FINAL DRAINAGE REPORT

FOR

I-70 over Havana Street
Design-Build

May 5, 2015

Prepared for:

Colorado Department of Transportation
Region 1, Denver Metro

Prepared by:

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TSH Project No.: 1303354DB

ENGINEERS STATEMENT:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by CDOT for drainage reports and said report is in conformity with the Contract Documents. I accept responsibility for any liability on my part in preparing this report.

Brendan Carroll, P.E. Date
Colorado PE 47074
For and on Behalf of Tsiouvaras Simmons Holderness, Inc.

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1. Introduction

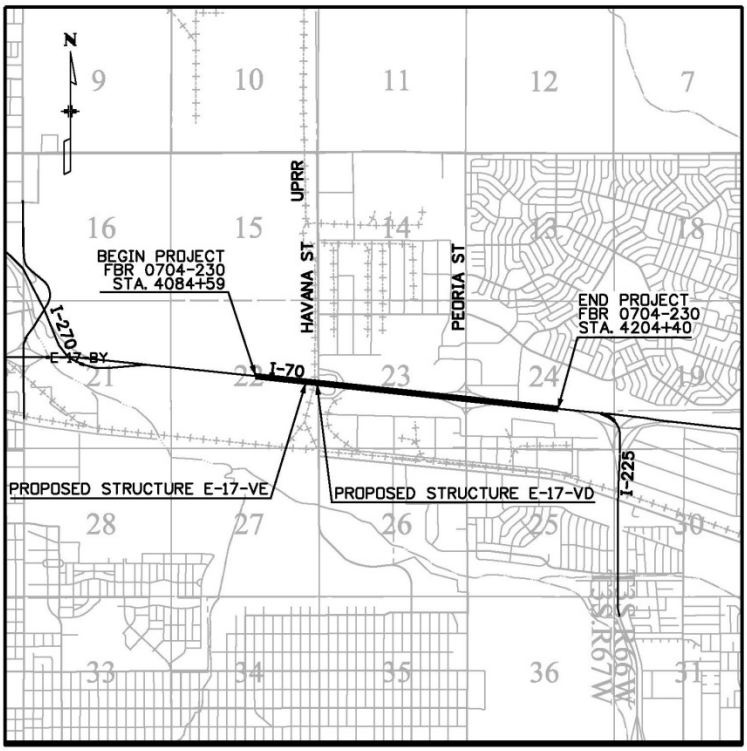
The purpose of this report is to document the preliminary drainage design for the Interstate 70 (I-70) over Havana Street Design-Build (Project). The Project will replace the existing I-70 Bridge over Havana Street. The Bridge replacement includes full-depth reconstruction of I-70 mainline from Station 4099+50.00 to Station 4115+50.00. Additionally, the Project will construct a Railway Overhead Structure to accommodate the future alignment of the UPRR Track.

The I-70 Bridge over Havana Street has been designed to accommodate the Ultimate I-70 East Project. Accordingly, proposed drainage facilities have been designed, where possible, to function in the Ultimate I-70 configuration.

Drainage improvements for the Project have also been designed to minimize impacts to the UPRR Track. Runoff from the widened section of I-70 will be directed downstream (west) of the UPRR Track and will, therefore, have no impact on UPRR right-of-way or easements. Local drainage systems designed for this Project divert water away from the UPRR Track. Additionally, improvements have been designed to divert some off-site drainage away from the UPRR Track in an effort to alleviate existing drainage issues in the Project area.

1.1 Location of Improvements

The Project is located at the I-70 and Havana Street Interchange in the City and County of Denver, Colorado. Mill and overlay limits extend beyond the interchange approximately 2250' to the west and 8815' to the east of Havana Street.



PROJECT LOCATION MAP

0' 1320' 2640' 5280'

1.2 Descriptions of Improvements

Roadway improvements for the I-70 over Havana Street Design-Build Project consist of replacement of the existing I-70 over Havana Street Bridge, full depth roadway reconstruction of the I-70 mainline from Station 4099+50 to Station 4115+50, construction of a Railway Overhead Structure, and mill and overlay of I-70 and ramps from Station 4084+59.00 to Station 4204+40. In addition, drainage improvements will be provided to capture and control roadway runoff in accordance with CDOT drainage design requirements. These drainage improvements will consist of embankment protectors and roadside ditches.

1.3 Discussion of Drainage Investigation

During the proposal and design phases of the Project, the design team performed a thorough investigation of the site including survey of existing facilities, review of previous drainage reports and review of existing hydraulic models. Much of the existing off-site hydrology and hydraulics analyses are based on the *Final Drainage Report – Central Park Boulevard Interchange with I-70*, prepared by Wilson and Company, May 30, 2010 (CPB Report).

2. Cross Drainage, Drainageway, and Irrigation Ditch Crossings

2.1 Location and General Discussion

The project area is part of a larger water shed that originates approximately 1500' upstream (east) of Peoria Streets and ends at the existing extended detention basin that was constructed as part of I-70 Central Bark Boulevard Interchange. The total watershed area is approximately 531 acres. Runoff generally follows I-70 corridor, flowing from east to west in ditches along the north and south sides of I-70 with crossings at Peoria Street and Havana Street, before being treated in the existing extended detention basins at the I-70 and Central Park Boulevard Interchange. Flows from the extended detention basin eventually flow to Sand Creek.

There are no major drainageways or irrigation ditch crossings within the project limits.

2.2 Hydrology and Design Flow Development

Existing hydrology for the entire watershed was prepared using Colorado Urban Hydrograph Procedure (CUHP) as part of the Central Park Boulevard Interchange with I-70 design. Hydraulic analysis for the existing condition was performed using the Environmental Protection Agency's (EPA's) Storm Water Management Model (SWMM).

The design team duplicated the existing conditions model using CUHP and SWMM for the design (10-year) and major/check (100-year) storm frequencies. Additionally, the design team used CUHP and SWMM to perform hydrologic and hydraulic analyses for the 10-year and 100-year frequencies in the proposed condition.

2.2.1 Information Sources

Existing hydrology for the watershed was documented in the Final Drainage Report for Central Park Boulevard Interchange with I-70, prepared by Wilson and Company dated May 30, 2010.

2.3 Agency Coordination (i.e. UDFCD, local agencies)

All drainage improvements occur within the CDOT right-of-way (ROW).

The Union Pacific Railroad has an existing easement for the UPRR Track that crosses below I-70 between Havana Street and the west abutment of the existing bridge. Within the easement is an 18-inch drain pipe that is undersized to convey the 100-year flow from the south side of I-70 to the north. Excess runoff drains overland in the current condition. This Project proposes to abandon the existing culvert and reroute runoff via open channel to the west before crossing I-70 through the proposed overhead railway crossing for the future UPRR Track alignment. In the future condition, this runoff will be rerouted back to its current path, crossing I-70 between Havana Street and the west bridge abutment, in the current location of the UPRR tracks.

The design team has designed the drainage improvements to meet criteria outlined in the BNSF Railway – Union Pacific Railroad *Guidelines for Railroad Grade Separation Projects*. A Railroad Preliminary (30%) Drainage Report was submitted to the UPRR and accepted.

2.4 Description of Structural Design (i.e. for non-CDOT standard CBCs)

There are no special structures associated with this project.

2.5 Hydraulic Design

There are two existing culverts crossing under Havana within the project limits. These culverts currently do not meet CDOT criteria for headwater-to-depth ratio. However, these undersized culverts provide detention to tributary flows within the gore areas. The existing detention was analyzed with the Final Drainage Report for Central Park Boulevard Interchange with I-70 and the proposed conditions are analyzed with this report. The proposed conditions do not significantly alter the existing conditions and therefore these culverts will not be replaced with this project.

2.6 Irrigation Ditch Crossings

There are no irrigation facilities within the project limits.

2.7 Drainageways and Floodplains

There are no FEMA designated 100-year floodplains in the Project vicinity. The project improvements have been designed to ensure that 100-year peak runoff rates do not exceed existing peaks downstream of the Central Park Boulevard extended detention basins. Therefore, no impacts to downstream floodplains are expected.

2.8 Scour Analysis

Not applicable.

2.9 Bank Stabilization

Not applicable.

3. Roadway Drainage Systems

3.1 General Discussion

Runoff from I-70 in the Project vicinity is generally conveyed by sheet flow off the roadway, down the roadway embankment and into existing roadside channels. The proposed design continues this pattern where possible. In areas where barrier and/or curb confine runoff to the roadway, embankment protectors are used at the ends of these sections to convey the flows to the toes of the slope and prevent erosion.

3.2 Design Coordination

3.2.1 Adjacent Segments

This Project is located upstream of the Central Park Boulevard interchange with I-70 and runoff from the Project drains via open channel to the existing City and County of Denver maintained extended detention basins. Additionally, off-site drainage from the east drains through the project site and continues on to the existing extended detention basin at Central Park Boulevard.

Project drainage improvements have been designed to limit runoff to pre-construction levels. On-site storage facilities (detention areas in the northeast and southeast interchange infields) have been analyzed to ensure that the detention areas have adequate capacity and that proposed discharge rates will not significantly exceed those of the existing condition. The proposed 100-year stage of the northeast and southeast Havana ponds are lower than existing therefore the ponds are anticipated to operate as they do in the existing condition will not impact the operation of the interchange. The existing culverts from each detention areas will be maintained.

It is not anticipated that this project will impact adjacent segments of I-70 or Havana Street.

3.2.2 Agency Coordination

The design team has worked with CDOT throughout the proposal and design phases of the Project to ensure conformance of the design with the I-70 EIS and contract documents.

The design team will continue to coordinate with UPRR, CDOT, and the City and County of Denver as needed throughout the construction project.

3.3 Drainage Basin Delineations & Characterization

3.3.1 Existing Basins

The existing hydrologic analysis for the site matches the proposed conditions hydrology included in the CPB Report. A summary of existing basins is provided below. See **Appendix 5.1** for hydrologic calculations and **Appendix 5.4** for basin maps.

Table 3-1 – Existing Basins

EXISTING BASIN SUMMARY				
BASIN ID	AREA (AC)	% IMPERVIOUS	PEAK FLOW (CFS)	
			10-YEAR	100-YEAR
E-10	36.75	65.0%	31	69
E-11	9.51	40.0%	15	37
E-20	64.42	65.0%	68	149
E-21	2.95	49.0%	5	11
E-40	18.63	30.0%	6	20
E-41	3.92	15.0%	2	6
E-60	30.51	35.0%	14	39

3.3.2 Proposed Basins

A summary of proposed basins is shown in **Table 3-2**, below. The percentage of imperviousness has been increased for basins D-11, D-20, D-40, D-41 and D-60 as result of the increased width of the

proposed bridge and transition areas. These parameters were used to perform the proposed CUHP hydrologic calculations.

Table 3-2 – Proposed Basins

PROPOSED BASIN SUMMARY				
BASIN ID	AREA (AC)	% IMPERVIOUS	PEAK FLOW (CFS)	
			10-YEAR	100-YEAR
D-10	36.75	65.0%	31	69
D-11	9.51	42.1%	16	38
D-20	64.42	65.5%	69	150
D-21	1.41	32.6%	1	3
D-40	18.63	31.2%	7	20
D-41	3.92	15.8%	2	6
D-60	32.05	37.8%	16	45

For the portion of the project where runoff is confined to the roadway, from the west side of the Railway Overhead Structure (approximately Station 4102+75) to the east approach of the proposed I-70 over Havana Street (approximately Station 4108+75), roadway sub-basins were delineate for use in calculating roadway spread and determining if additional storm sewer is required.

The roadway sub-basins have been delineated such that their widths are equal to the Ultimate I-70 roadway width and drainage facilities subsequently sized to ensure capacity for the Ultimate I-70 Configuration. They are considered 100% impervious, as they will be in the Ultimate I-70 configuration.

A summary of proposed roadway sub-basins is provided in Table 3-3, below. See **Appendix 5.4** for proposed basin maps and **Appendix 5.1** for hydrologic calculations.

Table 3-3 – Proposed Roadway Sub-Basins

PROPOSED ROADWAY SUB-BASIN SUMMARY				
BASIN ID	AREA (AC)	% IMPERVIOUS	PEAK FLOW (CFS)	
			10-YEAR	100-YEAR
4104L	0.97	100.0%	4.67	8.08
4104R	1.39	100.0%	6.69	11.58

3.4 Hydrology and Design Flow Development

Existing basin delineation and hydrologic analysis are documented in the Final Drainage Report for Central Park Boulevard Interchange with I-70. Basins and hydrologic parameters were reviewed and accepted by the design team as the basis for existing hydrology for this Project.

Since the overall watershed is greater than 90 acres, the proposed hydrologic calculations were performed using CUHP, a method of hydrologic analysis based upon the unit hydrograph principle, developed and calibrated using rainfall-runoff data collected in Colorado.

Using CUHP Version 1.3.3 software developed by UDFCD, a hydrograph was developed for each roadway basin. The model input parameters included the following:

- 100-year, 1-hour point rainfall = 2.57 inches
- Initial infiltration rate = 4.5 inches/hour
- Final infiltration rate = 0.6 inches/hour
- Horton's decay rate = 0.0018 /second
- Maximum depression storage:
    - Pervious = 0.35 watershed inches
    - Impervious = 0.1 watershed inches

These parameters are consistent with the Final Drainage Report for Central Park Boulevard Interchange with I-70 and the Master Plan Drainage Report.

For the portion of the project where runoff is confined to the roadway, from the west side of the Railway Overhead Structure (approximately Station 4102+75) to the east approach of the proposed I-70 over Havana Street Bridge (approximately Station 4108+75), roadway sub-basins were delineated for use in calculating roadway spread and determining if additional storm sewer is required.

Hydrologic calculations were performed using Rational Method for roadway sub-basins. Parameters for the Rational Method include drainage area size (acres), a dimensionless runoff coefficient (C), and rainfall intensity (I) (inches/hour) for a selected storm frequency, for a duration equal to the time of concentration (Tc).

Runoff coefficient is a fractional portion of the precipitation that appears as runoff and is expressed as a constant between zero and one as function of the impervious land cover and the drainage basin slope. The runoff coefficients for the roadway sub-basins were calculated using Equations RO-6 and RO-7 from Urban Drainage and Flood Control District's (UDFCD's) *Urban Storm Drainage Criteria Manual, Volume 1, Chapter 5*.

The Tc is estimated using the hydraulically longest flow path within a drainage basin. It is calculated by using the accumulated travel time for sheet flow, shallow concentrated flow, and concentrated flow in ditches and pipes. The minimum value for the initial Tc reaching the design point within any basin is 5 minutes.

The rainfall intensity is computed using the intensity-duration-frequency (IDF) relationship in the City and County of Denver *Storm Drainage Design and Technical Criteria*. The IDF relationships for the design storms are shown in **Table 3-4**.

Table 3-4 – Intensity-Duration-Frequency Summary

Time	Rainfall Intensity in Inches per Hour					Time	Rainfall Intensity in Inches per Hour				
Min.	2-yr	5-yr	10-yr	50-yr	100-yr	Min.	2-yr	5-yr	10-yr	50-yr	100-yr
5	3.22	4.55	5.26	7.63	8.72	35	1.36	1.92	2.22	3.22	3.68
10	2.57	3.63	4.19	6.09	6.95	36	1.34	1.88	2.18	3.16	3.61
11	2.47	3.49	4.04	5.86	6.69	37	1.31	1.85	2.14	3.11	3.55
12	2.38	3.36	3.89	5.65	6.45	38	1.29	1.82	2.11	3.06	3.49
13	2.30	3.25	3.76	5.45	6.23	39	1.27	1.79	2.07	3.01	3.44
14	2.23	3.14	3.63	5.27	6.02	40	1.25	1.76	2.04	2.96	3.38
15	2.16	3.04	3.52	5.11	5.83	41	1.23	1.74	2.01	2.92	3.33
16	2.09	2.95	3.41	4.95	5.66	42	1.21	1.71	1.98	2.87	3.28
17	2.03	2.86	3.31	4.81	5.49	43	1.19	1.69	1.95	2.83	3.23
18	1.97	2.78	3.22	4.67	5.34	44	1.18	1.66	1.92	2.79	3.19
19	1.92	2.71	3.13	4.55	5.19	45	1.16	1.64	1.89	2.75	3.14
20	1.87	2.64	3.05	4.43	5.06	46	1.14	1.61	1.87	2.71	3.10
21	1.82	2.57	2.97	4.31	4.93	47	1.13	1.59	1.84	2.67	3.05
22	1.78	2.51	2.90	4.21	4.81	48	1.11	1.57	1.82	2.64	3.01
23	1.73	2.45	2.83	4.11	4.69	49	1.10	1.55	1.79	2.60	2.97
24	1.69	2.39	2.76	4.01	4.58	50	1.08	1.53	1.77	2.57	2.93
25	1.66	2.34	2.70	3.92	4.48	51	1.07	1.51	1.75	2.53	2.89
26	1.62	2.28	2.64	3.84	4.38	52	1.06	1.49	1.72	2.50	2.86
27	1.58	2.24	2.59	3.75	4.29	53	1.04	1.47	1.70	2.47	2.82
28	1.55	2.19	2.53	3.68	4.20	54	1.03	1.45	1.68	2.44	2.79
29	1.52	2.14	2.48	3.60	4.11	55	1.02	1.44	1.66	2.41	2.75
30	1.49	2.10	2.43	3.53	4.03	56	1.01	1.42	1.64	2.38	2.72
31	1.46	2.06	2.39	3.46	3.95	57	0.99	1.40	1.62	2.35	2.69
32	1.43	2.02	2.34	3.40	3.88	58	0.98	1.39	1.60	2.33	2.66
33	1.41	1.99	2.30	3.34	3.81	59	0.97	1.37	1.58	2.30	2.63
34	1.38	1.95	2.26	3.28	3.74	60	0.96	1.35	1.57	2.27	2.60

Date: Jan 2006 Calculated based on Equation 5.1.
Revised:

3.4.1 Pavement, Median, and Roadside Drainage

For most of the site, roadway runoff is allowed to sheet off the road and down the embankment slopes to roadside channels.

3.5 Inlet/Catch Basin Spacing

Upstream (east) of the I-70 over Havana Street Bridge, the proposed roadway section utilizes CDOT Type 3 Guardrail without curb. Therefore, no concentrated flows form and no inlets or embankment protectors are required upstream of the east bridge abutment. Expansion joints have been eliminated from the bridge so no inlets are required on the approach slabs.

Between the I-70 over Havana Street Bridge and the west side of the Railway Overhead Structure, rigid barrier is used and runoff is confined to the roadway. CDOT Type 3 Embankment Protectors will be placed at the end of the barrier on each side to capture runoff and convey it to the toe of the slope. West of the embankment protectors, runoff will be able to sheet off the road as it does in the existing condition.

3.5.1 Storm Drain Design

There are no storm drains designed with this project.

3.5.2 Roadside Ditch and Channel Design

Existing roadside ditches are used throughout this section of the I-70 corridor. Project drainage improvements have been designed to not significantly exceed existing peak flows. Therefore, the Project proposes to use existing ditches without improvement and no negative impacts are expected.

The Project proposes to construct a channel originating on the south side of I-70, just west of Havana Street. The channel will divert runoff from the existing inlet and undersized 18" drain pipe that currently flows north through the UPRR Track easement. The proposed channel, which flows west, then north through the proposed Overhead Railway Structure before tying back into the existing channel north of I-70, has been sized to convey the full 100-year return frequency discharge. The lining of the ditch was design using HEC-15.

3.5.3 Erosion Control Design

CDOT Type 3 (piped) Embankment Protectors will be installed at the downstream termini of barrier/curb sections. These will intercept any concentrated flows and convey them to the toe of the slope to prevent embankment erosion.

Proposed channels have been designed with gentle slopes (<0.5%) to minimize the potential for channel erosion. Flexible channel linings have been designed in accordance with FHWA HEC-15, *Design of Roadside Channels with Flexible Linings*.

4. Permanent Best Management Practices

The need permanent best management practices for this project was evaluated using the criteria outlined in Book 2, Section 12.1.2.2 New Development Redevelopment – Permanent Water Quality (PWQ) of the contract documents.

4.1 Assumptions and Methodologies

There are approximately 63.03 acres of impervious area within the project limits. This proposed design will result in an increase in impervious area within the Project limits of approximately 1.24 acres. The resulting increase in impervious area is 1.97%. According to Book 2, Section 12.1.2.2, "To qualify for the 2014 NDRD Program, the new impervious area created by the Project shall not exceed 20% of the existing impervious area within the Project limits."

4.1.1 Allowable Release Rates

Not applicable.

4.2 Hydrology and Hydraulics

The Project area is part of a larger watershed that drains to an existing PWQ facility at Central Park Boulevard, as documented in the CPB Report. **Table 4-1** provides a comparison of existing and proposed conditions for the basins tributary to the Central Park Boulevard South WQ Pond. The existing basin parameters were obtained from the CPB Report. Proposed parameters reflect the increase in impervious areas resulting from this Project.

Table 4-1 – Central Park Boulevard South WQ Pond – Watershed Comparison

Basin ID	Basin Area (ac)	Existing		Basin Area (ac)	Proposed	
		% Imp.	Imp. Area (ac)		% Imp.	Imp. Area (ac)
10	36.75	65.0%	23.89	36.75	65.0%	23.89
11	9.51	40.0%	3.80	9.51	42.1%	4.00
20	64.42	65.0%	41.87	64.42	65.5%	42.20
21	2.95	49.0%	1.45	1.41	32.6%	0.46
40	18.63	30.0%	5.59	18.63	31.2%	5.81
41	3.92	15.0%	0.59	3.92	15.8%	0.62
42	3.09	70.0%	2.16	3.09	70.0%	2.16
43	1.18	35.0%	0.41	1.18	35.0%	0.41
50a	10.28	30.0%	3.08	10.28	30.0%	3.08
50b	5.93	45.0%	2.67	5.93	45.0%	2.67
53	2.13	55.0%	1.17	2.13	55.0%	1.17
60	30.51	35.0%	10.68	32.05	37.8%	12.12
61a	7.19	50.0%	3.60	7.19	50.0%	3.60
61b	2.38	25.0%	0.60	2.38	25.0%	0.60
62	13.13	45.0%	5.91	13.13	45.0%	5.91
63	2.79	52.0%	1.45	2.79	52.0%	1.45
65a	1.75	49.0%	0.86	1.75	49.0%	0.86
66	7.21	48.0%	3.46	7.21	48.0%	3.46
68	2.7	73.0%	1.97	2.7	73.0%	1.97
77	1.31	40.0%	0.52	1.31	40.0%	0.52
78	3.96	30.0%	1.19	3.96	30.0%	1.19
30	190.76	55.0%	104.92	190.76	55.0%	104.92
Total	**422.48**	**53%**	**221.83**	**422.48**	**53%**	**223.07**
MDCIA II		**42%**			**42%**	

Basin maps for the proposed conditions and from the CPB Report have been included in **Appendix 5.4**.

4.2.1 Storage and Outlet Design Documentation

As demonstrated in **Table 4-1**, the change in impervious area is negligible when viewed in the context of the entire watershed tributary to the Central Park Boulevard South WQ Pond. Since none of the South WQ Pond design parameters have changed appreciably, it is understood that the South WQ Pond will function as designed and documented in the CPB Report.

4.3 Adherence to the CDOT MS4 Permit and NDRD requirements

The project's flows were accounted for in the Final Drainage Report for Central Park Boulevard Interchange with I-70. The project did not alter the overall drainage basin tributary to the Central Park Boulevard extended detention basin enough to change the required water quality volumes of the

extended detention basin. This extended detention basin was designed and in in compliance with the 2004 NDRD program. Therefore this project is in compliance with the 2004 NDRD program.

In Part I.E.2.a.iii (A) of CDOT's 2014 MS4 Permit, Priority Development Projects are defined as projects which result in land disturbance of one or more acres and trigger one of the following:

- The Project requires and environmental assessment (EA) or an environmental impact statement (EIS) and results in a 20% increase in impervious area; or
- The project discharges to a stream segment that is on the 303(d) list for a Roadway Pollutant of Concern and results in a 20% increase in impervious area.

With an increase in impervious area of 1.97% and Sand Creek not being on the EPA 303(d) list, the Project does not trigger either of the above criteria. Therefore, the Project is classified as a Non-Priority No PWQ Project, and no on-site water quality is required. Therefore this project is in compliance with the 2014 NDRD program as well.

APPENDIX 5.1 – Hydrologic Analysis

Project Name :	I-70 & Havana Interchange
Job No. :	1303354DB
Date	4/30/2015
By :	ECM
Checked By :	BJC

TSIOUVARAS SIMMONS HOLDERNESS
CONSULTING ENGINEERS

Rational Method Calculations

Basin Charcteristics

Basin Description (ID) =	**4104L**		
Total Basin Area (A) =	0.97	acres	(see basin map)
			% impervious
Area Paved =	**0.97**	acres	100.00%
Area Unpaved (median) =	**0.00**	acres	0.00%
Area Residential (> .5 < 2 acre lots) =	**0.00**	acres	35.00%
Area Residential (> 2 acre lots) =	**0.00**	acres	15.00%
Area Undeveloped =	**0.00**	acres	2.00%
Other =	**0.00**	acres	50.00% (user entry)
Weighted % Impervious =			100.00%

General Basin Description (undeveloped or urbanized) : **Urbanized** (determines use of Tc (check) in section 2 below)

Time of Concentration:

Time (initial) calculated using the following equation :

$$t_i = \frac{1.8\,(1.1 - C_5)\,(L)^{0.5}}{S^{0.33}}$$

where :

C5 = runoff coefficient for 5-year frequency
L= length of overland flow in feet (500' maximum)
S = average basin slope in percent

Shallow concentrated and channel travel time calculated using the following equation :

$$t_t = \frac{L}{60V}$$

where :

t_t = Travel Time (min)
L = flow length (ft)
V = velocity (fps)

Overland			**Shallow Concentrated/Channel**		
Length =	**104.31**	ft	Length =	**431.55**	ft
$Elev_1$ =	**5310.20**		$Elev_1$ =	**5308.22**	
$Elev_2$ =	**5308.22**		$Elev_2$ =	**5302.43**	
$Elev_1$-$Elev_2$ =	1.98		$Elev_1$-$Elev_2$ =	5.79	ft
Slope =	1.90	%	Slope =	1.34	%
C_5	0.90		Velocity[1]=	2.32	fps
t_i =	0.67	min.	Watercourse Type =	**paved**	
			t_t =	3.10	min.
			t_i =	0.67	min.
			t_t =	3.10	min.
			$T_c = t_i + t_t$ =	3.77	min.
			T_c (check) =	12.98	min.
			Tc (used for calculation) =	5.00	min.

Runoff Coefficient (C):

From UDFCD 2001 equation RO-6 thru RO-7

$$C_A = K_A + (1.31i^3 - 1.44i^2 + 1.135i - 0.12)$$
$$C_{CD} = K_{CD} + (0.858i^3 - 0.786i^2 + 0.744i + 0.04)$$
$$C_B = (C_A + C_{CD})/2$$

i = % imperviousness/100 expressed as a decimal (see Table RO-3)
C_A = Runoff coefficient for Natural Resources Conservation Service, or NRCS Type A soil
C_B = Runoff coefficient for NRCS Type B soils
C_{CD} = Runoff coefficient for NRCS Type C and D soils
K_A = Correction Factor for Type A soils defined in Table RO-4
K_{CD} = Correction Factor for Type C and D soils defined in Table RO-4

Table RO-4 (UDFCD)

Correction Factors K_A and K_{CD} for Use with Equations RO-6 and RO-7

	Storm Return Period					
NCRS Soil Type	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
C and D	0	-0.10i+0.11	-0.18i+0.21	-0.28i+0.33	-0.33i+0.40	-0.39i+0.46
A	0	-0.08i+0.09	-0.14i+0.17	-0.19i+0.24	-0.22i+0.28	-0.25i+0.32
Project C and D	0	0.01	0.03	0.05	0.07	0.07
Project A	0	0.01	0.03	0.05	0.06	0.07

	Runoff Coefficient				
Frequency	C_A	C_{CD}	C_B	C_{other}	This Project (C_B)
2-year	0.885	0.886	0.886		0.886
5-year	0.895	0.896	0.896		0.896
10-year	0.915	0.916	0.916		0.916
25-year	0.935	0.936	0.936		0.936
50-year	0.945	0.956	0.951		0.951
100-year	0.955	0.956	0.956		0.956

Intensity (I):

Source :

Calculated Flow

Comments

Frequency	Intensity (inches/hour)	Peak Flow (cfs)
2-year	3.22	2.77 cfs
5-year	4.55	3.95 cfs
10-year	5.26	4.67 cfs
50-year	7.63	7.03 cfs
100-year	8.72	8.08 cfs

Project Name :	I-70 & Havana Interchange
Job No. :	1303354DB
Date	4/30/2015
By :	ECM
Checked By :	BJC

TSIOUVARAS SIMMONS HOLDERNESS
CONSULTING ENGINEERS

Rational Method Calculations

Basin Charcteristics

Basin Description (ID) =	**4104R**		
Total Basin Area (A) =	1.39	acres	(see basin map)
			% impervious
Area Paved =	**1.39**	acres	100.00%
Area Unpaved (median) =	**0.00**	acres	0.00%
Area Residential (> .5 < 2 acre lots) =	**0.00**	acres	35.00%
Area Residential (> 2 acre lots) =	**0.00**	acres	15.00%
Area Undeveloped =	**0.00**	acres	2.00%
Other =	**0.00**	acres	50.00% (user entry)
Weighted % Impervious =			100.00%

General Basin Description (undeveloped or urbanized) : **Urbanized** (determines use of Tc (check) in section 2 below)

Time of Concentration:

Time (initial) calculated using the following equation :

$$t_i = \frac{1.8\,(1.1 - C_5)\,(L)^{0.5}}{S^{0.33}}$$

where :

C5 = runoff coefficient for 5-year frequency
L= length of overland flow in feet (500' maximum)
S = average basin slope in percent

Shallow concentrated and channel travel time calculated using the following equation :

$$t_t = \frac{L}{60V}$$

where :

t_t = Travel Time (min)
L = flow length (ft)
V = velocity (fps)

Overland			**Shallow Concentrated/Channel**		
Length =	**115.53**	ft	Length =	**582.55**	ft
$Elev_1$ =	**5310.23**		$Elev_1$ =	**5307.91**	
$Elev_2$ =	**5307.91**		$Elev_2$ =	**5299.47**	
$Elev_1$-$Elev_2$ =	2.32		$Elev_1$-$Elev_2$ =	8.44	ft
Slope =	2.01	%	Slope =	1.45	%
C_5	0.90		Velocity[1]=	2.41	fps
t_i =	**0.69**	**min.**	Watercourse Type =	**paved**	
			t_t =	**4.03**	**min.**
			t_i =	**0.69**	**min.**
			t_t =	**4.03**	**min.**
			$T_c = t_i + t_t$ =	**4.72**	**min.**
			T_c (check) =	13.88	min.
			Tc (used for calculation) =	**5.00**	**min.**

Runoff Coefficient (C):

From UDFCD 2001 equation RO-6 thru RO-7

$$C_A = K_A + (1.31i^3 - 1.44i^2 + 1.135i - 0.12)$$
$$C_{CD} = K_{CD} + (0.858i^3 - 0.786i^2 + 0.744i + 0.04)$$
$$C_B = (C_A + C_{CD})/2$$

i = % imperviousness/100 expressed as a decimal (see Table RO-3)
C_A = Runoff coefficient for Natural Resources Conservation Service, or NRCS Type A soil
C_B = Runoff coefficient for NRCS Type B soils
C_{CD} = Runoff coefficient for NRCS Type C and D soils
K_A = Correction Factor for Type A soils defined in Table RO-4
K_{CD} = Correction Factor for Type C and D soils defined in Table RO-4

Table RO-4 (UDFCD)

Correction Factors K_A and K_{CD} for Use with Equations RO-6 and RO-7

	Storm Return Period					
NCRS Soil Type	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
C and D	0	-0.10i+0.11	-0.18i+0.21	-0.28i+0.33	-0.33i+0.40	-0.39i+0.46
A	0	-0.08i+0.09	-0.14i+0.17	-0.19i+0.24	-0.22i+0.28	-0.25i+0.32
Project C and D	0	0.01	0.03	0.05	0.07	0.07
Project A	0	0.01	0.03	0.05	0.06	0.07

	Runoff Coefficient				
Frequency	C_A	C_{CD}	C_B	C_{other}	This Project (C_B)
2-year	0.885	0.886	0.886		0.886
5-year	0.895	0.896	0.896		0.896
10-year	0.915	0.916	0.916		0.916
25-year	0.935	0.936	0.936		0.936
50-year	0.945	0.956	0.951		0.951
100-year	0.955	0.956	0.956		0.956

Intensity (I):

Source :

Calculated Flow

Comments

Frequency	Intensity (inches/hour)	Peak Flow (cfs)
2-year	**3.22**	**3.96** cfs
5-year	**4.55**	**5.66** cfs
10-year	**5.26**	**6.69** cfs
50-year	**7.63**	**10.08** cfs
100-year	**8.72**	**11.58** cfs

Summary of CUHP Input Parameters
10-Year Existing

								Maximum Depression Storage (Watershed in)		Infiltration		
Catchment Name	Print Mode	Raingage	Area (mi^2)	Distance to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Horton's Decay Coefficient (1/seconds)	Final Rate (in/hr)
10	3	10YR	0.057	0.56	1.4	0.007834	65	0.35	0.1	4.5	0.0018	0.6
11	3	10YR	0.015	0.05	0.1	0.010923	40	0.35	0.1	4.5	0.0018	0.6
20	3	10YR	0.101	0.65	1.3	0.009948	65	0.35	0.1	4.5	0.0018	0.6
21	3	10YR	0.005	0.071	0.1	0.019	49	0.35	0.1	4.5	0.0018	0.6
30	3	10YR	0.298	0.457	0.915	0.011	55	0.35	0.1	4.5	0.0018	0.6
40	3	10YR	0.029	0.305	0.564	0.005	30	0.35	0.1	4.5	0.0018	0.6
41	3	10YR	0.006	0.055	0.113	0.015	15	0.35	0.1	4.5	0.0018	0.6
42	3	10YR	0.005	0.08	0.201	0.014	70	0.35	0.1	4.5	0.0018	0.6
43	3	10YR	0.002	0.046	0.1	0.012	35	0.35	0.1	4.5	0.0018	0.6
50a	3	10YR	0.016	0.116	0.241	0.008	30	0.35	0.1	4.5	0.0018	0.6
50b	3	10YR	0.009	0.038	0.12	0.007	45	0.35	0.1	4.5	0.0018	0.6
53	3	10YR	0.003	0.019	0.083	0.015	55	0.35	0.1	4.5	0.0018	0.6
60	3	10YR	0.048	0.468	0.66	0.007	35	0.35	0.1	4.5	0.0018	0.6
61a	3	10YR	0.011	0.084	0.143	0.005	50	0.35	0.1	4.5	0.0018	0.6
61b	3	10YR	0.004	0.043	0.073	0.031	25	0.35	0.1	4.5	0.0018	0.6
62	3	10YR	0.021	0.05	0.238	0.008	45	0.35	0.1	4.5	0.0018	0.6
63	3	10YR	0.004	0.058	0.155	0.012	52	0.35	0.1	4.5	0.0018	0.6
65a	3	10YR	0.003	0.094	0.172	0.012	49	0.35	0.1	4.5	0.0018	0.6
65b	3	10YR	0.005	0.092	0.231	0.01	20	0.35	0.1	4.5	0.0018	0.6
66	3	10YR	0.011	0.1	0.18	0.004	48	0.35	0.1	4.5	0.0018	0.6
68	3	10YR	0.004	0.041	0.112	0.014	73	0.35	0.1	4.5	0.0018	0.6
70	3	10YR	0.007	0.06	0.118	0.005	45	0.35	0.1	4.5	0.0018	0.6
72	3	10YR	0.021	0.214	0.51	0.004	30	0.35	0.1	4.5	0.0018	0.6
73	3	10YR	0.002	0.059	0.085	0.016	45	0.35	0.1	4.5	0.0018	0.6
74	3	10YR	0.011	0.338	0.602	0.007	40	0.35	0.1	4.5	0.0018	0.6
75	3	10YR	0.005	0.055	0.11	0.026	30	0.35	0.1	4.5	0.0018	0.6
77	3	10YR	0.002	0.027	0.07	0.035	40	0.35	0.1	4.5	0.0018	0.6
78	3	10YR	0.006	0.029	0.099	0.011	30	0.35	0.1	4.5	0.0018	0.6
80	3	10YR	0.109	0.443	0.885	0.008	90	0.35	0.1	4.5	0.0018	0.6
90	3	10YR	0.01	0.177	0.328	0.006	50	0.35	0.1	4.5	0.0018	0.6

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 1.3.3)

10-Year Existing

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph		
Catchment Name/ID	User Comment for Catchment	Ct	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)
10		0.130	0.468	37.2	13.02	19.3	8.71	22.8	46	132,422	1.12	148,307	48.0	31	148,302
11		0.225	0.260	9.4	2.19	4.9	1.54	3.6	48	34,848	0.78	27,064	30.0	15	27,034
20		0.109	0.510	28.0	9.80	14.6	6.55	18.8	108	234,643	1.12	262,789	44.0	68	262,774
21		0.302	0.268	12.7	2.91	6.6	2.06	4.9	12	11,616	0.90	10,447	31.0	5	10,445
30		0.087	0.540	14.6	5.12	7.6	3.43	10.6	611	692,314	0.98	679,946	35.0	282	679,809
40		0.199	0.218	65.7	11.29	34.2	7.98	18.8	13	67,373	0.64	43,020	53.0	6	43,019
41		0.386	0.135	32.1	3.63	16.7	2.56	6.0	6	13,939	0.44	6,128	37.0	2	6,128
42		0.271	0.338	14.4	4.04	7.5	2.86	6.7	10	11,616	1.19	13,804	32.0	5	13,804
43		0.436	0.166	26.9	3.73	14.0	2.63	6.2	2	4,646	0.71	3,282	35.0	1	3,283
50a		0.240	0.199	32.3	5.24	16.8	3.70	8.7	15	37,171	0.64	23,735	38.0	6	23,734
50b		0.257	0.272	10.9	2.59	5.7	1.83	4.3	25	20,909	0.84	17,659	31.0	9	17,657
53		0.342	0.271	7.3	1.82	3.8	1.29	3.0	12	6,970	0.98	6,845	27.0	4	6,843
60		0.163	0.267	53.5	11.27	27.8	7.97	18.8	27	111,514	0.71	78,779	50.0	14	78,779
61a		0.235	0.307	15.3	3.91	8.0	2.76	6.5	22	25,555	0.91	23,334	32.0	9	23,330
61b		0.388	0.145	18.2	2.32	9.4	1.64	3.9	7	9,293	0.57	5,315	32.0	2	5,314
62		0.198	0.309	11.4	3.00	5.9	2.12	5.0	55	48,787	0.84	41,204	31.0	20	41,190
63		0.318	0.272	16.5	3.75	8.6	2.65	6.2	7	9,293	0.94	8,741	32.0	3	8,740
65a		0.353	0.248	26.6	5.38	13.8	3.80	9.0	3	6,970	0.90	6,268	37.0	2	6,267
65b		0.384	0.138	62.0	6.88	32.2	4.86	11.5	2	11,616	0.51	5,876	47.0	1	5,876
66		0.237	0.297	20.5	4.98	10.7	3.52	8.3	16	25,555	0.89	22,632	35.0	8	22,632
68		0.287	0.333	8.5	2.47	4.4	1.75	4.1	14	9,293	1.23	11,426	28.0	6	11,422
70		0.278	0.262	16.5	3.61	8.6	2.55	6.0	13	16,262	0.84	13,735	33.0	5	13,732
72		0.220	0.207	64.7	10.60	33.6	7.49	17.7	10	48,787	0.64	31,152	52.0	5	31,152
73		0.410	0.217	18.8	3.43	9.8	2.43	5.7	3	4,646	0.84	3,924	33.0	1	3,923
74		0.248	0.248	71.8	13.98	37.3	9.88	23.3	5	25,555	0.78	19,847	58.0	3	19,847
75		0.344	0.167	19.9	2.86	10.4	2.02	4.8	8	11,616	0.64	7,417	33.0	3	7,416
77		0.421	0.192	11.3	1.97	5.9	1.39	3.3	5	4,646	0.78	3,608	31.0	2	3,607
78		0.325	0.172	15.7	2.38	8.2	1.68	4.0	11	13,939	0.64	8,901	32.0	4	8,901
80		0.097	0.592	15.6	5.45	8.1	3.64	12.3	210	253,229	1.47	371,288	36.0	136	371,280
90		0.242	0.302	32.7	7.88	17.0	5.57	13.1	9	23,232	0.91	21,213	41.0	5	21,213

Summary of CUHP Input Parameters
100-Year Existing

								Maximum Depression Storage (Watershed in)		Infiltration		
Catchment Name	Print Mode	Raingage	Area (mi^2)	Distance to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Horton's Decay Coefficient (1/seconds)	Final Rate (in/hr)
10	3	100YR	0.057	0.56	1.4	0.007834	65	0.35	0.1	4.5	0.0018	0.6
11	3	100YR	0.015	0.05	0.1	0.010923	40	0.35	0.1	4.5	0.0018	0.6
20	3	100YR	0.101	0.65	1.3	0.009948	65	0.35	0.1	4.5	0.0018	0.6
21	3	100YR	0.005	0.071	0.1	0.019	49	0.35	0.1	4.5	0.0018	0.6
30	3	100YR	0.298	0.457	0.915	0.011	55	0.35	0.1	4.5	0.0018	0.6
40	3	100YR	0.029	0.305	0.564	0.005	30	0.35	0.1	4.5	0.0018	0.6
41	3	100YR	0.006	0.055	0.113	0.015	15	0.35	0.1	4.5	0.0018	0.6
42	3	100YR	0.005	0.08	0.201	0.014	70	0.35	0.1	4.5	0.0018	0.6
43	3	100YR	0.002	0.046	0.1	0.012	35	0.35	0.1	4.5	0.0018	0.6
50a	3	100YR	0.016	0.116	0.241	0.008	30	0.35	0.1	4.5	0.0018	0.6
50b	3	100YR	0.009	0.038	0.12	0.007	45	0.35	0.1	4.5	0.0018	0.6
53	3	100YR	0.003	0.019	0.083	0.015	55	0.35	0.1	4.5	0.0018	0.6
60	3	100YR	0.048	0.468	0.66	0.007	35	0.35	0.1	4.5	0.0018	0.6
61a	3	100YR	0.011	0.084	0.143	0.005	50	0.35	0.1	4.5	0.0018	0.6
61b	3	100YR	0.004	0.043	0.073	0.031	25	0.35	0.1	4.5	0.0018	0.6
62	3	100YR	0.021	0.05	0.238	0.008	45	0.35	0.1	4.5	0.0018	0.6
63	3	100YR	0.004	0.058	0.155	0.012	52	0.35	0.1	4.5	0.0018	0.6
65a	3	100YR	0.003	0.094	0.172	0.012	49	0.35	0.1	4.5	0.0018	0.6
65b	3	100YR	0.005	0.092	0.231	0.01	20	0.35	0.1	4.5	0.0018	0.6
66	3	100YR	0.011	0.1	0.18	0.004	48	0.35	0.1	4.5	0.0018	0.6
68	3	100YR	0.004	0.041	0.112	0.014	73	0.35	0.1	4.5	0.0018	0.6
70	3	100YR	0.007	0.06	0.118	0.005	45	0.35	0.1	4.5	0.0018	0.6
72	3	100YR	0.021	0.214	0.51	0.004	30	0.35	0.1	4.5	0.0018	0.6
73	3	100YR	0.002	0.059	0.085	0.016	45	0.35	0.1	4.5	0.0018	0.6
74	3	100YR	0.011	0.338	0.602	0.007	40	0.35	0.1	4.5	0.0018	0.6
75	3	100YR	0.005	0.055	0.11	0.026	30	0.35	0.1	4.5	0.0018	0.6
77	3	100YR	0.002	0.027	0.07	0.035	40	0.35	0.1	4.5	0.0018	0.6
78	3	100YR	0.006	0.029	0.099	0.011	30	0.35	0.1	4.5	0.0018	0.6
80	3	100YR	0.109	0.443	0.885	0.008	90	0.35	0.1	4.5	0.0018	0.6
90	3	100YR	0.01	0.177	0.328	0.006	50	0.35	0.1	4.5	0.0018	0.6

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 1.3.3)

100-Year Existing

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph		
Catchment Name/ID	User Comment for Catchment	Ct	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)
10		0.130	0.471	36.9	12.92	19.2	8.64	22.7	46	132,422	2.25	297,509	54.0	69	297,505
11		0.224	0.266	9.2	2.18	4.8	1.54	3.6	49	34,848	1.91	66,559	35.0	37	66,524
20		0.109	0.513	27.8	9.72	14.4	6.50	18.7	109	234,643	2.25	527,166	49.0	149	527,165
21		0.300	0.271	12.5	2.90	6.5	2.05	4.8	12	11,616	2.03	23,580	36.0	11	23,577
30		0.087	0.545	14.5	5.06	7.5	3.38	10.6	619	692,314	2.11	1,461,694	40.0	630	1,461,514
40		0.197	0.223	63.4	11.18	33.0	7.90	18.6	14	67,373	1.78	119,765	61.0	20	119,765
41		0.382	0.136	31.5	3.58	16.4	2.53	6.0	6	13,939	1.58	22,067	44.0	6	22,067
42		0.270	0.339	14.3	4.03	7.5	2.85	6.7	10	11,616	2.31	26,876	37.0	11	26,872
43		0.433	0.170	26.0	3.70	13.5	2.62	6.2	2	4,646	1.84	8,566	41.0	3	8,566
50a		0.237	0.204	31.1	5.19	16.2	3.66	8.6	15	37,171	1.78	66,077	45.0	18	66,073
50b		0.256	0.277	10.7	2.58	5.6	1.82	4.3	25	20,909	1.98	41,326	35.0	21	41,310
53		0.341	0.273	7.2	1.82	3.8	1.28	3.0	12	6,970	2.11	14,715	32.0	9	14,714
60		0.162	0.274	51.7	11.19	26.9	7.91	18.6	28	111,514	1.84	205,592	57.0	39	205,592
61a		0.234	0.310	15.1	3.89	7.8	2.75	6.5	22	25,555	2.04	52,220	37.0	22	52,217
61b		0.384	0.148	17.5	2.30	9.1	1.62	3.8	7	9,293	1.71	15,915	37.0	6	15,914
62		0.197	0.314	11.1	2.99	5.8	2.11	5.0	57	48,787	1.98	96,428	36.0	48	96,402
63		0.317	0.274	16.3	3.73	8.5	2.64	6.2	7	9,293	2.07	19,241	38.0	8	19,236
65a		0.352	0.251	26.2	5.35	13.6	3.78	8.9	3	6,970	2.03	14,148	43.0	4	14,147
65b		0.379	0.140	60.2	6.79	31.3	4.80	11.3	2	11,616	1.65	19,144	56.0	3	19,144
66		0.236	0.301	20.2	4.96	10.5	3.50	8.3	16	25,555	2.02	51,534	40.0	18	51,531
68		0.286	0.334	8.4	2.46	4.4	1.74	4.1	14	9,293	2.35	21,876	33.0	11	21,869
70		0.277	0.266	16.1	3.60	8.4	2.54	6.0	13	16,262	1.98	32,143	38.0	13	32,139
72		0.218	0.213	62.4	10.50	32.4	7.42	17.5	10	48,787	1.78	86,727	60.0	14	86,726
73		0.408	0.221	18.4	3.42	9.6	2.42	5.7	3	4,646	1.98	9,184	38.0	3	9,182
74		0.247	0.254	69.8	13.92	36.3	9.84	23.2	5	25,555	1.91	48,810	66.0	7	48,810
75		0.340	0.172	19.2	2.83	10.0	2.00	4.7	8	11,616	1.78	20,649	38.0	8	20,646
77		0.419	0.197	11.0	1.96	5.7	1.39	3.3	5	4,646	1.91	8,874	35.0	4	8,872
78		0.321	0.176	15.2	2.36	7.9	1.67	3.9	12	13,939	1.78	24,779	37.0	11	24,776
80		0.097	0.593	15.5	5.44	8.1	3.64	12.3	210	253,229	2.59	655,319	41.0	250	655,324
90		0.241	0.306	32.1	7.85	16.7	5.55	13.1	9	23,232	2.04	47,472	47.0	12	47,473

Summary of CUHP Input Parameters
10-Year Proposed

								Maximum Depression Storage (Watershed in)		Infiltration		
Catchment Name	Print Mode	Raingage	Area (mi^2)	Distance to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Horton's Decay Coefficient (1/seconds)	Final Rate (in/hr)
10	3	10YR	0.057	0.56	1.4	0.007834	65	0.35	0.1	4.5	0.0018	0.6
11	3	10YR	0.015	0.05	0.1	0.010923	42.1	0.35	0.1	4.5	0.0018	0.6
20	3	10YR	0.101	0.65	1.3	0.009948	65.5	0.35	0.1	4.5	0.0018	0.6
21	3	10YR	0.0022	0.071	0.1	0.019	32.6	0.35	0.1	4.5	0.0018	0.6
30	3	10YR	0.298	0.457	0.915	0.011	55	0.35	0.1	4.5	0.0018	0.6
40	3	10YR	0.029	0.305	0.564	0.005	31.2	0.35	0.1	4.5	0.0018	0.6
41	3	10YR	0.006	0.055	0.113	0.015	15.8	0.35	0.1	4.5	0.0018	0.6
42	3	10YR	0.005	0.08	0.201	0.014	70	0.35	0.1	4.5	0.0018	0.6
43	3	10YR	0.002	0.046	0.1	0.012	35	0.35	0.1	4.5	0.0018	0.6
50a	3	10YR	0.016	0.116	0.241	0.008	30	0.35	0.1	4.5	0.0018	0.6
50b	3	10YR	0.009	0.038	0.12	0.007	45	0.35	0.1	4.5	0.0018	0.6
53	3	10YR	0.003	0.019	0.083	0.015	55	0.35	0.1	4.5	0.0018	0.6
60	3	10YR	0.0501	0.468	0.66	0.007	37.8	0.35	0.1	4.5	0.0018	0.6
61a	3	10YR	0.011	0.084	0.143	0.005	50	0.35	0.1	4.5	0.0018	0.6
61b	3	10YR	0.004	0.043	0.073	0.031	25	0.35	0.1	4.5	0.0018	0.6
62	3	10YR	0.021	0.05	0.238	0.008	45	0.35	0.1	4.5	0.0018	0.6
63	3	10YR	0.004	0.058	0.155	0.012	52	0.35	0.1	4.5	0.0018	0.6
65a	3	10YR	0.003	0.094	0.172	0.012	49	0.35	0.1	4.5	0.0018	0.6
65b	3	10YR	0.005	0.092	0.231	0.01	20	0.35	0.1	4.5	0.0018	0.6
66	3	10YR	0.011	0.1	0.18	0.004	48	0.35	0.1	4.5	0.0018	0.6
68	3	10YR	0.004	0.041	0.112	0.014	73	0.35	0.1	4.5	0.0018	0.6
70	3	10YR	0.007	0.06	0.118	0.005	45	0.35	0.1	4.5	0.0018	0.6
72	3	10YR	0.021	0.214	0.51	0.004	30	0.35	0.1	4.5	0.0018	0.6
73	3	10YR	0.002	0.059	0.085	0.016	45	0.35	0.1	4.5	0.0018	0.6
74	3	10YR	0.011	0.338	0.602	0.007	40	0.35	0.1	4.5	0.0018	0.6
75	3	10YR	0.005	0.055	0.11	0.026	30	0.35	0.1	4.5	0.0018	0.6
77	3	10YR	0.002	0.027	0.07	0.035	40	0.35	0.1	4.5	0.0018	0.6
78	3	10YR	0.006	0.029	0.099	0.011	30	0.35	0.1	4.5	0.0018	0.6
80	3	10YR	0.109	0.443	0.885	0.008	90	0.35	0.1	4.5	0.0018	0.6
90	3	10YR	0.01	0.177	0.328	0.006	50	0.35	0.1	4.5	0.0018	0.6

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 1.3.3)

10-Yr Proposed

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph		
Catchment Name/ID	User Comment for Catchment	Ct	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)
10		0.130	0.468	37.2	13.02	19.3	8.71	22.8	46	132,422	1.12	148,307	48.0	31	148,302
11		0.223	0.276	8.8	2.17	4.6	1.53	3.6	51	34,848	0.81	28,056	30.0	16	28,046
20		0.109	0.512	27.8	9.73	14.5	6.51	18.7	109	234,643	1.13	264,392	43.0	69	264,388
21		0.432	0.158	30.9	4.05	16.1	2.86	6.7	2	5,111	0.67	3,443	37.0	1	3,443
30		0.087	0.540	14.6	5.12	7.6	3.43	10.6	611	692,314	0.98	679,946	35.0	282	679,809
40		0.197	0.224	63.1	11.16	32.8	7.89	18.6	14	67,373	0.65	44,112	52.0	7	44,112
41		0.382	0.136	31.6	3.59	16.4	2.54	6.0	6	13,939	0.45	6,275	37.0	2	6,275
42		0.271	0.338	14.4	4.04	7.5	2.86	6.7	10	11,616	1.19	13,804	32.0	5	13,804
43		0.436	0.166	26.9	3.73	14.0	2.63	6.2	2	4,646	0.71	3,282	35.0	1	3,283
50a		0.240	0.199	32.3	5.24	16.8	3.70	8.7	15	37,171	0.64	23,735	38.0	6	23,734
50b		0.257	0.272	10.9	2.59	5.7	1.83	4.3	25	20,909	0.84	17,659	31.0	9	17,657
53		0.342	0.271	7.3	1.82	3.8	1.29	3.0	12	6,970	0.98	6,845	27.0	4	6,843
60		0.157	0.291	47.3	10.90	24.6	7.70	18.2	32	116,392	0.74	86,700	48.0	16	86,698
61a		0.235	0.307	15.3	3.91	8.0	2.76	6.5	22	25,555	0.91	23,334	32.0	9	23,330
61b		0.388	0.145	18.2	2.32	9.4	1.64	3.9	7	9,293	0.57	5,315	32.0	2	5,314
62		0.198	0.309	11.4	3.00	5.9	2.12	5.0	55	48,787	0.84	41,204	31.0	20	41,190
63		0.318	0.272	16.5	3.75	8.6	2.65	6.2	7	9,293	0.94	8,741	32.0	3	8,740
65a		0.353	0.248	26.6	5.38	13.8	3.80	9.0	3	6,970	0.90	6,268	37.0	2	6,267
65b		0.384	0.138	62.0	6.88	32.2	4.86	11.5	2	11,616	0.51	5,876	47.0	1	5,876
66		0.237	0.297	20.5	4.98	10.7	3.52	8.3	16	25,555	0.89	22,632	35.0	8	22,632
68		0.287	0.333	8.5	2.47	4.4	1.75	4.1	14	9,293	1.23	11,426	28.0	6	11,422
70		0.278	0.262	16.5	3.61	8.6	2.55	6.0	13	16,262	0.84	13,735	33.0	5	13,732
72		0.220	0.207	64.7	10.60	33.6	7.49	17.7	10	48,787	0.64	31,152	52.0	5	31,152
73		0.410	0.217	18.8	3.43	9.8	2.43	5.7	3	4,646	0.84	3,924	33.0	1	3,923
74		0.248	0.248	71.8	13.98	37.3	9.88	23.3	5	25,555	0.78	19,847	58.0	3	19,847
75		0.344	0.167	19.9	2.86	10.4	2.02	4.8	8	11,616	0.64	7,417	33.0	3	7,416
77		0.421	0.192	11.3	1.97	5.9	1.39	3.3	5	4,646	0.78	3,608	31.0	2	3,607
78		0.325	0.172	15.7	2.38	8.2	1.68	4.0	11	13,939	0.64	8,901	32.0	4	8,901
80		0.097	0.592	15.6	5.45	8.1	3.64	12.3	210	253,229	1.47	371,288	36.0	136	371,280
90		0.242	0.302	32.7	7.88	17.0	5.57	13.1	9	23,232	0.91	21,213	41.0	5	21,213

Summary of CUHP Input Parameters
100-Year Proposed

								Maximum Depression Storage (Watershed in)		Infiltration		
Catchment Name	Print Mode	Raingage	Area (mi^2)	Distance to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Horton's Decay Coefficient (1/seconds)	Final Rate (in/hr)
10	3	100YR	0.057	0.56	1.4	0.007834	65	0.35	0.1	4.5	0.0018	0.6
11	3	100YR	0.015	0.05	0.1	0.010923	42.1	0.35	0.1	4.5	0.0018	0.6
20	3	100YR	0.101	0.65	1.3	0.009948	65.5	0.35	0.1	4.5	0.0018	0.6
21	3	100YR	0.0022	0.071	0.1	0.019	32.6	0.35	0.1	4.5	0.0018	0.6
30	3	100YR	0.298	0.457	0.915	0.011	55	0.35	0.1	4.5	0.0018	0.6
40	3	100YR	0.029	0.305	0.564	0.005	31.2	0.35	0.1	4.5	0.0018	0.6
41	3	100YR	0.006	0.055	0.113	0.015	15.8	0.35	0.1	4.5	0.0018	0.6
42	3	100YR	0.005	0.08	0.201	0.014	70	0.35	0.1	4.5	0.0018	0.6
43	3	100YR	0.002	0.046	0.1	0.012	35	0.35	0.1	4.5	0.0018	0.6
50a	3	100YR	0.016	0.116	0.241	0.008	30	0.35	0.1	4.5	0.0018	0.6
50b	3	100YR	0.009	0.038	0.12	0.007	45	0.35	0.1	4.5	0.0018	0.6
53	3	100YR	0.003	0.019	0.083	0.015	55	0.35	0.1	4.5	0.0018	0.6
60	3	100YR	0.05008	0.468	0.66	0.007	37.8	0.35	0.1	4.5	0.0018	0.6
61a	3	100YR	0.011	0.084	0.143	0.005	50	0.35	0.1	4.5	0.0018	0.6
61b	3	100YR	0.004	0.043	0.073	0.031	25	0.35	0.1	4.5	0.0018	0.6
62	3	100YR	0.021	0.05	0.238	0.008	45	0.35	0.1	4.5	0.0018	0.6
63	3	100YR	0.004	0.058	0.155	0.012	52	0.35	0.1	4.5	0.0018	0.6
65a	3	100YR	0.003	0.094	0.172	0.012	49	0.35	0.1	4.5	0.0018	0.6
65b	3	100YR	0.005	0.092	0.231	0.01	20	0.35	0.1	4.5	0.0018	0.6
66	3	100YR	0.011	0.1	0.18	0.004	48	0.35	0.1	4.5	0.0018	0.6
68	3	100YR	0.004	0.041	0.112	0.014	73	0.35	0.1	4.5	0.0018	0.6
70	3	100YR	0.007	0.06	0.118	0.005	45	0.35	0.1	4.5	0.0018	0.6
72	3	100YR	0.021	0.214	0.51	0.004	30	0.35	0.1	4.5	0.0018	0.6
73	3	100YR	0.002	0.059	0.085	0.016	45	0.35	0.1	4.5	0.0018	0.6
74	3	100YR	0.011	0.338	0.602	0.007	40	0.35	0.1	4.5	0.0018	0.6
75	3	100YR	0.005	0.055	0.11	0.026	30	0.35	0.1	4.5	0.0018	0.6
77	3	100YR	0.002	0.027	0.07	0.035	40	0.35	0.1	4.5	0.0018	0.6
78	3	100YR	0.006	0.029	0.099	0.011	30	0.35	0.1	4.5	0.0018	0.6
80	3	100YR	0.109	0.443	0.885	0.008	90	0.35	0.1	4.5	0.0018	0.6
90	3	100YR	0.01	0.177	0.328	0.006	50	0.35	0.1	4.5	0.0018	0.6

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 1.3.3)

100-Year Proposed

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph		
Catchment Name/ID	User Comment for Catchment	Ct	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)
10		0.130	0.471	36.9	12.92	19.2	8.64	22.7	46	132,422	2.25	297,509	54.0	69	297,505
11		0.222	0.282	8.6	2.16	4.5	1.53	3.6	52	34,848	1.94	67,531	34.0	38	67,516
20		0.109	0.515	27.6	9.66	14.3	6.46	18.7	110	234,643	2.25	528,736	49.0	150	528,736
21		0.428	0.162	29.8	4.01	15.5	2.84	6.7	2	5,118	1.81	9,273	43.0	3	9,273
30		0.087	0.545	14.5	5.06	7.5	3.38	10.6	619	692,314	2.11	1,461,694	40.0	630	1,461,514
40		0.195	0.230	60.8	11.06	31.6	7.81	18.4	14	67,373	1.79	120,831	60.0	20	120,830
41		0.378	0.137	30.9	3.55	16.1	2.51	5.9	6	13,939	1.59	22,212	43.0	6	22,212
42		0.270	0.339	14.3	4.03	7.5	2.85	6.7	10	11,616	2.31	26,876	37.0	11	26,872
43		0.433	0.170	26.0	3.70	13.5	2.62	6.2	2	4,646	1.84	8,566	41.0	3	8,566
50a		0.237	0.204	31.1	5.19	16.2	3.66	8.6	15	37,171	1.78	66,077	45.0	18	66,073
50b		0.256	0.277	10.7	2.58	5.6	1.82	4.3	25	20,909	1.98	41,326	35.0	21	41,310
53		0.341	0.273	7.2	1.82	3.8	1.28	3.0	12	6,970	2.11	14,715	32.0	9	14,714
60		0.156	0.299	45.9	10.84	23.9	7.66	18.1	33	116,341	1.88	218,809	55.0	45	218,808
61a		0.234	0.310	15.1	3.89	7.8	2.75	6.5	22	25,555	2.04	52,220	37.0	22	52,217
61b		0.384	0.148	17.5	2.30	9.1	1.62	3.8	7	9,293	1.71	15,915	37.0	6	15,914
62		0.197	0.314	11.1	2.99	5.8	2.11	5.0	57	48,787	1.98	96,428	36.0	48	96,402
63		0.317	0.274	16.3	3.73	8.5	2.64	6.2	7	9,293	2.07	19,241	38.0	8	19,236
65a		0.352	0.251	26.2	5.35	13.6	3.78	8.9	3	6,970	2.03	14,148	43.0	4	14,147
65b		0.379	0.140	60.2	6.79	31.3	4.80	11.3	2	11,616	1.65	19,144	56.0	3	19,144
66		0.236	0.301	20.2	4.96	10.5	3.50	8.3	16	25,555	2.02	51,534	40.0	18	51,531
68		0.286	0.334	8.4	2.46	4.4	1.74	4.1	14	9,293	2.35	21,876	33.0	11	21,869
70		0.277	0.266	16.1	3.60	8.4	2.54	6.0	13	16,262	1.98	32,143	38.0	13	32,139
72		0.218	0.213	62.4	10.50	32.4	7.42	17.5	10	48,787	1.78	86,727	60.0	14	86,726
73		0.408	0.221	18.4	3.42	9.6	2.42	5.7	3	4,646	1.98	9,184	38.0	3	9,182
74		0.247	0.254	69.8	13.92	36.3	9.84	23.2	5	25,555	1.91	48,810	66.0	7	48,810
75		0.340	0.172	19.2	2.83	10.0	2.00	4.7	8	11,616	1.78	20,649	38.0	8	20,646
77		0.419	0.197	11.0	1.96	5.7	1.39	3.3	5	4,646	1.91	8,874	35.0	4	8,872
78		0.321	0.176	15.2	2.36	7.9	1.67	3.9	12	13,939	1.78	24,779	37.0	11	24,776
80		0.097	0.593	15.5	5.44	8.1	3.64	12.3	210	253,229	2.59	655,319	41.0	250	655,324
90		0.241	0.306	32.1	7.85	16.7	5.55	13.1	9	23,232	2.04	47,472	47.0	12	47,473

5.0 RAINFALL

5.1 Introduction

The design rainfall data to be used to complete hydrologic analyses described in the RUNOFF chapter of these DENVER CRITERIA are presented in this section. More specifically, this chapter provides: 1) point precipitation values for Denver, 2) information on the Colorado Urban Hydrograph Procedure (CUHP), and 3) an intensity-duration-frequency table for use with the Rational Method. All hydrological analyses within Denver shall use the rainfall data presented herein for calculating storm runoff. There may be cases where the designer needs to consider events more extreme than the 100-year storm (e.g., for public safety).

The design storms and intensity-frequency-duration tables for Denver were developed using the rainfall data and procedures presented in the DISTRICT MANUAL and are presented herein for convenience.

5.2 Rainfall Depth-Duration-Frequency Values

A review of the isopluvial maps presented in the *Precipitation-Frequency Atlas of the Western United States, Volume III-Colorado* (National Oceanic and Atmospheric Administration [NOAA] Atlas) shows that all of Denver can be included in one rainfall zone. The precipitation values for various return periods and duration storms were found to have minimal variation.

The 1-hour point rainfall is necessary for use with both the Rational Method and CUHP and is also the basis for deriving durations less than one hour. For watersheds greater than 10 square miles, the 3-hour rainfall depth is required, and for watersheds 20 square miles and larger, the 6-hour rainfall depth is required for use with CUHP. One-hour point rainfall values are summarized in Table 5.1. To obtain durations less than 1 hour, the factors in Table 5.2 are applied to the 1-hour point rainfall.

Table 5.1. One-hour Point Rainfall Depths

Return Period	One-hour Point Rainfall (inches)
2-Year	0.95
5-Year	1.34
10-Year	1.55
50-Year	2.25
100-Year	2.57
Date: July, 1992 Revised:	Reference: Wastewater Management Division, 1987, as determined based on NOAA Atlas 2, Volume IIII.

Table 5.2. Calculation of Rainfall Durations Less than One Hour

Duration (minutes)	**5**	**10**	**15**	**30**
Relationship to 1-hour Point Precipitation (P_1)	$0.29P_1$	$0.45P_1$	$0.57P_1$	$0.79P_1$
Reference: UDFCD 2001, Volume 1.				

These point rainfall depths must be distributed temporally (e.g., 5-minute increments) for use with the CUHP model. Area adjustment of these point rainfall values is required based on watershed size when using CUHP. CUHP automatically calculates temporal adjustments to rainfall distribution for various storm events and watershed sizes in accordance with the RAINFALL chapter of the DISTRICT MANUAL.

Table 5.3 provides the rainfall intensity-duration values calculated for use with the Rational Method in small watersheds that are 160 acres or less in size, based on the following equation:

$$I = \frac{28.5\,P_1}{(10 + T_c)^{0.786}} \qquad \text{(Equation 5.1)}$$

in which:

I = rainfall intensity (inches per hour)

P_1 = 1-hour point rainfall depth (inches)

T_c = time of concentration (minutes)

Table 5.3. Rainfall Intensity Duration Values for Use with the Rational Method

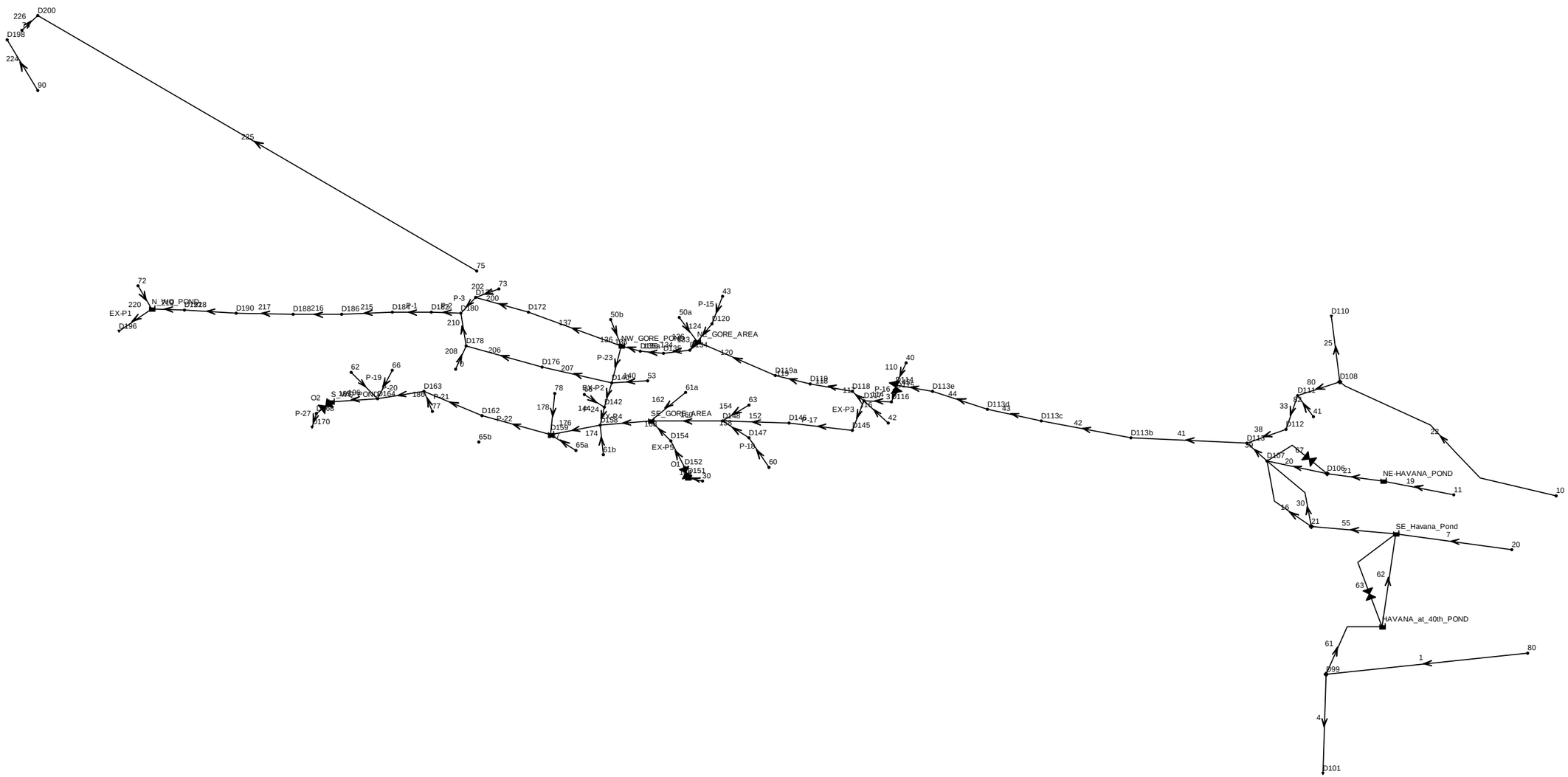
Time	Rainfall Intensity in Inches per Hour					Time	Rainfall Intensity in Inches per Hour				
Min.	2-yr	5-yr	10-yr	50-yr	100-yr	Min.	2-yr	5-yr	10-yr	50-yr	100-yr
5	3.22	4.55	5.26	7.63	8.72	35	1.36	1.92	2.22	3.22	3.68
10	2.57	3.63	4.19	6.09	6.95	36	1.34	1.88	2.18	3.16	3.61
11	2.47	3.49	4.04	5.86	6.69	37	1.31	1.85	2.14	3.11	3.55
12	2.38	3.36	3.89	5.65	6.45	38	1.29	1.82	2.11	3.06	3.49
13	2.30	3.25	3.76	5.45	6.23	39	1.27	1.79	2.07	3.01	3.44
14	2.23	3.14	3.63	5.27	6.02	40	1.25	1.76	2.04	2.96	3.38
15	2.16	3.04	3.52	5.11	5.83	41	1.23	1.74	2.01	2.92	3.33
16	2.09	2.95	3.41	4.95	5.66	42	1.21	1.71	1.98	2.87	3.28
17	2.03	2.86	3.31	4.81	5.49	43	1.19	1.69	1.95	2.83	3.23
18	1.97	2.78	3.22	4.67	5.34	44	1.18	1.66	1.92	2.79	3.19
19	1.92	2.71	3.13	4.55	5.19	45	1.16	1.64	1.89	2.75	3.14
20	1.87	2.64	3.05	4.43	5.06	46	1.14	1.61	1.87	2.71	3.10
21	1.82	2.57	2.97	4.31	4.93	47	1.13	1.59	1.84	2.67	3.05
22	1.78	2.51	2.90	4.21	4.81	48	1.11	1.57	1.82	2.64	3.01
23	1.73	2.45	2.83	4.11	4.69	49	1.10	1.55	1.79	2.60	2.97
24	1.69	2.39	2.76	4.01	4.58	50	1.08	1.53	1.77	2.57	2.93
25	1.66	2.34	2.70	3.92	4.48	51	1.07	1.51	1.75	2.53	2.89
26	1.62	2.28	2.64	3.84	4.38	52	1.06	1.49	1.72	2.50	2.86
27	1.58	2.24	2.59	3.75	4.29	53	1.04	1.47	1.70	2.47	2.82
28	1.55	2.19	2.53	3.68	4.20	54	1.03	1.45	1.68	2.44	2.79
29	1.52	2.14	2.48	3.60	4.11	55	1.02	1.44	1.66	2.41	2.75
30	1.49	2.10	2.43	3.53	4.03	56	1.01	1.42	1.64	2.38	2.72
31	1.46	2.06	2.39	3.46	3.95	57	0.99	1.40	1.62	2.35	2.69
32	1.43	2.02	2.34	3.40	3.88	58	0.98	1.39	1.60	2.33	2.66
33	1.41	1.99	2.30	3.34	3.81	59	0.97	1.37	1.58	2.30	2.63
34	1.38	1.95	2.26	3.28	3.74	60	0.96	1.35	1.57	2.27	2.60

Date: Jan 2006 Calculated based on Equation 5.1.
Revised:

APPENDIX 5.2 – Hydraulic Analysis

100-Year Existing Conditions Model

01/01/2005 00:01:00



```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.005)
--------------------------------------------------------------

10-Year Existing Conditions Model
WARNING 02: maximum depth increased for Node D174

*********************************************************
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 ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Starting Date ............ JAN-01-2005 00:00:00
Ending Date .............. JAN-02-2005 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... NO
Maximum Trials ........... 8
Head Tolerance ........... 0.005000 ft


**************************        Volume         Volume
Flow Routing Continuity        acre-feet       10^6 gal
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.000          0.000
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........       462.732        150.788
External Outflow .........         9.452          3.080
Internal Outflow .........       451.850        147.242
```

```
Evaporation Loss .........          0.000         0.000
Seepage Loss .............          0.000         0.000
Initial Stored Volume ....         12.100         3.943
Final Stored Volume ......         13.622         4.439
Continuity Error (%) .....         -0.020
```

****
Highest Continuity Errors
****

Node HAVANA_at_40th_POND (7.23%)
Node D192 (1.58%)

****
Highest Flow Instability Indexes
****

Link 185 (5)
Link P-20 (4)

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

```
Minimum Time Step           :     1.00 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
```

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
10	JUNCTION	0.00	0.00	5283.00	0 00:00
11	JUNCTION	0.00	0.00	5286.00	0 00:00
20	JUNCTION	0.00	0.00	5285.00	0 00:00
30	JUNCTION	0.11	2.31	5260.31	0 00:34
40	JUNCTION	0.00	0.00	5262.00	0 00:00

41	JUNCTION	0.00	0.00	5274.50	0	00:00
42	JUNCTION	0.00	0.00	5253.62	0	00:00
43	JUNCTION	0.01	0.18	5264.18	0	00:35
50a	JUNCTION	0.00	0.00	5250.10	0	00:00
50b	JUNCTION	0.00	0.00	5247.50	0	00:00
53	JUNCTION	0.00	0.00	5247.50	0	00:00
60	JUNCTION	0.07	0.74	5256.34	0	00:50
61a	JUNCTION	0.00	0.00	5246.75	0	00:00
61b	JUNCTION	0.00	0.00	5245.50	0	00:00
62	JUNCTION	0.00	0.00	5236.50	0	00:00
63	JUNCTION	0.00	0.00	5248.50	0	00:00
65a	JUNCTION	0.00	0.00	5254.00	0	00:00
65b	JUNCTION	0.00	0.00	0.00	0	00:00
66	JUNCTION	0.03	0.55	5244.55	0	00:35
68	JUNCTION	0.00	0.00	5246.50	0	00:00
70	JUNCTION	0.00	0.00	5249.30	0	00:00
72	JUNCTION	0.04	0.35	5240.35	0	00:52
73	JUNCTION	0.00	0.00	5249.00	0	00:00
74	JUNCTION	0.00	0.00	5230.00	0	00:00
75	JUNCTION	0.07	0.42	5245.42	0	00:38
77	JUNCTION	0.00	0.00	5240.50	0	00:00
78	JUNCTION	0.00	0.00	5242.80	0	00:00
80	JUNCTION	0.00	0.00	5290.00	0	00:00
90	JUNCTION	0.00	0.00	0.00	0	00:00
D107	JUNCTION	0.09	0.71	5275.71	0	00:36
D111	JUNCTION	0.17	2.03	5276.53	0	00:39
D112	JUNCTION	0.06	0.61	5274.61	0	00:49
D113	JUNCTION	0.17	1.20	5274.30	0	01:04
D113b	JUNCTION	0.21	1.46	5272.46	0	01:05
D113c	JUNCTION	0.21	1.43	5269.23	0	01:08
D113d	JUNCTION	0.26	1.75	5266.55	0	01:11
D113e	JUNCTION	0.31	2.46	5265.46	0	01:30
D114	JUNCTION	0.47	3.59	5265.34	0	01:30
D115	JUNCTION	0.22	1.49	5263.23	0	01:30
D116	JUNCTION	0.28	1.55	5258.15	0	01:31
D117	JUNCTION	0.66	4.54	5258.14	0	01:31
D118	JUNCTION	0.03	0.63	5258.12	0	01:31
D119	JUNCTION	0.04	0.58	5253.58	0	01:16
D119a	JUNCTION	0.06	0.64	5252.64	0	01:37
D120	JUNCTION	0.05	0.50	5253.60	0	00:35
D134	JUNCTION	0.10	1.23	5250.83	0	01:44
D135	JUNCTION	0.10	1.11	5250.45	0	01:44
D136	JUNCTION	0.05	0.50	5249.50	0	01:44
D140	JUNCTION	0.37	2.23	5249.23	0	02:33
D142	JUNCTION	0.17	1.01	5246.51	0	00:32
D145	JUNCTION	0.50	3.35	5254.35	0	01:31

D146	JUNCTION	0.33	1.42	5251.42	0	01:30
D147	JUNCTION	0.04	0.36	5249.86	0	00:50
D148	JUNCTION	0.19	0.87	5249.37	0	01:16
D152	JUNCTION	0.85	1.20	5251.20	0	01:45
D154	JUNCTION	0.52	0.79	5249.39	0	02:44
D158	JUNCTION	0.70	1.92	5246.12	0	03:02
D162	JUNCTION	1.23	3.04	5244.24	0	03:13
D163	JUNCTION	1.77	3.30	5243.70	0	03:26
D164	JUNCTION	2.10	3.17	5243.07	0	04:14
D168	JUNCTION	4.50	4.50	5241.00	0	00:00
D172	JUNCTION	0.00	0.00	5250.00	0	00:00
D174	JUNCTION	0.03	0.59	5249.59	0	00:36
D176	JUNCTION	0.00	0.00	5250.00	0	00:00
D178	JUNCTION	0.03	0.74	5249.54	0	00:36
D180	JUNCTION	0.06	1.02	5249.52	0	00:36
D182	JUNCTION	0.06	0.99	5249.09	0	00:37
D184	JUNCTION	0.04	0.82	5248.32	0	00:37
D186	JUNCTION	0.04	0.70	5246.70	0	00:44
D188	JUNCTION	0.09	0.82	5243.82	0	00:51
D190	JUNCTION	0.06	0.57	5242.57	0	00:55
D192	JUNCTION	0.08	0.57	5240.57	0	01:00
D198	JUNCTION	0.00	0.00	0.00	0	00:10
D200	JUNCTION	1.54	1.60	5231.10	0	01:39
D101	OUTFALL	0.20	4.00	5291.70	0	00:28
D110	OUTFALL	0.00	0.04	5283.84	0	00:48
D170	OUTFALL	7.51	7.51	5243.76	0	00:00
D196	OUTFALL	0.10	0.79	5238.79	0	01:31
21	DIVIDER	0.47	2.89	5278.89	0	01:43
D99	DIVIDER	0.25	6.41	5296.41	0	00:36
D106	DIVIDER	0.04	0.60	5278.60	0	00:39
D108	DIVIDER	0.28	4.56	5284.06	0	00:48
D151	STORAGE	3.39	4.70	5254.70	0	02:14
D159	STORAGE	1.23	3.16	5245.96	0	03:04
HAVANA_at_40th_POND	STORAGE	0.14	1.79	5282.79	0	00:45
N_WQ_POND	STORAGE	0.23	1.44	5239.94	0	01:31
NE_GORE_AREA	STORAGE	0.06	0.85	5250.95	0	01:43
NE-HAVANA_POND	STORAGE	0.04	0.79	5283.79	0	00:39
NW_GORE_POND	STORAGE	0.28	1.99	5249.49	0	02:33
S_WQ_POND	STORAGE	5.52	6.57	5243.07	0	04:13
SE_GORE_AREA	STORAGE	1.11	2.72	5249.32	0	02:52
SE_Havana_Pond	STORAGE	0.52	4.20	5282.20	0	01:42

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Node Inflow Summary
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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	Flow Balance Error Percent
10	JUNCTION	31.30	31.30	0	00:48	1.11	1.11	0.000
11	JUNCTION	15.06	15.06	0	00:30	0.202	0.202	0.000
20	JUNCTION	68.39	68.39	0	00:44	1.97	1.97	0.000
30	JUNCTION	282.22	282.22	0	00:35	5.08	5.08	-0.001
40	JUNCTION	6.33	6.33	0	00:53	0.322	0.322	0.000
41	JUNCTION	1.80	1.80	0	00:37	0.0458	0.0458	0.000
42	JUNCTION	5.40	5.40	0	00:32	0.103	0.103	0.000
43	JUNCTION	0.95	0.95	0	00:35	0.0246	0.0246	-0.017
50a	JUNCTION	6.20	6.20	0	00:38	0.178	0.178	0.000
50b	JUNCTION	8.87	8.87	0	00:31	0.132	0.132	0.000
53	JUNCTION	3.95	3.95	0	00:27	0.0512	0.0512	0.000
60	JUNCTION	13.53	13.53	0	00:50	0.589	0.589	-0.001
61a	JUNCTION	9.41	9.41	0	00:32	0.175	0.175	0.000
61b	JUNCTION	2.21	2.21	0	00:32	0.0398	0.0398	0.000
62	JUNCTION	20.38	20.38	0	00:31	0.308	0.308	0.000
63	JUNCTION	3.31	3.31	0	00:32	0.0654	0.0654	0.000
65a	JUNCTION	1.72	1.72	0	00:37	0.0469	0.0469	0.000
65b	JUNCTION	0.95	0.95	0	00:47	0.044	0.044	0.000
66	JUNCTION	7.58	7.58	0	00:35	0.169	0.169	-0.007
68	JUNCTION	5.86	5.86	0	00:28	0.0854	0.0854	0.000
70	JUNCTION	5.39	5.39	0	00:33	0.103	0.103	0.000
72	JUNCTION	4.64	4.64	0	00:52	0.233	0.233	-0.000
73	JUNCTION	1.40	1.40	0	00:33	0.0293	0.0293	0.000
74	JUNCTION	2.61	2.61	0	00:58	0.148	0.148	0.000
75	JUNCTION	2.78	2.78	0	00:33	0.0555	0.0555	-20.991
77	JUNCTION	1.82	1.82	0	00:31	0.027	0.027	0.000
78	JUNCTION	3.94	3.94	0	00:32	0.0666	0.0666	0.000
80	JUNCTION	135.63	135.63	0	00:36	2.78	2.78	0.000
90	JUNCTION	5.04	5.04	0	00:41	0.159	0.159	0.000
D107	JUNCTION	0.00	31.94	0	00:45	0	2.41	-0.133
D111	JUNCTION	0.00	23.07	0	00:40	0	1.05	0.086
D112	JUNCTION	0.00	23.13	0	00:43	0	1.05	-0.313
D113	JUNCTION	0.00	56.54	0	00:38	0	3.46	0.146
D113b	JUNCTION	0.00	52.68	0	01:04	0	3.46	0.021
D113c	JUNCTION	0.00	52.71	0	01:06	0	3.46	-0.029
D113d	JUNCTION	0.00	52.66	0	01:08	0	3.46	-0.044
D113e	JUNCTION	0.00	52.58	0	01:11	0	3.46	0.114
D114	JUNCTION	0.00	56.30	0	01:24	0	3.78	0.019
D115	JUNCTION	0.00	56.11	0	01:30	0	3.78	0.000

D116	JUNCTION	0.00	56.11	0	01:30	0	3.78	-0.001	
D117	JUNCTION	0.00	57.08	0	01:30	0	3.88	0.004	
D118	JUNCTION	0.00	16.15	0	01:31	0	0.482	-0.064	
D119	JUNCTION	0.00	16.15	0	01:32	0	0.482	-0.899	
D119a	JUNCTION	0.00	16.47	0	01:18	0	0.486	0.984	
D120	JUNCTION	0.00	0.95	0	00:35	0	0.0246	-0.347	
D134	JUNCTION	0.00	18.24	0	01:42	0	0.684	0.008	
D135	JUNCTION	0.00	18.22	0	01:44	0	0.684	-0.007	
D136	JUNCTION	0.00	18.22	0	01:44	0	0.684	0.066	
D140	JUNCTION	0.00	8.66	0	01:53	0	0.867	0.018	
D142	JUNCTION	0.00	10.17	0	00:32	0	0.952	-0.010	
D145	JUNCTION	0.00	40.92	0	01:31	0	3.4	-0.002	
D146	JUNCTION	0.00	40.92	0	01:32	0	3.4	0.020	
D147	JUNCTION	0.00	13.53	0	00:50	0	0.589	-0.236	
D148	JUNCTION	0.00	52.55	0	01:13	0	4.05	-0.301	
D152	JUNCTION	0.00	14.51	0	02:15	0	5.09	0.010	
D154	JUNCTION	0.00	14.51	0	02:15	0	5.09	0.010	
D158	JUNCTION	0.00	63.42	0	02:43	0	10.3	0.032	
D162	JUNCTION	0.00	62.90	0	03:02	0	10.4	-0.037	
D163	JUNCTION	0.00	62.86	0	03:04	0	10.4	0.020	
D164	JUNCTION	0.00	65.31	0	07:36	0	13.7	0.232	
D168	JUNCTION	0.00	265.99	0	04:13	0	147	0.005	
D172	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	gal
D174	JUNCTION	0.00	1.40	0	00:33	0	0.0293	0.160	
D176	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	gal
D178	JUNCTION	0.00	5.39	0	00:33	0	0.103	-0.010	
D180	JUNCTION	0.00	6.36	0	00:35	0	0.132	0.103	
D182	JUNCTION	0.00	6.33	0	00:36	0	0.132	0.012	
D184	JUNCTION	0.00	6.32	0	00:37	0	0.132	-0.674	
D186	JUNCTION	0.00	7.22	0	00:40	0	0.133	-0.506	
D188	JUNCTION	0.00	7.68	0	00:46	0	0.133	0.634	
D190	JUNCTION	0.00	6.53	0	00:54	0	0.133	-0.763	
D192	JUNCTION	0.00	7.54	0	00:58	0	0.134	1.600	
D198	JUNCTION	0.00	5.04	0	00:41	0	0.159	0.000	
D200	JUNCTION	0.00	4.77	0	00:47	0	0.219	0.000	
D101	OUTFALL	0.00	100.56	0	00:36	0	2.61	0.000	
D110	OUTFALL	0.00	9.96	0	00:48	0	0.105	0.000	
D170	OUTFALL	0.00	211.02	0	00:05	0	136	0.000	
D196	OUTFALL	0.00	6.41	0	01:31	0	0.365	0.000	
21	DIVIDER	4.73	25.77	0	01:33	0.0781	2.2	-0.025	
D99	DIVIDER	0.00	135.63	0	00:36	0	2.78	-0.224	
D106	DIVIDER	0.00	9.41	0	00:39	0	0.202	-0.000	
D108	DIVIDER	0.00	31.30	0	00:48	0	1.11	-0.114	
D151	STORAGE	0.00	282.31	0	00:35	0	6.56	0.000	
D159	STORAGE	0.00	63.32	0	02:45	0	10.4	0.171	
HAVANA_at_40th_POND	STORAGE	0.00	34.87	0	00:36	0	0.183	7.792	

N_WQ_POND	STORAGE	0.00	10.87	0	01:00	0	0.365	0.001
NE_GORE_AREA	STORAGE	0.00	18.81	0	01:33	0	0.684	-0.004
NE-HAVANA_POND	STORAGE	0.00	15.06	0	00:30	0	0.202	-0.000
NW_GORE_POND	STORAGE	0.00	19.00	0	01:44	0	0.815	-0.043
S_WQ_POND	STORAGE	0.00	70.83	0	07:37	0	16.1	-0.138
SE_GORE_AREA	STORAGE	0.00	68.81	0	01:15	0	9.33	0.275
SE_Havana_Pond	STORAGE	0.00	75.53	0	00:44	0	2.14	-0.029

****
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
11	JUNCTION	24.00	0.000	10.000
20	JUNCTION	24.00	0.000	10.000
42	JUNCTION	24.00	0.000	10.000
53	JUNCTION	24.00	0.000	10.000
61b	JUNCTION	24.00	0.000	5.000
62	JUNCTION	24.00	0.000	7.000
65a	JUNCTION	24.00	0.000	5.000
65b	JUNCTION	24.00	0.000	0.000
68	JUNCTION	24.00	0.000	5.200
70	JUNCTION	24.00	0.000	10.000
77	JUNCTION	24.00	0.000	7.500
D140	JUNCTION	1.48	0.228	1.772
D198	JUNCTION	24.00	0.000	0.000
D200	JUNCTION	22.34	0.000	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

65b	5.54	0.95	0	00:47	0.044	0.000
D168	24.00	265.99	0	04:13	146.935	0.000
D198	3.85	5.04	0	00:41	0.159	0.000
D200	22.34	2.86	0	01:39	0.095	0.000

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Infil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days	hr:min	Maximum Outflow CFS
D151	417.052	9	0	0	782.308	17	0	02:14	14.51
D159	7.082	7	0	0	30.691	28	0	03:04	62.90
HAVANA_at_40th_POND	0.222	0	0	0	5.934	6	0	00:45	7.21
N_WQ_POND	0.803	1	0	0	10.356	9	0	01:31	6.41
NE_GORE_AREA	0.226	0	0	0	4.619	9	0	01:43	18.24
NE-HAVANA_POND	0.227	0	0	0	7.068	7	0	00:39	9.41
NW_GORE_POND	4.386	2	0	0	46.460	22	0	02:33	8.47
S_WQ_POND	443.017	42	0	0	629.216	59	0	04:13	68.06
SE_GORE_AREA	22.549	5	0	0	118.272	27	0	02:52	54.97
SE_Havana_Pond	11.061	2	0	0	121.847	25	0	01:42	26.40

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
D101	12.81	31.52	100.56	2.610
D110	3.19	5.10	9.96	0.105
D170	100.00	210.99	211.02	136.359
D196	69.17	0.82	6.41	0.365
System	46.29	248.43	321.36	139.439

****
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
1	DUMMY	135.63	0	00:36			
4	CONDUIT	100.56	0	00:36	8.00	1.22	1.00
7	DUMMY	68.39	0	00:44			
16	CONDUIT	6.44	0	01:22	5.36	1.47	0.74
19	DUMMY	15.06	0	00:30			
20	CONDUIT	4.41	0	00:39	6.94	0.31	0.39
21	CONDUIT	9.41	0	00:39	8.50	0.29	0.38
22	DUMMY	31.30	0	00:48			
25	CONDUIT	9.96	0	00:48	0.97	0.00	0.03
30	CONDUIT	19.32	0	01:34	3.96	0.10	0.37
33	CONDUIT	23.13	0	00:43	10.99	0.96	0.65
38	CONDUIT	22.84	0	00:49	1.04	0.06	0.30
39	CONDUIT	36.22	0	00:38	1.53	0.07	0.30
41	CONDUIT	52.68	0	01:04	2.20	0.14	0.44
42	CONDUIT	52.71	0	01:06	3.49	0.19	0.48
43	CONDUIT	52.66	0	01:08	3.05	0.09	0.40
44	CONDUIT	52.58	0	01:11	3.00	0.15	0.52
45	CONDUIT	51.15	0	01:29	1.93	0.10	0.61
55	CONDUIT	25.23	0	01:42	8.10	1.74	0.97
61	CHANNEL	34.87	0	00:36	8.95	0.09	0.70
62	CONDUIT	7.21	0	00:45	4.52	1.41	0.90
80	CONDUIT	21.33	0	00:48	7.09	1.29	0.91
82	DUMMY	1.80	0	00:37			
110	DUMMY	6.33	0	00:53			
114	CONDUIT	56.11	0	01:31	1.73	0.06	0.69
116	DUMMY	5.40	0	00:32			
117	CONDUIT	16.15	0	01:31	2.60	0.08	0.42
118	CONDUIT	16.15	0	01:32	3.62	0.04	0.24
119	CONDUIT	16.47	0	01:18	1.05	0.04	0.30
120	CONDUIT	16.08	0	01:37	8.70	0.05	0.37
124	CONDUIT	0.95	0	00:36	2.69	0.14	0.58
126	DUMMY	6.20	0	00:38			
133	CONDUIT	18.24	0	01:42	1.16	0.13	0.50
134	CONDUIT	18.22	0	01:44	1.59	0.30	0.51
135	CONDUIT	18.22	0	01:44	3.14	0.02	0.12
135a	CONDUIT	18.22	0	01:44	3.11	0.15	0.31
136	DUMMY	8.87	0	00:31			
137	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
140	DUMMY	3.95	0	00:27			

144	DUMMY	5.86	0	00:28			
152	CONDUIT	40.92	0	01:32	3.19	0.31	0.57
154	DUMMY	3.31	0	00:32			
158	CONDUIT	13.53	0	00:50	1.77	0.06	0.60
160	CONDUIT	52.45	0	01:16	1.92	0.11	0.72
162	DUMMY	9.41	0	00:32			
164	CONDUIT	282.31	0	00:35	18.60	0.08	0.19
168	CONDUIT	14.50	0	02:16	9.78	0.02	0.28
174	DUMMY	2.21	0	00:32			
176	CONDUIT	63.27	0	02:46	1.63	0.14	0.64
178	DUMMY	3.94	0	00:32			
185	CONDUIT	70.83	0	07:37	10.76	0.33	0.64
186	DUMMY	1.82	0	00:31			
187	DUMMY	1.72	0	00:37			
196	DUMMY	20.38	0	00:31			
200	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
202	DUMMY	1.40	0	00:33			
206	CONDUIT	0.00	0	00:00	0.00	0.00	0.18
207	CONDUIT	0.00	0	00:00	0.00	0.00	0.50
208	DUMMY	5.39	0	00:33			
210	CONDUIT	5.01	0	00:35	0.65	0.01	0.22
215	CONDUIT	7.22	0	00:40	1.52	0.12	0.35
216	CONDUIT	7.68	0	00:46	1.67	0.11	0.36
217	CONDUIT	6.53	0	00:54	1.22	0.02	0.23
218	CONDUIT	7.54	0	00:58	1.26	0.01	0.18
219	CONDUIT	6.38	0	01:01	1.99	0.05	0.25
220	CONDUIT	4.64	0	00:52	2.66	0.02	0.16
224	DUMMY	5.04	0	00:41			
225	CONDUIT	2.52	0	00:38	1.51	0.03	0.58
226	DUMMY	2.61	0	00:58			
EX-P1	CONDUIT	6.41	0	01:31	2.67	0.42	0.37
EX-P2	CONDUIT	8.47	0	02:33	5.17	1.64	0.88
EX-P3	CONDUIT	40.92	0	01:31	8.61	2.06	0.93
EX-P4	CONDUIT	54.97	0	02:52	6.26	0.52	0.54
EX-P5	CONDUIT	14.51	0	02:15	7.63	0.31	0.33
P-1	CONDUIT	6.32	0	00:37	3.43	0.15	0.26
P-2	CONDUIT	6.33	0	00:36	2.98	0.15	0.27
P-3	CONDUIT	1.35	0	00:34	1.40	0.07	0.30
P-15	CONDUIT	0.95	0	00:35	2.70	0.02	0.17
P-16	CONDUIT	56.11	0	01:30	12.98	0.26	0.38
P-17	CONDUIT	40.92	0	01:32	7.33	1.12	0.74
P-18	CONDUIT	13.53	0	00:50	15.28	0.09	0.18
P-19	CONDUIT	7.58	0	00:35	3.73	0.11	0.54
P-20	CONDUIT	62.83	0	03:04	5.52	0.64	0.71
P-21	CONDUIT	62.86	0	03:04	5.45	0.57	0.69
P-22	CONDUIT	62.90	0	03:02	5.52	0.65	0.68

P-23	CONDUIT	8.47	0	02:31	2.90	0.64	1.00
P-24	CONDUIT	10.17	0	00:32	6.56	0.28	0.55
P-27	CONDUIT	211.02	0	00:05	13.27	2.36	1.00
3	ORIFICE	56.11	0	01:30			0.90
63	WEIR	0.00	0	00:00			0.00
67	WEIR	5.00	0	00:39			0.10
O2	WEIR	54.97	0	04:13			0.36
O1	DUMMY	14.51	0	02:15			

****
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	Norm Ltd	Inlet Ctrl
4	1.00	0.86	0.00	0.00	0.14	0.00	0.00	0.00	0.88	0.00
16	1.00	0.01	0.00	0.00	0.98	0.02	0.00	0.00	0.00	0.00
20	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
21	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
25	1.00	0.97	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00
30	1.00	0.01	0.84	0.00	0.01	0.14	0.00	0.00	0.83	0.00
33	1.00	0.01	0.75	0.00	0.07	0.17	0.00	0.00	0.81	0.00
38	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
39	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
41	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
42	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.85	0.00
43	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.97	0.00
44	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.96	0.00
45	1.00	0.01	0.02	0.00	0.97	0.00	0.00	0.00	0.35	0.00
55	1.00	0.01	0.00	0.00	0.16	0.00	0.00	0.83	0.00	0.00
61	1.00	0.02	0.97	0.00	0.01	0.00	0.00	0.00	0.98	0.00
62	1.00	0.02	0.00	0.00	0.11	0.00	0.00	0.87	0.02	0.00
80	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
114	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.77	0.00
117	7.20	0.73	0.19	0.00	0.07	0.00	0.00	0.00	0.00	0.00
118	1.00	0.05	0.68	0.00	0.26	0.01	0.00	0.00	0.90	0.00
119	1.00	0.05	0.00	0.00	0.95	0.00	0.00	0.00	0.95	0.00
120	2.41	0.01	0.04	0.00	0.22	0.74	0.00	0.00	0.06	0.00
124	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.08	0.00
133	1.00	0.01	0.08	0.00	0.92	0.00	0.00	0.00	0.93	0.00
134	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.87	0.00
135	1.75	0.02	0.00	0.00	0.08	0.00	0.00	0.91	0.01	0.00

135a	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.02	0.00
137	1.00	0.95	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
152	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
158	1.00	0.01	0.00	0.00	0.99	0.01	0.00	0.00	0.99	0.00
160	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.95	0.00
164	5.06	0.89	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00
168	3.37	0.00	0.00	0.00	0.00	0.09	0.00	0.91	0.00	0.00
176	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.84	0.00
185	2.35	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.00	0.00
200	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
206	1.00	0.58	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00
207	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
210	1.00	0.01	0.58	0.00	0.42	0.00	0.00	0.00	0.94	0.00
215	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.95	0.00
216	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
217	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
218	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.96	0.00
219	1.00	0.03	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.00
220	1.42	0.74	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00
225	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
EX-P1	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
EX-P2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
EX-P3	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
EX-P4	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
EX-P5	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
P-1	1.00	0.01	0.58	0.00	0.40	0.00	0.00	0.00	0.77	0.00
P-2	1.00	0.01	0.00	0.00	0.08	0.00	0.00	0.91	0.00	0.00
P-3	1.00	0.01	0.00	0.00	0.10	0.00	0.00	0.89	0.07	0.00
P-15	1.00	0.01	0.84	0.00	0.14	0.00	0.00	0.00	0.99	0.00
P-16	1.00	0.01	0.00	0.00	0.72	0.28	0.00	0.00	0.84	0.00
P-17	1.00	0.01	0.00	0.00	0.93	0.07	0.00	0.00	0.78	0.00
P-18	1.00	0.01	0.78	0.00	0.01	0.21	0.00	0.00	0.81	0.00
P-19	1.00	0.00	0.85	0.00	0.15	0.00	0.00	0.00	0.99	0.00
P-20	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
P-21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.59	0.00
P-22	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.01	0.01	0.00
P-23	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.80	0.00
P-24	1.00	0.00	0.01	0.00	0.97	0.02	0.00	0.00	0.95	0.00
P-27	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
4	0.41	0.41	0.41	0.40	0.01
16	0.01	0.01	0.01	3.75	0.01
55	0.01	0.01	0.01	3.32	0.01
62	0.01	0.01	0.01	0.48	0.01
80	0.01	0.01	0.01	1.18	0.01
EX-P2	0.01	0.01	0.01	4.01	0.01
EX-P3	0.01	0.01	0.01	3.14	0.01
P-17	0.01	0.01	0.01	1.82	0.01
P-27	24.00	24.00	24.00	24.00	0.01

Analysis begun on: Tue Mar 10 11:24:18 2015
Analysis ended on: Tue Mar 10 11:24:26 2015
Total elapsed time: 00:00:08

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.005)
--------------------------------------------------------------

100-Year Existing Conditions Model
WARNING 02: maximum depth increased for Node D174

*********************************************************
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 ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Starting Date ............ JAN-01-2005 00:00:00
Ending Date .............. JAN-02-2005 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... NO
Maximum Trials ........... 8
Head Tolerance ........... 0.005000 ft


**************************        Volume         Volume
Flow Routing Continuity        acre-feet       10^6 gal
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.000          0.000
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........       512.734        167.082
External Outflow .........        19.511          6.358
Internal Outflow .........       485.386        158.170
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Evaporation Loss .........          0.000         0.000
Seepage Loss .............          0.000         0.000
Initial Stored Volume ....         12.100         3.943
Final Stored Volume ......         19.917         6.490
Continuity Error (%) .....          0.004


*************************
Highest Continuity Errors
*************************
Node HAVANA_at_40th_POND (3.02%)


********************************
Highest Flow Instability Indexes
********************************
Link 185 (4)
Link P-20 (4)
Link P-21 (2)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.00 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00


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

----------------------------------------------------------------------
                                Average  Maximum  Maximum  Time of Max
                                  Depth    Depth      HGL   Occurrence
Node                 Type         Feet     Feet     Feet  days hr:min
----------------------------------------------------------------------
10                   JUNCTION     0.00     0.00  5283.00     0  00:00
11                   JUNCTION     0.00     0.00  5286.00     0  00:00
20                   JUNCTION     0.00     0.00  5285.00     0  00:00
30                   JUNCTION     0.15     3.45  5261.45     0  00:40
40                   JUNCTION     0.00     0.00  5262.00     0  00:00
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41	JUNCTION	0.00	0.00	5274.50	0	00:00
42	JUNCTION	0.00	0.00	5253.62	0	00:00
43	JUNCTION	0.02	0.29	5264.29	0	00:41
50a	JUNCTION	0.00	0.00	5250.10	0	00:00
50b	JUNCTION	0.00	0.00	5247.50	0	00:00
53	JUNCTION	0.00	0.00	5247.50	0	00:00
60	JUNCTION	0.11	1.41	5257.01	0	00:57
61a	JUNCTION	0.00	0.00	5246.75	0	00:00
61b	JUNCTION	0.00	0.00	5245.50	0	00:00
62	JUNCTION	0.00	0.00	5236.50	0	00:00
63	JUNCTION	0.00	0.00	5248.50	0	00:00
65a	JUNCTION	0.00	0.00	5254.00	0	00:00
65b	JUNCTION	0.00	0.00	0.00	0	00:00
66	JUNCTION	0.04	0.86	5244.86	0	00:40
68	JUNCTION	0.00	0.00	5246.50	0	00:00
70	JUNCTION	0.00	0.00	5249.30	0	00:00
72	JUNCTION	0.15	1.00	5241.00	0	03:24
73	JUNCTION	0.00	0.00	5249.00	0	00:00
74	JUNCTION	0.00	0.00	5230.00	0	00:00
75	JUNCTION	0.08	0.62	5245.62	0	00:44
77	JUNCTION	0.00	0.00	5240.50	0	00:00
78	JUNCTION	0.00	0.00	5242.80	0	00:00
80	JUNCTION	0.00	0.00	5290.00	0	00:00
90	JUNCTION	0.00	0.00	0.00	0	00:00
D107	JUNCTION	0.20	0.87	5275.87	0	00:37
D111	JUNCTION	0.21	2.65	5277.15	0	00:43
D112	JUNCTION	0.07	0.72	5274.72	0	01:05
D113	JUNCTION	0.32	1.47	5274.57	0	01:05
D113b	JUNCTION	0.40	1.75	5272.75	0	01:06
D113c	JUNCTION	0.40	1.71	5269.51	0	01:09
D113d	JUNCTION	0.49	2.14	5266.94	0	01:26
D113e	JUNCTION	0.63	3.66	5266.66	0	01:28
D114	JUNCTION	0.94	4.86	5266.61	0	01:28
D115	JUNCTION	0.42	1.97	5263.71	0	01:28
D116	JUNCTION	0.49	2.03	5258.63	0	01:25
D117	JUNCTION	1.19	5.00	5258.60	0	01:25
D118	JUNCTION	0.08	1.05	5258.54	0	01:25
D119	JUNCTION	0.07	0.85	5253.85	0	01:06
D119a	JUNCTION	0.10	0.96	5252.96	0	01:29
D120	JUNCTION	0.06	0.69	5253.79	0	00:37
D134	JUNCTION	0.26	2.03	5251.63	0	01:42
D135	JUNCTION	0.29	2.06	5251.40	0	02:19
D136	JUNCTION	0.32	2.34	5251.34	0	02:24
D140	JUNCTION	0.83	3.55	5250.55	0	02:27
D142	JUNCTION	0.36	1.54	5247.04	0	02:50
D145	JUNCTION	0.88	3.63	5254.63	0	01:22

D146	JUNCTION	0.51	1.44	5251.44	0	01:22
D147	JUNCTION	0.07	0.53	5250.03	0	00:57
D148	JUNCTION	0.37	1.42	5249.92	0	02:26
D152	JUNCTION	1.20	1.35	5251.35	0	02:15
D154	JUNCTION	0.72	1.22	5249.82	0	02:28
D158	JUNCTION	1.17	2.68	5246.88	0	02:53
D162	JUNCTION	1.90	3.79	5244.99	0	03:09
D163	JUNCTION	2.37	3.95	5244.35	0	03:22
D164	JUNCTION	2.55	3.61	5243.51	0	04:15
D168	JUNCTION	4.50	4.50	5241.00	0	00:00
D172	JUNCTION	0.11	1.28	5251.28	0	02:24
D174	JUNCTION	0.24	2.24	5251.24	0	02:24
D176	JUNCTION	0.04	0.52	5250.52	0	02:28
D178	JUNCTION	0.19	1.69	5250.49	0	02:27
D180	JUNCTION	0.25	1.99	5250.49	0	02:27
D182	JUNCTION	0.23	1.79	5249.89	0	02:28
D184	JUNCTION	0.16	1.25	5248.75	0	02:28
D186	JUNCTION	0.15	1.11	5247.11	0	02:33
D188	JUNCTION	0.22	1.24	5244.24	0	02:36
D190	JUNCTION	0.14	0.79	5242.79	0	02:39
D192	JUNCTION	0.19	1.03	5241.03	0	03:19
D198	JUNCTION	0.00	0.00	0.00	0	00:09
D200	JUNCTION	1.55	1.60	5231.10	0	00:57
D101	OUTFALL	0.24	4.00	5291.70	0	00:28
D110	OUTFALL	0.00	0.12	5283.92	0	00:54
D170	OUTFALL	7.51	7.51	5243.76	0	00:00
D196	OUTFALL	0.27	1.40	5239.40	0	03:24
21	DIVIDER	0.94	3.01	5279.01	0	02:00
D99	DIVIDER	0.34	6.70	5296.70	0	00:41
D106	DIVIDER	0.05	0.71	5278.71	0	00:48
D108	DIVIDER	0.38	4.64	5284.14	0	00:54
D151	STORAGE	4.99	6.53	5256.53	0	02:13
D159	STORAGE	1.95	4.00	5246.80	0	02:54
HAVANA_at_40th_POND	STORAGE	0.89	4.35	5285.35	0	01:55
N_WQ_POND	STORAGE	0.53	2.50	5241.00	0	03:24
NE_GORE_AREA	STORAGE	0.18	1.64	5251.74	0	01:40
NE-HAVANA_POND	STORAGE	0.07	1.35	5284.35	0	00:48
NW_GORE_POND	STORAGE	0.76	3.84	5251.34	0	02:24
S_WQ_POND	STORAGE	5.97	7.01	5243.51	0	04:14
SE_GORE_AREA	STORAGE	1.71	3.30	5249.90	0	02:27
SE_Havana_Pond	STORAGE	1.58	7.35	5285.35	0	01:55

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Node Inflow Summary
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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	Flow Balance Error Percent
10	JUNCTION	69.33	69.33	0	00:54	2.23	2.23	0.000
11	JUNCTION	36.74	36.74	0	00:35	0.498	0.498	0.000
20	JUNCTION	148.85	148.85	0	00:49	3.94	3.94	0.000
30	JUNCTION	629.87	629.87	0	00:40	10.9	10.9	-0.000
40	JUNCTION	19.54	19.54	0	01:01	0.896	0.896	0.000
41	JUNCTION	6.11	6.11	0	00:44	0.165	0.165	0.000
42	JUNCTION	10.93	10.93	0	00:37	0.201	0.201	0.000
43	JUNCTION	2.57	2.57	0	00:41	0.0641	0.0641	-0.007
50a	JUNCTION	17.91	17.91	0	00:45	0.494	0.494	0.000
50b	JUNCTION	20.83	20.83	0	00:35	0.309	0.309	0.000
53	JUNCTION	8.65	8.65	0	00:32	0.11	0.11	0.000
60	JUNCTION	39.00	39.00	0	00:57	1.54	1.54	-0.001
61a	JUNCTION	21.66	21.66	0	00:37	0.391	0.391	0.000
61b	JUNCTION	6.35	6.35	0	00:37	0.119	0.119	0.000
62	JUNCTION	47.98	47.98	0	00:36	0.721	0.721	0.000
63	JUNCTION	7.55	7.55	0	00:38	0.144	0.144	0.000
65a	JUNCTION	4.13	4.13	0	00:43	0.106	0.106	0.000
65b	JUNCTION	3.26	3.26	0	00:56	0.143	0.143	0.000
66	JUNCTION	18.01	18.01	0	00:40	0.385	0.385	-0.002
68	JUNCTION	11.41	11.41	0	00:33	0.164	0.164	0.000
70	JUNCTION	12.92	12.92	0	00:38	0.24	0.24	0.000
72	JUNCTION	14.29	14.29	0	01:00	0.649	0.649	0.030
73	JUNCTION	3.38	3.38	0	00:38	0.0687	0.0687	0.000
74	JUNCTION	7.31	7.31	0	01:06	0.365	0.365	0.000
75	JUNCTION	7.67	7.67	0	00:38	0.154	0.154	-13.041
77	JUNCTION	4.46	4.46	0	00:35	0.0664	0.0664	0.000
78	JUNCTION	10.70	10.70	0	00:37	0.185	0.185	0.000
80	JUNCTION	250.32	250.32	0	00:41	4.9	4.9	0.000
90	JUNCTION	12.20	12.20	0	00:47	0.355	0.355	0.000
D107	JUNCTION	0.00	54.56	0	00:53	0	6.1	-0.078
D111	JUNCTION	0.00	27.53	0	00:44	0	1.39	0.042
D112	JUNCTION	0.00	27.53	0	00:44	0	1.39	-0.328
D113	JUNCTION	0.00	80.83	0	00:50	0	7.5	0.094
D113b	JUNCTION	0.00	79.35	0	01:05	0	7.49	0.015
D113c	JUNCTION	0.00	79.34	0	01:07	0	7.49	-0.018
D113d	JUNCTION	0.00	79.28	0	01:09	0	7.49	-0.037
D113e	JUNCTION	0.00	79.15	0	01:11	0	7.5	0.124
D114	JUNCTION	0.00	90.63	0	01:17	0	8.38	-0.030
D115	JUNCTION	0.00	88.66	0	01:28	0	8.38	0.002

D116	JUNCTION	0.00	88.66	0	01:28	0	8.38	0.010
D117	JUNCTION	0.00	90.30	0	01:25	0	8.58	-0.007
D118	JUNCTION	0.00	46.43	0	01:25	0	1.88	-0.030
D119	JUNCTION	0.00	46.43	0	01:26	0	1.88	-0.449
D119a	JUNCTION	0.00	46.40	0	01:27	0	1.89	0.484
D120	JUNCTION	0.00	2.57	0	00:41	0	0.0641	-0.425
D134	JUNCTION	0.00	52.50	0	01:36	0	2.44	-0.008
D135	JUNCTION	0.00	52.42	0	01:37	0	2.44	-0.008
D136	JUNCTION	0.00	52.26	0	01:37	0	2.44	0.045
D140	JUNCTION	0.00	14.70	0	02:18	0	1.98	0.014
D142	JUNCTION	0.00	17.76	0	00:35	0	2	-0.006
D145	JUNCTION	0.00	43.87	0	01:25	0	6.7	-0.001
D146	JUNCTION	0.00	43.89	0	01:27	0	6.7	0.012
D147	JUNCTION	0.00	39.00	0	00:57	0	1.54	-0.177
D148	JUNCTION	0.00	84.39	0	01:04	0	8.39	-0.156
D152	JUNCTION	0.00	18.45	0	02:12	0	9.39	0.014
D154	JUNCTION	0.00	18.45	0	02:13	0	9.39	0.011
D158	JUNCTION	0.00	82.98	0	02:19	0	20.2	0.056
D162	JUNCTION	0.00	82.01	0	02:47	0	20.4	0.002
D163	JUNCTION	0.00	81.97	0	02:48	0	20.5	0.005
D164	JUNCTION	0.00	93.87	0	00:45	0	25.1	0.159
D168	JUNCTION	0.00	287.55	0	04:14	0	157	0.005
D172	JUNCTION	0.00	17.25	0	02:21	0	0.889	0.029
D174	JUNCTION	0.00	17.27	0	02:23	0	0.955	0.007
D176	JUNCTION	0.00	3.25	0	02:05	0	0.146	0.013
D178	JUNCTION	0.00	12.92	0	00:38	0	0.383	-0.033
D180	JUNCTION	0.00	20.42	0	02:27	0	1.33	-0.040
D182	JUNCTION	0.00	20.42	0	02:27	0	1.33	0.022
D184	JUNCTION	0.00	20.42	0	02:28	0	1.33	-0.150
D186	JUNCTION	0.00	20.44	0	02:30	0	1.33	-0.084
D188	JUNCTION	0.00	20.40	0	02:33	0	1.33	0.105
D190	JUNCTION	0.00	20.39	0	02:37	0	1.33	-0.258
D192	JUNCTION	0.00	20.37	0	02:40	0	1.34	0.430
D198	JUNCTION	0.00	12.20	0	00:47	0	0.355	0.000
D200	JUNCTION	0.00	13.45	0	00:54	0	0.543	0.000
D101	OUTFALL	0.00	103.63	0	00:41	0	3.37	0.000
D110	OUTFALL	0.00	47.87	0	00:54	0	1	0.000
D170	OUTFALL	0.00	211.02	0	00:05	0	136	0.000
D196	OUTFALL	0.00	18.98	0	03:24	0	1.98	0.000
21	DIVIDER	10.86	35.04	0	01:07	0.176	5.61	-0.008
D99	DIVIDER	0.00	250.32	0	00:41	0	4.9	-0.144
D106	DIVIDER	0.00	21.76	0	00:48	0	0.498	-0.000
D108	DIVIDER	0.00	69.33	0	00:54	0	2.23	-0.044
D151	STORAGE	0.00	629.98	0	00:40	0	12.4	-0.000
D159	STORAGE	0.00	82.87	0	02:19	0	20.5	0.163
HAVANA_at_40th_POND	STORAGE	0.00	146.55	0	00:41	0	1.65	3.111

N_WQ_POND	STORAGE	0.00	30.25	0	00:57	0	1.98	-0.022
NE_GORE_AREA	STORAGE	0.00	56.96	0	01:19	0	2.44	-0.000
NE-HAVANA_POND	STORAGE	0.00	36.74	0	00:35	0	0.498	-0.000
NW_GORE_POND	STORAGE	0.00	52.78	0	01:36	0	2.75	-0.016
S_WQ_POND	STORAGE	0.00	93.87	0	00:45	0	27.5	-0.099
SE_GORE_AREA	STORAGE	0.00	111.62	0	01:05	0	18.2	0.301
SE_Havana_Pond	STORAGE	0.00	247.65	0	00:51	0	5.55	-0.011

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Node Surcharge Summary
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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
11	JUNCTION	24.00	0.000	10.000
20	JUNCTION	24.00	0.000	10.000
42	JUNCTION	24.00	0.000	10.000
53	JUNCTION	24.00	0.000	10.000
61b	JUNCTION	24.00	0.000	5.000
62	JUNCTION	24.00	0.000	7.000
65a	JUNCTION	24.00	0.000	5.000
65b	JUNCTION	24.00	0.000	0.000
68	JUNCTION	24.00	0.000	5.200
70	JUNCTION	24.00	0.000	10.000
77	JUNCTION	24.00	0.000	7.500
D140	JUNCTION	5.54	1.554	0.446
D198	JUNCTION	24.00	0.000	0.000
D200	JUNCTION	23.05	0.000	0.000

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Node Flooding Summary
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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

65b	5.50	3.26	0	00:56	0.143	0.000
D168	24.00	287.55	0	04:14	157.250	0.000
D198	3.84	12.20	0	00:47	0.355	0.000
D200	23.05	13.36	0	00:57	0.411	0.000

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Storage Volume Summary
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Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Infil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days	hr:min	Maximum Outflow CFS
D151	925.289	20	0	0	1539.918	34	0	02:13	18.45
D159	15.241	14	0	0	45.675	42	0	02:54	82.01
HAVANA_at_40th_POND	10.527	11	0	0	72.092	73	0	01:55	100.07
N_WQ_POND	8.863	7	0	0	67.661	56	0	03:24	18.98
NE_GORE_AREA	1.725	3	0	0	23.140	46	0	01:40	52.50
NE-HAVANA_POND	0.653	1	0	0	20.608	19	0	00:48	21.76
NW_GORE_POND	23.849	11	0	0	162.245	77	0	02:24	31.93
S_WQ_POND	522.135	49	0	0	716.352	68	0	04:14	76.54
SE_GORE_AREA	52.344	12	0	0	182.393	41	0	02:27	71.39
SE_Havana_Pond	66.756	14	0	0	420.419	85	0	01:55	52.50

****
Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
D101	12.91	40.44	103.63	3.374
D110	6.34	24.48	47.87	1.004
D170	100.00	210.99	211.02	136.359
D196	79.24	3.87	18.98	1.980
System	49.62	279.78	368.50	142.717

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Link Flow Summary

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Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
1	DUMMY	250.32	0	00:41			
4	CONDUIT	103.63	0	00:41	8.25	1.26	1.00
7	DUMMY	148.85	0	00:49			
16	CONDUIT	6.88	0	01:00	5.35	1.57	0.79
19	DUMMY	36.74	0	00:35			
20	CONDUIT	5.92	0	00:48	7.47	0.41	0.46
21	CONDUIT	21.76	0	00:48	10.27	0.68	0.64
22	DUMMY	69.33	0	00:54			
25	CONDUIT	47.87	0	00:54	1.77	0.01	0.07
30	CONDUIT	28.16	0	01:07	4.30	0.15	0.46
33	CONDUIT	27.53	0	00:44	12.33	1.14	0.68
38	CONDUIT	27.43	0	00:48	1.13	0.07	0.36
39	CONDUIT	54.38	0	00:56	1.75	0.10	0.39
41	CONDUIT	79.35	0	01:05	2.45	0.22	0.54
42	CONDUIT	79.34	0	01:07	3.88	0.28	0.58
43	CONDUIT	79.28	0	01:09	3.32	0.14	0.48
44	CONDUIT	79.15	0	01:11	3.30	0.23	0.72
45	CONDUIT	72.94	0	01:27	1.67	0.15	0.85
55	CONDUIT	33.88	0	01:55	10.78	2.33	1.00
61	CHANNEL	146.55	0	00:41	9.72	0.39	0.85
62	CONDUIT	12.88	0	00:47	7.33	2.53	1.00
80	CONDUIT	21.46	0	00:54	7.13	1.30	0.91
82	DUMMY	6.11	0	00:44			
110	DUMMY	19.54	0	01:01			
114	CONDUIT	88.69	0	01:28	1.56	0.10	0.75
116	DUMMY	10.93	0	00:37			
117	CONDUIT	46.43	0	01:25	3.33	0.23	0.72
118	CONDUIT	46.43	0	01:26	5.06	0.13	0.38
119	CONDUIT	46.40	0	01:27	1.37	0.11	0.45
120	CONDUIT	46.37	0	01:29	8.25	0.14	0.65
124	CONDUIT	2.57	0	00:42	3.12	0.37	0.80
126	DUMMY	17.91	0	00:45			
133	CONDUIT	52.50	0	01:36	1.50	0.36	0.87
134	CONDUIT	52.42	0	01:37	2.24	0.85	0.88
135	CONDUIT	51.82	0	01:37	3.18	0.04	0.53
135a	CONDUIT	52.26	0	01:37	3.46	0.42	0.85
136	DUMMY	20.83	0	00:35			
137	CONDUIT	17.25	0	02:21	1.01	0.11	0.67
140	DUMMY	8.65	0	00:32			

144	DUMMY	11.41	0	00:33			
152	CONDUIT	44.50	0	01:27	2.91	0.33	0.68
154	DUMMY	7.55	0	00:38			
158	CONDUIT	38.99	0	00:57	2.34	0.18	0.76
160	CONDUIT	84.18	0	01:06	2.42	0.18	0.85
162	DUMMY	21.66	0	00:37			
164	CONDUIT	629.98	0	00:40	23.43	0.18	0.29
168	CONDUIT	18.44	0	02:15	10.25	0.02	0.45
174	DUMMY	6.35	0	00:37			
176	CONDUIT	82.62	0	02:28	1.91	0.19	0.83
178	DUMMY	10.70	0	00:37			
185	CONDUIT	93.87	0	00:45	10.76	0.44	0.73
186	DUMMY	4.46	0	00:35			
187	DUMMY	4.13	0	00:43			
196	DUMMY	47.98	0	00:36			
200	CONDUIT	17.22	0	02:23	1.88	0.08	0.46
202	DUMMY	3.38	0	00:38			
206	CONDUIT	3.15	0	02:37	0.41	0.05	0.55
207	CONDUIT	3.25	0	02:05	0.33	0.04	0.63
208	DUMMY	12.92	0	00:38			
210	CONDUIT	11.42	0	00:43	0.75	0.03	0.46
215	CONDUIT	20.44	0	02:30	1.99	0.33	0.59
216	CONDUIT	20.40	0	02:33	2.08	0.28	0.59
217	CONDUIT	20.39	0	02:37	1.69	0.07	0.34
218	CONDUIT	20.37	0	02:40	1.58	0.03	0.30
219	CONDUIT	20.01	0	02:41	2.53	0.15	0.52
220	CONDUIT	14.29	0	01:00	3.69	0.07	0.51
224	DUMMY	12.20	0	00:47			
225	CONDUIT	7.20	0	00:44	1.92	0.08	0.69
226	DUMMY	7.31	0	01:06			
EX-P1	CONDUIT	18.98	0	03:24	3.91	1.24	0.65
EX-P2	CONDUIT	11.51	0	02:27	6.72	2.23	0.93
EX-P3	CONDUIT	43.87	0	01:25	9.16	2.21	0.94
EX-P4	CONDUIT	71.39	0	02:21	6.64	0.68	0.65
EX-P5	CONDUIT	18.45	0	02:13	8.13	0.40	0.43
P-1	CONDUIT	20.42	0	02:28	5.09	0.48	0.43
P-2	CONDUIT	20.42	0	02:27	3.98	0.48	0.53
P-3	CONDUIT	17.26	0	02:24	3.99	0.93	0.83
P-15	CONDUIT	2.57	0	00:41	4.33	0.05	0.24
P-16	CONDUIT	88.66	0	01:28	14.21	0.41	0.50
P-17	CONDUIT	43.89	0	01:27	8.01	1.21	0.74
P-18	CONDUIT	39.00	0	00:57	19.73	0.27	0.32
P-19	CONDUIT	18.01	0	00:40	5.50	0.25	0.64
P-20	CONDUIT	81.94	0	02:49	6.06	0.83	0.84
P-21	CONDUIT	81.97	0	02:48	5.80	0.74	0.85
P-22	CONDUIT	82.01	0	02:47	5.72	0.85	0.85

P-23	CONDUIT	14.68	0	02:20	4.67	1.11	1.00
P-24	CONDUIT	17.75	0	00:35	7.55	0.49	0.81
P-27	CONDUIT	211.02	0	00:05	13.27	2.36	1.00
3	ORIFICE	88.66	0	01:28			1.00
63	WEIR	88.74	0	00:51			0.09
67	WEIR	15.85	0	00:48			0.21
O2	WEIR	76.54	0	04:14			0.45
O1	DUMMY	18.45	0	02:12			

****
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	Norm Ltd	Inlet Ctrl
4	1.00	0.86	0.00	0.00	0.14	0.00	0.00	0.00	0.88	0.00
16	1.00	0.01	0.00	0.00	0.98	0.02	0.00	0.00	0.00	0.00
20	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
21	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
25	1.00	0.94	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00
30	1.00	0.01	0.68	0.00	0.04	0.28	0.00	0.00	0.67	0.00
33	1.00	0.01	0.75	0.00	0.07	0.17	0.00	0.00	0.82	0.00
38	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.94	0.00
39	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
41	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
42	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.69	0.00
43	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.97	0.00
44	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.94	0.00
45	1.00	0.01	0.02	0.00	0.97	0.00	0.00	0.00	0.43	0.00
55	1.00	0.01	0.00	0.00	0.31	0.00	0.00	0.68	0.01	0.00
61	1.00	0.02	0.95	0.00	0.01	0.02	0.00	0.00	0.98	0.00
62	1.00	0.02	0.00	0.00	0.26	0.00	0.00	0.72	0.00	0.00
80	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
114	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.73	0.00
117	7.20	0.68	0.19	0.00	0.12	0.00	0.00	0.00	0.00	0.00
118	1.00	0.04	0.64	0.00	0.24	0.08	0.00	0.00	0.87	0.00
119	1.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.95	0.00
120	2.41	0.01	0.03	0.00	0.24	0.72	0.00	0.00	0.15	0.00
124	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.91	0.00
133	1.00	0.01	0.04	0.00	0.95	0.00	0.00	0.00	0.82	0.00
134	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.77	0.00
135	1.75	0.02	0.00	0.00	0.24	0.00	0.00	0.74	0.01	0.00

135a	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.03	0.00
137	1.00	0.71	0.00	0.00	0.22	0.00	0.00	0.07	0.08	0.00
152	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.08	0.00
158	1.00	0.01	0.00	0.00	0.99	0.01	0.00	0.00	0.90	0.00
160	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.80	0.00
164	5.06	0.89	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00
168	3.37	0.00	0.00	0.00	0.11	0.10	0.00	0.78	0.00	0.00
176	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.68	0.00
185	2.35	0.00	0.00	0.00	0.91	0.07	0.00	0.02	0.00	0.00
200	1.00	0.70	0.00	0.00	0.12	0.00	0.00	0.17	0.01	0.00
206	1.00	0.19	0.04	0.00	0.77	0.00	0.00	0.00	0.77	0.00
207	1.00	0.01	0.22	0.00	0.77	0.00	0.00	0.00	0.87	0.00
210	1.00	0.01	0.19	0.00	0.81	0.00	0.00	0.00	0.82	0.00
215	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.84	0.00
216	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
217	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
218	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.96	0.00
219	1.00	0.03	0.00	0.00	0.17	0.00	0.00	0.80	0.00	0.00
220	1.42	0.74	0.00	0.00	0.18	0.00	0.00	0.08	0.00	0.00
225	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
EX-P1	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
EX-P2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
EX-P3	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
EX-P4	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.89	0.00	0.00
EX-P5	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
P-1	1.00	0.01	0.01	0.00	0.98	0.01	0.00	0.00	0.38	0.00
P-2	1.00	0.01	0.00	0.00	0.18	0.00	0.00	0.81	0.00	0.00
P-3	1.00	0.01	0.00	0.00	0.19	0.00	0.00	0.81	0.00	0.00
P-15	1.00	0.01	0.85	0.00	0.10	0.05	0.00	0.00	0.99	0.00
P-16	1.00	0.01	0.00	0.00	0.56	0.43	0.00	0.00	0.68	0.00
P-17	1.00	0.01	0.00	0.00	0.79	0.20	0.00	0.00	0.62	0.00
P-18	1.00	0.01	0.78	0.00	0.01	0.20	0.00	0.00	0.85	0.00
P-19	1.00	0.00	0.85	0.00	0.15	0.00	0.00	0.00	0.99	0.00
P-20	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
P-21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.12	0.00
P-22	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.01	0.01	0.00
P-23	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.68	0.00
P-24	1.00	0.00	0.01	0.00	0.97	0.02	0.00	0.00	0.77	0.00
P-27	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

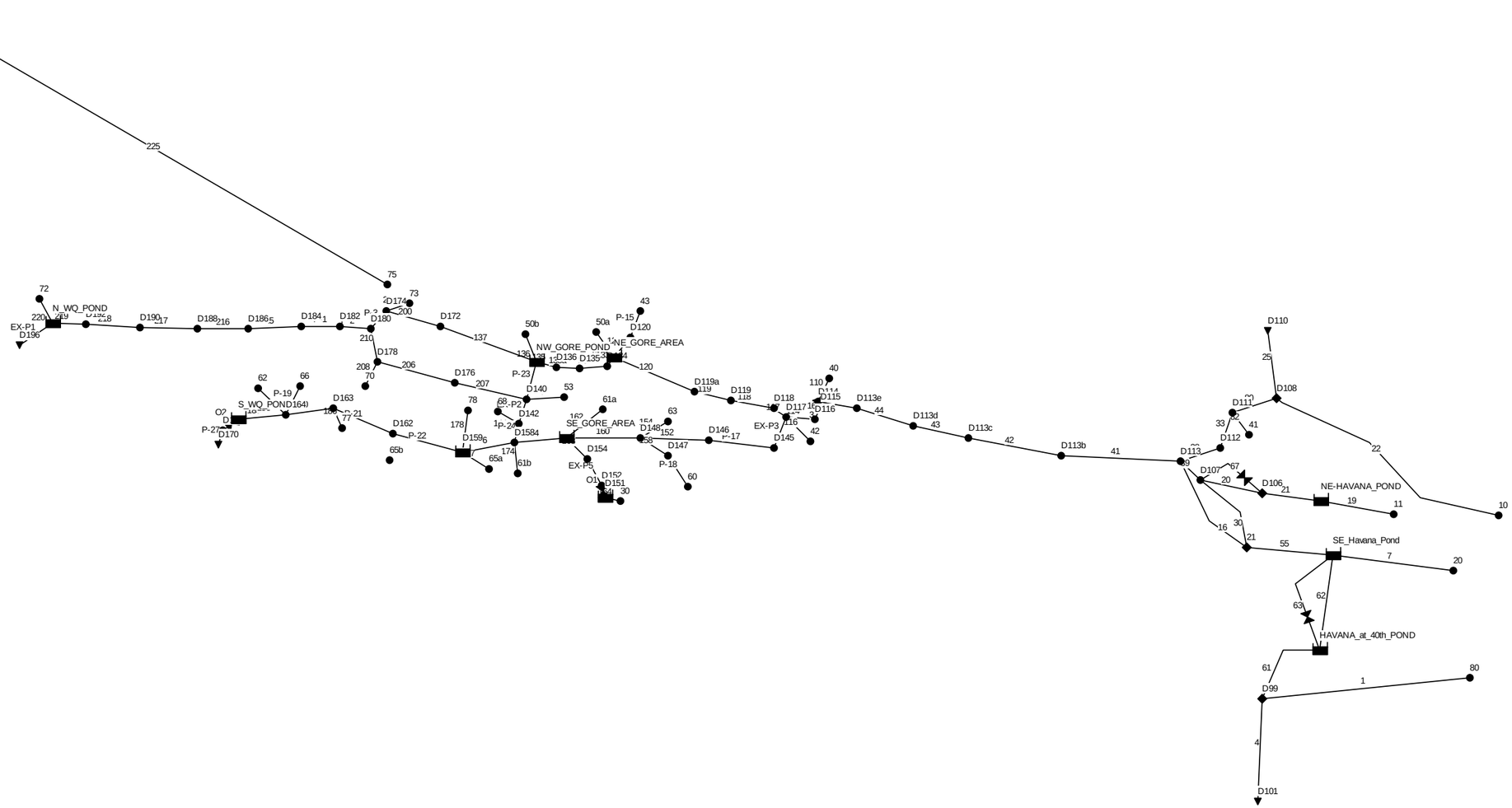
****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
4	0.84	0.84	0.84	0.83	0.01
16	0.01	0.01	0.01	7.49	0.01
33	0.01	0.01	0.01	0.88	0.01
55	1.35	1.35	1.35	7.06	0.01
62	5.26	5.26	5.26	3.57	0.01
80	0.01	0.01	0.01	1.81	0.01
EX-P1	0.01	0.01	0.01	2.33	0.01
EX-P2	0.01	0.01	0.01	6.96	0.01
EX-P3	0.01	0.01	0.01	6.88	0.01
P-17	0.01	0.01	0.01	2.91	0.01
P-23	4.76	4.76	4.76	1.44	0.01
P-27	24.00	24.00	24.00	24.00	0.01

Analysis begun on: Tue Mar 10 11:50:41 2015
Analysis ended on: Tue Mar 10 11:50:49 2015
Total elapsed time: 00:00:08

Proposed Conditions Model

01/01/2005 00:01:00



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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.005)
--------------------------------------------------------------

10-Year Proposed Conditions Model

*******************************************************
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 ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Starting Date ............ JAN-01-2005 00:00:00
Ending Date .............. JAN-02-2005 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... NO
Maximum Trials ........... 8
Head Tolerance ........... 0.005000 ft


**************************        Volume         Volume
Flow Routing Continuity        acre-feet       10^6 gal
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.000          0.000
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........       462.841        150.824
External Outflow .........         9.452          3.080
```

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Internal Outflow .........       451.958       147.277
Evaporation Loss .........         0.000         0.000
Seepage Loss .............         0.000         0.000
Initial Stored Volume ....        12.100         3.943
Final Stored Volume ......        13.622         4.439
Continuity Error (%) .....        -0.019
```

****
Highest Continuity Errors
****

```
Node HAVANA_at_40th_POND (7.34%)
Node D192 (1.58%)
Node D107 (-1.06%)
```

****
Highest Flow Instability Indexes
****

```
Link 185 (5)
Link P-20 (4)
```

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

```
Minimum Time Step           :     1.00 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
```

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
10	JUNCTION	0.00	0.00	5283.00	0 00:00

11	JUNCTION	0.00	0.00	5286.00	0	00:00
20	JUNCTION	0.00	0.00	5285.00	0	00:00
30	JUNCTION	0.11	2.31	5260.31	0	00:34
40	JUNCTION	0.00	0.00	5262.00	0	00:00
41	JUNCTION	0.00	0.00	5274.50	0	00:00
42	JUNCTION	0.00	0.00	5253.62	0	00:00
43	JUNCTION	0.01	0.18	5264.18	0	00:35
50a	JUNCTION	0.00	0.00	5250.10	0	00:00
50b	JUNCTION	0.00	0.00	5247.50	0	00:00
53	JUNCTION	0.00	0.00	5247.50	0	00:00
60	JUNCTION	0.07	0.82	5256.42	0	00:48
61a	JUNCTION	0.00	0.00	5246.75	0	00:00
61b	JUNCTION	0.00	0.00	5245.50	0	00:00
62	JUNCTION	0.00	0.00	5236.50	0	00:00
63	JUNCTION	0.00	0.00	5248.50	0	00:00
65a	JUNCTION	0.00	0.00	5254.00	0	00:00
65b	JUNCTION	0.00	0.00	0.00	0	00:00
66	JUNCTION	0.03	0.55	5244.55	0	00:35
68	JUNCTION	0.00	0.00	5246.50	0	00:00
70	JUNCTION	0.00	0.00	5249.30	0	00:00
72	JUNCTION	0.04	0.35	5240.35	0	00:52
73	JUNCTION	0.00	0.00	5249.00	0	00:00
74	JUNCTION	0.00	0.00	5230.00	0	00:00
75	JUNCTION	0.07	0.42	5245.42	0	00:38
77	JUNCTION	0.00	0.00	5240.50	0	00:00
78	JUNCTION	0.00	0.00	5242.80	0	00:00
80	JUNCTION	0.00	0.00	5290.00	0	00:00
90	JUNCTION	0.00	0.00	0.00	0	00:00
D107	JUNCTION	0.02	0.30	5275.30	0	00:46
D111	JUNCTION	0.17	2.07	5276.57	0	00:39
D112	JUNCTION	0.06	0.61	5274.61	0	00:50
D113	JUNCTION	0.16	1.21	5274.31	0	01:09
D113b	JUNCTION	0.20	1.47	5272.47	0	01:09
D113c	JUNCTION	0.20	1.44	5269.24	0	01:13
D113d	JUNCTION	0.25	1.77	5266.57	0	01:16
D113e	JUNCTION	0.31	2.52	5265.52	0	01:33
D114	JUNCTION	0.46	3.66	5265.41	0	01:33
D115	JUNCTION	0.22	1.51	5263.25	0	01:33
D116	JUNCTION	0.27	1.58	5258.18	0	01:34
D117	JUNCTION	0.64	4.57	5258.17	0	01:34
D118	JUNCTION	0.04	0.65	5258.14	0	01:34
D119	JUNCTION	0.04	0.58	5253.58	0	01:16
D119a	JUNCTION	0.06	0.66	5252.66	0	01:40
D120	JUNCTION	0.04	0.50	5253.60	0	00:35

D134	JUNCTION	0.11	1.27	5250.87	0	01:46
D135	JUNCTION	0.10	1.14	5250.48	0	01:47
D136	JUNCTION	0.06	0.58	5249.58	0	02:35
D140	JUNCTION	0.39	2.30	5249.30	0	02:37
D142	JUNCTION	0.18	1.01	5246.51	0	00:32
D145	JUNCTION	0.49	3.36	5254.36	0	01:34
D146	JUNCTION	0.32	1.42	5251.42	0	01:33
D147	JUNCTION	0.04	0.38	5249.88	0	00:48
D148	JUNCTION	0.18	0.88	5249.38	0	01:16
D152	JUNCTION	0.85	1.20	5251.20	0	01:41
D154	JUNCTION	0.52	0.80	5249.40	0	02:43
D158	JUNCTION	0.70	1.95	5246.15	0	03:01
D162	JUNCTION	1.23	3.07	5244.27	0	03:14
D163	JUNCTION	1.77	3.33	5243.73	0	03:27
D164	JUNCTION	2.10	3.19	5243.09	0	04:15
D168	JUNCTION	4.50	4.50	5241.00	0	00:00
D172	JUNCTION	0.00	0.00	5250.00	0	00:00
D174	JUNCTION	0.03	0.59	5249.59	0	00:36
D176	JUNCTION	0.00	0.00	5250.00	0	00:00
D178	JUNCTION	0.03	0.74	5249.54	0	00:36
D180	JUNCTION	0.06	1.02	5249.52	0	00:36
D182	JUNCTION	0.06	0.99	5249.09	0	00:37
D184	JUNCTION	0.04	0.82	5248.32	0	00:37
D186	JUNCTION	0.04	0.70	5246.70	0	00:44
D188	JUNCTION	0.09	0.82	5243.82	0	00:51
D190	JUNCTION	0.06	0.57	5242.57	0	00:55
D192	JUNCTION	0.08	0.57	5240.57	0	01:00
D198	JUNCTION	0.00	0.00	0.00	0	00:10
D200	JUNCTION	1.54	1.60	5231.10	0	01:39
D101	OUTFALL	0.20	4.00	5291.70	0	00:28
D110	OUTFALL	0.00	0.04	5283.84	0	00:48
D170	OUTFALL	7.51	7.51	5243.76	0	00:00
D196	OUTFALL	0.10	0.79	5238.79	0	01:31
21	DIVIDER	0.22	1.54	5277.04	0	00:38
D99	DIVIDER	0.25	6.41	5296.41	0	00:36
D106	DIVIDER	0.04	0.59	5278.59	0	00:40
D108	DIVIDER	0.28	4.56	5284.06	0	00:48
D151	STORAGE	3.39	4.70	5254.70	0	02:14
D159	STORAGE	1.23	3.19	5245.99	0	03:04
HAVANA_at_40th_POND	STORAGE	0.13	1.79	5282.79	0	00:45
N_WQ_POND	STORAGE	0.23	1.44	5239.94	0	01:31
NE_GORE_AREA	STORAGE	0.06	0.89	5250.99	0	01:46
NE-HAVANA_POND	STORAGE	0.04	0.78	5283.78	0	00:40
NW_GORE_POND	STORAGE	0.30	2.07	5249.57	0	02:37

S_WQ_POND	STORAGE	5.52	6.60	5243.10	0	04:13
SE_GORE_AREA	STORAGE	1.11	2.74	5249.34	0	02:44
SE_Havana_Pond	STORAGE	0.48	4.13	5282.13	0	01:40

****
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	Flow Balance Error Percent
10	JUNCTION	31.30	31.30	0	00:48	1.11	1.11	0.000
11	JUNCTION	15.96	15.96	0	00:30	0.21	0.21	0.000
20	JUNCTION	69.05	69.05	0	00:43	1.98	1.98	0.000
30	JUNCTION	282.22	282.22	0	00:35	5.08	5.08	-0.001
40	JUNCTION	6.69	6.69	0	00:52	0.33	0.33	0.000
41	JUNCTION	1.85	1.85	0	00:37	0.0469	0.0469	0.000
42	JUNCTION	5.40	5.40	0	00:32	0.103	0.103	0.000
43	JUNCTION	0.95	0.95	0	00:35	0.0246	0.0246	-0.017
50a	JUNCTION	6.20	6.20	0	00:38	0.178	0.178	0.000
50b	JUNCTION	8.87	8.87	0	00:31	0.132	0.132	0.000
53	JUNCTION	3.95	3.95	0	00:27	0.0512	0.0512	0.000
60	JUNCTION	16.26	16.26	0	00:48	0.649	0.649	-0.001
61a	JUNCTION	9.41	9.41	0	00:32	0.175	0.175	0.000
61b	JUNCTION	2.21	2.21	0	00:32	0.0398	0.0398	0.000
62	JUNCTION	20.38	20.38	0	00:31	0.308	0.308	0.000
63	JUNCTION	3.31	3.31	0	00:32	0.0654	0.0654	0.000
65a	JUNCTION	1.72	1.72	0	00:37	0.0469	0.0469	0.000
65b	JUNCTION	0.95	0.95	0	00:47	0.044	0.044	0.000
66	JUNCTION	7.58	7.58	0	00:35	0.169	0.169	-0.007
68	JUNCTION	5.86	5.86	0	00:28	0.0854	0.0854	0.000
70	JUNCTION	5.39	5.39	0	00:33	0.103	0.103	0.000
72	JUNCTION	4.64	4.64	0	00:52	0.233	0.233	-0.000
73	JUNCTION	1.40	1.40	0	00:33	0.0293	0.0293	0.000
74	JUNCTION	2.61	2.61	0	00:58	0.148	0.148	0.000
75	JUNCTION	2.78	2.78	0	00:33	0.0555	0.0555	-20.991
77	JUNCTION	1.82	1.82	0	00:31	0.027	0.027	0.000
78	JUNCTION	3.94	3.94	0	00:32	0.0666	0.0666	0.000
80	JUNCTION	135.63	135.63	0	00:36	2.78	2.78	0.000
90	JUNCTION	5.04	5.04	0	00:41	0.159	0.159	0.000

D107	JUNCTION	0.00	9.18	0	00:40	0	0.21	-1.051	
D111	JUNCTION	0.00	23.11	0	00:40	0	1.05	0.086	
D112	JUNCTION	0.00	23.14	0	00:44	0	1.05	-0.285	
D113	JUNCTION	0.00	55.83	0	00:50	0	3.43	0.182	
D113b	JUNCTION	0.00	53.76	0	01:09	0	3.43	0.016	
D113c	JUNCTION	0.00	53.77	0	01:11	0	3.43	-0.028	
D113d	JUNCTION	0.00	53.74	0	01:13	0	3.43	-0.046	
D113e	JUNCTION	0.00	53.69	0	01:16	0	3.43	0.117	
D114	JUNCTION	0.00	57.80	0	01:27	0	3.75	0.013	
D115	JUNCTION	0.00	57.62	0	01:33	0	3.75	0.000	
D116	JUNCTION	0.00	57.62	0	01:33	0	3.75	-0.001	
D117	JUNCTION	0.00	58.53	0	01:33	0	3.86	0.004	
D118	JUNCTION	0.00	17.43	0	01:34	0	0.534	-0.058	
D119	JUNCTION	0.00	17.43	0	01:35	0	0.534	-0.821	
D119a	JUNCTION	0.00	17.40	0	01:37	0	0.539	0.896	
D120	JUNCTION	0.00	0.95	0	00:35	0	0.0246	-0.374	
D134	JUNCTION	0.00	19.42	0	01:45	0	0.736	0.008	
D135	JUNCTION	0.00	19.41	0	01:46	0	0.736	-0.014	
D136	JUNCTION	0.00	19.41	0	01:47	0	0.736	0.071	
D140	JUNCTION	0.00	8.76	0	01:52	0	0.919	0.017	
D142	JUNCTION	0.00	10.17	0	00:32	0	1	-0.009	
D145	JUNCTION	0.00	41.09	0	01:34	0	3.32	-0.002	
D146	JUNCTION	0.00	41.09	0	01:35	0	3.32	0.025	
D147	JUNCTION	0.00	16.26	0	00:48	0	0.649	-0.247	
D148	JUNCTION	0.00	54.09	0	01:13	0	4.04	-0.318	
D152	JUNCTION	0.00	14.51	0	02:15	0	5.09	0.010	
D154	JUNCTION	0.00	14.51	0	02:15	0	5.09	0.010	
D158	JUNCTION	0.00	64.31	0	02:43	0	10.3	0.033	
D162	JUNCTION	0.00	63.77	0	03:02	0	10.4	-0.037	
D163	JUNCTION	0.00	63.73	0	03:03	0	10.4	0.020	
D164	JUNCTION	0.00	63.71	0	03:03	0	13.7	0.232	
D168	JUNCTION	0.00	266.98	0	04:13	0	147	0.005	
D172	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	gal
D174	JUNCTION	0.00	1.40	0	00:33	0	0.0293	0.160	
D176	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	gal
D178	JUNCTION	0.00	5.39	0	00:33	0	0.103	-0.010	
D180	JUNCTION	0.00	6.36	0	00:35	0	0.132	0.103	
D182	JUNCTION	0.00	6.33	0	00:36	0	0.132	0.012	
D184	JUNCTION	0.00	6.32	0	00:37	0	0.132	-0.674	
D186	JUNCTION	0.00	7.22	0	00:40	0	0.133	-0.506	
D188	JUNCTION	0.00	7.68	0	00:46	0	0.133	0.634	
D190	JUNCTION	0.00	6.53	0	00:54	0	0.133	-0.763	
D192	JUNCTION	0.00	7.54	0	00:58	0	0.134	1.600	
D198	JUNCTION	0.00	5.04	0	00:41	0	0.159	0.000	

D200	JUNCTION	0.00	4.77	0	00:47	0	0.219	0.000
D101	OUTFALL	0.00	100.56	0	00:36	0	2.61	0.000
D110	OUTFALL	0.00	9.96	0	00:48	0	0.105	0.000
D170	OUTFALL	0.00	211.02	0	00:05	0	136	0.000
D196	OUTFALL	0.00	6.41	0	01:31	0	0.365	0.000
21	DIVIDER	0.91	26.94	0	01:35	0.0258	2.16	-0.120
D99	DIVIDER	0.00	135.63	0	00:36	0	2.78	-0.224
D106	DIVIDER	0.00	9.18	0	00:40	0	0.21	-0.000
D108	DIVIDER	0.00	31.30	0	00:48	0	1.11	-0.115
D151	STORAGE	0.00	282.31	0	00:35	0	6.56	0.000
D159	STORAGE	0.00	64.22	0	02:44	0	10.4	0.171
HAVANA_at_40th_POND	STORAGE	0.00	34.87	0	00:36	0	0.18	7.916
N_WQ_POND	STORAGE	0.00	10.87	0	01:00	0	0.365	0.001
NE_GORE_AREA	STORAGE	0.00	19.94	0	01:36	0	0.736	-0.003
NE-HAVANA_POND	STORAGE	0.00	15.96	0	00:30	0	0.21	-0.000
NW_GORE_POND	STORAGE	0.00	20.17	0	01:46	0	0.868	-0.044
S_WQ_POND	STORAGE	0.00	67.85	0	07:45	0	16.1	-0.135
SE_GORE_AREA	STORAGE	0.00	70.34	0	01:15	0	9.31	0.290
SE_Havana_Pond	STORAGE	0.00	76.19	0	00:44	0	2.14	-0.030

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Node Surcharge Summary
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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
11	JUNCTION	24.00	0.000	10.000
20	JUNCTION	24.00	0.000	10.000
42	JUNCTION	24.00	0.000	10.000
53	JUNCTION	24.00	0.000	10.000
61b	JUNCTION	24.00	0.000	5.000
62	JUNCTION	24.00	0.000	7.000
65a	JUNCTION	24.00	0.000	5.000
65b	JUNCTION	24.00	0.000	0.000
68	JUNCTION	24.00	0.000	5.200
70	JUNCTION	24.00	0.000	10.000
77	JUNCTION	24.00	0.000	7.500
D140	JUNCTION	1.72	0.298	1.702
D198	JUNCTION	24.00	0.000	0.000

D200	JUNCTION	22.34	0.000	0.000

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Node Flooding Summary
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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
65b	5.54	0.95	0 00:47	0.044	0.000
D168	24.00	266.98	0 04:13	146.970	0.000
D198	3.85	5.04	0 00:41	0.159	0.000
D200	22.34	2.86	0 01:39	0.095	0.000

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Storage Volume Summary
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Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Infil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
D151	417.036	9	0	0	782.299	17	0 02:14	14.51
D159	7.126	7	0	0	31.266	29	0 03:04	63.77
HAVANA_at_40th_POND	0.202	0	0	0	5.934	6	0 00:45	7.21
N_WQ_POND	0.803	1	0	0	10.356	9	0 01:31	6.41
NE_GORE_AREA	0.249	0	0	0	5.023	10	0 01:46	19.42
NE-HAVANA_POND	0.280	0	0	0	8.206	7	0 00:40	9.18
NW_GORE_POND	4.962	2	0	0	50.899	24	0 02:37	8.66
S_WQ_POND	443.206	42	0	0	633.353	60	0 04:13	64.82
SE_GORE_AREA	22.609	5	0	0	120.612	27	0 02:44	55.65
SE_Havana_Pond	9.973	2	0	0	116.515	24	0 01:40	27.67

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
D101	12.81	31.52	100.56	2.610
D110	3.19	5.10	9.96	0.105
D170	100.00	210.99	211.02	136.359
D196	69.17	0.82	6.41	0.365
System	46.29	248.43	321.36	139.439

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Link Flow Summary
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Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
1	DUMMY	135.63	0	00:36			
4	CONDUIT	100.56	0	00:36	8.00	1.22	1.00
7	DUMMY	69.05	0	00:43			
16	CONDUIT	26.86	0	01:32	4.58	0.43	0.66
19	DUMMY	15.96	0	00:30			
20	CONDUIT	4.38	0	00:40	6.93	0.30	0.39
21	CONDUIT	9.18	0	00:40	8.45	0.29	0.38
22	DUMMY	31.30	0	00:48			
25	CONDUIT	9.96	0	00:48	0.97	0.00	0.03
30	CONDUIT	0.00	0	00:00	0.00	0.00	0.07
33	CONDUIT	23.14	0	00:44	10.99	0.96	0.65
38	CONDUIT	22.85	0	00:50	0.98	0.06	0.30
39	CONDUIT	8.66	0	00:46	0.63	0.02	0.24
41	CONDUIT	53.76	0	01:09	2.14	0.15	0.45
42	CONDUIT	53.77	0	01:11	3.51	0.19	0.48
43	CONDUIT	53.74	0	01:13	2.96	0.09	0.40
44	CONDUIT	53.69	0	01:16	2.93	0.16	0.53
45	CONDUIT	52.63	0	01:32	1.86	0.11	0.62
55	CONDUIT	26.61	0	01:40	8.64	1.50	0.95
61	CHANNEL	34.87	0	00:36	8.95	0.09	0.70
62	CONDUIT	7.21	0	00:45	4.52	1.41	0.88

80	CONDUIT	21.33	0	00:48	7.09	1.29	0.91
82	DUMMY	1.85	0	00:37			
110	DUMMY	6.69	0	00:52			
114	CONDUIT	57.62	0	01:34	1.70	0.06	0.70
116	DUMMY	5.40	0	00:32			
117	CONDUIT	17.43	0	01:34	2.57	0.09	0.44
118	CONDUIT	17.43	0	01:35	3.71	0.05	0.25
119	CONDUIT	17.40	0	01:37	1.06	0.04	0.31
120	CONDUIT	17.36	0	01:40	8.77	0.05	0.39
124	CONDUIT	0.95	0	00:36	2.69	0.14	0.59
126	DUMMY	6.20	0	00:38			
133	CONDUIT	19.42	0	01:45	1.17	0.13	0.51
134	CONDUIT	19.41	0	01:46	1.63	0.32	0.52
135	CONDUIT	19.41	0	01:47	3.21	0.02	0.14
135a	CONDUIT	19.41	0	01:47	3.19	0.15	0.32
136	DUMMY	8.87	0	00:31			
137	CONDUIT	0.00	0	00:00	0.00	0.00	0.06
140	DUMMY	3.95	0	00:27			
144	DUMMY	5.86	0	00:28			
152	CONDUIT	41.09	0	01:35	3.20	0.31	0.58
154	DUMMY	3.31	0	00:32			
158	CONDUIT	16.26	0	00:48	1.92	0.08	0.62
160	CONDUIT	53.97	0	01:16	2.05	0.11	0.72
162	DUMMY	9.41	0	00:32			
164	CONDUIT	282.31	0	00:35	18.60	0.08	0.19
168	CONDUIT	14.50	0	02:16	9.77	0.02	0.29
174	DUMMY	2.21	0	00:32			
176	CONDUIT	64.16	0	02:45	1.63	0.15	0.64
178	DUMMY	3.94	0	00:32			
185	CONDUIT	67.85	0	07:45	10.76	0.32	0.65
186	DUMMY	1.82	0	00:31			
187	DUMMY	1.72	0	00:37			
196	DUMMY	20.38	0	00:31			
200	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
202	DUMMY	1.40	0	00:33			
206	CONDUIT	0.00	0	00:00	0.00	0.00	0.18
207	CONDUIT	0.00	0	00:00	0.00	0.00	0.50
208	DUMMY	5.39	0	00:33			
210	CONDUIT	5.01	0	00:35	0.65	0.01	0.22
215	CONDUIT	7.22	0	00:40	1.52	0.12	0.35
216	CONDUIT	7.68	0	00:46	1.67	0.11	0.36
217	CONDUIT	6.53	0	00:54	1.22	0.02	0.23
218	CONDUIT	7.54	0	00:58	1.26	0.01	0.18
219	CONDUIT	6.38	0	01:01	1.99	0.05	0.25

220	CONDUIT	4.64	0	00:52	2.66	0.02	0.16
224	DUMMY	5.04	0	00:41			
225	CONDUIT	2.52	0	00:38	1.51	0.03	0.58
226	DUMMY	2.61	0	00:58			
EX-P1	CONDUIT	6.41	0	01:31	2.67	0.42	0.37
EX-P2	CONDUIT	8.66	0	02:37	5.26	1.67	0.88
EX-P3	CONDUIT	41.09	0	01:34	8.64	2.07	0.93
EX-P4	CONDUIT	55.65	0	02:44	6.28	0.53	0.54
EX-P5	CONDUIT	14.51	0	02:15	7.62	0.31	0.33
P-1	CONDUIT	6.32	0	00:37	3.43	0.15	0.26
P-2	CONDUIT	6.33	0	00:36	2.98	0.15	0.27
P-3	CONDUIT	1.35	0	00:34	1.40	0.07	0.30
P-15	CONDUIT	0.95	0	00:35	2.70	0.02	0.17
P-16	CONDUIT	57.62	0	01:33	12.98	0.26	0.39
P-17	CONDUIT	41.09	0	01:35	7.36	1.13	0.74
P-18	CONDUIT	16.26	0	00:48	16.07	0.11	0.20
P-19	CONDUIT	7.58	0	00:35	3.73	0.11	0.54
P-20	CONDUIT	63.70	0	03:04	5.57	0.65	0.72
P-21	CONDUIT	63.73	0	03:03	5.48	0.58	0.70
P-22	CONDUIT	63.77	0	03:02	5.53	0.66	0.68
P-23	CONDUIT	8.66	0	02:36	2.91	0.66	1.00
P-24	CONDUIT	10.17	0	00:32	6.56	0.28	0.56
P-27	CONDUIT	211.02	0	00:05	13.27	2.36	1.00
3	ORIFICE	57.62	0	01:33			0.91
63	WEIR	0.00	0	00:00			0.00
67	WEIR	4.81	0	00:40			0.09
O2	WEIR	55.96	0	04:13			0.37
O1	DUMMY	14.51	0	02:15			

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
4	1.00	0.86	0.00	0.00	0.14	0.00	0.00	0.00	0.88	0.00
16	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.84	0.00
20	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
21	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
25	1.00	0.97	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00

30	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	1.00	0.01	0.75	0.00	0.07	0.17	0.00	0.00	0.81	0.00
38	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
39	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.98	0.00
41	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
42	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.86	0.00
43	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.97	0.00
44	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.96	0.00
45	1.00	0.01	0.02	0.00	0.97	0.00	0.00	0.00	0.34	0.00
55	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
61	1.00	0.02	0.97	0.00	0.01	0.00	0.00	0.00	0.98	0.00
62	1.00	0.02	0.00	0.00	0.10	0.00	0.00	0.88	0.02	0.00
80	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
114	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.77	0.00
117	7.20	0.72	0.19	0.00	0.08	0.00	0.00	0.00	0.00	0.00
118	1.00	0.05	0.68	0.00	0.25	0.02	0.00	0.00	0.90	0.00
119	1.00	0.05	0.00	0.00	0.95	0.00	0.00	0.00	0.95	0.00
120	2.41	0.01	0.04	0.00	0.21	0.74	0.00	0.00	0.06	0.00
124	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.09	0.00
133	1.00	0.01	0.07	0.00	0.92	0.00	0.00	0.00	0.93	0.00
134	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.87	0.00
135	1.75	0.02	0.00	0.00	0.08	0.00	0.00	0.90	0.01	0.00
135a	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.03	0.00
137	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
152	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
158	1.00	0.01	0.00	0.00	0.99	0.01	0.00	0.00	0.99	0.00
160	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.94	0.00
164	5.06	0.89	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00
168	3.37	0.00	0.00	0.00	0.00	0.10	0.00	0.90	0.00	0.00
176	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.84	0.00
185	2.35	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.00	0.00
200	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
206	1.00	0.58	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00
207	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
210	1.00	0.01	0.58	0.00	0.42	0.00	0.00	0.00	0.94	0.00
215	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.95	0.00
216	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
217	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
218	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.96	0.00
219	1.00	0.03	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.00
220	1.42	0.74	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00
225	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
EX-P1	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
EX-P2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00

EX-P3	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
EX-P4	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
EX-P5	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
P-1	1.00	0.01	0.58	0.00	0.40	0.00	0.00	0.00	0.77	0.00
P-2	1.00	0.01	0.00	0.00	0.08	0.00	0.00	0.91	0.00	0.00
P-3	1.00	0.01	0.00	0.00	0.10	0.00	0.00	0.89	0.07	0.00
P-15	1.00	0.01	0.84	0.00	0.14	0.00	0.00	0.00	0.99	0.00
P-16	1.00	0.01	0.00	0.00	0.73	0.26	0.00	0.00	0.84	0.00
P-17	1.00	0.01	0.00	0.00	0.93	0.06	0.00	0.00	0.79	0.00
P-18	1.00	0.01	0.79	0.00	0.01	0.19	0.00	0.00	0.82	0.00
P-19	1.00	0.00	0.85	0.00	0.15	0.00	0.00	0.00	0.99	0.00
P-20	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
P-21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.59	0.00
P-22	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.01	0.01	0.00
P-23	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.79	0.00
P-24	1.00	0.00	0.01	0.00	0.97	0.02	0.00	0.00	0.95	0.00
P-27	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
4	0.41	0.41	0.41	0.40	0.01
55	0.01	0.01	0.01	3.06	0.01
62	0.01	0.01	0.01	0.49	0.01
80	0.01	0.01	0.01	1.18	0.01
EX-P2	0.01	0.01	0.01	4.22	0.01
EX-P3	0.01	0.01	0.01	3.08	0.01
P-17	0.01	0.01	0.01	1.90	0.01
P-23	0.70	0.70	0.70	0.01	0.01
P-27	24.00	24.00	24.00	24.00	0.01

Analysis begun on: Tue May 05 11:18:47 2015
Analysis ended on: Tue May 05 11:18:54 2015
Total elapsed time: 00:00:07

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.005)

100-Year Proposed Conditions Model

****
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 ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Starting Date ............ JAN-01-2005 00:00:00
Ending Date .............. JAN-02-2005 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... NO
Maximum Trials ........... 8
Head Tolerance ........... 0.005000 ft
```

********** Flow Routing Continuity **********	Volume acre-feet ---	Volume 10^6 gal ---
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	512.796	167.102
External Outflow	19.617	6.393
Internal Outflow	485.339	158.155
Evaporation Loss	0.000	0.000
Seepage Loss	0.000	0.000
Initial Stored Volume	12.100	3.943

```
Final Stored Volume ......        19.915         6.490
Continuity Error (%) .....         0.004


*************************
Highest Continuity Errors
*************************
Node HAVANA_at_40th_POND (3.02%)


*******************************
Highest Flow Instability Indexes
*******************************
Link 185 (4)
Link P-20 (4)
Link 55 (3)
Link P-21 (2)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.00 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00


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

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
10	JUNCTION	0.00	0.00	5283.00	0 00:00
11	JUNCTION	0.00	0.00	5286.00	0 00:00
20	JUNCTION	0.00	0.00	5285.00	0 00:00
30	JUNCTION	0.15	3.45	5261.45	0 00:40
40	JUNCTION	0.00	0.00	5262.00	0 00:00
41	JUNCTION	0.00	0.00	5274.50	0 00:00
42	JUNCTION	0.00	0.00	5253.62	0 00:00
43	JUNCTION	0.02	0.29	5264.29	0 00:41
50a	JUNCTION	0.00	0.00	5250.10	0 00:00

50b	JUNCTION	0.00	0.00	5247.50	0	00:00
53	JUNCTION	0.00	0.00	5247.50	0	00:00
60	JUNCTION	0.12	1.56	5257.16	0	00:55
61a	JUNCTION	0.00	0.00	5246.75	0	00:00
61b	JUNCTION	0.00	0.00	5245.50	0	00:00
62	JUNCTION	0.00	0.00	5236.50	0	00:00
63	JUNCTION	0.00	0.00	5248.50	0	00:00
65a	JUNCTION	0.00	0.00	5254.00	0	00:00
65b	JUNCTION	0.00	0.00	0.00	0	00:00
66	JUNCTION	0.04	0.86	5244.86	0	00:40
68	JUNCTION	0.00	0.00	5246.50	0	00:00
70	JUNCTION	0.00	0.00	5249.30	0	00:00
72	JUNCTION	0.15	1.01	5241.01	0	03:28
73	JUNCTION	0.00	0.00	5249.00	0	00:00
74	JUNCTION	0.00	0.00	5230.00	0	00:00
75	JUNCTION	0.08	0.62	5245.62	0	00:44
77	JUNCTION	0.00	0.00	5240.50	0	00:00
78	JUNCTION	0.00	0.00	5242.80	0	00:00
80	JUNCTION	0.00	0.00	5290.00	0	00:00
90	JUNCTION	0.00	0.00	0.00	0	00:00
D107	JUNCTION	0.03	0.49	5275.49	0	00:53
D111	JUNCTION	0.22	2.69	5277.19	0	00:42
D112	JUNCTION	0.07	0.71	5274.71	0	01:09
D113	JUNCTION	0.31	1.46	5274.56	0	01:10
D113b	JUNCTION	0.39	1.74	5272.74	0	01:11
D113c	JUNCTION	0.38	1.70	5269.50	0	01:13
D113d	JUNCTION	0.47	2.13	5266.93	0	01:30
D113e	JUNCTION	0.62	3.64	5266.64	0	01:32
D114	JUNCTION	0.92	4.84	5266.59	0	01:32
D115	JUNCTION	0.41	1.97	5263.71	0	01:32
D116	JUNCTION	0.48	2.03	5258.63	0	01:30
D117	JUNCTION	1.17	4.99	5258.59	0	01:30
D118	JUNCTION	0.09	1.04	5258.53	0	01:30
D119	JUNCTION	0.08	0.84	5253.84	0	01:32
D119a	JUNCTION	0.10	0.95	5252.95	0	01:34
D120	JUNCTION	0.06	0.69	5253.79	0	00:37
D134	JUNCTION	0.27	2.02	5251.62	0	01:51
D135	JUNCTION	0.29	2.08	5251.42	0	02:24
D136	JUNCTION	0.33	2.36	5251.36	0	02:29
D140	JUNCTION	0.84	3.57	5250.57	0	02:32
D142	JUNCTION	0.37	1.60	5247.10	0	02:47
D145	JUNCTION	0.86	3.62	5254.62	0	01:20
D146	JUNCTION	0.49	1.43	5251.43	0	01:19
D147	JUNCTION	0.07	0.56	5250.06	0	00:55
D148	JUNCTION	0.37	1.47	5249.97	0	02:20
D152	JUNCTION	1.20	1.36	5251.36	0	02:16
D154	JUNCTION	0.73	1.27	5249.87	0	02:24
D158	JUNCTION	1.18	2.74	5246.94	0	02:49

D162	JUNCTION	1.90	3.83	5245.03	0	03:05
D163	JUNCTION	2.37	3.98	5244.38	0	03:16
D164	JUNCTION	2.55	3.62	5243.52	0	04:11
D168	JUNCTION	4.50	4.50	5241.00	0	00:00
D172	JUNCTION	0.11	1.30	5251.30	0	02:29
D174	JUNCTION	0.25	2.26	5251.26	0	02:29
D176	JUNCTION	0.04	0.53	5250.53	0	02:33
D178	JUNCTION	0.20	1.70	5250.50	0	02:32
D180	JUNCTION	0.26	2.00	5250.50	0	02:32
D182	JUNCTION	0.24	1.80	5249.90	0	02:33
D184	JUNCTION	0.17	1.26	5248.76	0	02:33
D186	JUNCTION	0.15	1.11	5247.11	0	02:38
D188	JUNCTION	0.22	1.25	5244.25	0	02:41
D190	JUNCTION	0.14	0.80	5242.80	0	02:44
D192	JUNCTION	0.19	1.04	5241.04	0	03:23
D198	JUNCTION	0.00	0.00	0.00	0	00:09
D200	JUNCTION	1.55	1.60	5231.10	0	00:57
D101	OUTFALL	0.24	4.00	5291.70	0	00:28
D110	OUTFALL	0.00	0.12	5283.92	0	00:54
D170	OUTFALL	7.51	7.51	5243.76	0	00:00
D196	OUTFALL	0.28	1.40	5239.40	0	03:29
21	DIVIDER	0.49	1.80	5277.30	0	03:12
D99	DIVIDER	0.34	6.70	5296.70	0	00:41
D106	DIVIDER	0.05	0.70	5278.70	0	00:48
D108	DIVIDER	0.38	4.64	5284.14	0	00:54
D151	STORAGE	4.99	6.53	5256.53	0	02:13
D159	STORAGE	1.94	4.05	5246.85	0	02:50
HAVANA_at_40th_POND	STORAGE	0.86	4.34	5285.34	0	00:51
N_WQ_POND	STORAGE	0.54	2.51	5241.01	0	03:28
NE_GORE_AREA	STORAGE	0.18	1.63	5251.73	0	01:44
NE-HAVANA_POND	STORAGE	0.07	1.31	5284.31	0	00:48
NW_GORE_POND	STORAGE	0.77	3.86	5251.36	0	02:29
S_WQ_POND	STORAGE	5.97	7.03	5243.53	0	04:10
SE_GORE_AREA	STORAGE	1.71	3.34	5249.94	0	02:23
SE_Havana_Pond	STORAGE	1.49	7.31	5285.31	0	01:54

****
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	Flow Balance Error Percent
10	JUNCTION	69.33	69.33	0	00:54	2.23	2.23	0.000

11	JUNCTION	38.22	38.22	0	00:34	0.505	0.505	0.000
20	JUNCTION	149.81	149.81	0	00:49	3.95	3.95	0.000
30	JUNCTION	629.87	629.87	0	00:40	10.9	10.9	-0.000
40	JUNCTION	20.30	20.30	0	01:00	0.904	0.904	0.000
41	JUNCTION	6.21	6.21	0	00:43	0.166	0.166	0.000
42	JUNCTION	10.93	10.93	0	00:37	0.201	0.201	0.000
43	JUNCTION	2.57	2.57	0	00:41	0.0641	0.0641	-0.007
50a	JUNCTION	17.91	17.91	0	00:45	0.494	0.494	0.000
50b	JUNCTION	20.83	20.83	0	00:35	0.309	0.309	0.000
53	JUNCTION	8.65	8.65	0	00:32	0.11	0.11	0.000
60	JUNCTION	45.14	45.14	0	00:55	1.64	1.64	-0.002
61a	JUNCTION	21.66	21.66	0	00:37	0.391	0.391	0.000
61b	JUNCTION	6.35	6.35	0	00:37	0.119	0.119	0.000
62	JUNCTION	47.98	47.98	0	00:36	0.721	0.721	0.000
63	JUNCTION	7.55	7.55	0	00:38	0.144	0.144	0.000
65a	JUNCTION	4.13	4.13	0	00:43	0.106	0.106	0.000
65b	JUNCTION	3.26	3.26	0	00:56	0.143	0.143	0.000
66	JUNCTION	18.01	18.01	0	00:40	0.385	0.385	-0.002
68	JUNCTION	11.41	11.41	0	00:33	0.164	0.164	0.000
70	JUNCTION	12.92	12.92	0	00:38	0.24	0.24	0.000
72	JUNCTION	14.29	14.29	0	01:00	0.649	0.649	0.030
73	JUNCTION	3.38	3.38	0	00:38	0.0687	0.0687	0.000
74	JUNCTION	7.31	7.31	0	01:06	0.365	0.365	0.000
75	JUNCTION	7.67	7.67	0	00:38	0.154	0.154	-13.041
77	JUNCTION	4.46	4.46	0	00:35	0.0664	0.0664	0.000
78	JUNCTION	10.70	10.70	0	00:37	0.185	0.185	0.000
80	JUNCTION	250.32	250.32	0	00:41	4.9	4.9	0.000
90	JUNCTION	12.20	12.20	0	00:47	0.355	0.355	0.000
D107	JUNCTION	0.00	21.01	0	00:48	0	0.505	-0.776
D111	JUNCTION	0.00	27.72	0	00:43	0	1.39	0.044
D112	JUNCTION	0.00	27.74	0	00:44	0	1.39	-0.311
D113	JUNCTION	0.00	79.40	0	00:54	0	7.41	0.115
D113b	JUNCTION	0.00	77.84	0	01:10	0	7.41	0.010
D113c	JUNCTION	0.00	77.83	0	01:12	0	7.41	-0.016
D113d	JUNCTION	0.00	77.78	0	01:13	0	7.41	-0.030
D113e	JUNCTION	0.00	77.67	0	01:16	0	7.41	0.119
D114	JUNCTION	0.00	89.99	0	01:20	0	8.31	-0.036
D115	JUNCTION	0.00	88.40	0	01:32	0	8.31	0.001
D116	JUNCTION	0.00	88.40	0	01:32	0	8.31	0.011
D117	JUNCTION	0.00	89.73	0	01:29	0	8.51	-0.008
D118	JUNCTION	0.00	45.90	0	01:30	0	1.94	-0.026
D119	JUNCTION	0.00	45.90	0	01:30	0	1.94	-0.407
D119a	JUNCTION	0.00	45.88	0	01:32	0	1.95	0.438
D120	JUNCTION	0.00	2.57	0	00:41	0	0.0641	-0.427
D134	JUNCTION	0.00	51.65	0	01:39	0	2.5	-0.008
D135	JUNCTION	0.00	51.56	0	01:39	0	2.5	-0.007
D136	JUNCTION	0.00	51.37	0	01:39	0	2.5	0.043
D140	JUNCTION	0.00	14.75	0	02:24	0	2.01	0.013

D142	JUNCTION	0.00	17.76	0	00:35	0	2.03	-0.005
D145	JUNCTION	0.00	43.83	0	01:30	0	6.56	-0.001
D146	JUNCTION	0.00	43.85	0	01:34	0	6.56	0.016
D147	JUNCTION	0.00	45.14	0	00:55	0	1.64	-0.177
D148	JUNCTION	0.00	88.62	0	01:05	0	8.35	-0.167
D152	JUNCTION	0.00	18.44	0	02:12	0	9.39	0.014
D154	JUNCTION	0.00	18.44	0	02:13	0	9.39	0.011
D158	JUNCTION	0.00	84.20	0	02:19	0	20.2	0.056
D162	JUNCTION	0.00	83.17	0	02:43	0	20.4	0.002
D163	JUNCTION	0.00	83.12	0	02:44	0	20.5	0.004
D164	JUNCTION	0.00	94.31	0	00:45	0	25.1	0.175
D168	JUNCTION	0.00	288.35	0	04:10	0	157	0.005
D172	JUNCTION	0.00	17.49	0	02:26	0	0.919	0.029
D174	JUNCTION	0.00	17.50	0	02:28	0	0.985	0.006
D176	JUNCTION	0.00	3.25	0	02:15	0	0.151	0.008
D178	JUNCTION	0.00	12.92	0	00:38	0	0.388	-0.030
D180	JUNCTION	0.00	20.65	0	02:32	0	1.37	-0.041
D182	JUNCTION	0.00	20.65	0	02:32	0	1.37	0.021
D184	JUNCTION	0.00	20.65	0	02:33	0	1.37	-0.148
D186	JUNCTION	0.00	20.66	0	02:35	0	1.37	-0.081
D188	JUNCTION	0.00	20.62	0	02:38	0	1.37	0.102
D190	JUNCTION	0.00	20.61	0	02:42	0	1.37	-0.251
D192	JUNCTION	0.00	20.59	0	02:44	0	1.37	0.420
D198	JUNCTION	0.00	12.20	0	00:47	0	0.355	0.000
D200	JUNCTION	0.00	13.45	0	00:54	0	0.543	0.000
D101	OUTFALL	0.00	103.63	0	00:41	0	3.37	0.000
D110	OUTFALL	0.00	47.87	0	00:54	0	1	0.000
D170	OUTFALL	0.00	211.02	0	00:05	0	136	0.000
D196	OUTFALL	0.00	19.03	0	03:29	0	2.01	0.000
21	DIVIDER	2.55	36.37	0	01:20	0.0694	5.51	-0.041
D99	DIVIDER	0.00	250.32	0	00:41	0	4.9	-0.144
D106	DIVIDER	0.00	21.01	0	00:48	0	0.505	-0.000
D108	DIVIDER	0.00	69.33	0	00:54	0	2.23	-0.053
D151	STORAGE	0.00	629.98	0	00:40	0	12.4	-0.000
D159	STORAGE	0.00	84.15	0	02:02	0	20.4	0.163
HAVANA_at_40th_POND	STORAGE	0.00	146.55	0	00:41	0	1.64	3.111
N_WQ_POND	STORAGE	0.00	30.25	0	00:57	0	2.01	-0.021
NE_GORE_AREA	STORAGE	0.00	55.33	0	01:21	0	2.5	-0.000
NE-HAVANA_POND	STORAGE	0.00	38.22	0	00:34	0	0.505	-0.000
NW_GORE_POND	STORAGE	0.00	51.83	0	01:39	0	2.81	-0.016
S_WQ_POND	STORAGE	0.00	94.31	0	00:46	0	27.5	-0.100
SE_GORE_AREA	STORAGE	0.00	115.80	0	01:05	0	18.1	0.313
SE_Havana_Pond	STORAGE	0.00	248.50	0	00:51	0	5.55	-0.008

****
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
11	JUNCTION	24.00	0.000	10.000
20	JUNCTION	24.00	0.000	10.000
42	JUNCTION	24.00	0.000	10.000
53	JUNCTION	24.00	0.000	10.000
61b	JUNCTION	24.00	0.000	5.000
62	JUNCTION	24.00	0.000	7.000
65a	JUNCTION	24.00	0.000	5.000
65b	JUNCTION	24.00	0.000	0.000
68	JUNCTION	24.00	0.000	5.200
70	JUNCTION	24.00	0.000	10.000
77	JUNCTION	24.00	0.000	7.500
D140	JUNCTION	5.63	1.566	0.434
D198	JUNCTION	24.00	0.000	0.000
D200	JUNCTION	23.05	0.000	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
65b	5.50	3.26	0 00:56	0.143	0.000
D168	24.00	288.35	0 04:10	157.235	0.000
D198	3.84	12.20	0 00:47	0.355	0.000
D200	23.05	13.36	0 00:57	0.411	0.000

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Infil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS

D151	925.276	20	0	0	1539.910	34	0	02:13	18.44
D159	15.313	14	0	0	46.765	43	0	02:50	83.17
HAVANA_at_40th_POND	10.056	10	0	0	71.523	72	0	00:51	100.07
N_WQ_POND	9.035	8	0	0	68.032	57	0	03:28	19.03
NE_GORE_AREA	1.777	3	0	0	22.685	45	0	01:44	51.65
NE-HAVANA_POND	0.776	1	0	0	23.101	20	0	00:48	21.01
NW_GORE_POND	24.353	12	0	0	163.613	77	0	02:29	32.24
S_WQ_POND	521.845	49	0	0	719.468	68	0	04:10	77.33
SE_GORE_AREA	52.609	12	0	0	188.161	43	0	02:23	72.61
SE_Havana_Pond	62.557	13	0	0	414.510	84	0	01:54	52.47

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
D101	12.91	40.44	103.63	3.374
D110	6.34	24.47	47.87	1.003
D170	100.00	210.99	211.02	136.359
D196	79.59	3.92	19.03	2.015
System	49.71	279.82	368.50	142.752

****
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
1	DUMMY	250.32	0 00:41			
4	CONDUIT	103.63	0 00:41	8.25	1.26	1.00
7	DUMMY	149.81	0 00:49			
16	CONDUIT	36.16	0 01:21	4.63	0.58	0.77
19	DUMMY	38.22	0 00:34			
20	CONDUIT	5.83	0 00:48	7.45	0.40	0.46
21	CONDUIT	21.01	0 00:48	10.20	0.66	0.62
22	DUMMY	69.33	0 00:54			
25	CONDUIT	47.87	0 00:54	1.77	0.01	0.07

30	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
33	CONDUIT	27.74	0	00:44	12.43	1.15	0.68
38	CONDUIT	27.56	0	00:47	1.09	0.07	0.36
39	CONDUIT	20.66	0	00:53	0.69	0.04	0.32
41	CONDUIT	77.84	0	01:10	2.39	0.21	0.53
42	CONDUIT	77.83	0	01:12	3.86	0.28	0.57
43	CONDUIT	77.78	0	01:13	3.18	0.13	0.47
44	CONDUIT	77.67	0	01:16	3.16	0.23	0.72
45	CONDUIT	73.16	0	01:34	1.49	0.15	0.85
55	CONDUIT	35.11	0	01:54	11.21	1.97	1.00
61	CHANNEL	146.55	0	00:41	9.72	0.39	0.85
62	CONDUIT	12.91	0	00:47	7.35	2.53	1.00
80	CONDUIT	21.51	0	00:43	7.13	1.30	0.92
82	DUMMY	6.21	0	00:43			
110	DUMMY	20.30	0	01:00			
114	CONDUIT	88.41	0	01:32	1.56	0.10	0.75
116	DUMMY	10.93	0	00:37			
117	CONDUIT	45.90	0	01:30	3.18	0.23	0.71
118	CONDUIT	45.90	0	01:30	5.04	0.13	0.38
119	CONDUIT	45.88	0	01:32	1.35	0.11	0.45
120	CONDUIT	45.85	0	01:34	8.05	0.14	0.64
124	CONDUIT	2.57	0	00:42	3.12	0.37	0.80
126	DUMMY	17.91	0	00:45			
133	CONDUIT	51.65	0	01:39	1.49	0.36	0.87
134	CONDUIT	51.56	0	01:39	2.22	0.84	0.88
135	CONDUIT	50.95	0	01:39	3.18	0.04	0.54
135a	CONDUIT	51.37	0	01:39	3.39	0.41	0.85
136	DUMMY	20.83	0	00:35			
137	CONDUIT	17.49	0	02:26	1.01	0.11	0.68
140	DUMMY	8.65	0	00:32			
144	DUMMY	11.41	0	00:33			
152	CONDUIT	44.57	0	01:24	2.93	0.33	0.69
154	DUMMY	7.55	0	00:38			
158	CONDUIT	45.14	0	00:55	2.50	0.21	0.78
160	CONDUIT	88.48	0	01:07	2.53	0.19	0.87
162	DUMMY	21.66	0	00:37			
164	CONDUIT	629.98	0	00:40	23.43	0.18	0.29
168	CONDUIT	18.44	0	02:15	10.25	0.02	0.47
174	DUMMY	6.35	0	00:37			
176	CONDUIT	83.84	0	02:25	1.92	0.19	0.84
178	DUMMY	10.70	0	00:37			
185	CONDUIT	94.31	0	00:46	10.76	0.45	0.73
186	DUMMY	4.46	0	00:35			
187	DUMMY	4.13	0	00:43			
196	DUMMY	47.98	0	00:36			
200	CONDUIT	17.46	0	02:28	1.89	0.08	0.47
202	DUMMY	3.38	0	00:38			
206	CONDUIT	3.18	0	02:43	0.41	0.05	0.56

207	CONDUIT	3.25	0	02:15	0.32	0.04	0.63
208	DUMMY	12.92	0	00:38			
210	CONDUIT	11.42	0	00:43	0.75	0.03	0.46
215	CONDUIT	20.66	0	02:35	2.00	0.33	0.59
216	CONDUIT	20.62	0	02:38	2.08	0.28	0.59
217	CONDUIT	20.61	0	02:42	1.69	0.07	0.34
218	CONDUIT	20.59	0	02:44	1.58	0.03	0.30
219	CONDUIT	20.24	0	02:45	2.53	0.15	0.52
220	CONDUIT	14.29	0	01:00	3.69	0.07	0.51
224	DUMMY	12.20	0	00:47			
225	CONDUIT	7.20	0	00:44	1.92	0.08	0.69
226	DUMMY	7.31	0	01:06			
EX-P1	CONDUIT	19.03	0	03:29	3.91	1.25	0.65
EX-P2	CONDUIT	11.54	0	02:32	6.73	2.23	0.93
EX-P3	CONDUIT	43.83	0	01:30	9.15	2.21	0.94
EX-P4	CONDUIT	72.61	0	02:21	6.66	0.69	0.66
EX-P5	CONDUIT	18.44	0	02:13	8.12	0.40	0.44
P-1	CONDUIT	20.65	0	02:33	5.11	0.49	0.44
P-2	CONDUIT	20.65	0	02:32	3.99	0.49	0.53
P-3	CONDUIT	17.49	0	02:28	4.01	0.95	0.83
P-15	CONDUIT	2.57	0	00:41	4.33	0.05	0.24
P-16	CONDUIT	88.40	0	01:32	14.14	0.40	0.50
P-17	CONDUIT	43.85	0	01:34	8.05	1.21	0.74
P-18	CONDUIT	45.14	0	00:55	20.26	0.32	0.35
P-19	CONDUIT	18.01	0	00:40	5.50	0.25	0.64
P-20	CONDUIT	83.09	0	02:45	6.13	0.84	0.84
P-21	CONDUIT	83.12	0	02:44	5.84	0.75	0.86
P-22	CONDUIT	83.17	0	02:43	5.74	0.87	0.86
P-23	CONDUIT	14.75	0	02:25	4.69	1.12	1.00
P-24	CONDUIT	17.75	0	00:35	7.53	0.49	0.82
P-27	CONDUIT	211.02	0	00:05	13.27	2.36	1.00
3	ORIFICE	88.40	0	01:32			1.00
63	WEIR	88.69	0	00:51			0.08
67	WEIR	15.18	0	00:48			0.20
O2	WEIR	77.33	0	04:10			0.45
O1	DUMMY	18.44	0	02:12			

****
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	Norm Ltd	Inlet Ctrl
4	1.00	0.86	0.00	0.00	0.14	0.00	0.00	0.00	0.88	0.00

16	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.69	0.00
20	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
21	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
25	1.00	0.94	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00
30	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	1.00	0.01	0.75	0.00	0.07	0.17	0.00	0.00	0.82	0.00
38	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.94	0.00
39	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.98	0.00
41	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
42	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.70	0.00
43	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.97	0.00
44	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.94	0.00
45	1.00	0.01	0.02	0.00	0.97	0.00	0.00	0.00	0.40	0.00
55	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
61	1.00	0.02	0.95	0.00	0.01	0.02	0.00	0.00	0.98	0.00
62	1.00	0.02	0.00	0.00	0.24	0.00	0.00	0.74	0.00	0.00
80	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
114	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.73	0.00
117	7.20	0.68	0.19	0.00	0.13	0.00	0.00	0.00	0.00	0.00
118	1.00	0.04	0.64	0.00	0.25	0.08	0.00	0.00	0.87	0.00
119	1.00	0.04	0.00	0.00	0.96	0.00	0.00	0.00	0.95	0.00
120	2.41	0.01	0.03	0.00	0.24	0.72	0.00	0.00	0.15	0.00
124	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.18	0.00
133	1.00	0.01	0.04	0.00	0.96	0.00	0.00	0.00	0.81	0.00
134	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.77	0.00
135	1.75	0.02	0.00	0.00	0.25	0.00	0.00	0.74	0.01	0.00
135a	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.03	0.00
137	1.00	0.70	0.00	0.00	0.22	0.00	0.00	0.07	0.08	0.00
152	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.09	0.00
158	1.00	0.01	0.00	0.00	0.99	0.01	0.00	0.00	0.89	0.00
160	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.80	0.00
164	5.06	0.89	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00
168	3.37	0.00	0.00	0.00	0.12	0.11	0.00	0.77	0.00	0.00
176	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.68	0.00
185	2.35	0.00	0.00	0.00	0.91	0.07	0.00	0.02	0.00	0.00
200	1.00	0.70	0.00	0.00	0.12	0.00	0.00	0.17	0.01	0.00
206	1.00	0.19	0.04	0.00	0.77	0.00	0.00	0.00	0.77	0.00
207	1.00	0.01	0.22	0.00	0.77	0.00	0.00	0.00	0.87	0.00
210	1.00	0.01	0.18	0.00	0.81	0.00	0.00	0.00	0.81	0.00
215	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.84	0.00
216	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
217	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
218	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.96	0.00
219	1.00	0.03	0.00	0.00	0.17	0.00	0.00	0.80	0.00	0.00
220	1.42	0.74	0.00	0.00	0.18	0.00	0.00	0.08	0.00	0.00
225	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.97	0.00
EX-P1	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
EX-P2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00

EX-P3	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
EX-P4	1.00	0.00	0.00	0.00	0.12	0.00	0.00	0.88	0.00	0.00
EX-P5	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
P-1	1.00	0.01	0.01	0.00	0.98	0.01	0.00	0.00	0.38	0.00
P-2	1.00	0.01	0.00	0.00	0.18	0.00	0.00	0.81	0.00	0.00
P-3	1.00	0.01	0.00	0.00	0.19	0.00	0.00	0.80	0.00	0.00
P-15	1.00	0.01	0.85	0.00	0.10	0.05	0.00	0.00	0.99	0.00
P-16	1.00	0.01	0.00	0.00	0.58	0.41	0.00	0.00	0.69	0.00
P-17	1.00	0.01	0.00	0.00	0.80	0.19	0.00	0.00	0.64	0.00
P-18	1.00	0.01	0.79	0.00	0.01	0.19	0.00	0.00	0.87	0.00
P-19	1.00	0.00	0.85	0.00	0.15	0.00	0.00	0.00	0.99	0.00
P-20	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
P-21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.12	0.00
P-22	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.01	0.01	0.00
P-23	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.67	0.00
P-24	1.00	0.00	0.01	0.00	0.97	0.02	0.00	0.00	0.77	0.00
P-27	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
4	0.84	0.84	0.84	0.83	0.01
33	0.01	0.01	0.01	0.88	0.01
55	0.85	0.85	1.10	6.63	0.01
62	4.97	4.97	4.97	3.53	0.01
80	0.01	0.01	0.01	1.81	0.01
EX-P1	0.01	0.01	0.01	2.36	0.01
EX-P2	0.01	0.01	0.01	7.05	0.01
EX-P3	0.01	0.01	0.01	6.75	0.01
P-17	0.01	0.01	0.01	3.03	0.01
P-23	4.85	4.85	4.85	1.48	0.01
P-27	24.00	24.00	24.00	24.00	0.01

Analysis begun on: Tue May 05 11:14:04 2015
Analysis ended on: Tue May 05 11:14:12 2015
Total elapsed time: 00:00:08

Hydraulic Analysis Report

Project Data

Project Title: Project - I-70 Over Havana St DB
Designer: JAS
Project Date: Monday, May 04, 2015
Project Units: U.S. Customary Units
Notes:

Channel Analysis: RR Ditch (Vegetated)

Notes:

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 3.0000 ft/ft
Side Slope 2 (Z2): 3.0000 ft/ft
Channel Width: 4.0000 ft
Longitudinal Slope: 0.0034 ft/ft
Manning's n: 0.0525
Flow: 36.4000 cfs

Result Parameters

Depth: 1.9775 ft
Area of Flow: 19.6419 ft^2
Wetted Perimeter: 16.5070 ft
Hydraulic Radius: 1.1899 ft
Average Velocity: 1.8532 ft/s
Top Width: 15.8651 ft
Froude Number: 0.2935
Critical Depth: 1.0506 ft
Critical Velocity: 4.8443 ft/s
Critical Slope: 0.0466 ft/ft
Critical Top Width: 10.30 ft
Calculated Max Shear Stress: 0.4196 lb/ft^2
Calculated Avg Shear Stress: 0.2525 lb/ft^2

Channel Lining Analysis: RR Channel Vegetated Lining Design Analysis

Notes:

Lining Input Parameters

Channel Lining Type: Vegetation
Specific Weight of Water: 62.4 lb/ft^3
Height of Vegetation: 0.333 ft
Vegetation Condition is fair
Growth Form of Vegetation is mixed
Cf: 0.7
See HEC-15, Table 4.5 (default: 0.75 for Good cover factor and Mixed growth form)
soil is noncohesive
D75: 0.1
Safety Factor: 1

Lining Results

Cn: 0.142135
Permissible Soil Shear Stress: 0.04 lb/ft^2
Mean Boundary Shear Stress: 0.252453 lb/ft^2
Maximum Shear Stress on the Channel Bottom: 0.419552 lb/ft^2
Manning's n: 0.0525061
Soil Grain Roughness: 0.0177136
Effective Shear Stress: 0.0116877 lb/ft^2
Permissible Shear Stress on Vegetation: 1.17151 lb/ft^2
This value is compared with the maximum shear stress times the safety factor to determi
stability

Channel Bottom Shear Results

channel bottom is stable

Channel Lining Stability Results

the channel is stable

Channel Summary

Name of Selected Channel: RR Ditch (Vegetated)

Channel Analysis: RR Ditch (Gravel)

Notes:

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 3.5000 ft/ft
Side Slope 2 (Z2): 3.5000 ft/ft
Channel Width: 4.0000 ft
Longitudinal Slope: 0.0046 ft/ft
Manning's n: 0.0409
Flow: 36.4000 cfs

Result Parameters

Depth: 1.5790 ft
Area of Flow: 15.0429 ft^2
Wetted Perimeter: 15.4955 ft
Hydraulic Radius: 0.9708 ft
Average Velocity: 2.4198 ft/s
Top Width: 15.0532 ft
Froude Number: 0.4266
Critical Depth: 1.0192 ft
Critical Velocity: 4.7193 ft/s
Critical Slope: 0.0284 ft/ft
Critical Top Width: 11.13 ft
Calculated Max Shear Stress: 0.4532 lb/ft^2
Calculated Avg Shear Stress: 0.2787 lb/ft^2

Channel Lining Analysis: RR Channel Gravel Lining Design Analysis

Notes:

Lining Input Parameters

Channel Lining Type: Riprap, Cobble, or Gravel
D50: 0.16 ft
Riprap Specific Weight: 130 lb/ft^3
Water Specific Weight: 62.4 lb/ft^3
Riprap Shape is Crushed
Safety Factor: 1
Calculated Safety Factor: 1.00016

Lining Results

Angle of Repose: 41.6 degrees
Relative Flow Depth: 6.24867
Manning's n method: Blodgett
Manning's n: 0.0408596

Channel Bottom Shear Results

V*: 0.483754
Reynold's Number: 6359.96
Shield's Parameter: 0.047
shear stress on channel bottom: 0.453501 lb/ft^2
Permissible shear stress for channel bottom: 0.508352 lb/ft^2
channel bottom is stable
Stable D50: 0.142758 ft

Channel Side Shear Results

K1: 0.901
K2: 0.910376
Kb: 0
shear stress on side of channel: 0.453501 lb/ft^2
Permissible shear stress for side of channel: 0.462791 lb/ft^2
Stable Side D50: 0.141288 lb/ft^2
side of channel is stable

Channel Lining Stability Results

the channel is stable

Channel Summary

Name of Selected Channel: RR Ditch (Gravel)

Channel Analysis: 4104R Fill Slope

Notes:

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 3.0000 ft/ft
Side Slope 2 (Z2): 3.0000 ft/ft
Channel Width: 4.0000 ft
Longitudinal Slope: 0.0091 ft/ft
Manning's n: 0.0470
Flow: 11.5800 cfs

Result Parameters

Depth: 0.8392 ft
Area of Flow: 5.4695 ft^2
Wetted Perimeter: 9.3075 ft
Hydraulic Radius: 0.5876 ft
Average Velocity: 2.1172 ft/s
Top Width: 9.0352 ft
Froude Number: 0.4795
Critical Depth: 0.5523 ft
Critical Velocity: 3.7068 ft/s
Critical Slope: 0.0441 ft/ft
Critical Top Width: 7.31 ft
Calculated Max Shear Stress: 0.4765 lb/ft^2
Calculated Avg Shear Stress: 0.3337 lb/ft^2

Channel Lining Analysis: 4104R Channel Lining Design Analysis

Notes:

Lining Input Parameters

Channel Lining Type: Vegetation
Specific Weight of Water: 62.4 lb/ft^3
Height of Vegetation: 0.333 ft
Vegetation Condition is fair
Growth Form of Vegetation is mixed
Cf: 0.7
See HEC-15, Table 4.5 (default: 0.75 for Good cover factor and Mixed growth form)
soil is noncohesive
D75: 0.1
Safety Factor: 1

Lining Results

Cn: 0.142135
Permissible Soil Shear Stress: 0.04 lb/ft^2
Mean Boundary Shear Stress: 0.333688 lb/ft^2
Maximum Shear Stress on the Channel Bottom: 0.476528 lb/ft^2
Manning's n: 0.0469619
Soil Grain Roughness: 0.0177136
Effective Shear Stress: 0.0165943 lb/ft^2
Permissible Shear Stress on Vegetation: 0.937165 lb/ft^2
This value is compared with the maximum shear stress times the safety factor to determi
stability

Channel Bottom Shear Results

channel bottom is stable

Channel Lining Stability Results

the channel is stable

Channel Summary

Name of Selected Channel: 4104R Fill Slope

Project Name : I-70 over Havana DB
Job No. : 1303354D
Date: 5 May 15
By : JAS
Checked By : BJC

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CONSULTING ENGINEERS

CDOT CULVERT OUTLET PAVING

Hydraulic Data

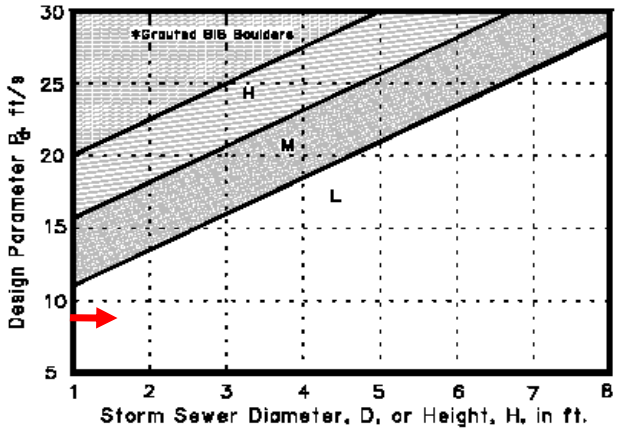
Structure ID = **4106F1**

Flow =	8.58 cfs	
Pipe Type =	RCP	(CMP, ACMP, RCP, CBC, HDPE)
Diameter, Span or Rise =	1.50 ft	
Outlet Velocity =	5.21 fps	
Outlet Depth =	1.50 ft	
Outlet Froude Number =	**0.75**	

Quantity Estimate

P_d (Riprap Sizing Parameter) =	**8.69**		
Riprap Classification =	L	(per UDFCD Figure HS-20)	
Riprap d_{50} =	**9.00**	inches	
Minimum Riprap Thickness =	**18.00**	inches	
Diameter (CMP) =	**18.00**	inches	
Span x Rise (inches) (ACMP) =	N/A		
End Section Length =	**78.00**	inches	(per CDOT M-603-10)
End Section Width at End =	**36.00**	inches	(per CDOT M-603-10)
End Section Area =	**14.63**	sf	
Riprap Thickness =	**1.50**	ft	
Outlet Paving Length =	**12.50**	feet	(4 x D + End Section Length)
Outlet Paving Width at End Section =	**4.50**	feet	(3 x D)
Outlet Paving Width at End of Apron =	**10.75**	feet	[2 x (L x .25) + (3 x D)]
Riprap Area =	**80.69**	sf	
Min. Riprap =	**4.48**	cy	9 -inch
Type II Bedding=	**2.99**	cy	

Riprap Sizing



Appendix 5.3 - Permanent Best Management Practices

I-70 over Havana Street Design Build

Water Quality Area Comparison

Central Park Boulevard - South WQ Pond

Basin ID	Basin Area (ac)	**Existing**		Basin Area (ac)	**Proposed**	
		% Imp.	Imp. Area (ac)		% Imp.	Imp. Area (ac)
10	36.75	65.0%	23.89	36.75	65.0%	23.89
11	9.51	40.0%	3.80	9.51	42.1%	4.00
20	64.42	65.0%	41.87	64.42	65.5%	42.20
21	2.95	49.0%	1.45	1.41	32.6%	0.46
40	18.63	30.0%	5.59	18.63	31.2%	5.81
41	3.92	15.0%	0.59	3.92	15.8%	0.62
42	3.09	70.0%	2.16	3.09	70.0%	2.16
43	1.18	35.0%	0.41	1.18	35.0%	0.41
50a	10.28	30.0%	3.08	10.28	30.0%	3.08
50b	5.93	45.0%	2.67	5.93	45.0%	2.67
53	2.13	55.0%	1.17	2.13	55.0%	1.17
60	30.51	35.0%	10.68	32.05	37.8%	12.13
61a	7.19	50.0%	3.60	7.19	50.0%	3.60
61b	2.38	25.0%	0.60	2.38	25.0%	0.60
62	13.13	45.0%	5.91	13.13	45.0%	5.91
63	2.79	52.0%	1.45	2.79	52.0%	1.45
65a	1.75	49.0%	0.86	1.75	49.0%	0.86
66	7.21	48.0%	3.46	7.21	48.0%	3.46
68	2.7	73.0%	1.97	2.7	73.0%	1.97
77	1.31	40.0%	0.52	1.31	40.0%	0.52
78	3.96	30.0%	1.19	3.96	30.0%	1.19
30	190.76	55.0%	104.92	190.76	55.0%	104.92
Total	**422.48**	**53%**	**221.83**	**422.48**	**53%**	**223.07**
MDCIA II		**42%**			**42%**	

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer:	**D. Moffett**
Company:	**Wilson & Company**
Date:	**May 27, 2010**
Project:	**Central Park Boulevard**
Location:	**South Water Quality Pond**

1. Basin Storage Volume	
A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	I_a = 42.00 % i = 0.42
B) Contributing Watershed Area (Area)	Area = 422.480 acres
C) Water Quality Capture Volume (WQCV) ($WQCV = 1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$)	WQCV = 0.19 watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area * 1.2	Vol = 7.8203 acre-feet
2. Outlet Works	
A) Outlet Type (Check One)	X Orifice Plate Perforated Riser Pipe Other:
B) Depth at Outlet Above Lowest Perforation (H)	H = 4.91 feet
C) Recommended Maximum Outlet Area per Row, (A_o)	A_o = 10.4 square inches
D) Perforation Dimensions: i) Circular Perforation Diameter or ii) Width of 2" High Rectangular Perforations	 D = inches W = 5.20 inches
E) Number of Columns (nc, See Table 6a-1 For Maximum)	nc = 1 number
F) Actual Design Outlet Area per Row (A_o)	A_o = 10.4 square inches
G) Number of Rows (nr)	nr = 15 number
H) Total Outlet Area (A_{ot})	A_{ot} = 153.3 square inches
3. Trash Rack	
A) Needed Open Area: A_t = 0.5 * (Figure 7 Value) * A_{ot}	A_t = 4,607 square inches
B) Type of Outlet Opening (Check One)	≤ 2" Diameter **Round** X 2" High **Rectangular** Other:
C) For 2", or Smaller, **Round Opening** (Ref.: Figure 6a):	
i) Width of Trash Rack and Concrete Opening (W_{conc}) from Table 6a-1	W_{conc} = inches
ii) Height of Trash Rack Screen (H_{TR})	H_{TR} = inches

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer:	**D. Moffett**
Company:	**Wilson & Company**
Date:	**May 27, 2010**
Project:	**Central Park Boulevard**
Location:	**South Water Quality Pond**

iii) Type of Screen (Based on Depth H), Describe if "Other"	____ S.S. #93 VEE Wire (US Filter) ____ Other: ____
iv) Screen Opening Slot Dimension, Describe if "Other"	____ 0.139" (US Filter) ____ Other: ____
v) Spacing of Support Rod (O.C.) Type and Size of Support Rod (Ref.: Table 6a-2)	____ inches
vi) Type and Size of Holding Frame (Ref.: Table 6a-2)	
D) For 2" High **Rectangular Opening** (Refer to Figure 6b):	
I) Width of Rectangular Opening (W)	W = 5.20 inches
ii) Width of Perforated Plate Opening (W_{conc} = W + 12")	W_{conc} = 17.20 inches
iii) Width of Trashrack Opening ($W_{opening}$) from Table 6b-1	$W_{opening}$ = 78.0 inches
iv) Height of Trash Rack Screen (H_{TR})	H_{TR} = 89 inches
v) Type of Screen (based on depth H) (Describe if "Other")	X Klemp™ KPP Series Aluminum ____ Other: ____
vi) Cross-bar Spacing (Based on Table 6b-1, Klemp™ KPP Grating). Describe if "Other"	4.00 inches ____ Other: ____
vii) Minimum Bearing Bar Size (Klemp™ Series, Table 6b-2) (Based on depth of WQCV surcharge)	**2.00 in. x 3/16 in.**
4. Detention Basin length to width ratio	____ (L/W)
5 Pre-sedimentation Forebay Basin - Enter design values	
A) Volume (3% to 5% of Design Volume from 1D) (3% - 5% of Design Volume (0.2346 - 0.391 acre-feet.)	0.2350 acre-feet
B) Surface Area	0.141 acres
C) Connector Pipe Diameter (Size to drain this volume in 5-minutes under inlet control)	12 inches
D) Paved/Hard Bottom and Sides	**YES** yes/no

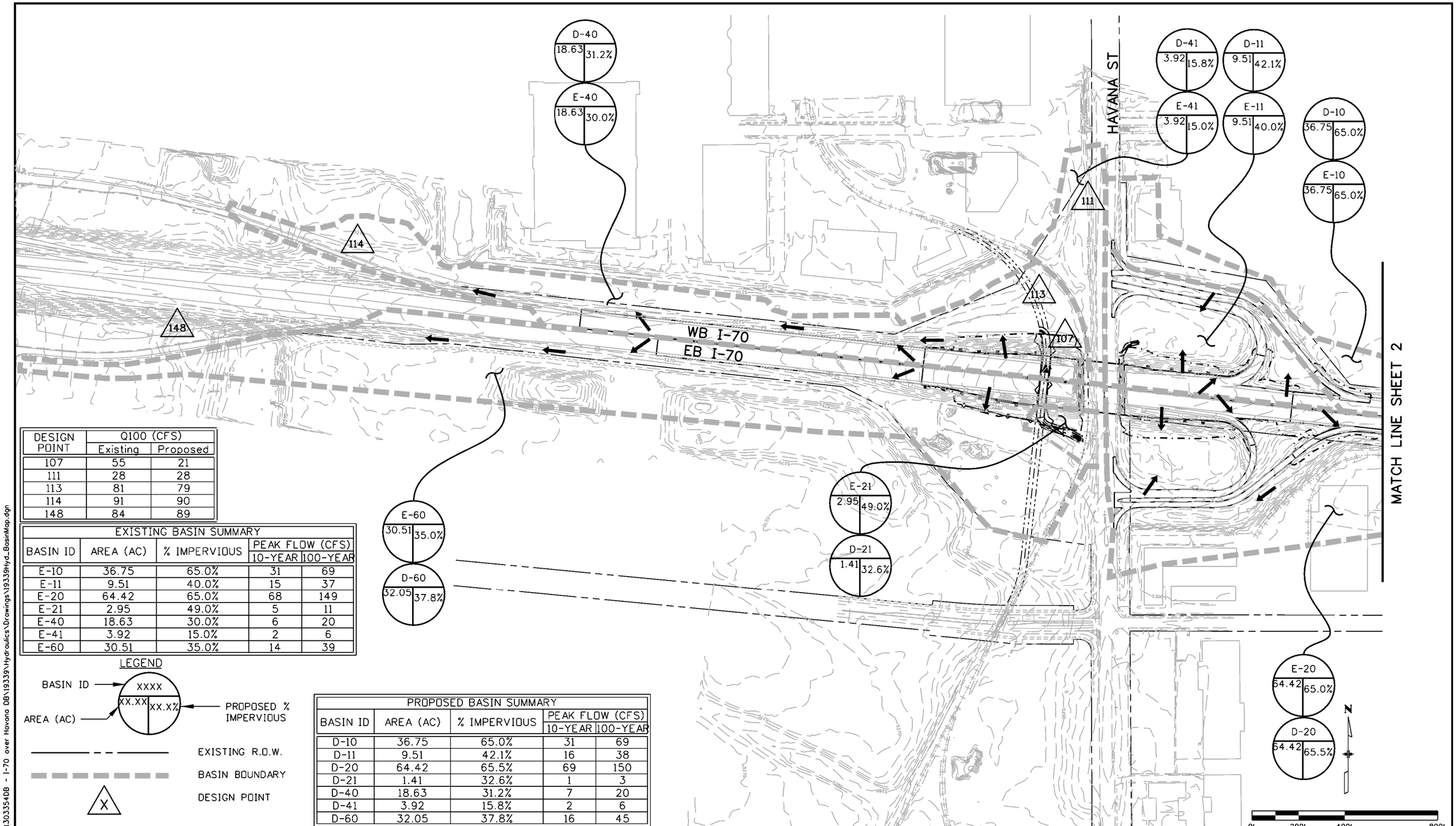
Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer: D. Moffett
Company: Wilson & Company
Date: May 27, 2010
Project: Central Park Boulevard
Location: South Water Quality Pond

6. Two-Stage Design - See Figure EDB-1	
A) Top Stage (Depth D_{WQ} = 2' Minimum) Top Stage Storage: no less than 96.5% of Design Volume (7.5462 acre-feet.)	D_{WQ} = 4.91 feet Storage= 7.8200 acre-feet
B) Bottom Stage Depth (D_{BS} = 0.33' Minimum Below Trickle Channel Invert) Bottom Stage Storage: no less than 0.5% of Design Volume (0.0391 acre-feet.) Storage = A * Depth Above WS To Bottom Of Top Stage	D_{BS} = 0.67 feet Storage= 0.0400 acre-feet Surf. Area= 0.060 acres
C) Micro Pool (Minimum Depth = the Larger of 0.50 * Top Stage Depth (2.46 ') or 2.5 '	Depth= 2.00 feet
NOTE: Micro Pool Depth in cell L139 is smaller than recommended. D) Total Volume: Vol_{tot} = Storage from 5A + 6A + 6B (Must be > Design Volume in 1D, or 7.8203 acre-feet.)	Vol_{tot} = 8.0950 acre-feet
7. Basin Side Slopes (Z, horizontal distance per unit vertical) Minimum Z = 4, Flatter Preferred	Z = 4.00 (horizontal/vertical)
8. Dam Embankment Side Slopes (Z, horizontal distance) per unit vertical) Minimum Z = 3, Flatter Preferred	Z = 3.00 (horizontal/vertical)
9. Vegetation (Check the method or describe "Other")	X Native Grass Irrigated Turf Grass Other:

Notes:

Appendix 5.4 - Basin Maps



DESIGN POINT	Q100 (CFS)	
	Existing	Proposed
107	55	21
111	28	28
113	81	79
114	91	90
148	84	89

EXISTING BASIN SUMMARY				
BASIN ID	AREA (AC)	% IMPERVIOUS	PEAK FLOW (CFS)	
			10-YEAR	100-YEAR
E-10	36.75	65.0%	31	69
E-11	9.51	40.0%	15	37
E-20	64.42	65.0%	68	149
E-21	2.95	49.0%	5	11
E-40	18.63	30.0%	6	20
E-41	3.92	15.0%	2	6
E-60	30.51	35.0%	14	39

LEGEND

BASIN ID — XXXX

AREA (AC) — XX.XX

PROPOSED % IMPERVIOUS — XX.X%

EXISTING R.O.W.

BASIN BOUNDARY

X — DESIGN POINT

FLOW DIRECTION

PROPOSED BASIN SUMMARY				
BASIN ID	AREA (AC)	% IMPERVIOUS	PEAK FLOW (CFS)	
			10-YEAR	100-YEAR
D-10	36.75	65.0%	31	69
D-11	9.51	42.1%	16	38
D-20	64.42	65.5%	69	150
D-21	1.41	32.6%	1	3
D-40	18.63	31.2%	7	20
D-41	3.92	15.8%	2	6
D-60	32.05	37.8%	16	45

90% SUBMITTAL MAY 2015

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Horiz. Scale: 1:400 Vert. Scale: As Noted

LAWRENCE
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CONSULTING ENGINEERS

Sheet Revisions

Date:	Comments	Init.

Colorado Department of Transportation
4670 N. Holly
Denver, CO 80216
Phone:
FAX: 303-398-6781
Region 1
KK

As Constructed
No Revisions:
Revised:
Void:

I-70 OVER HAVANA STREET DESIGN-BUILD
BASIN MAP (1 OF 2)

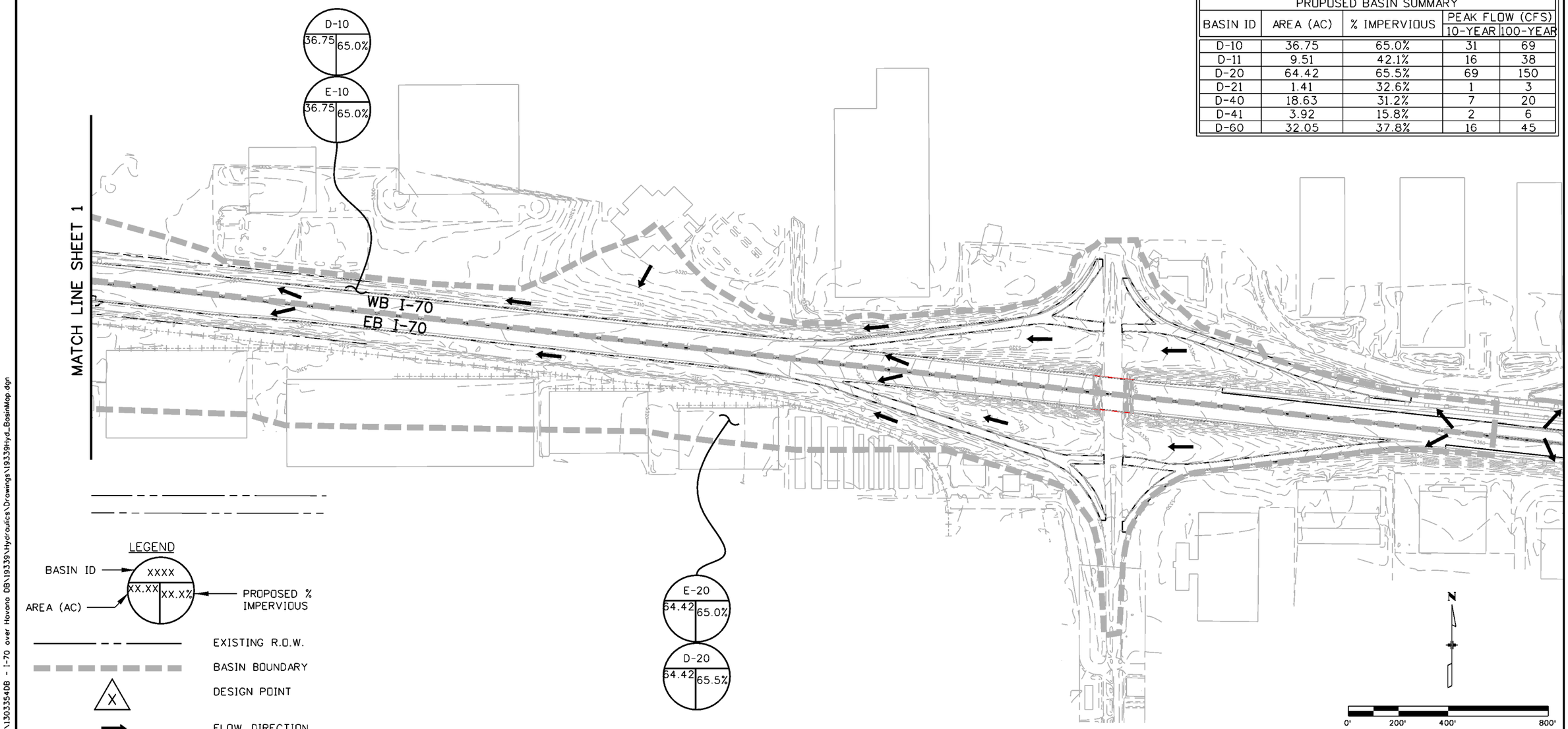
Designer: B. CARROLL
Detailer: L. NICHOLS
Sheet Subset: BASIN
Structure Numbers
Subset Sheets: 1 of 3

FBR 0704-230
19339
Sheet Number

DESIGN POINT	Q100 (CFS)	
	Existing	Proposed
107	55	21
111	28	28
113	81	79
114	91	90
148	84	89

EXISTING BASIN SUMMARY				
BASIN ID	AREA (AC)	% IMPERVIOUS	PEAK FLOW (CFS)	
			10-YEAR	100-YEAR
E-10	36.75	65.0%	31	69
E-11	9.51	40.0%	15	37
E-20	64.42	65.0%	68	149
E-21	2.95	49.0%	5	11
E-40	18.63	30.0%	6	20
E-41	3.92	15.0%	2	6
E-60	30.51	35.0%	14	39

PROPOSED BASIN SUMMARY				
BASIN ID	AREA (AC)	% IMPERVIOUS	PEAK FLOW (CFS)	
			10-YEAR	100-YEAR
D-10	36.75	65.0%	31	69
D-11	9.51	42.1%	16	38
D-20	64.42	65.5%	69	150
D-21	1.41	32.6%	1	3
D-40	18.63	31.2%	7	20
D-41	3.92	15.8%	2	6
D-60	32.05	37.8%	16	45



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CONSULTING ENGINEERS

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Date:	Comments	Init.

Colorado Department of Transportation
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FAX: 303-398-6781
Region 1
KK

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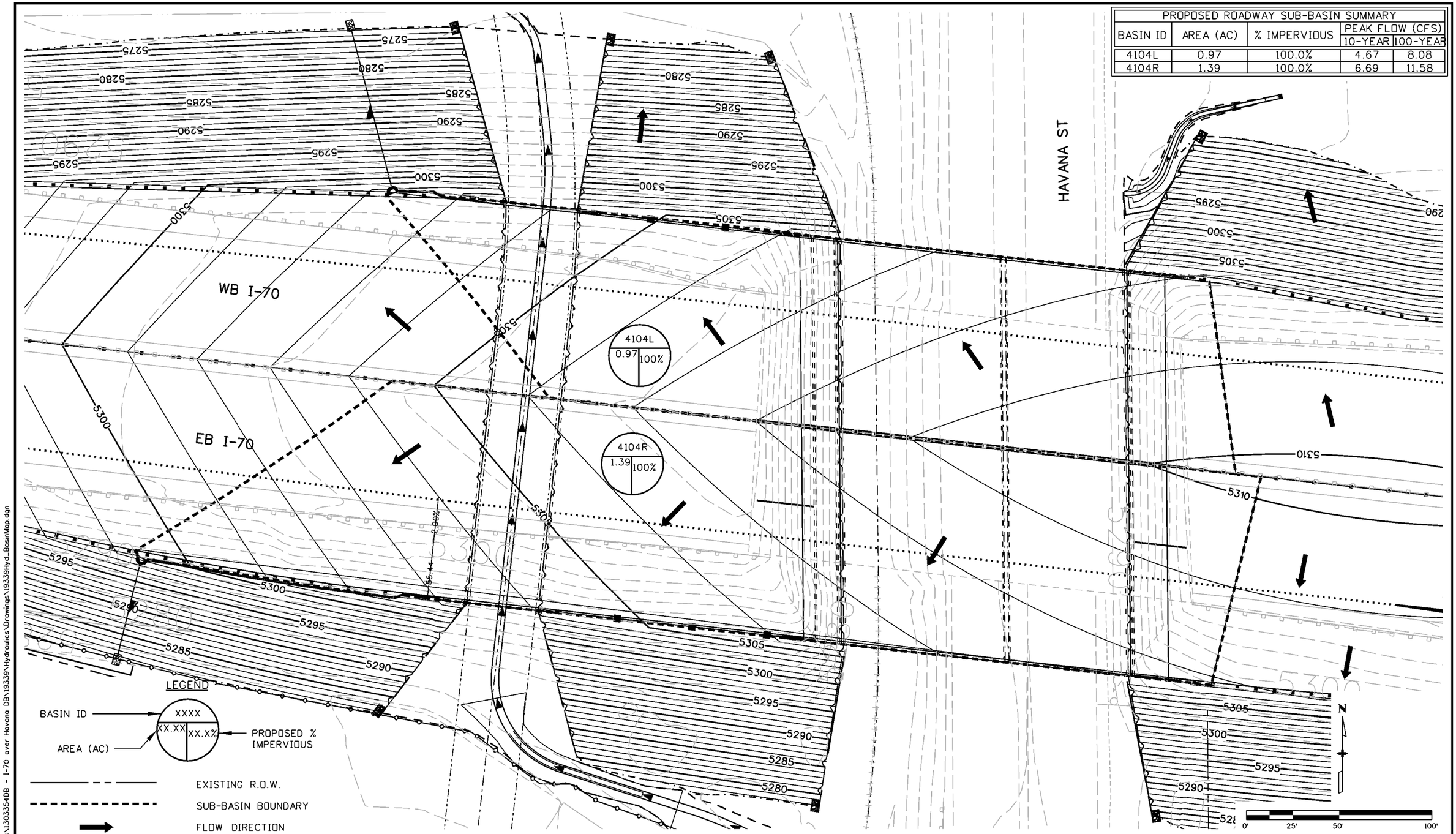
No Revisions:
Revised:
Void:

I-70 OVER HAVANA STREET DESIGN-BUILD
BASIN MAP (2 OF 2)

Designer: B. CARROLL
Detailer: L. NICHOLS
Sheet Subset: BASIN
Structure Numbers
Subset Sheets: 2 of 3

FBR 0704-230
19339
Sheet Number

PROPOSED ROADWAY SUB-BASIN SUMMARY				
BASIN ID	AREA (AC)	% IMPERVIOUS	PEAK FLOW (CFS)	
			10-YEAR	100-YEAR
4104L	0.97	100.0%	4.67	8.08
4104R	1.39	100.0%	6.69	11.58



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FAX: 303-398-6781
Region 1
KK

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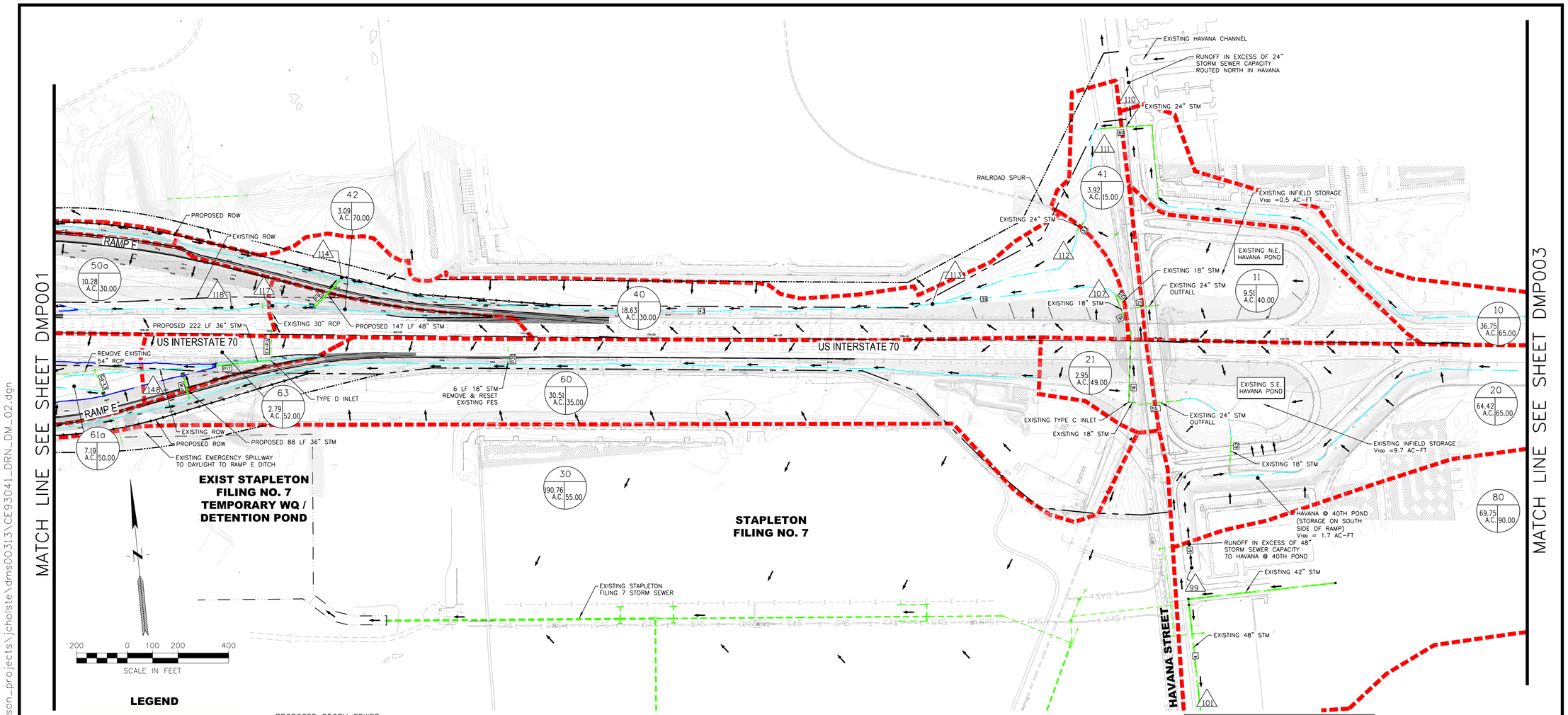
No Revisions:
Revised:
Void:

I-70 OVER HAVANA STREET DESIGN-BUILD
ROADWAY SUB-BASIN MAP

Designer: B. CARROLL
Detailer: L. NICHOLS
Sheet Subset: BASIN
Structure Numbers
Subset Sheets: 3 of 3

FBR 0704-230
19339
Sheet Number



LEGEND

- PROPOSED STORM SEWER
- SWALE
- BASIN BOUNDARY(SWMM)
- BASIN BOUNDARY (RATIONAL METHOD)
- 5250 EXISTING CONTOUR
- 5250 PROPOSED CONTOUR
- APPROXIMATE LIMIT OF 100 YEAR ON-SITE PONDING
- BASIN NAME, BASIN AREA, PERCENT IMPERVIOUS — BASIN BUBBLE
- XX — SWMM ROUTING ELEMENT ID (CONDUIT)
- X — DESIGN POINT
- E.P. — EMBANKMENT PROTECTOR

BASIN RUNOFF SUMMARY	
BASIN	Q100 (CFS)
10	69
11	37
20	149
21	11
30	630
40	20
41	6

BASIN RUNOFF SUMMARY	
BASIN	Q100 (CFS)
42	11
50a	18
60	39
61a	22
63	8
80	250

DESIGN POINT SUMMARY	
DESIGN POINT	Q100 (CFS)
99	250
101	104
107	55
110	48
111	28
112	28

DESIGN POINT SUMMARY	
DESIGN POINT	Q100 (CFS)
113	81
114	90
117	90
118	46
148	85

PIPE RUN SUMMARY		
PIPE RUN	Q100 (CFS)	PIPE SIZE
P16	88	48"
P17	44	36"
P18	39	36"
EX-P3	44	30"
EX-P5	18	36"

OFFSITE SWMM ROUTING ELEMENT SUMMARY	
ELEMENT	Q100 (CFS)
4	104
16	7
20	6
21	22
33	28
39	55
43	79
55	34
61	147
62	13
80	22

Sheet Revisions

Number	Date:	Comments	Init.
A	02/12/10	PRELIMINARY DESIGN (FIR) PACKAGE	VSF
B	04/09/10	FDR - EARLY GRADING, DRAINAGE & UTILITY PACKAGE	VSF
1	06/03/10	RFC - EARLY GRADING, DRAINAGE & UTILITY PACKAGE	VSF
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CENTRAL PARK BLVD.
INTERCHANGE WITH I-70

SEMA WILSON & COMPANY

DRAINAGE AREA MAP NO. 2

Designer: VSF	Date: 05/10	Check: JCH	Date: 05/10	Structure Numbers	.
Detailer: JML	Date: 05/10	Check: JCH	Date: 05/10		.

Project No.	CE 93041
Sheet Subset	DRAINAGE
Sheet Number	DMP002

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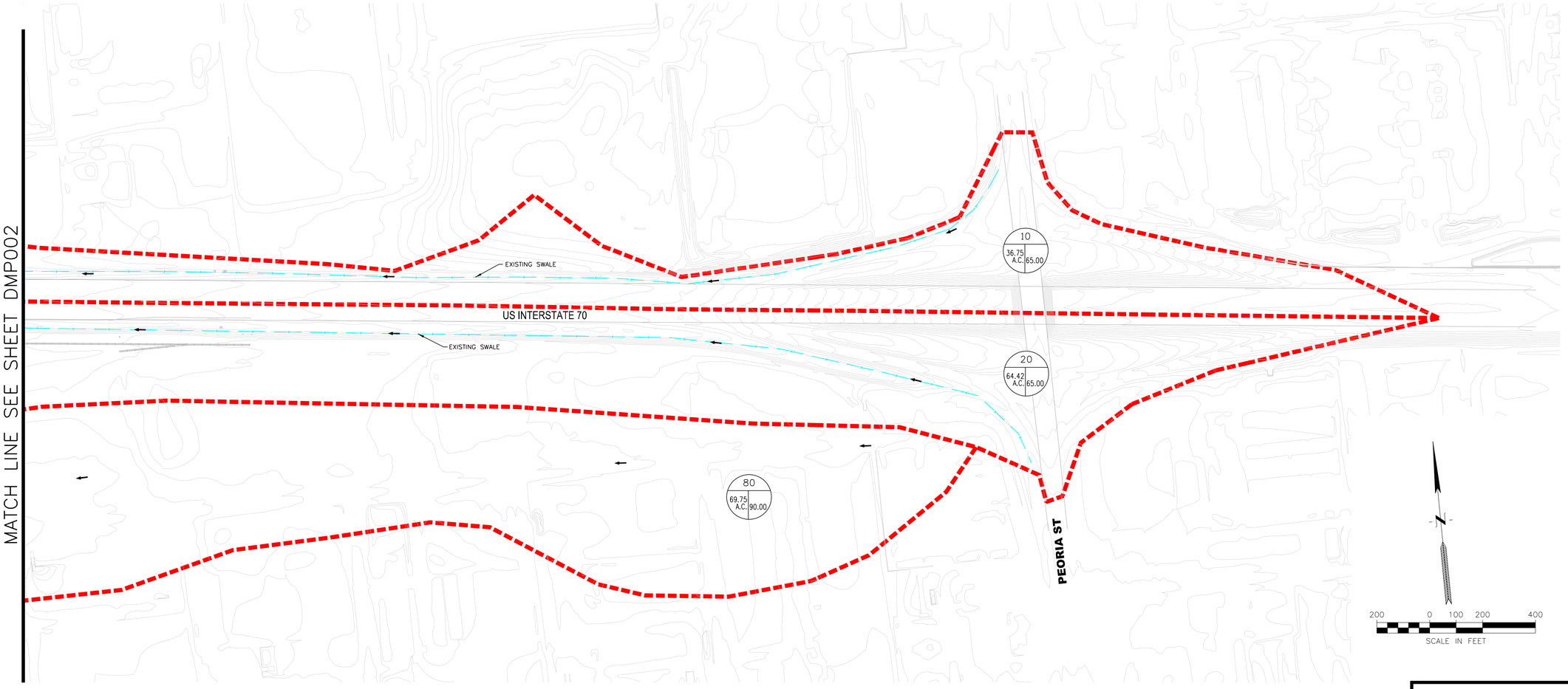

LEGEND

PROPOSED STORM SEWER

SWALE

BASIN BOUNDARY(SWMM)

5250 EXISTING CONTOUR

5250 PROPOSED CONTOUR

BASIN NAME — XX

BASIN AREA — X AC. X — PERCENT IMPERVIOUS

BASIN BUBBLE

BASIN RUNOFF SUMMARY	
BASIN	Q100 (CFS)
10	69
20	149
80	250

PRELIMINARY
NOT FOR CONSTRUCTION

Sheet Revisions

Number	Date:	Comments	Init.
A	02/12/10	PRELIMINARY DESIGN (FIR) PACKAGE	VSF
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CENTRAL PARK BLVD.
INTERCHANGE WITH I-70

DRAINAGE AREA MAP NO.3
(OFFSITE AREA)

Designer: VSF	Date: 04/10	Check: JCH	Date: 04/10	Structure Numbers	.
Detailer: JML	Date: 04/10	Check: JCH	Date: 04/10		.

Project No.	CE 93041
Sheet Subset	DRAINAGE
Sheet Number	DMP003

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