1178     R1                   MH2
B3                             95.70   2020.00        0.00      1.5769     R1                   MH3
B4                             95.70   2020.00        0.00      1.5769     R1                   MH4


************
Node Summary
************

Name                 Type                 Invert Elev.     Max. Depth     Ponded Area     External Inflow
-------------------------------------------------------------------------------------------------------
MH1                  JUNCTION                 5000.00          10.00           0.0
MH2                  JUNCTION                 5000.00          10.00           0.0
MH3                  JUNCTION                 5000.00          10.00           0.0
```

MH4	JUNCTION	5000.00	10.00	0.0
O1	OUTFALL	4994.00	3.00	0.0
O2	OUTFALL	4994.00	3.00	0.0
O3	OUTFALL	4994.00	3.00	0.0
O4	OUTFALL	4994.00	3.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
P1	MH1	O1	CONDUIT	400.0	1.5002	0.0130
P2	MH2	O2	CONDUIT	400.0	1.5002	0.0130
P3	MH3	O3	CONDUIT	400.0	1.5002	0.0130
P4	MH4	O4	CONDUIT	400.0	1.5002	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
P1	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P2	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P3	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P4	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69

****
Control Actions Taken
****

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Total Precipitation	86.580	2.600
Evaporation Loss	0.000	0.000
Infiltration Loss	35.712	1.072
Surface Runoff	50.122	1.505
Final Surface Storage	0.749	0.023
Continuity Error (%)	-0.005	

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	50.122	16.333
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	50.121	16.333
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.001	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****

IR

Routing Time Step Summary
****
Minimum Time Step : 5.00 sec
Average Time Step : 5.00 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
B1	2.60	0.00	0.00	1.19	1.37	3.82	6.81	0.527
B2	2.60	0.00	0.00	0.84	1.73	4.96	14.96	0.666
B3	2.60	0.00	0.00	1.32	1.27	3.31	16.88	0.490
B4	2.60	0.00	0.00	0.96	1.63	4.24	36.19	0.627

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
MH1	JUNCTION	0.19	0.59	5000.59	0 03:27
MH2	JUNCTION	0.20	0.87	5000.87	0 02:12
MH3	JUNCTION	0.15	0.93	5000.93	0 02:03
MH4	JUNCTION	0.15	1.40	5001.40	0 02:03
O1	OUTFALL	0.19	0.59	4994.59	0 03:27
O2	OUTFALL	0.19	0.87	4994.87	0 02:26
O3	OUTFALL	0.13	0.93	4994.93	0 02:03
O4	OUTFALL	0.14	1.40	4995.40	0 02:03

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
MH1	JUNCTION	6.81	6.81	0 03:27	3.821	3.821
MH2	JUNCTION	14.96	14.96	0 02:12	4.963	4.963
MH3	JUNCTION	16.88	16.88	0 02:03	3.312	3.312
MH4	JUNCTION	36.19	36.19	0 02:03	4.236	4.236
O1	OUTFALL	0.00	6.81	0 03:27	0.000	3.821
O2	OUTFALL	0.00	14.96	0 02:12	0.000	4.963
O3	OUTFALL	0.00	16.89	0 02:03	0.000	3.312
O4	OUTFALL	0.00	36.18	0 02:03	0.000	4.236

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
O1	99.36	1.20	6.81	3.821
O2	99.51	1.56	14.96	4.963
O3	99.46	1.04	16.89	3.312
O4	99.59	1.33	36.18	4.236
System	99.48	5.12	74.34	16.331

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
P1	CONDUIT	6.81	0 03:27	7.01	0.08	0.20
P2	CONDUIT	14.96	0 02:12	8.80	0.18	0.29
P3	CONDUIT	16.89	0 02:03	9.10	0.21	0.31
P4	CONDUIT	36.18	0 02:03	11.20	0.44	0.47

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	--- Fraction of Time in Flow Class ---- Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
P1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.73	0.0000
P2	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.73	0.0000
P3	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P4	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.72	0.0000

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Feb 03 15:33:13 2011
Analysis ended on: Thu Feb 03 15:33:15 2011
Total elapsed time: 00:00:02

RUN #1

R#1

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011
Results printed on 2-3-2011 %IMP=0 D-IMP and D-PER=/0
Rain Time Interval adjusted at 0:03

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

```
****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ DEC-24-2010 00:00:00
Ending Date .............. DEC-28-2010 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:03:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 5.00 sec

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 4
Number of nodes ........... 8
Number of links ........... 4
Number of pollutants ...... 0
Number of land uses ....... 0
```

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
R1	Rain	CUMULATIVE	3 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
B1	102.70	2060.00	0.00	0.0958	R1	MH1
B2	105.50	2050.00	0.00	0.1178	R1	MH2
B3	95.70	2020.00	0.00	1.5769	R1	MH3
B4	95.70	2020.00	0.00	1.5769	R1	MH4

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
MH1	JUNCTION	5000.00	10.00	0.0	
MH2	JUNCTION	5000.00	10.00	0.0	
MH3	JUNCTION	5000.00	10.00	0.0	

MH4	JUNCTION	5000.00	10.00	0.0
O1	OUTFALL	4994.00	3.00	0.0
O2	OUTFALL	4994.00	3.00	0.0
O3	OUTFALL	4994.00	3.00	0.0
O4	OUTFALL	4994.00	3.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
P1	MH1	O1	CONDUIT	400.0	1.5002	0.0130
P2	MH2	O2	CONDUIT	400.0	1.5002	0.0130
P3	MH3	O3	CONDUIT	400.0	1.5002	0.0130
P4	MH4	O4	CONDUIT	400.0	1.5002	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
P1	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P2	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P3	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P4	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69

****
Control Actions Taken
****

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Total Precipitation	86.580	2.600
Evaporation Loss	0.000	0.000
Infiltration Loss	39.477	1.186
Surface Runoff	27.646	0.830
Final Surface Storage	19.457	0.584
Continuity Error (%)	-0.001	

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	27.646	9.009
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	27.646	9.009
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

R#1

Routing Time Step Summary
****

Minimum Time Step	:	5.00 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
B1	2.60	0.00	0.00	1.24	0.73	2.02	2.42	0.279
B2	2.60	0.00	0.00	0.88	0.94	2.71	4.67	0.363
B3	2.60	0.00	0.00	1.55	0.74	1.93	5.35	0.286
B4	2.60	0.00	0.00	1.10	0.90	2.35	9.16	0.347

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
MH1	JUNCTION	0.15	0.35	5000.35	0 06:03
MH2	JUNCTION	0.16	0.49	5000.49	0 06:00
MH3	JUNCTION	0.10	0.52	5000.52	0 03:34
MH4	JUNCTION	0.10	0.68	5000.68	0 02:42
O1	OUTFALL	0.14	0.35	4994.35	0 06:03
O2	OUTFALL	0.15	0.49	4994.49	0 06:00
O3	OUTFALL	0.10	0.52	4994.52	0 03:34
O4	OUTFALL	0.10	0.68	4994.68	0 02:42

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
MH1	JUNCTION	2.42	2.42	0 06:03	2.023	2.023
MH2	JUNCTION	4.67	4.67	0 06:00	2.706	2.706
MH3	JUNCTION	5.35	5.35	0 03:33	1.934	1.934
MH4	JUNCTION	9.16	9.16	0 02:42	2.346	2.346
O1	OUTFALL	0.00	2.42	0 06:03	0.000	2.023
O2	OUTFALL	0.00	4.67	0 06:00	0.000	2.706
O3	OUTFALL	0.00	5.35	0 03:34	0.000	1.934
O4	OUTFALL	0.00	9.16	0 02:42	0.000	2.346

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

Fort-1

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
O1	90.98	0.69	2.42	2.023
O2	91.83	0.92	4.67	2.706
O3	41.96	1.44	5.35	1.934
O4	43.44	1.69	9.16	2.346
System	67.05	4.74	20.29	9.008

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
P1	CONDUIT	2.42	0 06:03	5.16	0.03	0.12
P2	CONDUIT	4.67	0 06:00	6.26	0.06	0.16
P3	CONDUIT	5.35	0 03:34	6.49	0.07	0.17
P4	CONDUIT	9.16	0 02:42	7.63	0.11	0.23

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
P1	1.00	0.01	0.00	0.00	0.06	0.93	0.00	0.00	1.55	0.0000
P2	1.00	0.01	0.00	0.00	0.05	0.94	0.00	0.00	1.58	0.0000
P3	1.00	0.01	0.00	0.00	0.56	0.42	0.00	0.00	0.73	0.0000
P4	1.00	0.01	0.00	0.00	0.55	0.44	0.00	0.00	0.76	0.0000

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Feb 03 15:36:40 2011
Analysis ended on: Thu Feb 03 15:36:42 2011
Total elapsed time: 00:00:02

RUN #2

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

R #2

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)
--------------------------------------------------------------

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011
Results printed on 2-3-2011  %IMP=0 D-IMP and D-PER=0 Low CN
Rain Time Interval adjusted at 0:03

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ..................... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ DEC-24-2010 00:00:00
Ending Date .............. DEC-28-2010 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:03:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 5.00 sec

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 4
Number of nodes ........... 8
Number of links ........... 4
Number of pollutants ...... 0
Number of land uses ....... 0

****************
Raingage Summary
****************

Name            Data Source          Data Type       Recording Interval
-----------------------------------------------------------------------
R1              Rain                 CUMULATIVE      3 min.

*******************
Subcatchment Summary
*******************
Name                  Area     Width     %Imperv     %Slope     Rain Gage            Outlet
-----------------------------------------------------------------------------------------------
B1                   102.70   2060.00       56.00     0.0958     R1                   MH1
B2                   105.50   2050.00       80.00     0.1178     R1                   MH2
B3                    95.70   2020.00       56.00     1.5769     R1                   MH3
B4                    95.70   2020.00       80.00     1.5769     R1                   MH4

************
Node Summary
************

Name            Type            Invert Elev.     Max. Depth     Ponded Area     External Inflow
-------------------------------------------------------------------------------------------------
MH1             JUNCTION             5000.00          10.00             0.0
MH2             JUNCTION             5000.00          10.00             0.0
MH3             JUNCTION             5000.00          10.00             0.0
```

MH4	JUNCTION	5000.00	10.00	0.0	
O1	OUTFALL	4994.00	3.00	0.0	
O2	OUTFALL	4994.00	3.00	0.0	
O3	OUTFALL	4994.00	3.00	0.0	
O4	OUTFALL	4994.00	3.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
P1	MH1	O1	CONDUIT	400.0	1.5002	0.0130
P2	MH2	O2	CONDUIT	400.0	1.5002	0.0130
P3	MH3	O3	CONDUIT	400.0	1.5002	0.0130
P4	MH4	O4	CONDUIT	400.0	1.5002	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
P1	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P2	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P3	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P4	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69

****
Control Actions Taken
****

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Total Precipitation	86.580	2.600
Evaporation Loss	0.000	0.000
Infiltration Loss	22.069	0.663
Surface Runoff	64.469	1.936
Final Surface Storage	0.098	0.003
Continuity Error (%)	-0.065	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	64.469	21.008
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	60.511	19.718
Internal Outflow	3.957	1.289
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.002	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****

R#2

Routing Time Step Summary
****

Minimum Time Step	:	5.00 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.02

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
B1	2.60	0.00	0.00	0.94	1.65	4.60	109.35	0.635
B2	2.60	0.00	0.00	0.41	2.19	6.27	135.73	0.841
B3	2.60	0.00	0.00	0.90	1.70	4.43	212.94	0.655
B4	2.60	0.00	0.00	0.41	2.20	5.71	266.71	0.845

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
MH1	JUNCTION	0.15	7.77	5007.77	0 01:33
MH2	JUNCTION	0.18	10.00	5010.00	0 01:29
MH3	JUNCTION	0.14	10.00	5010.00	0 01:24
MH4	JUNCTION	0.15	10.00	5010.00	0 01:23
O1	OUTFALL	0.12	3.00	4997.00	0 01:28
O2	OUTFALL	0.13	3.00	4997.00	0 01:27
O3	OUTFALL	0.10	3.00	4997.00	0 01:22
O4	OUTFALL	0.11	3.00	4997.00	0 01:22

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
MH1	JUNCTION	109.35	109.35	0 01:33	4.604	4.604
MH2	JUNCTION	135.73	135.73	0 01:36	6.267	6.267
MH3	JUNCTION	212.84	212.84	0 01:30	4.428	4.428
MH4	JUNCTION	266.63	266.63	0 01:30	5.708	5.708
O1	OUTFALL	0.00	109.34	0 01:33	0.000	4.603
O2	OUTFALL	0.00	120.24	0 01:34	0.000	6.153
O3	OUTFALL	0.00	120.24	0 01:29	0.000	4.090
O4	OUTFALL	0.00	120.24	0 01:28	0.000	4.870

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
MH1	JUNCTION	0.46	4.772	2.228
MH2	JUNCTION	0.75	7.000	0.000
MH3	JUNCTION	0.46	7.000	0.000

MH4	JUNCTION	0.70	7.000	0.000

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Depth Feet
MH2	0.41	15.48	0 01:36	0.113	10.00
MH3	0.28	92.32	0 01:30	0.338	10.00
MH4	0.48	145.97	0 01:30	0.838	10.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
O1	99.95	1.44	109.34	4.603
O2	99.95	1.92	120.24	6.153
O3	99.95	1.28	120.24	4.090
O4	71.31	2.13	120.24	4.870
System	92.79	6.77	470.07	19.717

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
P1	CONDUIT	109.34	0 01:33	15.47	1.34	1.00
P2	CONDUIT	120.24	0 01:34	17.01	1.47	1.00
P3	CONDUIT	120.24	0 01:29	17.01	1.47	1.00
P4	CONDUIT	120.24	0 01:28	17.01	1.47	1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
P1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.73	0.0000
P2	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	1.63	0.0000
P3	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.60	0.0000
P4	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	1.42	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
P1	0.30	0.30	0.30	0.51	0.30

P2	0.66	0.66	0.66	0.78	0.66
P3	0.39	0.39	0.39	0.49	0.39
P4	0.63	0.63	0.64	0.72	0.63

B#2

Analysis begun on: Thu Feb 03 17:05:22 2011
Analysis ended on: Thu Feb 03 17:05:24 2011
Total elapsed time: 00:00:02

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

R#3

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)
--------------------------------------------------------------

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011
Results printed on 2-4-2011  %IMP=0 D-IMP and D-PER=/0 Low CN
Rain Time Interval adjusted at 0:03

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date ..... DEC-24-2010 00:00:00
Ending Date ..... DEC-28-2010 23:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:05:00
Wet Time Step ..... 00:03:00
Dry Time Step ..... 01:00:00
Routing Time Step ..... 5.00 sec


*************
Element Count
*************
Number of rain gages ..... 1
Number of subcatchments ... 4
Number of nodes ..... 8
Number of links ..... 4
Number of pollutants ..... 0
Number of land uses ..... 0


****************
Raingage Summary
****************

Name                 Data Source          Data Type       Recording Interval
-----------------------------------------------------------------------------
R1                   Rain                 CUMULATIVE      3 min.


*********************
Subcatchment Summary
*********************
Name                            Area     Width   %Imperv   %Slope Rain Gage  Outlet
-----------------------------------------------------------------------------------
B1                            102.70   2060.00     56.00    0.0958 R1         MH1
B2                            105.50   2050.00     80.00    0.1178 R1         MH2
B3                             95.70   2020.00     56.00    1.5769 R1         MH3
B4                             95.70   2020.00     80.00    1.5769 R1         MH4


************
Node Summary
************

Name                 Type                 Invert Elev.    Max. Depth   Ponded Area   External Inflow
-----------------------------------------------------------------------------------------------------
MH1                  JUNCTION                  5000.00         10.00           0.0
MH2                  JUNCTION                  5000.00         10.00           0.0
MH3                  JUNCTION                  5000.00         10.00           0.0
```

A.3

MH4	JUNCTION	5000.00	10.00	0.0
O1	OUTFALL	4994.00	3.00	0.0
O2	OUTFALL	4994.00	3.00	0.0
O3	OUTFALL	4994.00	3.00	0.0
O4	OUTFALL	4994.00	3.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
P1	MH1	O1	CONDUIT	400.0	1.5002	0.0130
P2	MH2	O2	CONDUIT	400.0	1.5002	0.0130
P3	MH3	O3	CONDUIT	400.0	1.5002	0.0130
P4	MH4	O4	CONDUIT	400.0	1.5002	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
P1	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P2	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P3	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P4	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69

****
Control Actions Taken
****

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Total Precipitation	86.580	2.600
Evaporation Loss	0.000	0.000
Infiltration Loss	22.069	0.663
Surface Runoff	64.446	1.935
Final Surface Storage	0.121	0.004
Continuity Error (%)	-0.065	

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	64.446	21.001
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	60.492	19.712
Internal Outflow	3.953	1.288
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.002	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****

R#3

Routing Time Step Summary
****

Minimum Time Step	:	5.00 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.02

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
B1	2.60	0.00	0.00	0.94	1.65	4.60	109.29	0.635
B2	2.60	0.00	0.00	0.41	2.19	6.26	135.65	0.841
B3	2.60	0.00	0.00	0.90	1.70	4.43	212.91	0.655
B4	2.60	0.00	0.00	0.41	2.20	5.71	266.66	0.845

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
MH1	JUNCTION	0.15	7.76	5007.76	0 01:33
MH2	JUNCTION	0.18	10.00	5010.00	0 01:29
MH3	JUNCTION	0.14	10.00	5010.00	0 01:24
MH4	JUNCTION	0.15	10.00	5010.00	0 01:23
O1	OUTFALL	0.12	3.00	4997.00	0 01:28
O2	OUTFALL	0.13	3.00	4997.00	0 01:27
O3	OUTFALL	0.10	3.00	4997.00	0 01:22
O4	OUTFALL	0.11	3.00	4997.00	0 01:22

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
MH1	JUNCTION	109.29	109.29	0 01:33	4.602	4.602
MH2	JUNCTION	135.65	135.65	0 01:36	6.264	6.264
MH3	JUNCTION	212.82	212.82	0 01:30	4.427	4.427
MH4	JUNCTION	266.57	266.57	0 01:30	5.706	5.706
O1	OUTFALL	0.00	109.28	0 01:33	0.000	4.602
O2	OUTFALL	0.00	120.24	0 01:34	0.000	6.151
O3	OUTFALL	0.00	120.24	0 01:29	0.000	4.089
O4	OUTFALL	0.00	120.24	0 01:28	0.000	4.868

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
MH1	JUNCTION	0.46	4.760	2.240
MH2	JUNCTION	0.75	7.000	0.000
MH3	JUNCTION	0.46	7.000	0.000

MH4	JUNCTION	0.70	7.000	0.000

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Depth Feet
MH2	0.41	15.40	0 01:36	0.113	10.00
MH3	0.28	92.30	0 01:30	0.338	10.00
MH4	0.48	145.92	0 01:30	0.838	10.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
O1	99.95	1.44	109.28	4.602
O2	99.95	1.92	120.24	6.151
O3	99.95	1.28	120.24	4.089
O4	71.31	2.13	120.24	4.868
System	92.79	6.76	470.01	19.711

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
P1	CONDUIT	109.28	0 01:33	15.46	1.34	1.00
P2	CONDUIT	120.24	0 01:34	17.01	1.47	1.00
P3	CONDUIT	120.24	0 01:29	17.01	1.47	1.00
P4	CONDUIT	120.24	0 01:28	17.01	1.47	1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
P1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.73	0.0000
P2	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	1.63	0.0000
P3	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.60	0.0000
P4	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	1.42	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
P1	0.30	0.30	0.30	0.51	0.30

P2	0.66	0.66	0.66	0.78	0.66
P3	0.39	0.39	0.39	0.49	0.39
P4	0.64	0.64	0.64	0.72	0.64

R#3

Analysis begun on: Fri Feb 04 09:39:30 2011
Analysis ended on: Fri Feb 04 09:39:32 2011
Total elapsed time: 00:00:02

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

R#4

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)
--------------------------------------------------------------

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011
Results printed on 2-4-2011  Run #4
Rain Time Interval adjusted at 0:03

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ..............  CFS
Process Models:
  Rainfall/Runoff .......  YES
  Snowmelt ..............  NO
  Groundwater ...........  NO
  Flow Routing ..........  YES
  Ponding Allowed .......  YES
  Water Quality .........  NO
Infiltration Method .....  CURVE_NUMBER
Flow Routing Method .....  DYNWAVE
Starting Date ...........  DEC-24-2010 00:00:00
Ending Date .............  DEC-28-2010 23:00:00
Antecedent Dry Days .....  0.0
Report Time Step ........  00:05:00
Wet Time Step ...........  00:03:00
Dry Time Step ...........  01:00:00
Routing Time Step .......  5.00 sec


*************
Element Count
*************
Number of rain gages ....  1
Number of subcatchments ...  4
Number of nodes .........  8
Number of links .........  4
Number of pollutants ....  0
Number of land uses .....  0


****************
Raingage Summary
****************

Name                 Data Source          Data Type       Recording Interval
----------------------------------------------------------------------------
R1                   Rain                 CUMULATIVE      3 min.


*********************
Subcatchment Summary
*********************
Name                            Area     Width   %Imperv   %Slope Rain Gage  Outlet
----------------------------------------------------------------------------------
B1                            102.70   2060.00     56.00    0.0958 R1         MH1
B2                            105.50   2050.00     80.00    0.1178 R1         MH2
B3                             95.70   2020.00     56.00    1.5769 R1         MH3
B4                             95.70   2020.00     80.00    1.5769 R1         MH4


************
Node Summary
************

Name                 Type            Invert Elev.    Max. Depth   Ponded Area   External Inflow
-----------------------------------------------------------------------------------------------
MH1                  JUNCTION             5000.00         10.00           0.0
MH2                  JUNCTION             5000.00         10.00           0.0
MH3                  JUNCTION             5000.00         10.00           0.0
```

MH4	JUNCTION	5000.00	10.00	0.0
O1	OUTFALL	4994.00	3.00	0.0
O2	OUTFALL	4994.00	3.00	0.0
O3	OUTFALL	4994.00	3.00	0.0
O4	OUTFALL	4994.00	3.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
P1	MH1	O1	CONDUIT	400.0	1.5002	0.0130
P2	MH2	O2	CONDUIT	400.0	1.5002	0.0130
P3	MH3	O3	CONDUIT	400.0	1.5002	0.0130
P4	MH4	O4	CONDUIT	400.0	1.5002	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
P1	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P2	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P3	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P4	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69

****
Control Actions Taken
****

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Total Precipitation	86.580	2.600
Evaporation Loss	0.000	0.000
Infiltration Loss	22.447	0.674
Surface Runoff	63.979	1.921
Final Surface Storage	0.196	0.006
Continuity Error (%)	-0.048	

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	63.979	20.848
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	61.609	20.076
Internal Outflow	2.366	0.771
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.004	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

R#4

Routing Time Step Summary
****
Minimum Time Step : 5.00 sec
Average Time Step : 5.00 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.01

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
B1	2.60	0.00	0.00	0.97	1.62	4.52	82.79	0.624
B2	2.60	0.00	0.00	0.42	2.17	6.22	102.96	0.836
B3	2.60	0.00	0.00	0.91	1.69	4.40	177.14	0.651
B4	2.60	0.00	0.00	0.41	2.19	5.70	211.27	0.844

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
MH1	JUNCTION	0.14	2.50	5002.50	0 01:39
MH2	JUNCTION	0.17	6.53	5006.53	0 01:45
MH3	JUNCTION	0.14	10.00	5010.00	0 01:25
MH4	JUNCTION	0.16	10.00	5010.00	0 01:24
O1	OUTFALL	0.13	2.79	4996.79	0 01:39
O2	OUTFALL	0.15	3.00	4997.00	0 01:34
O3	OUTFALL	0.11	3.00	4997.00	0 01:24
O4	OUTFALL	0.11	3.00	4997.00	0 01:23

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
MH1	JUNCTION	82.79	82.79	0 01:39	4.524	4.524
MH2	JUNCTION	102.96	102.96	0 01:45	6.224	6.224
MH3	JUNCTION	177.09	177.09	0 01:30	4.397	4.397
MH4	JUNCTION	211.24	211.24	0 01:30	5.702	5.702
O1	OUTFALL	0.00	82.80	0 01:39	0.000	4.524
O2	OUTFALL	0.00	102.96	0 01:45	0.000	6.224
O3	OUTFALL	0.00	120.24	0 01:30	0.000	4.201
O4	OUTFALL	0.00	120.24	0 01:29	0.000	5.127

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
MH2	JUNCTION	0.63	3.535	3.465
MH3	JUNCTION	0.47	7.000	0.000
MH4	JUNCTION	0.70	7.000	0.000

1#4

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Depth Feet
MH3	0.26	56.61	0 01:30	0.196	10.00
MH4	0.48	90.86	0 01:30	0.575	10.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
O1	99.94	1.41	82.80	4.524
O2	99.94	1.94	102.96	6.224
O3	99.95	1.31	120.24	4.201
O4	99.95	1.60	120.24	5.127
System	99.95	6.27	425.17	20.075

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
P1	CONDUIT	82.80	0 01:39	13.18	1.01	0.88
P2	CONDUIT	102.96	0 01:45	14.57	1.26	1.00
P3	CONDUIT	120.24	0 01:30	17.01	1.47	1.00
P4	CONDUIT	120.24	0 01:29	17.01	1.47	1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
P1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P2	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	1.70	0.0000
P3	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.66	0.0000
P4	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	1.53	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
P1	0.01	0.01	0.01	0.16	0.01
P2	0.43	0.43	0.43	0.68	0.43
P3	0.39	0.39	0.39	0.50	0.39

P4	0.65	0.65	0.65	0.73	0.65

R#4

Analysis begun on: Fri Feb 04 09:48:07 2011
Analysis ended on: Fri Feb 04 09:48:10 2011
Total elapsed time: 00:00:03

Run #5

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)

R#5

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011
Results printed on 2-4-2011 Run #5
Rain Time Interval adjusted at 0:03

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****

Flow Units .... CFS
Process Models:
  Rainfall/Runoff .... YES
  Snowmelt .... NO
  Groundwater .... NO
  Flow Routing .... YES
  Ponding Allowed .... YES
  Water Quality .... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date DEC-24-2010 00:00:00
Ending Date DEC-28-2010 23:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:03:00
Dry Time Step 01:00:00
Routing Time Step .... 5.00 sec

****
Element Count
****

Number of rain gages 1
Number of subcatchments ... 4
Number of nodes 8
Number of links 4
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
R1	Rain	CUMULATIVE	3 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
B1	102.70	750.00	56.00	0.0958	R1	MH1
B2	105.50	1050.00	80.00	0.1178	R1	MH2
B3	95.70	315.00	56.00	1.5769	R1	MH3
B4	95.70	670.00	80.00	1.5769	R1	MH4

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
MH1	JUNCTION	5000.00	10.00	0.0	
MH2	JUNCTION	5000.00	10.00	0.0	
MH3	JUNCTION	5000.00	10.00	0.0	

#5

MH4	JUNCTION	5000.00	10.00	0.0
O1	OUTFALL	4994.00	3.00	0.0
O2	OUTFALL	4994.00	3.00	0.0
O3	OUTFALL	4994.00	3.00	0.0
O4	OUTFALL	4994.00	3.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
P1	MH1	O1	CONDUIT	400.0	1.5002	0.0130
P2	MH2	O2	CONDUIT	400.0	1.5002	0.0130
P3	MH3	O3	CONDUIT	400.0	1.5002	0.0130
P4	MH4	O4	CONDUIT	400.0	1.5002	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
P1	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P2	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P3	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P4	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69

****
Control Actions Taken
****

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Total Precipitation	86.580	2.600
Evaporation Loss	0.000	0.000
Infiltration Loss	22.983	0.690
Surface Runoff	63.320	1.902
Final Surface Storage	0.301	0.009
Continuity Error (%)	-0.028	

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	63.320	20.634
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	62.812	20.468
Internal Outflow	0.505	0.165
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.004	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

R #5

```
Routing Time Step Summary
*************************
Minimum Time Step           :     5.00 sec
Average Time Step           :     5.00 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.01
```

```
**************************
Subcatchment Runoff Summary
**************************
```

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
B1	2.60	0.00	0.00	0.99	1.59	4.44	60.38	0.613
B2	2.60	0.00	0.00	0.42	2.18	6.24	91.80	0.837
B3	2.60	0.00	0.00	0.95	1.64	4.25	80.15	0.629
B4	2.60	0.00	0.00	0.41	2.19	5.70	145.01	0.843

```
******************
Node Depth Summary
******************
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
MH1	JUNCTION	0.15	1.92	5001.92	0 01:51
MH2	JUNCTION	0.17	4.53	5004.53	0 01:40
MH3	JUNCTION	0.14	2.41	5002.41	0 01:39
MH4	JUNCTION	0.17	10.00	5010.00	0 01:28
O1	OUTFALL	0.13	1.92	4995.92	0 01:51
O2	OUTFALL	0.15	2.85	4996.85	0 01:48
O3	OUTFALL	0.12	2.41	4996.41	0 01:39
O4	OUTFALL	0.12	3.00	4997.00	0 01:26

```
******************
Node Inflow Summary
******************
```

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
MH1	JUNCTION	60.38	60.38	0 01:51	4.445	4.445
MH2	JUNCTION	91.80	91.80	0 01:48	6.238	6.238
MH3	JUNCTION	80.15	80.15	0 01:39	4.252	4.252
MH4	JUNCTION	145.01	145.01	0 01:33	5.698	5.698
O1	OUTFALL	0.00	60.37	0 01:51	0.000	4.444
O2	OUTFALL	0.00	91.81	0 01:48	0.000	6.237
O3	OUTFALL	0.00	80.14	0 01:39	0.000	4.252
O4	OUTFALL	0.00	120.24	0 01:32	0.000	5.533

```
**********************
Node Surcharge Summary
**********************

Surcharging occurs when water rises above the top of the highest conduit.
```

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
MH2	JUNCTION	0.42	1.527	5.473
MH4	JUNCTION	0.70	7.000	0.000

1 of 5

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Depth Feet
MH4	0.39	24.75	0 01:33	0.165	10.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
O1	99.94	1.39	60.37	4.444
O2	99.94	1.95	91.81	6.237
O3	99.94	1.33	80.14	4.252
O4	99.95	1.73	120.24	5.533
System	99.94	6.39	350.02	20.467

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
P1	CONDUIT	60.37	0 01:51	12.64	0.74	0.64
P2	CONDUIT	91.81	0 01:48	13.19	1.12	0.97
P3	CONDUIT	80.14	0 01:39	13.17	0.98	0.80
P4	CONDUIT	120.24	0 01:32	17.01	1.47	1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
P1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P2	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.71	0.0000
P3	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P4	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	1.59	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
P2	0.01	0.01	0.01	0.56	0.01
P4	0.63	0.63	0.63	0.73	0.63

Analysis begun on: Fri Feb 04 10:16:17 2011

Analysis ended on: Fri Feb 04 10:16:20 2011
Total elapsed time: 00:00:03

R #5

RUN #6

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

R#6

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)
--------------------------------------------------------------

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011
Results printed on 2-4-2011  Run #6
Rain Time Interval adjusted at 0:03

*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ DEC-24-2010 00:00:00
Ending Date .............. DEC-28-2010 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:03:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 5.00 sec

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 4
Number of nodes ........... 8
Number of links ........... 4
Number of pollutants ...... 0
Number of land uses ....... 0

****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
R1	Rain	CUMULATIVE	3 min.

```
********************
Subcatchment Summary
********************
```

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
B1	102.70	750.00	56.00	0.0958	R1	MH1
B2	105.50	1050.00	80.00	0.1178	R1	MH2
B3	95.70	315.00	56.00	1.5769	R1	MH3
B4	95.70	670.00	80.00	1.5769	R1	MH4

```
************
Node Summary
************
```

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
MH1	JUNCTION	5000.00	10.00	0.0	
MH2	JUNCTION	5000.00	10.00	0.0	
MH3	JUNCTION	5000.00	10.00	0.0	

MH4	JUNCTION	5000.00	10.00	0.0
O1	OUTFALL	4994.00	3.00	0.0
O2	OUTFALL	4994.00	3.00	0.0
O3	OUTFALL	4994.00	3.00	0.0
O4	OUTFALL	4994.00	3.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
P1	MH1	O1	CONDUIT	400.0	1.5002	0.0130
P2	MH2	O2	CONDUIT	400.0	1.5002	0.0130
P3	MH3	O3	CONDUIT	400.0	1.5002	0.0130
P4	MH4	O4	CONDUIT	400.0	1.5002	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
P1	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P2	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P3	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P4	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69

****
Control Actions Taken
****

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Total Precipitation	86.580	2.600
Evaporation Loss	0.000	0.000
Infiltration Loss	22.983	0.690
Surface Runoff	63.320	1.902
Final Surface Storage	0.301	0.009
Continuity Error (%)	-0.028	

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	63.320	20.634
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	62.812	20.468
Internal Outflow	0.505	0.165
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.004	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****

R #6

Routing Time Step Summary
****

Minimum Time Step	:	5.00 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.01

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
B1	2.60	0.00	0.00	0.99	1.59	4.44	60.38	0.613
B2	2.60	0.00	0.00	0.42	2.18	6.24	91.80	0.837
B3	2.60	0.00	0.00	0.95	1.64	4.25	80.15	0.629
B4	2.60	0.00	0.00	0.41	2.19	5.70	145.01	0.843

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
MH1	JUNCTION	0.15	1.92	5001.92	0 01:51
MH2	JUNCTION	0.17	4.53	5004.53	0 01:40
MH3	JUNCTION	0.14	2.41	5002.41	0 01:39
MH4	JUNCTION	0.17	10.00	5010.00	0 01:28
O1	OUTFALL	0.13	1.92	4995.92	0 01:51
O2	OUTFALL	0.15	2.85	4996.85	0 01:48
O3	OUTFALL	0.12	2.41	4996.41	0 01:39
O4	OUTFALL	0.12	3.00	4997.00	0 01:26

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
MH1	JUNCTION	60.38	60.38	0 01:51	4.445	4.445
MH2	JUNCTION	91.80	91.80	0 01:48	6.238	6.238
MH3	JUNCTION	80.15	80.15	0 01:39	4.252	4.252
MH4	JUNCTION	145.01	145.01	0 01:33	5.698	5.698
O1	OUTFALL	0.00	60.37	0 01:51	0.000	4.444
O2	OUTFALL	0.00	91.81	0 01:48	0.000	6.237
O3	OUTFALL	0.00	80.14	0 01:39	0.000	4.252
O4	OUTFALL	0.00	120.24	0 01:32	0.000	5.533

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
MH2	JUNCTION	0.42	1.527	5.473
MH4	JUNCTION	0.70	7.000	0.000

1 of 6

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Depth Feet
MH4	0.39	24.75	0 01:33	0.165	10.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
O1	99.94	1.39	60.37	4.444
O2	99.94	1.95	91.81	6.237
O3	99.94	1.33	80.14	4.252
O4	99.95	1.73	120.24	5.533
System	99.94	6.39	350.02	20.467

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
P1	CONDUIT	60.37	0 01:51	12.64	0.74	0.64
P2	CONDUIT	91.81	0 01:48	13.19	1.12	0.97
P3	CONDUIT	80.14	0 01:39	13.17	0.98	0.80
P4	CONDUIT	120.24	0 01:32	17.01	1.47	1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
P1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P2	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.71	0.0000
P3	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P4	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	1.59	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
P2	0.01	0.01	0.01	0.56	0.01
P4	0.63	0.63	0.63	0.73	0.63

Analysis begun on: Fri Feb 04 10:48:14 2011

Analysis ended on: Fri Feb 04 10:48:17 2011
Total elapsed time: 00:00:03

R #6

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

R#7

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)
--------------------------------------------------------------

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011
Results printed on 2-4-2011  Run #7
Rain Time Interval adjusted at 0:03

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date ..... DEC-24-2010 00:00:00
Ending Date ..... DEC-28-2010 23:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:05:00
Wet Time Step ..... 00:03:00
Dry Time Step ..... 01:00:00
Routing Time Step ..... 5.00 sec


*************
Element Count
*************
Number of rain gages ..... 1
Number of subcatchments ... 4
Number of nodes ..... 8
Number of links ..... 4
Number of pollutants ..... 0
Number of land uses ..... 0


****************
Raingage Summary
****************

Name            Data Source          Data Type    Recording Interval
-----------------------------------------------------------------
R1              Rain                 CUMULATIVE   3 min.


*******************
Subcatchment Summary
*******************
Name            Area     Width    %Imperv   %Slope    Rain Gage       Outlet
-----------------------------------------------------------------------------
B1              102.70   750.00    56.00    0.0958    R1              MH1
B2              105.50  1050.00    80.00    0.1178    R1              MH2
B3               95.70   315.00    56.00    1.5769    R1              MH3
B4               95.70   670.00    80.00    1.5769    R1              MH4


************
Node Summary
************

Name            Type          Invert Elev.   Max. Depth   Ponded Area   External Inflow
-----------------------------------------------------------------------------------------
MH1             JUNCTION           5000.00        10.00           0.0
MH2             JUNCTION           5000.00        10.00           0.0
MH3             JUNCTION           5000.00        10.00           0.0
```

MH4	JUNCTION	5000.00	10.00	0.0
O1	OUTFALL	4994.00	3.00	0.0
O2	OUTFALL	4994.00	3.00	0.0
O3	OUTFALL	4994.00	3.00	0.0
O4	OUTFALL	4994.00	3.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
P1	MH1	O1	CONDUIT	400.0	1.5002	0.0130
P2	MH2	O2	CONDUIT	400.0	1.5002	0.0130
P3	MH3	O3	CONDUIT	400.0	1.5002	0.0130
P4	MH4	O4	CONDUIT	400.0	1.5002	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
P1	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P2	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P3	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P4	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69

****
Control Actions Taken
****

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Total Precipitation	86.580	2.600
Evaporation Loss	0.000	0.000
Infiltration Loss	22.983	0.690
Surface Runoff	63.309	1.901
Final Surface Storage	0.313	0.009
Continuity Error (%)	-0.028	

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	63.309	20.630
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	62.822	20.472
Internal Outflow	0.483	0.158
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.004	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****

R#7

Routing Time Step Summary
****

Minimum Time Step	:	5.00 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.01

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
B1	2.60	0.00	0.00	0.99	1.59	4.44	60.17	0.613
B2	2.60	0.00	0.00	0.42	2.18	6.24	91.35	0.837
B3	2.60	0.00	0.00	0.95	1.64	4.25	79.91	0.629
B4	2.60	0.00	0.00	0.41	2.19	5.70	144.41	0.843

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
MH1	JUNCTION	0.15	1.92	5001.92	0 01:51
MH2	JUNCTION	0.17	4.44	5004.44	0 01:40
MH3	JUNCTION	0.14	2.40	5002.40	0 01:39
MH4	JUNCTION	0.17	10.00	5010.00	0 01:28
O1	OUTFALL	0.13	1.91	4995.91	0 01:51
O2	OUTFALL	0.15	2.85	4996.85	0 01:48
O3	OUTFALL	0.12	2.40	4996.40	0 01:39
O4	OUTFALL	0.12	3.00	4997.00	0 01:26

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
MH1	JUNCTION	60.17	60.17	0 01:51	4.443	4.443
MH2	JUNCTION	91.34	91.34	0 01:48	6.237	6.237
MH3	JUNCTION	79.91	79.91	0 01:39	4.251	4.251
MH4	JUNCTION	144.41	144.41	0 01:33	5.697	5.697
O1	OUTFALL	0.00	60.17	0 01:51	0.000	4.443
O2	OUTFALL	0.00	91.35	0 01:48	0.000	6.236
O3	OUTFALL	0.00	79.90	0 01:39	0.000	4.251
O4	OUTFALL	0.00	120.24	0 01:32	0.000	5.540

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
MH2	JUNCTION	0.40	1.444	5.556
MH4	JUNCTION	0.70	7.000	0.000

1 of 7

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Depth Feet
MH4	0.38	24.15	0 01:33	0.158	10.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
O1	99.94	1.39	60.17	4.443
O2	99.94	1.95	91.35	6.236
O3	99.94	1.33	79.90	4.251
O4	99.95	1.73	120.24	5.540
System	99.94	6.39	349.13	20.470

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
P1	CONDUIT	60.17	0 01:51	12.63	0.74	0.64
P2	CONDUIT	91.35	0 01:48	13.19	1.12	0.97
P3	CONDUIT	79.90	0 01:39	13.17	0.98	0.80
P4	CONDUIT	120.24	0 01:32	17.01	1.47	1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
P1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P2	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.71	0.0000
P3	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P4	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	1.59	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
P2	0.01	0.01	0.01	0.55	0.01
P4	0.63	0.63	0.63	0.72	0.63

Analysis begun on: Fri Feb 04 10:52:14 2011

Analysis ended on: Fri Feb 04 10:52:16 2011
Total elapsed time: 00:00:02

R#7

R#8

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011
Results printed on 2-4-2011 Run #8
Rain Time Interval adjusted at 0:03

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****

Flow Units .... CFS
Process Models:
  Rainfall/Runoff .... YES
  Snowmelt .... NO
  Groundwater .... NO
  Flow Routing .... YES
  Ponding Allowed .... YES
  Water Quality .... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date DEC-24-2010 00:00:00
Ending Date DEC-28-2010 23:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:03:00
Dry Time Step 01:00:00
Routing Time Step .... 5.00 sec

****
Element Count
****

Number of rain gages 1
Number of subcatchments ... 4
Number of nodes 8
Number of links 4
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
R1	Rain	CUMULATIVE	3 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
B1	102.70	750.00	56.00	0.0958	R1	MH1
B2	105.50	1050.00	80.00	0.1178	R1	MH2
B3	95.70	315.00	56.00	1.5769	R1	MH3
B4	95.70	670.00	80.00	1.5769	R1	MH4

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
MH1	JUNCTION	5000.00	10.00	0.0	
MH2	JUNCTION	5000.00	10.00	0.0	
MH3	JUNCTION	5000.00	10.00	0.0	

#8

MH4	JUNCTION	5000.00	10.00	0.0
O1	OUTFALL	4994.00	3.00	0.0
O2	OUTFALL	4994.00	3.00	0.0
O3	OUTFALL	4994.00	3.00	0.0
O4	OUTFALL	4994.00	3.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
P1	MH1	O1	CONDUIT	400.0	1.5002	0.0130
P2	MH2	O2	CONDUIT	400.0	1.5002	0.0130
P3	MH3	O3	CONDUIT	400.0	1.5002	0.0130
P4	MH4	O4	CONDUIT	400.0	1.5002	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
P1	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P2	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P3	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P4	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69

****
Control Actions Taken
****

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Total Precipitation	86.580	2.600
Evaporation Loss	0.000	0.000
Infiltration Loss	22.983	0.690
Surface Runoff	63.320	1.902
Final Surface Storage	0.301	0.009
Continuity Error (%)	-0.028	

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	63.320	20.634
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	62.812	20.468
Internal Outflow	0.505	0.165
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.004	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

R#8

Routing Time Step Summary
****
Minimum Time Step : 5.00 sec
Average Time Step : 5.00 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.01

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
B1	2.60	0.00	0.00	0.99	1.59	4.44	60.38	0.613
B2	2.60	0.00	0.00	0.42	2.18	6.24	91.80	0.837
B3	2.60	0.00	0.00	0.95	1.64	4.25	80.15	0.629
B4	2.60	0.00	0.00	0.41	2.19	5.70	145.01	0.843

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
MH1	JUNCTION	0.15	1.92	5001.92	0 01:51
MH2	JUNCTION	0.17	4.53	5004.53	0 01:40
MH3	JUNCTION	0.14	2.41	5002.41	0 01:39
MH4	JUNCTION	0.17	10.00	5010.00	0 01:28
O1	OUTFALL	0.13	1.92	4995.92	0 01:51
O2	OUTFALL	0.15	2.85	4996.85	0 01:48
O3	OUTFALL	0.12	2.41	4996.41	0 01:39
O4	OUTFALL	0.12	3.00	4997.00	0 01:26

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
MH1	JUNCTION	60.38	60.38	0 01:51	4.445	4.445
MH2	JUNCTION	91.80	91.80	0 01:48	6.238	6.238
MH3	JUNCTION	80.15	80.15	0 01:39	4.252	4.252
MH4	JUNCTION	145.01	145.01	0 01:33	5.698	5.698
O1	OUTFALL	0.00	60.37	0 01:51	0.000	4.444
O2	OUTFALL	0.00	91.81	0 01:48	0.000	6.237
O3	OUTFALL	0.00	80.14	0 01:39	0.000	4.252
O4	OUTFALL	0.00	120.24	0 01:32	0.000	5.533

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
MH2	JUNCTION	0.42	1.527	5.473
MH4	JUNCTION	0.70	7.000	0.000

#8

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Depth Feet
MH4	0.39	24.75	0 01:33	0.165	10.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
O1	99.94	1.39	60.37	4.444
O2	99.94	1.95	91.81	6.237
O3	99.94	1.33	80.14	4.252
O4	99.95	1.73	120.24	5.533
System	99.94	6.39	350.02	20.467

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
P1	CONDUIT	60.37	0 01:51	12.64	0.74	0.64
P2	CONDUIT	91.81	0 01:48	13.19	1.12	0.97
P3	CONDUIT	80.14	0 01:39	13.17	0.98	0.80
P4	CONDUIT	120.24	0 01:32	17.01	1.47	1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
P1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P2	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.71	0.0000
P3	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P4	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	1.59	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
P2	0.01	0.01	0.01	0.56	0.01
P4	0.63	0.63	0.63	0.73	0.63

Analysis begun on: Fri Feb 04 10:49:09 2011

```
Analysis ended on:  Fri Feb 04 10:49:11 2011
Total elapsed time: 00:00:02
```

R # 8

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

RUN #9

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)
--------------------------------------------------------------

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011
Results printed on 2-4-2011  Run #9
Rain Time Interval adjusted at 0:03

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ..............  CFS
Process Models:
  Rainfall/Runoff ........  YES
  Snowmelt ...............  NO
  Groundwater ............  NO
  Flow Routing ...........  YES
  Ponding Allowed ........  YES
  Water Quality ..........  NO
Infiltration Method ......  CURVE_NUMBER
Flow Routing Method ......  DYNWAVE
Starting Date ............  DEC-24-2010 00:00:00
Ending Date ..............  DEC-28-2010 23:00:00
Antecedent Dry Days ......  0.0
Report Time Step .........  00:05:00
Wet Time Step ............  00:03:00
Dry Time Step ............  01:00:00
Routing Time Step ........  5.00 sec


*************
Element Count
*************
Number of rain gages ......  1
Number of subcatchments ...  4
Number of nodes ...........  8
Number of links ...........  4
Number of pollutants ......  0
Number of land uses .......  0


****************
Raingage Summary
****************

Name                 Data Source          Data Type       Recording Interval
------------------------------------------------------------------------
R1                   Rain                 CUMULATIVE      3 min.


*******************
Subcatchment Summary
*******************
Name                 Area     Width     %Imperv   %Slope    Rain Gage        Outlet
------------------------------------------------------------------------------------
B1                   102.70   750.00    56.00     0.0958    R1               MH1
B2                   105.50   1050.00   80.00     0.1178    R1               MH2
B3                   95.70    315.00    56.00     1.5769    R1               MH3
B4                   95.70    670.00    80.00     1.5769    R1               MH4


************
Node Summary
************

Name                 Type          Invert Elev.   Max. Depth   Ponded Area   External Inflow
------------------------------------------------------------------------------------------
MH1                  JUNCTION      5000.00        10.00        0.0
MH2                  JUNCTION      5000.00        10.00        0.0
MH3                  JUNCTION      5000.00        10.00        0.0
```

MH4	JUNCTION	5000.00	10.00	0.0
O1	OUTFALL	4994.00	3.00	0.0
O2	OUTFALL	4994.00	3.00	0.0
O3	OUTFALL	4994.00	3.00	0.0
O4	OUTFALL	4994.00	3.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
P1	MH1	O1	CONDUIT	400.0	1.5002	0.0130
P2	MH2	O2	CONDUIT	400.0	1.5002	0.0130
P3	MH3	O3	CONDUIT	400.0	1.5002	0.0130
P4	MH4	O4	CONDUIT	400.0	1.5002	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
P1	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P2	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P3	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P4	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69

****
Control Actions Taken
****

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Total Precipitation	86.580	2.600
Evaporation Loss	0.000	0.000
Infiltration Loss	44.731	1.343
Surface Runoff	41.120	1.235
Final Surface Storage	0.756	0.023
Continuity Error (%)	-0.031	

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	41.119	13.399
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	41.118	13.399
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.001	0.000
Continuity Error (%)	0.001	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

R #9

Routing Time Step Summary
****
Minimum Time Step : 5.00 sec
Average Time Step : 5.00 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
B1	2.60	0.00	0.00	1.61	0.94	2.61	3.66	0.360
B2	2.60	0.00	0.00	1.10	1.49	4.26	22.74	0.573
B3	2.60	0.00	0.00	1.58	0.99	2.57	5.71	0.381
B4	2.60	0.00	0.00	1.08	1.52	3.95	46.97	0.584

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
MH1	JUNCTION	0.18	0.43	5000.43	0 06:33
MH2	JUNCTION	0.16	1.08	5001.08	0 03:18
MH3	JUNCTION	0.16	0.54	5000.54	0 04:33
MH4	JUNCTION	0.13	1.63	5001.63	0 02:18
O1	OUTFALL	0.18	0.43	4994.43	0 06:33
O2	OUTFALL	0.15	1.08	4995.08	0 03:18
O3	OUTFALL	0.15	0.54	4994.54	0 05:21
O4	OUTFALL	0.12	1.63	4995.63	0 02:18

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
MH1	JUNCTION	3.66	3.66	0 06:33	2.611	2.611
MH2	JUNCTION	22.74	22.74	0 03:18	4.264	4.264
MH3	JUNCTION	5.71	5.71	0 04:33	2.575	2.575
MH4	JUNCTION	46.97	46.97	0 02:18	3.948	3.948
O1	OUTFALL	0.00	3.66	0 06:33	0.000	2.611
O2	OUTFALL	0.00	22.74	0 03:18	0.000	4.264
O3	OUTFALL	0.00	5.71	0 04:33	0.000	2.575
O4	OUTFALL	0.00	46.96	0 02:18	0.000	3.948

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

#9

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
O1	98.92	0.82	3.66	2.611
O2	99.02	1.34	22.74	4.264
O3	98.96	0.81	5.71	2.575
O4	99.23	1.24	46.96	3.948
System	99.03	4.22	68.19	13.398

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
P1	CONDUIT	3.66	0 06:33	5.83	0.04	0.14
P2	CONDUIT	22.74	0 03:18	9.90	0.28	0.36
P3	CONDUIT	5.71	0 04:33	6.66	0.07	0.18
P4	CONDUIT	46.96	0 02:18	11.95	0.57	0.54

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	--- Fraction of Time in Flow Class --- Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
P1	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	1.64	0.0000
P2	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	1.72	0.0000
P3	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	1.69	0.0000
P4	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	1.63	0.0000

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Feb 04 11:02:13 2011
Analysis ended on: Fri Feb 04 11:02:16 2011
Total elapsed time: 00:00:03

Run #10

R #10

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)
--------------------------------------------------------------

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011
Results printed on 2-4-2011  Run #10
Rain Time Interval adjusted at 0:03

*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ DEC-24-2010 00:00:00
Ending Date .............. DEC-28-2010 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:03:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 5.00 sec

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 4
Number of nodes ........... 8
Number of links ........... 4
Number of pollutants ...... 0
Number of land uses ....... 0

****************
Raingage Summary
****************
                                                   Data        Recording
Name                Data Source                    Type        Interval
--------------------------------------------------------------------------
R1                  Rain                           CUMULATIVE    3 min.

*******************
Subcatchment Summary
*******************
Name                     Area     Width   %Imperv    %Slope   Rain Gage              Outlet
---------------------------------------------------------------------------------------------------
B1                     102.70    750.00     56.00    0.0958   R1                     MH1
B2                     105.50   1050.00     80.00    0.1178   R1                     MH2
B3                      95.70    315.00     56.00    1.5769   R1                     MH3
B4                      95.70    670.00     80.00    1.5769   R1                     MH4

************
Node Summary
************
                                          Invert      Max.    Ponded    External
Name                Type                   Elev.     Depth      Area    Inflow
--------------------------------------------------------------------------------
MH1                 JUNCTION             5000.00     10.00       0.0
MH2                 JUNCTION             5000.00     10.00       0.0
MH3                 JUNCTION             5000.00     10.00       0.0
```

D#10

MH4	JUNCTION	5000.00	10.00	0.0
O1	OUTFALL	4994.00	3.00	0.0
O2	OUTFALL	4994.00	3.00	0.0
O3	OUTFALL	4994.00	3.00	0.0
O4	OUTFALL	4994.00	3.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
P1	MH1	O1	CONDUIT	400.0	1.5002	0.0130
P2	MH2	O2	CONDUIT	400.0	1.5002	0.0130
P3	MH3	O3	CONDUIT	400.0	1.5002	0.0130
P4	MH4	O4	CONDUIT	400.0	1.5002	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
P1	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P2	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P3	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P4	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69

****
Control Actions Taken
****

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Total Precipitation	86.580	2.600
Evaporation Loss	0.000	0.000
Infiltration Loss	22.983	0.690
Surface Runoff	63.320	1.902
Final Surface Storage	0.301	0.009
Continuity Error (%)	-0.028	

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	63.320	20.634
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	62.812	20.468
Internal Outflow	0.505	0.165
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.004	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011

R#10

Routing Time Step Summary
****
Minimum Time Step : 5.00 sec
Average Time Step : 5.00 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.01

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
B1	2.60	0.00	0.00	0.99	1.59	4.44	60.38	0.613
B2	2.60	0.00	0.00	0.42	2.18	6.24	91.80	0.837
B3	2.60	0.00	0.00	0.95	1.64	4.25	80.15	0.629
B4	2.60	0.00	0.00	0.41	2.19	5.70	145.01	0.843

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
MH1	JUNCTION	0.15	1.92	5001.92	0 01:51
MH2	JUNCTION	0.17	4.53	5004.53	0 01:40
MH3	JUNCTION	0.14	2.41	5002.41	0 01:39
MH4	JUNCTION	0.17	10.00	5010.00	0 01:28
O1	OUTFALL	0.13	1.92	4995.92	0 01:51
O2	OUTFALL	0.15	2.85	4996.85	0 01:48
O3	OUTFALL	0.12	2.41	4996.41	0 01:39
O4	OUTFALL	0.12	3.00	4997.00	0 01:26

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
MH1	JUNCTION	60.38	60.38	0 01:51	4.445	4.445
MH2	JUNCTION	91.80	91.80	0 01:48	6.238	6.238
MH3	JUNCTION	80.15	80.15	0 01:39	4.252	4.252
MH4	JUNCTION	145.01	145.01	0 01:33	5.698	5.698
O1	OUTFALL	0.00	60.37	0 01:51	0.000	4.444
O2	OUTFALL	0.00	91.81	0 01:48	0.000	6.237
O3	OUTFALL	0.00	80.14	0 01:39	0.000	4.252
O4	OUTFALL	0.00	120.24	0 01:32	0.000	5.533

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
MH2	JUNCTION	0.42	1.527	5.473
MH4	JUNCTION	0.70	7.000	0.000

#10

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Depth Feet
MH4	0.39	24.75	0 01:33	0.165	10.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
O1	99.94	1.39	60.37	4.444
O2	99.94	1.95	91.81	6.237
O3	99.94	1.33	80.14	4.252
O4	99.95	1.73	120.24	5.533
System	99.94	6.39	350.02	20.467

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
P1	CONDUIT	60.37	0 01:51	12.64	0.74	0.64
P2	CONDUIT	91.81	0 01:48	13.19	1.12	0.97
P3	CONDUIT	80.14	0 01:39	13.17	0.98	0.80
P4	CONDUIT	120.24	0 01:32	17.01	1.47	1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
P1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P2	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.71	0.0000
P3	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P4	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	1.59	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
P2	0.01	0.01	0.01	0.56	0.01
P4	0.63	0.63	0.63	0.73	0.63

Analysis begun on: Fri Feb 04 11:07:01 2011

Analysis ended on: Fri Feb 04 11:07:04 2011
Total elapsed time: 00:00:03

R #10

RUN #11

R#11

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011
Results printed on 3-17-2011 Run #11
Rain Time Interval adjusted at 0:03

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date DEC-24-2010 00:00:00
Ending Date DEC-28-2010 23:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:03:00
Dry Time Step 01:00:00
Routing Time Step ..... 5.00 sec

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 4
Number of nodes 8
Number of links 4
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
R1	Rain	CUMULATIVE	3 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
B1	102.70	400.00	56.00	0.0958	R1	MH1
B2	105.50	400.00	80.00	0.1178	R1	MH2
B3	95.70	400.00	56.00	1.5769	R1	MH3
B4	95.70	400.00	80.00	1.5769	R1	MH4

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
MH1	JUNCTION	5000.00	10.00	0.0	
MH2	JUNCTION	5000.00	10.00	0.0	
MH3	JUNCTION	5000.00	10.00	0.0	
MH4	JUNCTION	5000.00	10.00	0.0	
O1	OUTFALL	4994.00	3.00	0.0	
O2	OUTFALL	4994.00	3.00	0.0	
O3	OUTFALL	4994.00	3.00	0.0	

O4	OUTFALL	4994.00	3.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
P1	MH1	O1	CONDUIT	400.0	1.5002	0.0130
P2	MH2	O2	CONDUIT	400.0	1.5002	0.0130
P3	MH3	O3	CONDUIT	400.0	1.5002	0.0130
P4	MH4	O4	CONDUIT	400.0	1.5002	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
P1	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P2	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P3	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P4	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69

****
Control Actions Taken
****

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Total Precipitation	86.580	2.600
Evaporation Loss	0.000	0.000
Infiltration Loss	23.349	0.701
Surface Runoff	62.815	1.886
Final Surface Storage	0.434	0.013
Continuity Error (%)	-0.021	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	62.815	20.469
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	62.813	20.468
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.003	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	5.00 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00

R#11

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
B1	2.60	0.00	0.00	1.02	1.55	4.33	41.07	0.598
B2	2.60	0.00	0.00	0.43	2.15	6.16	49.81	0.827
B3	2.60	0.00	0.00	0.94	1.65	4.29	92.21	0.634
B4	2.60	0.00	0.00	0.41	2.19	5.68	107.07	0.841

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
MH1	JUNCTION	0.16	1.51	5001.51	0 02:03
MH2	JUNCTION	0.19	1.69	5001.69	0 02:03
MH3	JUNCTION	0.14	4.54	5004.54	0 01:30
MH4	JUNCTION	0.16	7.31	5007.31	0 01:41
O1	OUTFALL	0.14	1.51	4995.51	0 02:03
O2	OUTFALL	0.18	1.69	4995.69	0 02:03
O3	OUTFALL	0.12	2.85	4996.85	0 01:36
O4	OUTFALL	0.13	3.00	4997.00	0 01:30

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
MH1	JUNCTION	41.07	41.07	0 02:03	4.335	4.335
MH2	JUNCTION	49.81	49.81	0 02:03	6.163	6.163
MH3	JUNCTION	92.21	92.21	0 01:36	4.286	4.286
MH4	JUNCTION	107.07	107.07	0 01:42	5.684	5.684
O1	OUTFALL	0.00	41.06	0 02:03	0.000	4.334
O2	OUTFALL	0.00	49.79	0 02:03	0.000	6.163
O3	OUTFALL	0.00	92.21	0 01:36	0.000	4.286
O4	OUTFALL	0.00	107.07	0 01:42	0.000	5.684

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
MH3	JUNCTION	0.29	1.542	5.458
MH4	JUNCTION	0.62	4.309	2.691

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

R#11

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
O1	99.93	1.35	41.06	4.334
O2	99.93	1.92	49.79	6.163
O3	99.94	1.34	92.21	4.286
O4	99.94	1.77	107.07	5.684
System	99.94	6.39	276.02	20.467

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
P1	CONDUIT	41.06	0 02:03	11.57	0.50	0.50
P2	CONDUIT	49.79	0 02:03	12.12	0.61	0.56
P3	CONDUIT	92.21	0 01:36	13.18	1.13	0.98
P4	CONDUIT	107.07	0 01:42	15.15	1.31	1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
P1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P2	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.74	0.0000
P3	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.73	0.0000
P4	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	1.65	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
P3	0.01	0.01	0.01	0.36	0.01
P4	0.47	0.47	0.47	0.66	0.47

Analysis begun on: Thu Mar 17 10:21:33 2011
Analysis ended on: Thu Mar 17 10:21:35 2011
Total elapsed time: 00:00:02

RUN #12

(R#12)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.021)

Sensitivity Analysis #1 - SWMM and AHYMO Comparison Results 1-21-2011
Results printed on 5-25-2011 Run #11 → #12
Rain Time Interval adjusted at 0:03

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date DEC-24-2010 00:00:00
Ending Date DEC-28-2010 23:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:03:00
Dry Time Step 01:00:00
Routing Time Step ..... 5.00 sec

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 4
Number of nodes 8
Number of links 4
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
R1	Rain	CUMULATIVE	3 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
B1	102.70	400.00	56.00	0.0958	R1	MH1
B2	105.50	400.00	80.00	0.1178	R1	MH2
B3	95.70	400.00	56.00	1.5769	R1	MH3
B4	95.70	400.00	80.00	1.5769	R1	MH4

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
MH1	JUNCTION	5000.00	10.00	0.0	
MH2	JUNCTION	5000.00	10.00	0.0	
MH3	JUNCTION	5000.00	10.00	0.0	
MH4	JUNCTION	5000.00	10.00	0.0	
O1	OUTFALL	4994.00	3.00	0.0	
O2	OUTFALL	4994.00	3.00	0.0	
O3	OUTFALL	4994.00	3.00	0.0	

O4	OUTFALL	4994.00	3.00	0.0

P4/2

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
P1	MH1	O1	CONDUIT	400.0	1.5002	0.0130
P2	MH2	O2	CONDUIT	400.0	1.5002	0.0130
P3	MH3	O3	CONDUIT	400.0	1.5002	0.0130
P4	MH4	O4	CONDUIT	400.0	1.5002	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
P1	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P2	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P3	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69
P4	CIRCULAR	3.00	7.07	0.75	3.00	1	81.69

****
Control Actions Taken
****

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Total Precipitation	86.580	2.600
Evaporation Loss	0.000	0.000
Infiltration Loss	23.349	0.701
Surface Runoff	60.572	1.819
Final Surface Storage	2.678	0.080
Continuity Error (%)	-0.022	

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	60.572	19.738
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	60.569	19.737
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.004	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	5.00 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00

R#12

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
B1	2.60	0.00	0.00	1.02	1.50	4.18	38.65	0.577
B2	2.60	0.00	0.00	0.43	2.07	5.94	46.64	0.797
B3	2.60	0.00	0.00	0.94	1.59	4.14	87.14	0.613
B4	2.60	0.00	0.00	0.41	2.11	5.48	101.18	0.811

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
MH1	JUNCTION	0.15	1.45	5001.45	0 02:03
MH2	JUNCTION	0.19	1.62	5001.62	0 02:03
MH3	JUNCTION	0.13	2.72	5002.72	0 01:36
MH4	JUNCTION	0.15	6.21	5006.21	0 01:42
O1	OUTFALL	0.14	1.45	4995.45	0 02:03
O2	OUTFALL	0.17	1.62	4995.62	0 02:03
O3	OUTFALL	0.12	2.82	4996.82	0 01:36
O4	OUTFALL	0.13	3.00	4997.00	0 01:34

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
MH1	JUNCTION	38.65	38.65	0 02:03	4.180	4.180
MH2	JUNCTION	46.64	46.64	0 02:03	5.936	5.936
MH3	JUNCTION	87.14	87.14	0 01:36	4.142	4.142
MH4	JUNCTION	101.18	101.18	0 01:42	5.479	5.479
O1	OUTFALL	0.00	38.64	0 02:03	0.000	4.180
O2	OUTFALL	0.00	46.62	0 02:03	0.000	5.936
O3	OUTFALL	0.00	87.12	0 01:36	0.000	4.142
O4	OUTFALL	0.00	101.18	0 01:42	0.000	5.478

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
MH4	JUNCTION	0.58	3.212	3.788

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

P#12

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
O1	99.36	1.31	38.64	4.180
O2	99.36	1.86	46.62	5.936
O3	99.38	1.30	87.12	4.142
O4	99.38	1.72	101.18	5.478
System	99.37	6.20	259.74	19.736

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
P1	CONDUIT	38.64	0 02:03	11.39	0.47	0.48
P2	CONDUIT	46.62	0 02:03	11.93	0.57	0.54
P3	CONDUIT	87.12	0 01:36	13.18	1.07	0.92
P4	CONDUIT	101.18	0 01:42	14.31	1.24	1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
P1	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	1.73	0.0000
P2	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	1.73	0.0000
P3	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	1.72	0.0000
P4	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	1.65	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
P3	0.01	0.01	0.01	0.29	0.01
P4	0.33	0.33	0.33	0.63	0.33

Analysis begun on: Wed May 25 08:26:23 2011
Analysis ended on: Wed May 25 08:26:26 2011
Total elapsed time: 00:00:03