PRELIMINARY DRAINAGE STUDY

For:

Nirvana Business Park
DR21-0024

821 Main Street
Chula Vista, CA 91911

APN: 644-050-13, 644-050-14, and 644-050-80

Prepared By:

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3-14-2022

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May 5, 2022

PLSA Job No. 3668

DECLARATION OF RESPONSIBLE CHARGE

I, hereby declare that I am the Engineer of Work for this project. That I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions code, and that the design is consistent with current standards.

I understand that the check of project drawings and specifications by the City of Chula Vista is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

Gregory W. Lang R.C.E. 68075 EXP. 6-30-23	DATE

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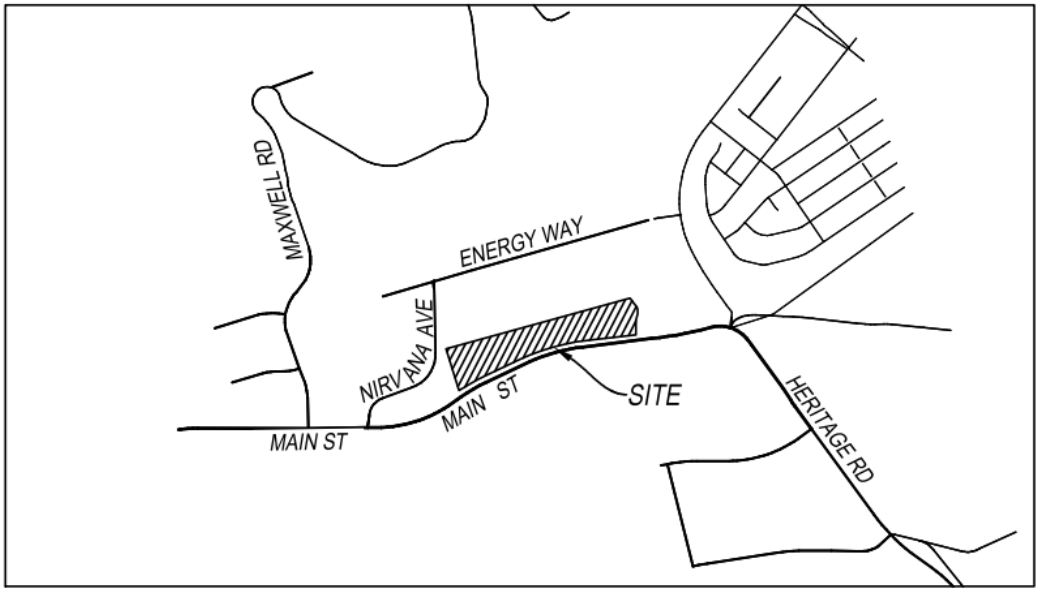

VICINITY MAP

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1. INTRODUCTION

This Preliminary Drainage Study for the proposed Nirvana Business Park has been prepared to analyze the hydrologic characteristics of the existing and proposed project site. This report presents both the methodology and the calculations used for determining the storm water runoff from the project site in the existing and proposed conditions produced by the 50-year and 100-year, 6-hour storm event.

1.1 Project Description

The Nirvana Business Park is an industrial complex consisting of three two-story buildings and one three-story storage facility totaling 296,753 square feet on 13.31 acres, located at 821 Main Street in the City of Chula Vista, San Diego County, California. The property is defined as Parcel 1 and 2 of Parcel Map 21587 and a portion of Lot 2, Sec 20, T18S, R1E San Bernadino Meridian of ROS 16999.

The project site is identified as Tax Assessor parcel numbers – APN 644-050-13, 14 and a portion of 644-050-80. The project includes Design Review to construct four buildings as follows:

- Building 1 – a 59,044 square-foot warehouse with office and mezzanine
- Building 2 – a 44,592 square-foot warehouse with office and mezzanine
- Building 3 – a 140,802 square-foot, 3-story self-storage building
- Building 4 – a 50,030 warehouse with office and mezzanine

The site is General Plan designated IL – Limited Industrial and Zoned (ILP) Limited Industrial. The proposed light industrial uses include primarily warehouse and manufacturing, assembly, storage, and warehouse distribution. The self-storage facility will feature interior and exterior accessible storage spaces, with surface loading and elevators for upper floors.

Hours of operation for the business park are planned to be Monday through Friday 6:00 a.m. to 6:00 p.m. and Saturday 6:00 a.m. to noon. The self-storage facilities will have 24/7 access.

The existing site is currently undeveloped except for existing, public drainage infrastructure located along the southern property boundary on the north side of Main Street. The site is bounded to the north by automobile salvage yards, to the west by industrial buildings, to the south by Main Street, and to the east by the Otay Ranch Village 3 development.

The site condition is divided into four (4) drainage basins, Basin A through Basin D, and four (4) separate discharge locations across the project site.

Treatment of storm water runoff from the site has been addressed in a separate report- *Storm Water Quality Management Plan for Nirvana Business Park* by PLSA, dated March 14, 2022. The project's Points of Compliance (POCs) for hydromodification management have been detailed on the Node Maps found in Appendix 1 and 2.

Per Section 3 – General Design Criteria of the City of Chula Vista Subdivision Manual (March 2012), the Modified Rational Method should be used to determine peak flow rates when the contributing drainage area is up to 1.0 square mile in size. All public and private drainage facilities shall be designed for a 100-year frequency storm. In addition, all drainage facilities within street right of ways shall be designed for a 50-year frequency storm.

Methodology used for the computation of design rainfall events, runoff coefficients, and rainfall intensity values are consistent with the criteria set forth in Section 3 – General Design Criteria of the City of Chula Vista Subdivision Manual, revised March 2012.

Existing hydrologic data was found from the City of Chula Vista Drainage Master Plan, dated February 2005. The project site is located in the Otay River Drainage Basin.

1.2 Existing Conditions

The 13.31-acre project site consists of undeveloped land located northeast of the intersection of Main Street and Nirvana Avenue along the north side of Main Street. Topographically, the site slopes from the north to the southerly property boundary, comprised of four (4) existing drainage basins with four (4) discharge locations. There are two (2) major offsite drainage conveyances through the project site.

Existing Drainage Basin A comprises the western portion of the site and includes offsite runoff from an offsite area northwest of the project site. Offsite runoff is conveyed through a 60" corrugated steel pipe (CSP) storm drain and splits into two (2) 54" CSP storm drains before discharging through a headwall at the northwest corner of the site. The existing 50-year offsite flow is 181.47 cubic feet per second per the City of Chula Vista Drainage Master Plan (see Appendix 3 for references). Flow then travels south through an open channel to an existing public 6' x 2.5' double RCB culvert system underneath Main Street. The culvert system discharges to the south of Main Street and into the Otay River Valley.

Existing Drainage Basin B is located in the center of the site and includes offsite runoff from the north. Offsite runoff is conveyed through a 72" CSP storm drain and discharges through a headwall at the northern property boundary. The existing 50-year peak source flow is 312.81 cubic feet per second per the City of Chula Vista Drainage Master Plan (see Appendix 3 for references). Flow then travels south through an open channel to three (3) existing public 48" RCP storm drains underneath Main Street. The culvert system discharges to the south of Main Street and into the Otay River Valley.

Existing Drainage Basin C comprises the eastern portion of the site. Runoff surface flows down the existing hillside and across the southern property boundary into Main Street. Runoff is then directed via curb and gutter to an existing Type B curb inlet along Main Street. The curb inlet discharges south through an existing 24" RCP storm drain and into the Otay River Valley.

Existing Drainage Basin D comprises the southern portion of the site. Runoff sheet flows down the existing hillside and across the southern property boundary into Main Street. Runoff is then directed via curb and gutter to an existing Type B curb inlet along Main Street. The curb inlet discharges south through an existing 18" RCP storm drain and into the Otay River Valley.

For additional information regarding the existing storm drain infrastructure conveying offsite drainage, refer to As-Built Drawing No. 75-97, 75-98D and 75-101D on file with the City of Chula Vista. Existing 50-year peak flow rates at the storm drain outfalls were found from the City of Chula Vista Drainage Master Plan (see Appendix 3 for references).

The Otay River flows to the west and outlets at the San Diego Bay and ultimately the Pacific Ocean. The site is not within a FEMA 100-year floodplain boundary or regulatory floodway.

Per the United States Department of Agriculture (USDA) Web Soil Survey, the project site is Hydrologic Soil Group C and D. Refer to Appendix C of this report for the USDA Web Soil Survey and geotechnical findings.

Table 1.1 summarizes the existing condition 100-year peak flows at the project's discharge locations. Table 1.2 summarizes the existing condition 50-year peak flows at the project's discharge locations including offsite flow from the public storm drain channels. For delineated basin details, please refer to the Existing Condition Hydrology Node Map included in Appendix 1 of this report.

TABLE 1.1 – Summary of Existing Condition 100-Year Peak Flows

Existing Drainage Basin	Drainage Area (ac)	Runoff Coefficient, C	Tc (min)	100-Year Intensity, I (in/hr)	Existing Q100 (cfs)
Basin A	4.41	0.57	5.19	6.24	15.44
Basin B	2.96	0.58	4.35	6.32	10.90
Basin C	4.77	0.57	4.87	6.32	17.22
Basin D	1.26	0.60	5.00	6.32	4.77
Total	13.39	0.58			48.33

TABLE 1.2 – Summary of Existing Condition 50-Year Peak Flows

Existing Drainage Basin	Drainage Area (ac)	Runoff Coefficient, C	Tc (min)	50-Year Intensity, I (in/hr)	Existing Q50 (cfs)	Offsite Flow Q50 (cfs)	Summed Data Flow Q50 (cfs)
Basin A	4.41	0.57	4.46	5.53	13.70	181.47	195.17
Basin B	2.96	0.58	3.34	5.53	9.54	312.81	322.35
Basin C	4.77	0.57	4.87	5.53	15.07	0	15.07
Basin D	1.26	0.60	5.00	5.53	4.18	0	4.18
Total	13.39	0.58			42.49	494.28	536.77

Note: Offsite flows are the cumulative source flows from the existing offsite drainage conveyances. See the Existing Condition Hydrology Node Map (Appendix 1) for location of existing offsite drainage conveyances. Summed Data flow is the Existing 50-year peak flow plus the Offsite Flow.

1.3 Proposed Conditions

The project will include the construction of four industrial buildings, paved roadways and parking areas, retaining walls, and other associated improvements. The project will be accessed by a proposed driveway off Nirvana Avenue. Drainage improvements will consist of curb inlets, catch basins, ribbon gutters, brow ditches, and storm drain pipes. The project will also have two underground detention systems and for peak flow attenuation as well as two proprietary Modular Wetland Systems for storm water quality treatment.

The proposed site will consist of four (4) major drainage basins with four (4) discharge locations to mimic the existing conditions. The site grading and onsite storm drain system have been designed to avoid diversion of drainage.

The two existing on-site, open channel drainage conveyances which transport off-site storm water from upstream public storm drain infrastructure will be replaced with a new 60" RCP pipe and a 72" RCP pipe. The existing open channels will be replaced by pipe storm drain infrastructure to allow the grading and development of the property since the existing channels bisect the property from its access point out to

Nirvana Avenue. The proposed alignment of these two new drainage systems will be slightly adjusted from the existing open channel flow paths through the property but maintain the same connection points to the existing public storm drain infrastructure north of the project site and south of the project site as in the existing condition. The new on-site storm drain infrastructure will convey the off-site run-on to the existing discharge points along the southerly property line to the existing public storm drain infrastructure underneath Main Street. The existing public storm drain easements per PM 21587 will be vacated and new public storm drain easements will be prepared to align with the proposed public, on-site storm drain infrastructure.

A 60"-dia RCP storm drain will convey offsite runoff from the northwest and discharge to the existing 6' x 2.5' double RCB culvert system underneath Main Street. The existing culvert system discharges to the south of Main Street and into the Otay River. A 72"-dia RCP storm drain will convey offsite runoff from the north and discharge to the three (3) existing 48"-dia RCP storm drains underneath Main Street. The three (3) existing 48"-dia RCP storm drains discharge to the south of Main Street and into the Otay River.

Storm water runoff from the western portion of the proposed development (Drainage Basin A) is routed to the northwest corner of the site for storm water treatment and detention and discharged into the proposed 60" RCP offsite runoff storm drain system. Runoff from the cut slope at the northwest corner of the site will discharge directly to the 60" RCP storm drain system. The proposed 60” RCP storm drain will connect to the existing 6' x 2.5' double RCB culvert system underneath Main Street.

Storm water from the eastern portion of the proposed development (Drainage Basin B) is routed to the northeast corner of the site for storm water treatment and detention and discharged into the proposed 72" RCP offsite runoff storm drain system. Slope runoff along the northern property boundary will discharge directly into the proposed 72” RCP storm drain system. The proposed 72” RCP storm drain will connect to the existing triple 48" RCP storm drain system underneath Main Street.

Slope runoff along the southern property boundary will sheet flow into a new brow ditch located along the right-of-way line along Main Street. There is a high point on Main Street which forms two drainage basins. Runoff from Drainage Basin C will discharge into the existing Type B curb inlet and existing 18” RCP storm drain under Main Street. Runoff from Drainage Basin D will discharge into the existing Type B curb inlet and existing 24” RCP storm drain under Main Street.

All developed site runoff discharges through existing storm drain infrastructure and into the Otay River. The Otay River travels west and outlets at the San Diego Bay and ultimately the Pacific Ocean.

Prior to discharging from the project site, the project’s runoff is directed to a series of BMPs including trash screen devices, Contech pretreatment units, StormTrap underground detention vaults, and BioClean Modular Wetland Systems. The underground detention vaults have been designed to meet 50-year and 100-year peak flow detention requirements. The Modular Wetland Systems (MWS) have been designed for storm water treatment. Treatment of storm water runoff from the site has been addressed in a separate report- “Priority Development Project (PDP) Storm Water Quality Management Plan (SWQMP) for Nirvana Business Park” by Pasco Laret Suiter & Associates. The project is exempt from hydromodification management requirements.

The underground detention vaults have been designed to provide flow control in the form of peak flow attenuation. The vaults have been designed to include low-flow and mid-flow orifice outlets and an overflow weir to control peak flows for the design storms analyzed. The required water quality treatment flow is diverted to the downstream Modular Wetland System in accordance with City of Chula Vista BMP Design Manual. Overflow relief for the 100-year storm event is provided with a partition weir

installed within the vaults and discharged directly to the proposed 60”-dia and 72”-dia storm drain pipes conveying offsite runoff through the project site.

Table 1.3 below summarizes the proposed and detained condition 100-year peak flows at the project’s discharge locations. Table 1.4 below summarizes the proposed and detained condition 50-year peak flows at the project’s discharge locations, including offsite flow from the public storm drain channels.

For delineated basin details, please refer to the Proposed Condition Hydrology Node Map included as an Attachment of this report.

TABLE 1.3 – Summary of Proposed Condition 100-Year Peak Flows

Proposed Drainage Basin	Drainage Area (ac)	Runoff Coefficient, C	Tc (min)	100-Year Intensity, I (in/hr)	Proposed Q100 (cfs)	Detained Q100 (cfs)
Basin A	7.50	0.81	9.31	4.47	27.06	14.44
Basin B	5.72	0.82	6.00	5.93	27.54	10.64
Basin C	0.48	0.60	5.00	6.32	1.82	1.82
Basin D	0.31	0.60	5.00	6.32	1.16	1.16
Total	14.00	0.80			57.58	28.06

Note: Proposed 100-year flows are post-project peak flows that have not been reduced from detention routing.

TABLE 1.4 – Summary of Proposed Condition 50-Year Peak Flows

Proposed Drainage Basin	Drainage Area (ac)	Runoff Coefficient, C	Tc (min)	50-Year Intensity, I (in/hr)	Proposed Q50 (cfs)	Detained Q50 (cfs)	Offsite Flow Q50 (cfs)	Summed Data Flow Q50 (cfs)
Basin A	7.50	0.81	9.20	4.47	23.34	9.33	181.47	190.80
Basin B	5.72	0.82	6.11	5.15	23.91	7.14	312.81	319.95
Basin C	0.48	0.60	5.00	5.53	1.59	1.59	0	1.59
Basin D	0.31	0.60	5.00	5.53	1.01	1.01	0	1.01
Total	14.00	0.80			49.86	19.08	494.28	513.36

Note: Proposed 50-year flows are post-project peak flows that have not been reduced from detention routing.
Offsite flows are the cumulative source flows from the existing offsite drainage conveyances. See Proposed Condition Hydrology Node Map (Appendix 2) for location of existing offsite drainage conveyances.
Summed Data flow is the Detained 50-year peak flow plus the Offsite Flow.

2. METHODOLOGY

Runoff calculations for Nirvana Business Park, have been performed in accordance with Section 3 – General Design Criteria of the City of Chula Vista Subdivision Manual dated March 2012. Per City of City of Chula Vista design criteria, the Modified Rational Method should be used to determine peak flowrates for local drainage basins. Advanced Engineering Software (AES) was used to calculate the peak runoff from the 50-year and 100-year, 6-hour storm event using the Rational Method. Please refer to this report's Appendix for the results of these calculations.

2.1 Rational Method

As mentioned above, runoff from the project site was calculated for the 50-year and 100-year storm event. Runoff was calculated using the Rational Method which is given by the following equation:

$Q = C \times I \times A$

Where:
Q = Flow rate in cubic feet per second (cfs)
C = Runoff coefficient
I = Rainfall Intensity in inches per hour (in/hr)
A = Drainage basin area in acres, (ac)

Rational Method calculations were performed using the AES 2016 computer program. To perform the hydrology routing, the total watershed area is divided into sub-areas which discharge at designated nodes. The procedure for the sub-area summation model is as follows:

(1) Subdivide the watershed into an initial sub-areas and subsequent sub-areas, which are generally less than 10 acres in size. Assign upstream and downstream node numbers to each sub-area.

(2) Estimate an initial T_c by using the appropriate nomograph or overland flow velocity estimation. The minimum T_c considered is 5.0 minutes. All T_c values for the proposed project were assumed to be 5 minutes due to the small size of each contributing drainage area.

(3) Using the initial T_c, determine the corresponding values of I. Then Q = CIA.

(4) Using Q, estimate the travel time between this node and the next by Manning's equation as applied to particular channel or conduit linking the two nodes. Then, repeat the calculation for Q based on the revised intensity (which is a function of the revised time of concentration)

For drainage areas where the runoff is not conveyed in a defined channel, or the drainage pattern is sheet flow, the 50-year and 100-year flow rates are calculated using Q = CIA. The time of concentration is assumed to be 5 minutes when calculating the rainfall intensity. Refer to Table 1.1 for the 50-year and 100-year peak flow calculation for Existing Drainage Basin D, and Table 1.2 for the 50-year and 100-year peak flow calculation for Proposed Drainage Basin C and Proposed Drainage Basin D.

2.2 Runoff Coefficient

In accordance with City of Chula Vista design standards, runoff coefficients were based on land use. An appropriate runoff coefficient (C) for each type of land use in the subarea was selected from Section 3-203.3 of the City of Chula Vista Subdivision Manual and multiplied by the percentage of total area (A) included in that class. The sum of products for all land uses is the weighted runoff coefficient (∑[C]). See Tables 2.1 and 2.2 below for weighted runoff coefficient "C" calculations. The Existing and Proposed Condition Hydrology Node Maps show the drainage basin subareas, on-site drainage system and nodal points.

Runoff coefficients of 0.55 and 0.60 were selected from Section 3-203.3 for hilly and steep vegetated slopes, consistent with existing conditions. The existing site is assumed to be 0% impervious. See Table 2.1 below for existing condition weighted runoff coefficient "C" calculations.

In the proposed condition, the developed site was assigned a runoff coefficient of 0.85 for commercial area. Developed slopes along the northern and southern property boundary were classified as steep per Section 3-203.3 and assigned a runoff coefficient of 0.60. See Table 2.2 below for proposed condition weighted runoff coefficient "C" calculations.

TABLE 2.1- Summary of Existing Condition Weighted Runoff Coefficient Calculations

Existing Condition - Weighted Runoff Coefficient							
Up Node	Down Node	Area (ac)	C_1	A_1	C_2	A_2	C
10	11	0.13	0.45	0.13	0.60	0.00	0.45
11	12	3.48	0.45	3.48	0.60	0.00	0.45
20	13	0.13	0.45	0.00	0.60	0.13	0.60
21	21	0.13	0.45	0.13	0.60	0.00	0.45
30	22	2.10	0.45	2.10	0.60	0.00	0.45
Basin D		2.24	0.45	0.00	0.60	2.24	0.60

Note: C values taken from Section 3-203.3 of the City of Chula Vista Subdivision Manual
Runoff Coefficient of 0.55 for Vegetated Slopes, Hilly
Runoff Coefficient of 0.60 for Vegetated Slopes, Steep

TABLE 2.2- Summary of Proposed Condition Weighted Runoff Coefficient Calculations

Proposed Condition - Weighted Runoff Coefficient							
Up Node	Down Node	Area (ac)	C_1	A_1	C_2	A_2	C
100	101	0.12	0.85	0.12	0.60	0.00	0.85
101	102	0.62	0.85	0.62	0.60	0.00	0.85
103	102	0.16	0.85	0.16	0.60	0.00	0.85
105	104	0.64	0.85	0.64	0.60	0.00	0.85
107	106	0.63	0.85	0.63	0.60	0.00	0.85
109	108	1.62	0.85	1.62	0.60	0.00	0.85
111	110	0.20	0.85	0.20	0.60	0.00	0.85
113	112	1.23	0.85	1.16	0.60	0.07	0.83
115	114	1.14	0.85	1.14	0.60	0.00	0.85
118	117	0.58	0.85	0.00	0.60	0.58	0.60
122	122	0.42	0.85	0.00	0.60	0.42	0.60
200	201	0.05	0.85	0.05	0.60	0.00	0.85
201	202	0.65	0.85	0.65	0.60	0.00	0.85
203	202	0.60	0.85	0.60	0.60	0.00	0.85
205	204	0.28	0.85	0.00	0.60	0.28	0.60
207	206	0.31	0.85	0.31	0.60	0.00	0.85
208	208	0.34	0.85	0.34	0.60	0.00	0.85
209	210	0.31	0.85	0.31	0.60	0.00	0.85
211	211	0.45	0.85	0.45	0.60	0.00	0.85
213	212	0.68	0.85	0.68	0.60	0.00	0.85
215	214	1.53	0.85	1.53	0.60	0.00	0.85
218	218	0.32	0.85	0.00	0.60	0.32	0.60
219	219	0.08	0.85	0.00	0.60	0.08	0.60
220	220	0.09	0.85	0.00	0.60	0.09	0.60
Basin C		0.48	0.85	0.00	0.60	0.48	0.60
Basin D		0.31	0.85	0.00	0.60	0.31	0.60

Note: C values taken from Section 3-203.3 of the City of Chula Vista Subdivision Manual
Runoff Coefficient of 0.85 for Commercial Area
Runoff Coefficient of 0.60 for Vegetated Slopes, Steep

2.3 Rainfall Intensity

Rainfall intensity is calculated per Section 3-203.3 of the City of Chula Vista Subdivision Manual, which is given by the following equation:

$I = 7.44P_6D^{-0.645}$

Where:
I = Rainfall Intensity in inches per hour (in/hr)
P_6 = Adjusted 6-hour storm precipitation
D = Duration in minutes (use Tc)

The intensity values for varying time of concentrations were input manually into the AES computer program where runoff calculations were performed. The 6-hour storm rainfall amount (P_6) for the 50-year and 100-year storm frequency was determined using City of Chula Vista Isopluvial Maps provided from Figure 7 of the City of Chula Vista Drainage Master Plan. See Appendix 3 of this report for Isopluvial maps for the 50-year and 100-year rainfall event.

2.4 Tributary Areas

Drainage basins for the existing and proposed project site are delineated in the Existing and Proposed Condition Hydrology Node Maps located in Appendix 1 and 2 of this report and graphically portray the tributary area for each drainage basin.

2.5 Hydraulics

The hydraulics of existing and proposed storm drain pipes were analyzed using the AES computer program. For pipe flow, a Manning's N value of 0.011 was used to reflect the use of HDPE pipe. A Manning's N value of 0.013 was used to reflect the use of RCP pipe.

The County of Los Angeles Water Surface Pressure Gradient (WSPGW) program was used to perform the hydraulic grade line analysis of the proposed 60" and 72" storm drain conveyance systems in conformance with the City of Chula Vista Subdivision Manual (March 2012). The WSPGW program computes and plots uniform and non-uniform steady flow water surface profiles and pressure gradients in open channels or closed conduits with irregular or regular sections. The flow in a system may alternate between supercritical, sub-critical, or pressure flow in any sequence. The program uses mathematical and hydraulic principles to calculate data such as cross-sectional area, wetted perimeter, normal depth, critical depth, velocity, pressure, and momentum. Hydraulic analysis has been performed based on the proposed 50-year condition as described in Section 1.3. Refer to Appendix 6 for detailed WSPGW output.

The 50-year storm was analyzed for the storm drains that convey the off-site run-on and the existing public storm drain infrastructure per the City of Chula Vista's Subdivision Manual Section 3 General Design Criteria in Section 3-201.3.

The results of the WSPGW analysis shows high velocities in the proposed 60" RCP and 72" RCP storm drain pipes. To mitigate potential RCP pipe abrasion from high peak velocities, thicker wall RCP pipe with high-strength concrete will be used. The new RCP pipes will also be installed with a slurry backfill in the pipe bedding zone. For pipe velocities that exceed 20 feet per second, the concrete thickness on the inside of the RCP pipe will be increased by a minimum of 1.5 inches to provide additional concrete cover over the pipe's reinforcing steel and over the reinforcing steel for the proposed box culvert. The concrete design strength for reinforced concrete pipe and box culverts in these reaches shall be 5,000 psi for

velocities exceeding 20 feet per second and 6,000 psi for velocities exceeding 30 feet per second. In addition, water tight joints will be utilized in accordance with ASTM C76/C443/C361 & C655, Greenbook S 207-2 and Caltrans S 65 requirements.

2.6 Energy Dissipation

The proposed flow velocity at the downstream end of the existing public storm drain facilities was calculated using WSPGW. The size of existing rip rap energy dissipation at the existing storm drain systems' outfalls are per As-Built Drawing No. 92-160 for the existing double 48" RCP storm drain outfall under Main Street (50-Year Existing Condition Hydrology Node 14) and Drawing No. 94-103 for the existing triple 48" RCP storm drain outfall under Main Street (50-Year Existing Condition Hydrology Node 23). The proposed peak 50-year velocities were compared to the design velocity rating of the existing rip rap rock class and thickness per the table found in San Diego Regional Standard Drawing (SDRSD) D-40. Since the existing rip rap energy dissipaters are not sufficiently sized for energy dissipation the proposed 50-year peak flow rates and velocities, the existing rip rap pads will be re-constructed. The existing rip rap pads will be grouted and additional rip rap will be placed down gradient of the grouted rip rap at lengths shown on the Proposed Condition Hydrology Node Map – 50-Year Storm Frequency. See 50-Year Proposed Condition Hydrology Nodes 124 and 221 for proposed rip rap locations.

The sizes of the new rip rap pads have been calculated using HEC-RAS software. Please refer to Appendix 7 for HEC-RAS output.

The 50-year storm was analyzed for the storm drains that convey the off-site run-on and the existing public storm drain infrastructure per the City of Chula Vista's Subdivision Manual Section 3 General Design Criteria in Section 3-201.3.

2.7 Curb Inlet and Catch Basin Sizing

Curb inlets and catch basins will be sized in accordance with City of Chula Vista Subdivision Manual (March 2012) upon final engineering.

2.8 Detention Basin Routing

The detention facility was modeled using the Army Corps of Engineers HEC-HMS 4.3 software. Hydraulic Modified-Puls detention routing was performed to analyze the developed condition 50-year and 100-year peak flow rate at the project's detention system. Stage-storage-discharge tables were generated and input into HEC-HMS to model the design of the vault outlet structure. This procedure was selected in order to model the flow control requirements and to accurately represent the middle stages of the BMP for accurate mid-flow orifice and emergency weir sizing. The stage-storage-discharge tables have been provided in Appendix 5. The HEC-HMS Modified-Puls results are summarized in Table 2.3 below.

TABLE 2.3- Summary of 100-Year Detention Basin Routing

Detention Basin	Tributary Area (ac)	Runoff Coefficient, C	Inflow Tc (min)[1]	100-Year Peak Inflow (cfs)	Outflow Tc (min)	100-Year Peak Outflow (cfs)	Peak Elevation (ft)[2]
BMP-A1	6.49	0.85	10	25.13	16	12.79	6.99
BMP-B1	5.22	0.85	6	27.00	12	9.98	5.14

Notes: (1) Inflow time of concentration rounded to the nearest time interval that HEC-HMS could accept
(2) Peak elevation measured from the invert of the mid-flow orifice
(3) P6-100yr = 2.4 inches

TABLE 2.4- Summary of 50-Year Detention Basin Routing

Detention Basin	Tributary Area (ac)	Runoff Coefficient, C	Inflow Tc (min)[1]	50-Year Peak Inflow (cfs)	Outflow Tc (min)	50-Year Peak Outflow (cfs)	Peak Elevation (ft)[2]
BMP-A1	6.49	0.85	10	21.67	17	7.91	6.55
BMP-B1	5.22	0.85	6	23.47	11	6.44	4.38

Notes: (1) Inflow time of concentration rounded to the nearest time interval that HEC-HMS could accept
(2) Peak elevation measured from the invert of the mid-flow orifice
(3) P6-50yr = 2.1 inches

A Rational Method inflow hydrograph was generated using RickRat Hydro software from Rick Engineering. The parameters of the drainage area were entered into RickRat Hydro software to generate an inflow hydrograph. The data from this hydrograph was then entered into HEC-HMS software to model the release rates from the detention system.

HEC-HMS allows for hydrology input time steps of 1, 2, 3, 4, 5, 10, 15 & 20 minutes. Rick Rat Hydro requires a minimum time of concentration (Tc) of 5 minutes. Therefore, the time of concentration (Tc) used for the concentration of the hydrograph was rounded to the nearest time interval that RickRat Hydro and HEC-HMS could accept. The peak flow remains as per the modified Rational Method analysis and is not reduced (or increased) from this hydrograph development accordingly.

Rational Method hydrographs, stage-storage-discharge relationships and HEC-HMS model output is provided in Appendix 5 of this report.

3. CALCULATIONS/RESULTS

3.1 Pre- & Post-Development Peak Flow Comparison

Below are a series of tables which summarize the calculations provided in the appendices of this report.

Table 3.1 itemizes the existing condition peak flow rates for the 50-year and 100-year storm event at the project's discharge locations.

TABLE 3.1- Existing Condition Peak Flow Summary

Drainage Basin	Drainage Area (ac)	Runoff Coefficient, C	Existing Q100 (cfs)	Existing Q50 (cfs)
Basin A	4.41	0.57	15.44	13.70
Basin B	2.96	0.58	10.90	9.54
Basin C	4.77	0.57	17.22	15.07
Basin D	1.26	0.60	4.77	4.18
Total	13.39	0.58	48.33	42.49

Table 3.2 itemizes the proposed unmitigated and mitigated condition peak flow rates for the 50-year and 100-year storm event at the project's discharge locations.

TABLE 3.2- Proposed and Detained Condition Peak Flow Summary

Drainage Basin	Drainage Area (ac)	Runoff Coefficient, C	Detained Q100 (cfs)	Detained Q50 (cfs)
Basin A	7.50	0.81	14.44	9.33
Basin B	5.72	0.82	10.64	7.14
Basin C	0.48	0.60	1.82	1.82
Basin D	0.31	0.60	1.16	1.16
Total	14.00	0.80	28.06	19.45

Table 3.3 shows that the total storm water peak flow for the proposed development is less than the existing storm water peak flow for the 50-year and 100-year rainfall event.

TABLE 3.3- Existing Vs. Detained Condition Peak Flow Summary

Drainage Basin	Existing Q100 (cfs)	Detained Q100 (cfs)	Existing Vs. Detained Q100 (cfs)	Existing Q50 (cfs)	Detained Q50 (cfs)	Existing Vs. Detained Q50 (cfs)
Basin A	15.44	14.44	-1.00	13.70	9.33	-4.37
Basin B	10.90	10.64	-0.26	9.54	7.14	-2.40
Basin C	17.22	1.82	-15.40	15.07	1.82	-13.25
Basin D	4.77	1.16	-3.61	4.18	1.16	-3.02
Total	48.33	28.06	-20.28	42.49	19.45	-23.04

3.2 Storm Water Quality

The proposed site will have a Modular Wetland System that will provide the required storm water quality treatment for the project. For information regarding BMP sizing and the water quality design, refer to the *Storm Water Quality Management Plan for Nirvana Business Park* by PLSA, dated March 14, 2022, under separate cover.

3.3 Hydromodification

The project is exempt from hydromodification management plan (HMP) requirements. For additional information regarding HMP exemption, refer to the *Storm Water Quality Management Plan for Nirvana Business Park* by PLSA, dated March 14, 2022, under separate cover.

4. CONCLUSION

This report analyzed the 50-year and 100-year storm event hydrology for the proposed site using the Advanced Engineering Software (AES) and demonstrated that the post-developed peak flow rates are less than the pre-developed peak flow rates at the project's discharge locations. In addition, the proposed storm drain systems are sized to convey the proposed flow rates and calculations can be found in the appendices of this report. As shown in Tables 3.1 through 3.3, the proposed project will not contribute storm water runoff which would exceed the capacity of existing or planned storm water drainage systems.

As discussed in Section 2.5, the proposed RCP pipe and concrete box culverts will be slurry backfilled to help mitigate the anticipated peak flow velocities through these systems. In addition, concrete cover over the reinforcing steel inside of the storm drain conduits will be increased by 1-1/2 inches, higher strength concrete will be utilized, and water tight gasket joints will be constructed as additional measures to help mitigate the anticipated high velocities in the new proposed storm drain systems.

While the 50-year peak flow velocity in the two existing public storm drain systems in Main Street are higher than in the existing condition, the proposed redesigned rip rap energy dissipaters will effectively attenuate the flows as per the County of San Diego's Hydraulic Design Manual. As showing in the hydraulic analysis presented in Appendix 7, the proposed rip rap energy dissipaters at the existing public storm drain outfalls into the Otay River have been adequately sized to handle the increased peak 50-year velocities from the proposed project.

Appendix 1

Existing Condition Hydrology Node Maps

LEGEND

DESCRIPTION	SYMBOL
HYDROLOGY NODE EXISTING Q50 (CFS)	100 1.00
SUB-BASIN AREA	A=0.10
WEIGHTED RUNOFF COEFFICIENT	C=0.45
RIGHT-OF-WAY	RW
PROPERTY LINE	P/L
BASIN BOUNDARY	
SUB-BASIN BOUNDARY	
FLOWLINE	
DIRECTION OF FLOW	

HYDROLOGIC SOIL GROUP

HYDROLOGIC SOIL TYPE: C & D

DEPTH TO GROUNDWATER

DEPTH TO GROUNDWATER > 20 FT

PROJECT CHARACTERISTICS

PARCEL AREA:	13.31 AC
EXISTING IMPERVIOUS AREA:	0 AC
EXISTING LANDSCAPE AREA:	0 AC
EXISTING PERVIOUS AREA:	13.31 AC

RUNOFF COEFFICIENT

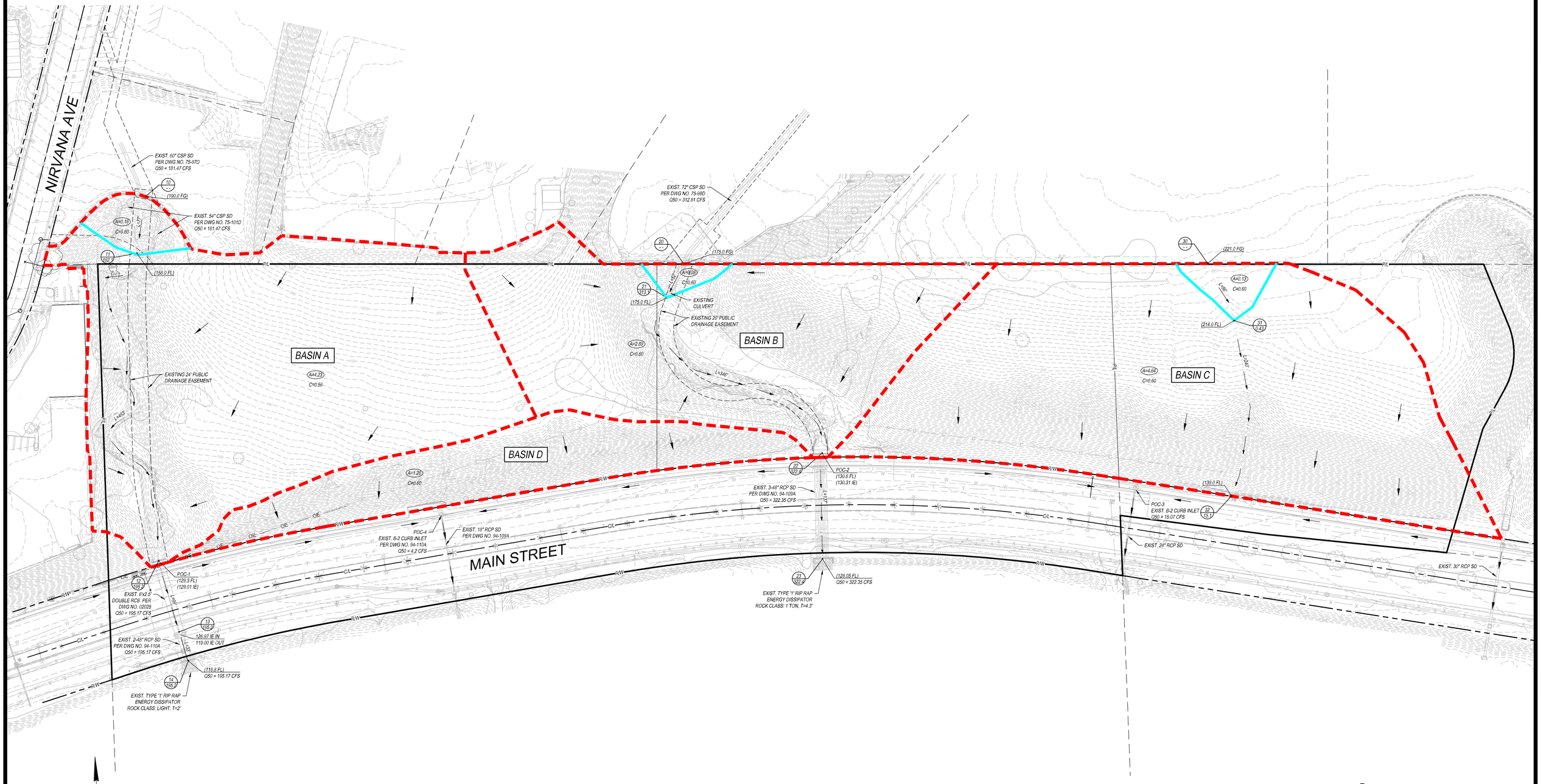
IN ACCORDANCE WITH SECTION 3 - GENERAL DESIGN CRITERIA OF THE CITY OF CHULA VISTA SUBDIVISION MANUAL, RUNOFF COEFFICIENTS WERE BASED ON LAND USE. AN APPROPRIATE RUNOFF COEFFICIENT WAS SELECTED FROM SECTION 3-203.3 AND MULTIPLIED BY THE PERCENTAGE OF TOTAL AREA IN THAT CLASS. THE SUM OF THE PRODUCTS FOR ALL LAND USES IS THE WEIGHTED RUNOFF COEFFICIENT.

SEE TABLE 2.2 OF THE "PRELIMINARY DRAINAGE STUDY FOR NIRVANA BUSINESS PARK" BY PLSA DATED MARCH 2022 FOR EXISTING CONDITION WEIGHTED RUNOFF COEFFICIENT "C" CALCULATIONS.

SUMMARY OF EXISTING CONDITION 50-YEAR PEAK FLOWS

DRAINAGE BASIN	DRAINAGE AREA (AC)	IMPERVIOUS AREA (AC)	% IMP	WEIGHTED RUNOFF COEFFICIENT, C	EXISTING 50-YEAR PEAK FLOW (CFS)	OFFSITE 50-YEAR FLOW (CFS)	SUMMED DATA 50-YEAR FLOW (CFS)
BASIN A	4.41	0	0%	0.57	13.70	181.47	195.17
BASIN B	2.96	0	0%	0.58	9.54	312.81	322.35
BASIN C	4.77	0	0%	0.57	15.07	0	15.07
BASIN D	1.26	0	0%	0.60	4.16	0	4.16
TOTAL	13.39	0	0%	0.58	42.49	494.28	536.77

NOTE:
OFFSITE FLOWS ARE FLOWS FROM THE EXISTING OFFSITE DRAINAGE CONVEYANCES. SEE THE EXISTING CONDITION HYDROLOGY NODE MAP FOR LOCATION OF EXISTING OFFSITE DRAINAGE CONVEYANCES.
SUMMED DATA FLOW IS THE EXISTING 50-YEAR PEAK FLOW PLUS THE OFFSITE FLOW.



EXISTING CONDITION HYDROLOGY NODE MAP
50-YEAR STORM FREQUENCY
SCALE 1"=50'

50' 25' 0 50' 100' 150'
SCALE: 1" = 50'

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Phone 858.259.8212 | www.plsaengineering.com

EXISTING CONDITION HYDROLOGY NODE MAP

50-YEAR STORM FREQUENCY
NIRVANA BUSINESS PARK
821 MAIN STREET
CHULA VISTA, CA
PLSA JOB NO. 3668
MARCH 2022

LEGEND

DESCRIPTION	SYMBOL
HYDROLOGY NODE EXISTING Q100 (CFS)	100 1.00
SUB-BASIN AREA	A=0.10
WEIGHTED RUNOFF COEFFICIENT	C=0.45
RIGHT-OF-WAY	R/W
PROPERTY LINE	P/L
BASIN BOUNDARY	
SUB-BASIN BOUNDARY	
FLOWLINE	
DIRECTION OF FLOW	

HYDROLOGIC SOIL GROUP

HYDROLOGIC SOIL TYPE: C & D

DEPTH TO GROUNDWATER

DEPTH TO GROUNDWATER > 20 FT

PROJECT CHARACTERISTICS

PARCEL AREA:	13.31 AC
EXISTING IMPERVIOUS AREA:	0 AC
EXISTING LANDSCAPE AREA:	0 AC
EXISTING PERVIOUS AREA:	13.31 AC

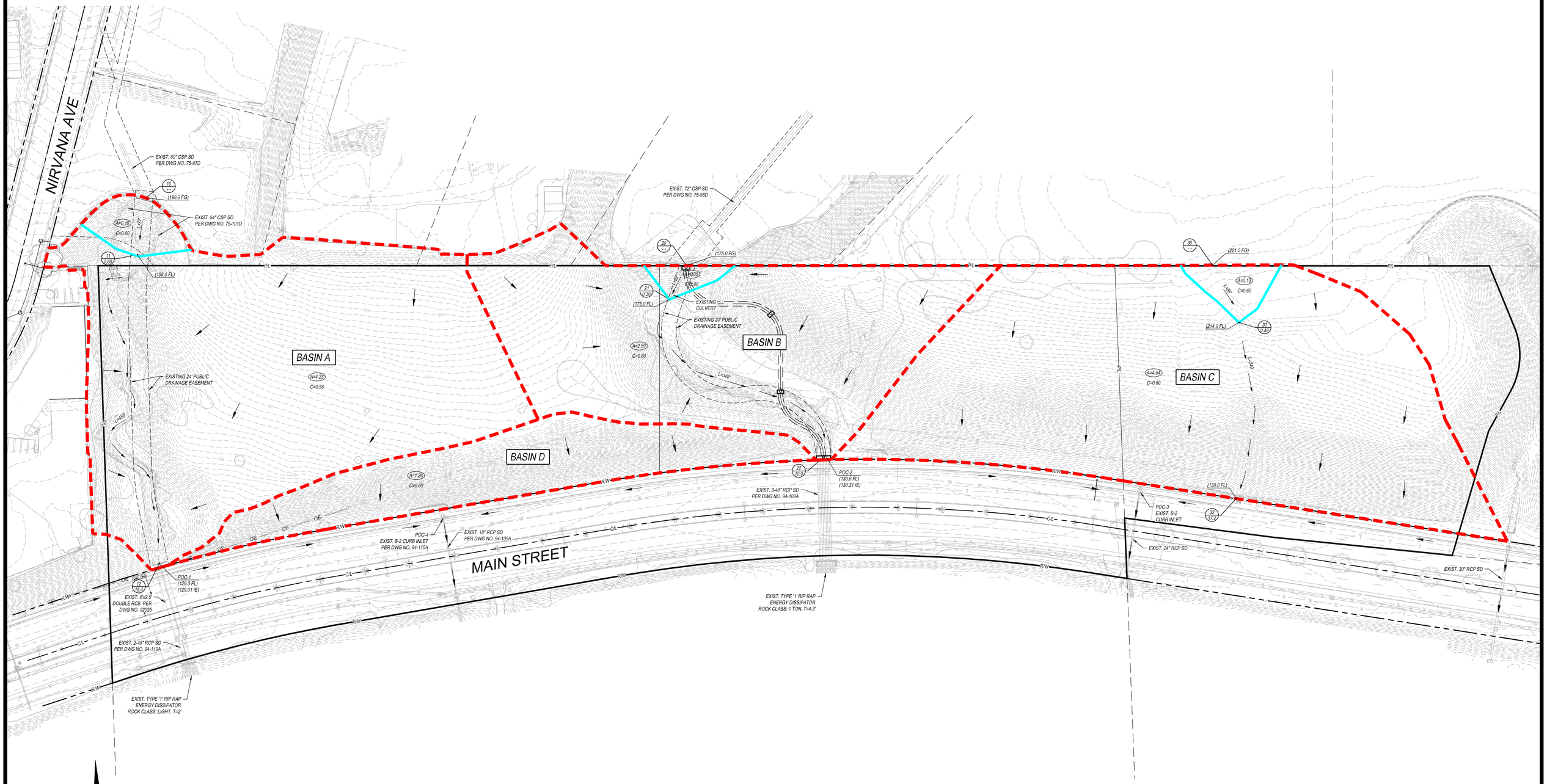
RUNOFF COEFFICIENT

IN ACCORDANCE WITH SECTION 3 - GENERAL DESIGN CRITERIA OF THE CITY OF CHULA VISTA SUBDIVISION MANUAL, RUNOFF COEFFICIENTS WERE BASED ON LAND USE. AN APPROPRIATE RUNOFF COEFFICIENT WAS SELECTED FROM SECTION 3-203.3 AND MULTIPLIED BY THE PERCENTAGE OF TOTAL AREA IN THAT CLASS. THE SUM OF THE PRODUCTS FOR ALL LAND USES IS THE WEIGHTED RUNOFF COEFFICIENT.

SEE TABLE 2.2 OF THE "PRELIMINARY DRAINAGE STUDY FOR NIRVANA BUSINESS PARK" BY PLSA DATED MARCH 2022 FOR EXISTING CONDITION WEIGHTED RUNOFF COEFFICIENT "C" CALCULATIONS.

SUMMARY OF EXISTING CONDITION 100-YEAR PEAK FLOWS

DRAINAGE BASIN	DRAINAGE AREA (AC)	IMPERVIOUS AREA (AC)	% IMP	WEIGHTED RUNOFF COEFFICIENT, C	EXISTING 100-YEAR PEAK FLOW (CFS)
BASIN A	4.41	0	0%	0.57	15.44
BASIN B	2.96	0	0%	0.58	10.90
BASIN C	4.77	0	0%	0.57	17.22
BASIN D	1.26	0	0%	0.60	4.77
TOTAL	13.39	0	0%	0.58	48.33



50' 25' 0 50' 100' 150'

SCALE: 1" = 50'

EXISTING CONDITION HYDROLOGY NODE MAP
100-YEAR STORM FREQUENCY
SCALE 1"=50'

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EXISTING CONDITION HYDROLOGY NODE MAP

100-YEAR STORM FREQUENCY

NIRVANA BUSINESS PARK
821 MAIN STREET
CHULA VISTA, CA
PLSA JOB NO. 3668
MARCH 2022

Appendix 2

Proposed Condition Hydrology Node Maps

LEGEND

DESCRIPTION	SYMBOL
HYDROLOGY NODE DETAINED Q50 (CFS)	100 1.00
SUB-BASIN AREA	A=0.10
WEIGHTED RUNOFF COEFFICIENT	C=0.45
RIGHT-OF-WAY	R/W
PROPERTY LINE	P/L
BASIN BOUNDARY	
SUB-BASIN BOUNDARY	
DIRECTION OF FLOW	
FLOWLINE	

HYDROLOGIC SOIL GROUP

HYDROLOGIC SOIL TYPE: C & D

DEPTH TO GROUNDWATER

DEPTH TO GROUNDWATER > 20 FT

PROJECT CHARACTERISTICS

PARCEL AREA:	13.31 AC
PROPOSED DISTURBED AREA:	14.11 AC
PROPOSED IMPERVIOUS AREA:	9.75 AC
PROPOSED PERVIOUS / LANDSCAPE AREA:	4.37 AC

RUNOFF COEFFICIENT

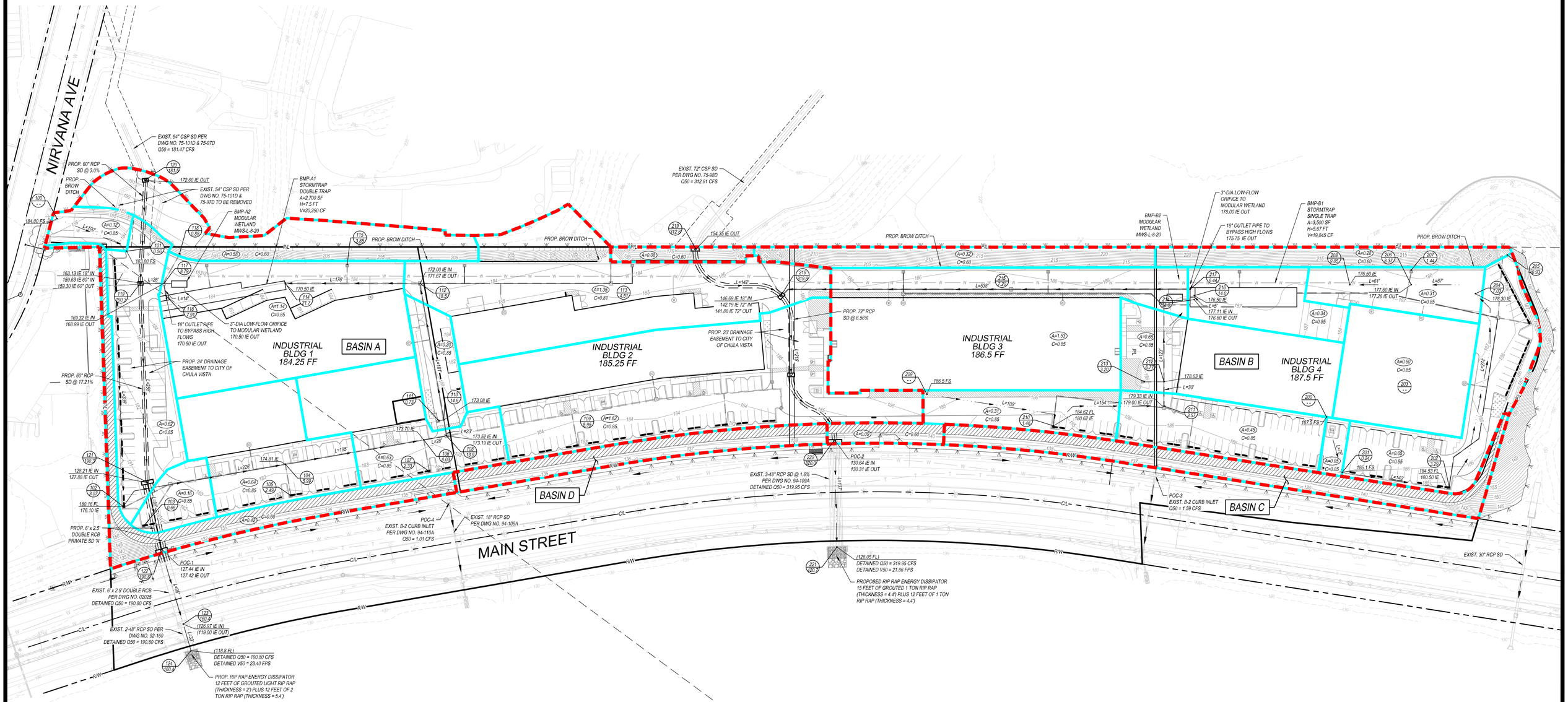
IN ACCORDANCE WITH SECTION 3 - GENERAL DESIGN CRITERIA OF THE CITY OF CHULA VISTA SUBDIVISION MANUAL, RUNOFF COEFFICIENTS WERE BASED ON LAND USE. AN APPROPRIATE RUNOFF COEFFICIENT WAS SELECTED FROM SECTION 3-203.3 AND MULTIPLIED BY THE PERCENTAGE OF TOTAL AREA IN THAT CLASS. THE SUM OF THE PRODUCTS FOR ALL LAND USES IS THE WEIGHTED RUNOFF COEFFICIENT.

SEE TABLE 2.2 OF THE "PRELIMINARY DRAINAGE STUDY FOR NIRVANA BUSINESS PARK" BY PLSA DATED MARCH 2022 FOR PROPOSED CONDITION WEIGHTED RUNOFF COEFFICIENT "C" CALCULATIONS.

SUMMARY OF PROPOSED CONDITION 50-YEAR PEAK FLOWS

DRAINAGE BASIN	DRAINAGE AREA (AC)	IMPERVIOUS AREA (AC)	% IMP	WEIGHTED RUNOFF COEFFICIENT, C	PROPOSED 50-YEAR PEAK FLOW (CFS)	DETAINED 50-YEAR PEAK FLOW (CFS)	OFFSITE 50-YEAR FLOW (CFS)	SUMMED DATA 50-YEAR FLOW (CFS)
BASIN A	7.50	5.38	71.7%	0.81	23.34	9.33	181.47	190.80
BASIN B	5.72	4.37	76.5%	0.82	23.91	7.14	312.81	319.95
BASIN C	0.48	0	0%	0.60	1.59	1.59	0	1.59
BASIN D	0.31	0	0%	0.60	1.01	1.01	0	1.01
TOTAL	14.00	9.75	69.6%	0.80	49.86	19.08	494.28	513.36

NOTE:
PROPOSED 100-YEAR PEAK FLOWS ARE POST-PROJECT PEAK FLOWS THAT HAVE NOT BEEN REDUCED FROM DETENTION ROUTING.
DETAINED 100-YEAR PEAK FLOWS ARE POST-PROJECT PEAK FLOWS THAT HAVE BEEN REDUCED BY ROUTING THROUGH THE PROJECT'S DETENTION FACILITIES.
OFFSITE FLOWS ARE FLOWS FROM THE EXISTING OFFSITE DRAINAGE CONVEYANCES. SEE THE PROPOSED CONDITION HYDROLOGY NODE MAP FOR LOCATION OF EXISTING OFFSITE DRAINAGE CONVEYANCES.
SUMMED DATA FLOW IS THE DETAINED 50-YEAR PEAK FLOW PLUS THE OFFSITE FLOW.



PROPOSED CONDITION HYDROLOGY NODE MAP
50-YEAR STORM FREQUENCY
SCALE 1"=50'

50' 25' 0 50' 100' 150'
SCALE: 1" = 50'

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PROPOSED CONDITION HYDROLOGY NODE MAP

50-YEAR STORM FREQUENCY

NIRVANA BUSINESS PARK
821 MAIN STREET
CHULA VISTA, CA
PLSA JOB NO. 3668
MARCH 2022

LEGEND

DESCRIPTION	SYMBOL
HYDROLOGY NODE DETAINED Q100 (CFS)	100 1.00
SUB-BASIN AREA	A=0.10
WEIGHTED RUNOFF COEFFICIENT	C=0.45
RIGHT-OF-WAY	R/W
PROPERTY LINE	P/L
BASIN BOUNDARY	
SUB-BASIN BOUNDARY	
DIRECTION OF FLOW	
FLOWLINE	

HYDROLOGIC SOIL GROUP

HYDROLOGIC SOIL TYPE: C & D

DEPTH TO GROUNDWATER

DEPTH TO GROUNDWATER > 20 FT

PROJECT CHARACTERISTICS

PARCEL AREA:	13.31 AC
PROPOSED DISTURBED AREA:	14.11 AC
PROPOSED IMPERVIOUS AREA:	9.75 AC
PROPOSED PERVIOUS / LANDSCAPE AREA:	4.37 AC

RUNOFF COEFFICIENT

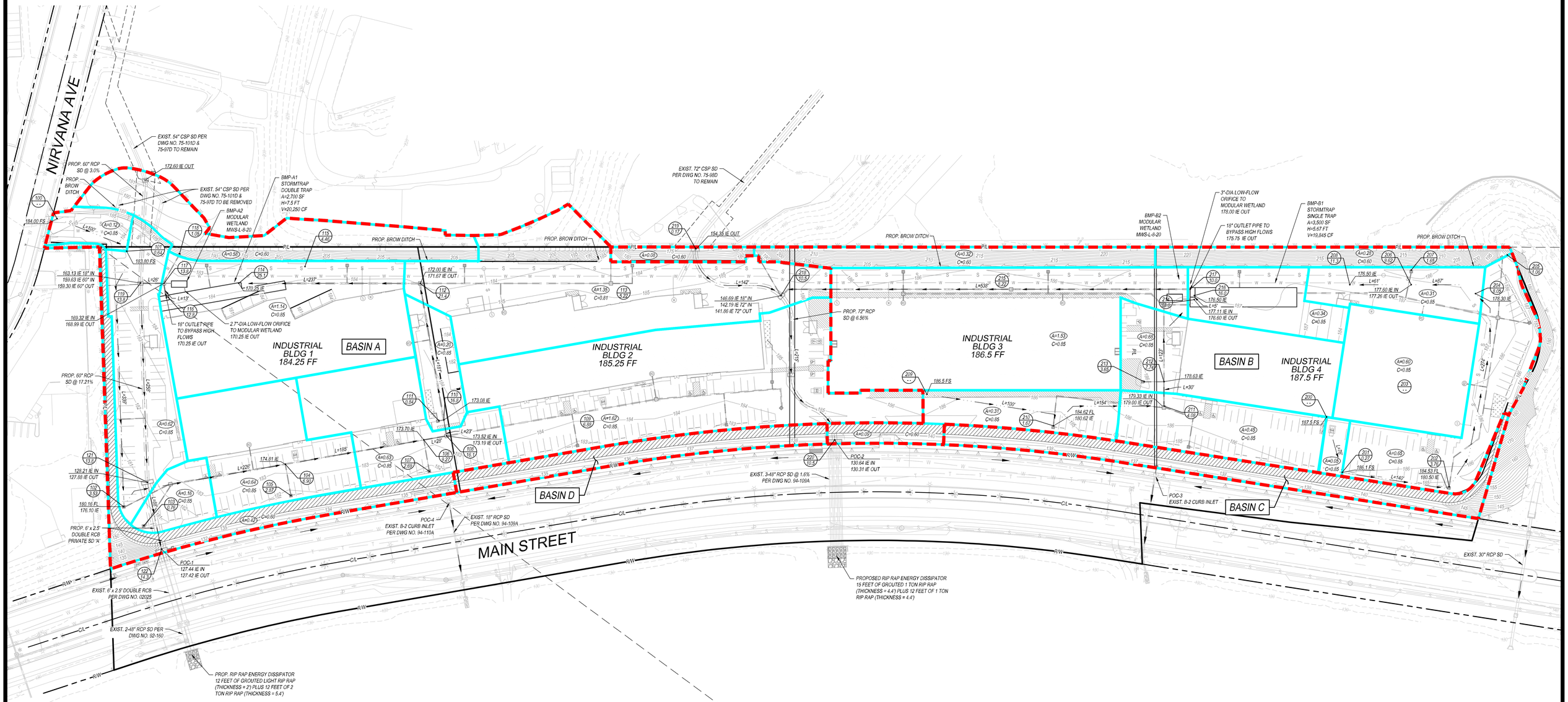
IN ACCORDANCE WITH SECTION 3 - GENERAL DESIGN CRITERIA OF THE CITY OF CHULA VISTA SUBDIVISION MANUAL, RUNOFF COEFFICIENTS WERE BASED ON LAND USE. AN APPROPRIATE RUNOFF COEFFICIENT WAS SELECTED FROM SECTION 3-203.3 AND MULTIPLIED BY THE PERCENTAGE OF TOTAL AREA IN THAT CLASS. THE SUM OF THE PRODUCTS FOR ALL LAND USES IS THE WEIGHTED RUNOFF COEFFICIENT.

SEE TABLE 2.2 OF THE "PRELIMINARY DRAINAGE STUDY FOR NIRVANA BUSINESS PARK" BY PLSA DATED MARCH 2022 FOR PROPOSED CONDITION WEIGHTED RUNOFF COEFFICIENT "C" CALCULATIONS.

SUMMARY OF PROPOSED CONDITION 100-YEAR PEAK FLOWS

DRAINAGE BASIN	DRAINAGE AREA (AC)	IMPERVIOUS AREA (AC)	% IMP	WEIGHTED RUNOFF COEFFICIENT, C	PROPOSED 100-YEAR PEAK FLOW (CFS)	DETAINED 100-YEAR PEAK FLOW (CFS)
BASIN A	7.50	5.38	71.7%	0.81	27.06	14.44
BASIN B	5.72	4.37	76.5%	0.82	27.54	10.64
BASIN C	0.48	0	0%	0.60	1.82	1.82
BASIN D	0.31	0	0%	0.60	1.16	1.16
TOTAL	14.00	9.75	69.6%	0.80	57.58	28.06

NOTE:
PROPOSED 100-YEAR PEAK FLOWS ARE POST-PROJECT PEAK FLOWS THAT HAVE NOT BEEN REDUCED FROM DETENTION ROUTING.
DETAINED 100-YEAR PEAK FLOWS ARE POST-PROJECT PEAK FLOWS THAT HAVE BEEN REDUCED BY ROUTING THROUGH THE PROJECT'S DETENTION FACILITIES.



PROPOSED CONDITION HYDROLOGY NODE MAP
100-YEAR STORM FREQUENCY
SCALE 1"=50'

50' 25' 0 50' 100' 150'
SCALE: 1" = 50'

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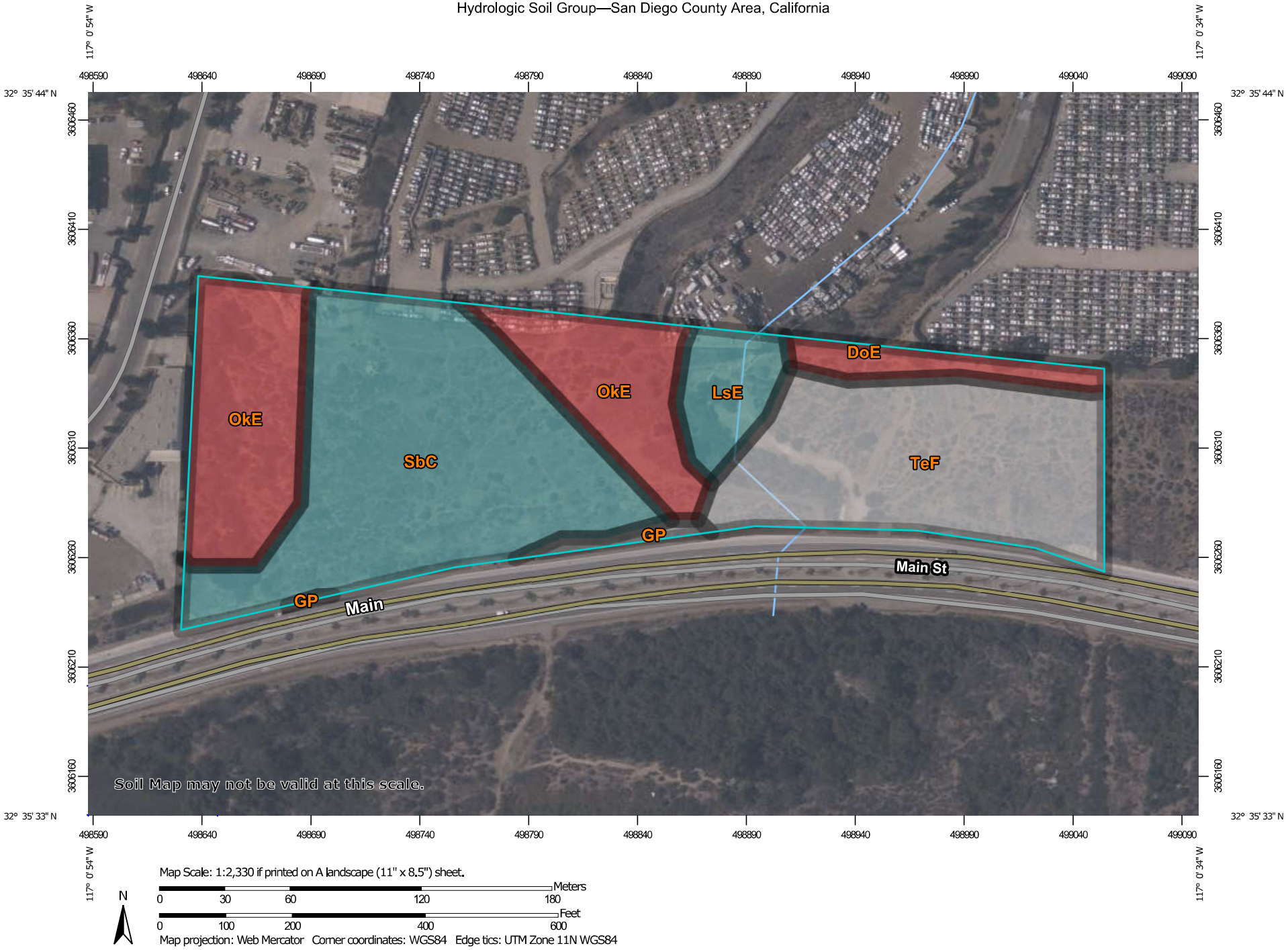
PROPOSED CONDITION HYDROLOGY NODE MAP

100-YEAR STORM FREQUENCY

NIRVANA BUSINESS PARK
821 MAIN STREET
CHULA VISTA, CA
PLSA JOB NO. 3668
MARCH 2022

Appendix 3

Hydrology Design Summary



Map Scale: 1:2,330 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 18, 2018—Aug 22, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
DoE	Diablo-Olivenhain complex, 9 to 30 percent slopes	D	0.5	4.1%
GP	Gravel pits		0.1	1.1%
LsE	Linne clay loam, 9 to 30 percent slopes	C	0.6	5.6%
OkE	Olivenhain-Urban land complex, 9 to 30 percent slopes	D	2.8	25.0%
SbC	Salinas clay loam, 2 to 9 percent slopes	C	4.2	37.5%
TeF	Terrace escarpments		3.0	26.6%
Totals for Area of Interest			**11.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Chula Vista Drainage Master Plan

Figure 7: Rainfall Isopluvials

100 Year Rainfall Event

- 6 Hour Isopluvial
- 24 Hour Isopluvial

1 inch equals 4,200 feet

CITY OF CHULA VISTA

PBS&J

Map Date:	Feb 12, 2004
Projection:	State Plane
Datum:	NAD 83
Zone:	California VI
Units:	Feet

Project Site
P6 = 2.25 in
P24 = 3.75 in

SR-54 EB
SR-54 WB
E L ST
L ST
TELEGRAPH CANYON RD
OTAY LAKES RD

4in
2.5in
4.5in
5.5in
6in
6.5in
3in
5in

SN1 SN2 SR1 SR2 SR3 SR4 SR5 SR6 SR7 SV1 SV2
CL1 CL2 CL3 CL4 CL5 CL6
TC1 TC2 TC3
JN1 JN2 JN3
SW1 SW2 SW3 SW4 SW6 SW7
PR1
GC1 SE1
BA1 BA2 BA3 BA4 BA5 BA6 BA7
GA1 GA2 GA3 GA4
OL1 OL2 OL3 OL4
LC1
RC1
PC1
WC1
SC1
RH1 RH2 RH3 RH4 RH5 RH6 RH7 RH8
OR1 OR2 OR3 OR4 OR5 OR6 OR7 OR8 OR9 OR10 OR11 OR12 OR13 OR14 OR15 OR16 OR17 OR18 OR19 OR20 OR21 OR22 OR23 OR24 OR25 OR26 OR27 OR28 OR29 OR30 OR31 OR32 OR33 OR34 OR35 OR36 OR37 OR38 OR39 OR40 OR41 OR42
OS1 OS2 OS3 OS4 OS5 OS6 OS7

Appendix 4

AES Rational Method Calculations

EXISTING CONDITION - 50 YEAR

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**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1452

                              Analysis prepared by:

                         PASCO LARET SUITER & ASSOCIATES
                              535 NORTH HIGHWAY 101
                                     SUITE A
                              SOLANA BEACH CA 92705

--------------------------------------------------------------------------
  FILE NAME: 3668E50.DAT
  TIME/DATE OF STUDY: 16:14 03/23/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  5.533
   2)  10.000;  3.538
   3)  15.000;  2.724
   4)  20.000;  2.263
   5)  25.000;  1.959
   6)  30.000;  1.742
   7)  40.000;  1.447
   8)  50.000;  1.253
   9)  60.000;  1.114
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    77.00
  UPSTREAM ELEVATION(FEET) =    190.00
```

```
  DOWNSTREAM ELEVATION(FEET) =    159.00
  ELEVATION DIFFERENCE(FEET) =     31.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.666
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.60
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.60

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =  16
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED CONSTANT SOURCE FLOW AT NODE<<<<<
============================================================================
  USER-SPECIFIED CONSTANT SOURCE FLOW =   181.47(CFS)
  USER-SPECIFIED AREA ASSOCIATED TO SOURCE FLOW =   115.00(ACRES)
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =   181.47  AREA(AC.) =   115.00
  * SUMMED DATA: FLOW(CFS) =   182.07    TOTAL AREA(ACRES) =   115.18

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    159.00  DOWNSTREAM(FEET) =    130.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   483.00   CHANNEL SLOPE =  0.0600
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =  10.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5600
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     188.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.09
  AVERAGE FLOW DEPTH(FEET) =   2.34   TRAVEL TIME(MIN.) =   0.67
  Tc(MIN.) =    4.33
  SUBAREA AREA(ACRES) =     4.23       SUBAREA RUNOFF(CFS) =   13.11
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.562
  TOTAL AREA(ACRES) =        4.4         PEAK FLOW RATE(CFS) =      13.70

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  2.37   FLOW VELOCITY(FEET/SEC.) =  12.22
  * TOTAL SOURCE FLOW(CFS) =     181.47
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     560.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   129.01  DOWNSTREAM(FEET) =   126.97
  FLOW LENGTH(FEET) =    99.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  52.0 INCH PIPE IS  33.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.55
  GIVEN PIPE DIAMETER(INCH) =  52.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =     195.17
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    4.42
  * TOTAL SOURCE FLOW(CFS) =     181.47
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     659.00 FEET.
```

```
****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   119.00  DOWNSTREAM(FEET) =   118.80
 FLOW LENGTH(FEET) =    33.00   MANNING'S N =  0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.89
 (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
  AT DEPTH = 0.82 * DIAMETER)
 GIVEN PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   2
 PIPE-FLOW(CFS) =     195.17
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    4.48
 * TOTAL SOURCE FLOW(CFS) =     181.47
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     692.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .6000
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    52.00
 UPSTREAM ELEVATION(FEET) =    175.00
 DOWNSTREAM ELEVATION(FEET) =    154.00
 ELEVATION DIFFERENCE(FEET) =     21.00
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.013
 WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.27
 TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
 FLOW PROCESS FROM NODE     21.00 TO NODE     21.00 IS CODE =  16
----------------------------------------------------------------------------
 >>>>>USER SPECIFIED CONSTANT SOURCE FLOW AT NODE<<<<<
============================================================================
 USER-SPECIFIED CONSTANT SOURCE FLOW =   312.81(CFS)
 USER-SPECIFIED AREA ASSOCIATED TO SOURCE FLOW =   227.30(ACRES)
 * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =   312.81  AREA(AC.) =   227.30
 * SUMMED DATA: FLOW(CFS) =   313.08    TOTAL AREA(ACRES) =   227.38

****************************************************************************
 FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    175.00  DOWNSTREAM(FEET) =    130.60
 CHANNEL LENGTH THRU SUBAREA(FEET) =   346.00   CHANNEL SLOPE =  0.1283
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =  10.00
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .5800
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     317.71
```

```
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  18.35
  AVERAGE FLOW DEPTH(FEET) =   2.48   TRAVEL TIME(MIN.) =   0.31
  Tc(MIN.) =    3.33
  SUBAREA AREA(ACRES) =     2.89       SUBAREA RUNOFF(CFS) =    9.27
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.581
  TOTAL AREA(ACRES) =        3.0         PEAK FLOW RATE(CFS) =       9.54

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  2.51   FLOW VELOCITY(FEET/SEC.) =  18.35
  * TOTAL SOURCE FLOW(CFS) =     312.81
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     398.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   130.31  DOWNSTREAM(FEET) =   128.05
  FLOW LENGTH(FEET) =   137.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.31
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   3
  PIPE-FLOW(CFS) =     322.35
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    3.47
  * TOTAL SOURCE FLOW(CFS) =     312.81
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =     535.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    86.00
  UPSTREAM ELEVATION(FEET) =    221.00
  DOWNSTREAM ELEVATION(FEET) =    214.00
  ELEVATION DIFFERENCE(FEET) =      7.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.149
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    214.00  DOWNSTREAM(FEET) =    139.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   240.00   CHANNEL SLOPE =  0.3125
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   2.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5700
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.75
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.40
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   0.74
  Tc(MIN.) =    4.89
  SUBAREA AREA(ACRES) =     4.64       SUBAREA RUNOFF(CFS) =   14.63
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.571
  TOTAL AREA(ACRES) =        4.8         PEAK FLOW RATE(CFS) =      15.07

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   6.73
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     326.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.8  TC(MIN.) =      4.89
  PEAK FLOW RATE(CFS)   =      15.07
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

PROPOSED CONDITION - 50 YEAR

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1452

                              Analysis prepared by:

                         PASCO LARET SUITER & ASSOCIATES
                              535 NORTH HIGHWAY 101
                                     SUITE A
                              SOLANA BEACH CA 92705

--------------------------------------------------------------------------
  FILE NAME: 3668P50.DAT
  TIME/DATE OF STUDY: 16:21 03/23/2022
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  5.533
   2)  10.000;  3.538
   3)  15.000;  2.724
   4)  20.000;  2.263
   5)  25.000;  1.959
   6)  30.000;  1.742
   7)  40.000;  1.447
   8)  50.000;  1.253
   9)  60.000;  1.114
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    184.00
```

```
  DOWNSTREAM ELEVATION(FEET) =    183.80
  ELEVATION DIFFERENCE(FEET) =      0.20
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.009
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    50.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.56
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.56

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  183.80  DOWNSTREAM ELEVATION(FEET) =  180.16
  STREET LENGTH(FEET) =   339.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.86
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =    8.66
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.15
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.68
  STREET FLOW TRAVEL TIME(MIN.) =   2.63   Tc(MIN.) =    6.64
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.880
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    0.62      SUBAREA RUNOFF(CFS) =    2.57
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       3.07

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.05
  FLOW VELOCITY(FEET/SEC.) =  2.39   DEPTH*VELOCITY(FT*FT/SEC.) =   0.86
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     439.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.880
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.66
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       3.73
```

```
 TC(MIN.) =    6.64

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   176.10  DOWNSTREAM(FEET) =   174.81
 FLOW LENGTH(FEET) =   226.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.90
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.73
 PIPE TRAVEL TIME(MIN.) =   0.77    Tc(MIN.) =    7.40
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     665.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.574
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
 SUBAREA AREA(ACRES) =    0.64   SUBAREA RUNOFF(CFS) =    2.49
 TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       5.99
 TC(MIN.) =    7.40

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   174.81  DOWNSTREAM(FEET) =   173.70
 FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.62
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.99
 PIPE TRAVEL TIME(MIN.) =   0.55    Tc(MIN.) =    7.95
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     850.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.355
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
 SUBAREA AREA(ACRES) =    0.63   SUBAREA RUNOFF(CFS) =    2.33
 TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       8.03
 TC(MIN.) =    7.95

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    108.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   173.70  DOWNSTREAM(FEET) =   173.52
  FLOW LENGTH(FEET) =    28.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.13
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.03
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    8.03
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     878.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    109.00 TO NODE    108.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.324
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    1.62   SUBAREA RUNOFF(CFS) =    5.95
  TOTAL AREA(ACRES) =        3.8   TOTAL RUNOFF(CFS) =      13.93
  TC(MIN.) =    8.03

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   173.19  DOWNSTREAM(FEET) =   173.08
  FLOW LENGTH(FEET) =    23.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.33
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.93
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    8.09
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     901.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.300
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.73
  TOTAL AREA(ACRES) =        4.0   TOTAL RUNOFF(CFS) =      14.58
  TC(MIN.) =    8.09

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   173.08  DOWNSTREAM(FEET) =   172.00
  FLOW LENGTH(FEET) =   181.00   MANNING'S N =  0.011
```

```
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.98
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.58
  PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =    8.52
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =    1082.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.128
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8399
  SUBAREA AREA(ACRES) =    1.35   SUBAREA RUNOFF(CFS) =    4.51
  TOTAL AREA(ACRES) =        5.3   TOTAL RUNOFF(CFS) =      18.51
  TC(MIN.) =    8.52

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   171.67  DOWNSTREAM(FEET) =   170.50
  FLOW LENGTH(FEET) =   176.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.62
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.51
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =    8.91
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    114.00 =    1258.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.974
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8417
  SUBAREA AREA(ACRES) =    1.14   SUBAREA RUNOFF(CFS) =    3.85
  TOTAL AREA(ACRES) =        6.5   TOTAL RUNOFF(CFS) =      21.67
  TC(MIN.) =    8.91

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    117.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   170.50  DOWNSTREAM(FEET) =   169.32
  FLOW LENGTH(FEET) =    14.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.91
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.67
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    8.92
```

```
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    117.00 =    1272.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    118.00 TO NODE    117.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.970
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .6000
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8218
 SUBAREA AREA(ACRES) =    0.58   SUBAREA RUNOFF(CFS) =    1.38
 TOTAL AREA(ACRES) =       7.1   TOTAL RUNOFF(CFS) =     23.03
 TC(MIN.) =    8.92

****************************************************************************
 FLOW PROCESS FROM NODE    117.00 TO NODE    119.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   168.99  DOWNSTREAM(FEET) =   162.63
 FLOW LENGTH(FEET) =    26.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  31.65
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      23.03
 PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    8.93
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    119.00 =    1298.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    119.00 IS CODE =  16
----------------------------------------------------------------------------
 >>>>>USER SPECIFIED CONSTANT SOURCE FLOW AT NODE<<<<<
============================================================================
 USER-SPECIFIED CONSTANT SOURCE FLOW =   181.47(CFS)
 USER-SPECIFIED AREA ASSOCIATED TO SOURCE FLOW =   115.00(ACRES)
 * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =   181.47  AREA(AC.) =   115.00
 * SUMMED DATA: FLOW(CFS) =   204.50    TOTAL AREA(ACRES) =   122.06

****************************************************************************
 FLOW PROCESS FROM NODE    119.00 TO NODE    121.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   159.30  DOWNSTREAM(FEET) =   128.21
 FLOW LENGTH(FEET) =   258.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  60.0 INCH PIPE IS  19.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  36.54
 GIVEN PIPE DIAMETER(INCH) =  60.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     204.50
 PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    9.05
 * TOTAL SOURCE FLOW(CFS) =     181.47
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    121.00 =    1556.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =   127.88  DOWNSTREAM(FEET) =   127.44
 FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.47
 (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
  AT DEPTH = 0.82 * DIAMETER)
 GIVEN PIPE DIAMETER(INCH) =  52.00    NUMBER OF PIPES =   2
 PIPE-FLOW(CFS) =     204.50
 PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    9.20
 * TOTAL SOURCE FLOW(CFS) =     181.47
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    122.00 =    1644.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.855
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .6000
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8094
 SUBAREA AREA(ACRES) =    0.42   SUBAREA RUNOFF(CFS) =    0.97
 TOTAL AREA(ACRES) =        7.5   TOTAL RUNOFF(CFS) =      23.34
 TC(MIN.) =    9.20

 * SOURCE FLOW DATA: FLOW(CFS) =     181.47     AREA(ACRES) =      115.0
 * SUMMED DATA: FLOW(CFS) =     204.81    TOTAL AREA(ACRES) =      122.5

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   127.42  DOWNSTREAM(FEET) =   126.97
 FLOW LENGTH(FEET) =    95.00   MANNING'S N =  0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.22
 (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
  AT DEPTH = 0.82 * DIAMETER)
 GIVEN PIPE DIAMETER(INCH) =  52.00    NUMBER OF PIPES =   2
 PIPE-FLOW(CFS) =     204.81
 PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    9.38
 * TOTAL SOURCE FLOW(CFS) =     181.47
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    123.00 =    1739.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   119.00  DOWNSTREAM(FEET) =   118.80
 FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.98
 (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
  AT DEPTH = 0.82 * DIAMETER)
 GIVEN PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   2
 PIPE-FLOW(CFS) =     204.81
 PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    9.45
 * TOTAL SOURCE FLOW(CFS) =     181.47
```

```
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    124.00 =    1779.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    76.00
 UPSTREAM ELEVATION(FEET) =    187.50
 DOWNSTREAM ELEVATION(FEET) =    186.10
 ELEVATION DIFFERENCE(FEET) =      1.40
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.200
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.24
 TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.24

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  186.10  DOWNSTREAM ELEVATION(FEET) =  184.53
 STREET LENGTH(FEET) =   140.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.76
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.31
   HALFSTREET FLOOD WIDTH(FEET) =    8.34
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.16
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.67
 STREET FLOW TRAVEL TIME(MIN.) =   1.08   Tc(MIN.) =    4.28
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
 SUBAREA AREA(ACRES) =    0.65      SUBAREA RUNOFF(CFS) =    3.06
 TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       3.29

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.29
 FLOW VELOCITY(FEET/SEC.) =  2.47   DEPTH*VELOCITY(FT*FT/SEC.) =   0.90
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     216.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    203.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    2.82
  TOTAL AREA(ACRES) =        1.3   TOTAL RUNOFF(CFS) =       6.11
  TC(MIN.) =    4.28

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   180.50  DOWNSTREAM(FEET) =   178.30
  FLOW LENGTH(FEET) =   274.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.16
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.11
  PIPE TRAVEL TIME(MIN.) =   0.74    Tc(MIN.) =    5.02
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     490.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.525
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8057
  SUBAREA AREA(ACRES) =    0.28   SUBAREA RUNOFF(CFS) =    0.93
  TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       7.03
  TC(MIN.) =    5.02

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    206.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   178.30  DOWNSTREAM(FEET) =   177.30
  FLOW LENGTH(FEET) =    87.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.33
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.03
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    5.22
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =     577.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.446
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8130
  SUBAREA AREA(ACRES) =    0.31   SUBAREA RUNOFF(CFS) =    1.44
  TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       8.37
  TC(MIN.) =    5.22

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    208.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   177.26  DOWNSTREAM(FEET) =   176.50
  FLOW LENGTH(FEET) =    61.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.05
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.37
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    5.34
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    208.00 =     638.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    208.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.396
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8186
  SUBAREA AREA(ACRES) =    0.34   SUBAREA RUNOFF(CFS) =    1.56
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       9.85
  TC(MIN.) =    5.34

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    208.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    209.00 TO NODE    210.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    186.50
  DOWNSTREAM ELEVATION(FEET) =    184.62
  ELEVATION DIFFERENCE(FEET) =      1.88
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.326
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    83.20
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.46
  TOTAL AREA(ACRES) =      0.31   TOTAL RUNOFF(CFS) =      1.46
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   180.62  DOWNSTREAM(FEET) =   179.33
  FLOW LENGTH(FEET) =   154.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.42
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.46
  PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =    3.91
  LONGEST FLOWPATH FROM NODE    209.00 TO NODE    211.00 =     254.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    211.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.45   SUBAREA RUNOFF(CFS) =    2.12
  TOTAL AREA(ACRES) =        0.8   TOTAL RUNOFF(CFS) =       3.57
  TC(MIN.) =    3.91

****************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    212.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   179.00  DOWNSTREAM(FEET) =   178.63
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.43
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.57
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    3.98
  LONGEST FLOWPATH FROM NODE    209.00 TO NODE    212.00 =     284.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    213.00 TO NODE    212.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.68   SUBAREA RUNOFF(CFS) =    3.20
  TOTAL AREA(ACRES) =        1.4   TOTAL RUNOFF(CFS) =       6.77
  TC(MIN.) =    3.98

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    214.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   178.63  DOWNSTREAM(FEET) =   177.11
  FLOW LENGTH(FEET) =   123.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.52
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.77
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    4.26
  LONGEST FLOWPATH FROM NODE    209.00 TO NODE    214.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    214.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    1.53   SUBAREA RUNOFF(CFS) =    7.20
  TOTAL AREA(ACRES) =        3.0   TOTAL RUNOFF(CFS) =      13.97
  TC(MIN.) =    4.26

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    216.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   176.60  DOWNSTREAM(FEET) =   176.50
  FLOW LENGTH(FEET) =     5.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.80
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.97
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    4.27
  LONGEST FLOWPATH FROM NODE    209.00 TO NODE    216.00 =     412.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    216.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       13.97     4.27       5.533        2.97
  LONGEST FLOWPATH FROM NODE    209.00 TO NODE    216.00 =     412.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        9.85     5.34       5.396        2.23
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    216.00 =     638.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
```

```
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      21.83       4.27        5.533
      2      23.47       5.34        5.396

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      23.47   Tc(MIN.) =    5.34
  TOTAL AREA(ACRES) =        5.2

****************************************************************************
  FLOW PROCESS FROM NODE    217.00 TO NODE    218.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   175.75  DOWNSTREAM(FEET) =   146.69
  FLOW LENGTH(FEET) =   538.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.81
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      23.47
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =    5.85
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    218.00 =    1176.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    218.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.195
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8228
  SUBAREA AREA(ACRES) =    0.32   SUBAREA RUNOFF(CFS) =    1.00
  TOTAL AREA(ACRES) =        5.5   TOTAL RUNOFF(CFS) =      23.59
  TC(MIN.) =    5.85

****************************************************************************
  FLOW PROCESS FROM NODE    219.00 TO NODE    219.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.195
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8196
  SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.25
  TOTAL AREA(ACRES) =        5.6   TOTAL RUNOFF(CFS) =      23.84
  TC(MIN.) =    5.85

****************************************************************************
  FLOW PROCESS FROM NODE    219.00 TO NODE    218.00 IS CODE =  16
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED CONSTANT SOURCE FLOW AT NODE<<<<<
============================================================================
  USER-SPECIFIED CONSTANT SOURCE FLOW =   312.81(CFS)
  USER-SPECIFIED AREA ASSOCIATED TO SOURCE FLOW =   227.30(ACRES)
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =   312.81  AREA(AC.) =   227.30
  * SUMMED DATA: FLOW(CFS) =   336.65    TOTAL AREA(ACRES) =   232.90

****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    220.00 IS CODE =  41
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   141.86  DOWNSTREAM(FEET) =   130.64
  FLOW LENGTH(FEET) =   216.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  72.0 INCH PIPE IS  29.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  30.51
  GIVEN PIPE DIAMETER(INCH) =  72.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     336.65
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    5.97
  * TOTAL SOURCE FLOW(CFS) =     312.81
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    220.00 =    1392.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.148
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8162
  SUBAREA AREA(ACRES) =    0.09   SUBAREA RUNOFF(CFS) =    0.28
  TOTAL AREA(ACRES) =        5.7   TOTAL RUNOFF(CFS) =      23.91
  TC(MIN.) =    5.97

  * SOURCE FLOW DATA: FLOW(CFS) =     312.81     AREA(ACRES) =      227.3
  * SUMMED DATA: FLOW(CFS) =     336.72    TOTAL AREA(ACRES) =      233.0

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    221.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   130.31  DOWNSTREAM(FEET) =   128.05
  FLOW LENGTH(FEET) =   137.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.31
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   3
  PIPE-FLOW(CFS) =     336.72
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    6.11
  * TOTAL SOURCE FLOW(CFS) =     312.81
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    221.00 =    1529.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.7  TC(MIN.) =      6.11
  PEAK FLOW RATE(CFS)   =      23.91
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =     312.81  AREA(AC.) =      227.3
  * SUMMED DATA: FLOW(CFS) =     336.72    TOTAL AREA(ACRES) =      233.0
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

DETAINED CONDITION - 50 YEAR

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1452

                              Analysis prepared by:

                         PASCO LARET SUITER & ASSOCIATES
                              535 NORTH HIGHWAY 101
                                     SUITE A
                              SOLANA BEACH CA 92705

------------------------------------------------------------------------------
  FILE NAME: 3668P50.DAT
  TIME/DATE OF STUDY: 16:20 03/23/2022
------------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  5.533
   2)  10.000;  3.538
   3)  15.000;  2.724
   4)  20.000;  2.263
   5)  25.000;  1.959
   6)  30.000;  1.742
   7)  40.000;  1.447
   8)  50.000;  1.253
   9)  60.000;  1.114
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

******************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    184.00
```

```
  DOWNSTREAM ELEVATION(FEET) =    183.80
  ELEVATION DIFFERENCE(FEET) =      0.20
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.009
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    50.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.56
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.56

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  183.80  DOWNSTREAM ELEVATION(FEET) =  180.16
  STREET LENGTH(FEET) =   339.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.86
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =    8.66
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.15
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.68
  STREET FLOW TRAVEL TIME(MIN.) =   2.63   Tc(MIN.) =    6.64
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.880
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    0.62      SUBAREA RUNOFF(CFS) =    2.57
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       3.07

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.05
  FLOW VELOCITY(FEET/SEC.) =  2.39   DEPTH*VELOCITY(FT*FT/SEC.) =   0.86
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     439.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.880
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.66
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       3.73
```

```
 TC(MIN.) =    6.64

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   176.10  DOWNSTREAM(FEET) =   174.81
 FLOW LENGTH(FEET) =   226.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.90
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.73
 PIPE TRAVEL TIME(MIN.) =   0.77    Tc(MIN.) =    7.40
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     665.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.574
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
 SUBAREA AREA(ACRES) =    0.64   SUBAREA RUNOFF(CFS) =    2.49
 TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       5.99
 TC(MIN.) =    7.40

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   174.81  DOWNSTREAM(FEET) =   173.70
 FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.62
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.99
 PIPE TRAVEL TIME(MIN.) =   0.55    Tc(MIN.) =    7.95
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     850.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.355
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
 SUBAREA AREA(ACRES) =    0.63   SUBAREA RUNOFF(CFS) =    2.33
 TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       8.03
 TC(MIN.) =    7.95

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    108.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   173.70  DOWNSTREAM(FEET) =   173.52
  FLOW LENGTH(FEET) =    28.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.13
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.03
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    8.03
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     878.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    109.00 TO NODE    108.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.324
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    1.62   SUBAREA RUNOFF(CFS) =    5.95
  TOTAL AREA(ACRES) =        3.8   TOTAL RUNOFF(CFS) =      13.93
  TC(MIN.) =    8.03

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   173.19  DOWNSTREAM(FEET) =   173.08
  FLOW LENGTH(FEET) =    23.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.33
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.93
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    8.09
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     901.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.300
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.73
  TOTAL AREA(ACRES) =        4.0   TOTAL RUNOFF(CFS) =      14.58
  TC(MIN.) =    8.09

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   173.08  DOWNSTREAM(FEET) =   172.00
  FLOW LENGTH(FEET) =   181.00   MANNING'S N =  0.011
```

```
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.98
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.58
  PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =    8.52
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =    1082.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.128
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8399
  SUBAREA AREA(ACRES) =    1.35   SUBAREA RUNOFF(CFS) =    4.51
  TOTAL AREA(ACRES) =        5.3   TOTAL RUNOFF(CFS) =      18.51
  TC(MIN.) =    8.52

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   171.67  DOWNSTREAM(FEET) =   170.50
  FLOW LENGTH(FEET) =   176.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.62
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.51
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =    8.91
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    114.00 =    1258.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.974
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8417
  SUBAREA AREA(ACRES) =    1.14   SUBAREA RUNOFF(CFS) =    3.85
  TOTAL AREA(ACRES) =        6.5   TOTAL RUNOFF(CFS) =      21.67
  TC(MIN.) =    8.91

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  17.00   RAIN INTENSITY(INCH/HOUR) =  2.54
  TOTAL AREA(ACRES) =     6.49   TOTAL RUNOFF(CFS) =      7.91

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    117.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   170.50  DOWNSTREAM(FEET) =   169.32
  FLOW LENGTH(FEET) =    14.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.23
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.91
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   17.01
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    117.00 =    1272.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    117.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.538
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4898
  SUBAREA AREA(ACRES) =    0.58   SUBAREA RUNOFF(CFS) =    0.88
  TOTAL AREA(ACRES) =        7.1   TOTAL RUNOFF(CFS) =       8.79
  TC(MIN.) =   17.01

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    119.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   168.99  DOWNSTREAM(FEET) =   162.63
  FLOW LENGTH(FEET) =    26.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.23
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.79
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =   17.03
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    119.00 =    1298.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    119.00 IS CODE =  16
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED CONSTANT SOURCE FLOW AT NODE<<<<<
============================================================================
  USER-SPECIFIED CONSTANT SOURCE FLOW =   181.47(CFS)
  USER-SPECIFIED AREA ASSOCIATED TO SOURCE FLOW =   115.00(ACRES)
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =   181.47  AREA(AC.) =   115.00
  * SUMMED DATA: FLOW(CFS) =   190.26    TOTAL AREA(ACRES) =   122.07

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    121.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   159.30  DOWNSTREAM(FEET) =   128.21
  FLOW LENGTH(FEET) =   258.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  60.0 INCH PIPE IS  18.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  35.81
  GIVEN PIPE DIAMETER(INCH) =  60.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     190.26
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   17.15
```

```
  * TOTAL SOURCE FLOW(CFS) =     181.47
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    121.00 =    1556.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   127.88  DOWNSTREAM(FEET) =   127.44
  FLOW LENGTH(FEET) =    88.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.47
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  52.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =     190.26
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =   17.31
  * TOTAL SOURCE FLOW(CFS) =     181.47
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    122.00 =    1644.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.511
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4959
  SUBAREA AREA(ACRES) =    0.42   SUBAREA RUNOFF(CFS) =    0.63
  TOTAL AREA(ACRES) =        7.5   TOTAL RUNOFF(CFS) =       9.33
  TC(MIN.) =   17.31

  * SOURCE FLOW DATA: FLOW(CFS) =     181.47     AREA(ACRES) =      115.0
  * SUMMED DATA: FLOW(CFS) =     190.80    TOTAL AREA(ACRES) =      122.5

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   127.42  DOWNSTREAM(FEET) =   126.97
  FLOW LENGTH(FEET) =    95.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.22
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  52.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =     190.80
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =   17.48
  * TOTAL SOURCE FLOW(CFS) =     181.47
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    123.00 =    1739.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   119.00  DOWNSTREAM(FEET) =   118.80
```

```
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.98
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =     190.80
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   17.55
  * TOTAL SOURCE FLOW(CFS) =     181.47
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    124.00 =    1779.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    76.00
  UPSTREAM ELEVATION(FEET) =    187.50
  DOWNSTREAM ELEVATION(FEET) =    186.10
  ELEVATION DIFFERENCE(FEET) =      1.40
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.200
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.24
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.24

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  186.10  DOWNSTREAM ELEVATION(FEET) =  184.53
  STREET LENGTH(FEET) =   140.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.76
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    8.34
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.16
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.67
  STREET FLOW TRAVEL TIME(MIN.) =   1.08   Tc(MIN.) =    4.28
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    0.65      SUBAREA RUNOFF(CFS) =    3.06
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       3.29
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.29
  FLOW VELOCITY(FEET/SEC.) =  2.47   DEPTH*VELOCITY(FT*FT/SEC.) =   0.90
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     216.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    2.82
  TOTAL AREA(ACRES) =        1.3   TOTAL RUNOFF(CFS) =       6.11
  TC(MIN.) =    4.28

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   180.50  DOWNSTREAM(FEET) =   178.30
  FLOW LENGTH(FEET) =   274.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.16
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.11
  PIPE TRAVEL TIME(MIN.) =   0.74    Tc(MIN.) =    5.02
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     490.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.525
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8057
  SUBAREA AREA(ACRES) =    0.28   SUBAREA RUNOFF(CFS) =    0.93
  TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       7.03
  TC(MIN.) =    5.02

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    206.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   178.30  DOWNSTREAM(FEET) =   177.30
  FLOW LENGTH(FEET) =    87.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.33
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.03
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    5.22
```

```
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =     577.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    207.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.446
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8130
 SUBAREA AREA(ACRES) =    0.31   SUBAREA RUNOFF(CFS) =    1.44
 TOTAL AREA(ACRES) =       1.9   TOTAL RUNOFF(CFS) =       8.37
 TC(MIN.) =    5.22

****************************************************************************
 FLOW PROCESS FROM NODE    206.00 TO NODE    208.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   177.26  DOWNSTREAM(FEET) =   176.50
 FLOW LENGTH(FEET) =    61.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.05
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.37
 PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    5.34
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    208.00 =     638.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    208.00 TO NODE    208.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.396
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8186
 SUBAREA AREA(ACRES) =    0.34   SUBAREA RUNOFF(CFS) =    1.56
 TOTAL AREA(ACRES) =       2.2   TOTAL RUNOFF(CFS) =       9.85
 TC(MIN.) =    5.34

****************************************************************************
 FLOW PROCESS FROM NODE    208.00 TO NODE    208.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    209.00 TO NODE    210.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 UPSTREAM ELEVATION(FEET) =    186.50
 DOWNSTREAM ELEVATION(FEET) =    184.62
 ELEVATION DIFFERENCE(FEET) =      1.88
```

```
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.326
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH =    83.20
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      1.46
 TOTAL AREA(ACRES) =      0.31   TOTAL RUNOFF(CFS) =      1.46

****************************************************************************
 FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   180.62  DOWNSTREAM(FEET) =   179.33
 FLOW LENGTH(FEET) =   154.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.42
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.46
 PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =    3.91
 LONGEST FLOWPATH FROM NODE    209.00 TO NODE    211.00 =     254.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    211.00 TO NODE    211.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
 SUBAREA AREA(ACRES) =    0.45   SUBAREA RUNOFF(CFS) =    2.12
 TOTAL AREA(ACRES) =        0.8   TOTAL RUNOFF(CFS) =       3.57
 TC(MIN.) =    3.91

****************************************************************************
 FLOW PROCESS FROM NODE    211.00 TO NODE    212.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   179.00  DOWNSTREAM(FEET) =   178.63
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.43
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.57
 PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    3.98
 LONGEST FLOWPATH FROM NODE    209.00 TO NODE    212.00 =     284.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    213.00 TO NODE    212.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.68   SUBAREA RUNOFF(CFS) =    3.20
  TOTAL AREA(ACRES) =        1.4   TOTAL RUNOFF(CFS) =       6.77
  TC(MIN.) =    3.98

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    214.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   178.63  DOWNSTREAM(FEET) =   177.11
  FLOW LENGTH(FEET) =   123.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.52
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.77
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    4.26
  LONGEST FLOWPATH FROM NODE    209.00 TO NODE    214.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    214.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    1.53   SUBAREA RUNOFF(CFS) =    7.20
  TOTAL AREA(ACRES) =        3.0   TOTAL RUNOFF(CFS) =      13.97
  TC(MIN.) =    4.26

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    216.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   176.60  DOWNSTREAM(FEET) =   176.50
  FLOW LENGTH(FEET) =     5.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.80
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.97
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    4.27
  LONGEST FLOWPATH FROM NODE    209.00 TO NODE    216.00 =     412.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    216.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       13.97     4.27       5.533        2.97
  LONGEST FLOWPATH FROM NODE    209.00 TO NODE    216.00 =     412.00 FEET.
```

```
  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)   (ACRE)
      1        9.85      5.34       5.396        2.23
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    216.00 =     638.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      21.83       4.27        5.533
      2      23.47       5.34        5.396

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      23.47   Tc(MIN.) =    5.34
  TOTAL AREA(ACRES) =        5.2

****************************************************************************
  FLOW PROCESS FROM NODE    217.00 TO NODE    217.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  11.00   RAIN INTENSITY(INCH/HOUR) =  3.38
  TOTAL AREA(ACRES) =     5.22   TOTAL RUNOFF(CFS) =      6.44

****************************************************************************
  FLOW PROCESS FROM NODE    217.00 TO NODE    218.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   175.75  DOWNSTREAM(FEET) =   146.69
  FLOW LENGTH(FEET) =   538.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.04
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.44
  PIPE TRAVEL TIME(MIN.) =   0.69    Tc(MIN.) =   11.69
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    218.00 =    1176.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    218.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.263
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3791
  SUBAREA AREA(ACRES) =    0.32   SUBAREA RUNOFF(CFS) =    0.63
  TOTAL AREA(ACRES) =        5.5   TOTAL RUNOFF(CFS) =       6.85
  TC(MIN.) =   11.69

****************************************************************************
  FLOW PROCESS FROM NODE    219.00 TO NODE    219.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.263
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3822
  SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.16
  TOTAL AREA(ACRES) =        5.6   TOTAL RUNOFF(CFS) =       7.01
  TC(MIN.) =   11.69

****************************************************************************
  FLOW PROCESS FROM NODE    219.00 TO NODE    218.00 IS CODE =  16
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED CONSTANT SOURCE FLOW AT NODE<<<<<
============================================================================
  USER-SPECIFIED CONSTANT SOURCE FLOW =   312.81(CFS)
  USER-SPECIFIED AREA ASSOCIATED TO SOURCE FLOW =   227.30(ACRES)
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =   312.81  AREA(AC.) =   227.30
  * SUMMED DATA: FLOW(CFS) =   319.82    TOTAL AREA(ACRES) =   232.92

****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    220.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   141.86  DOWNSTREAM(FEET) =   130.64
  FLOW LENGTH(FEET) =   216.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  72.0 INCH PIPE IS  28.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  30.09
  GIVEN PIPE DIAMETER(INCH) =  72.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     319.82
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   11.81
  * TOTAL SOURCE FLOW(CFS) =     312.81
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    220.00 =    1392.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.244
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3856
  SUBAREA AREA(ACRES) =    0.09   SUBAREA RUNOFF(CFS) =    0.18
  TOTAL AREA(ACRES) =        5.7   TOTAL RUNOFF(CFS) =       7.14
  TC(MIN.) =   11.81

  * SOURCE FLOW DATA: FLOW(CFS) =     312.81     AREA(ACRES) =      227.3
  * SUMMED DATA: FLOW(CFS) =     319.95    TOTAL AREA(ACRES) =      233.0

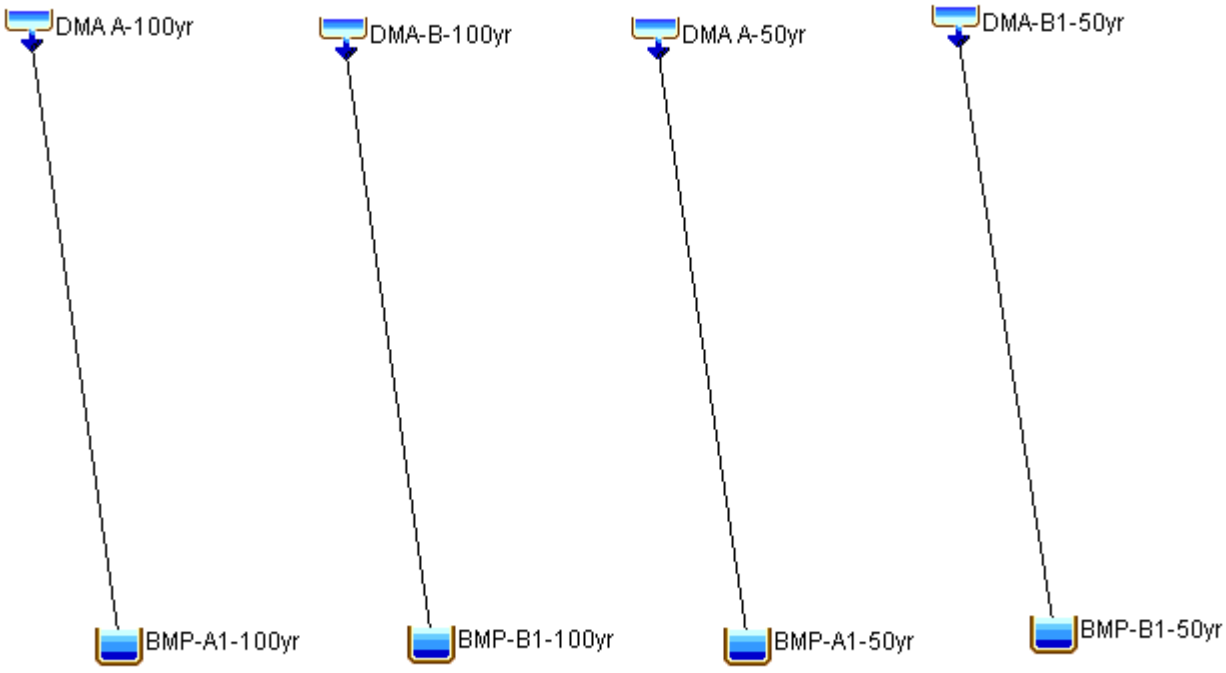
****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    221.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   130.31  DOWNSTREAM(FEET) =   128.05
  FLOW LENGTH(FEET) =   137.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.31
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   3
  PIPE-FLOW(CFS) =     319.95
```

```
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =   11.95
  * TOTAL SOURCE FLOW(CFS) =     312.81
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    221.00 =    1529.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =         5.7  TC(MIN.) =     11.95
  PEAK FLOW RATE(CFS)   =        7.14
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =     312.81  AREA(AC.) =      227.3
  * SUMMED DATA: FLOW(CFS) =     319.95    TOTAL AREA(ACRES) =      233.0
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix 5

Modified-Puls Detention Routing

HEC-HMS Detention Routing Summary



Summary Results for Reservoir "BMP-A1-100yr"

Project: Nirvana Simulation Run: Q100
Reservoir: BMP-A1-100yr

Start of Run:	01Jan2000, 00:00	Basin Model:	Post_Dev
End of Run:	01Jan2000, 06:05	Meteorologic Model:	Met 1
Compute Time:	DATA CHANGED, RECOMPUTE	Control Specifications:	Control 1

Volume Units: (•) IN ( ) AC-FT

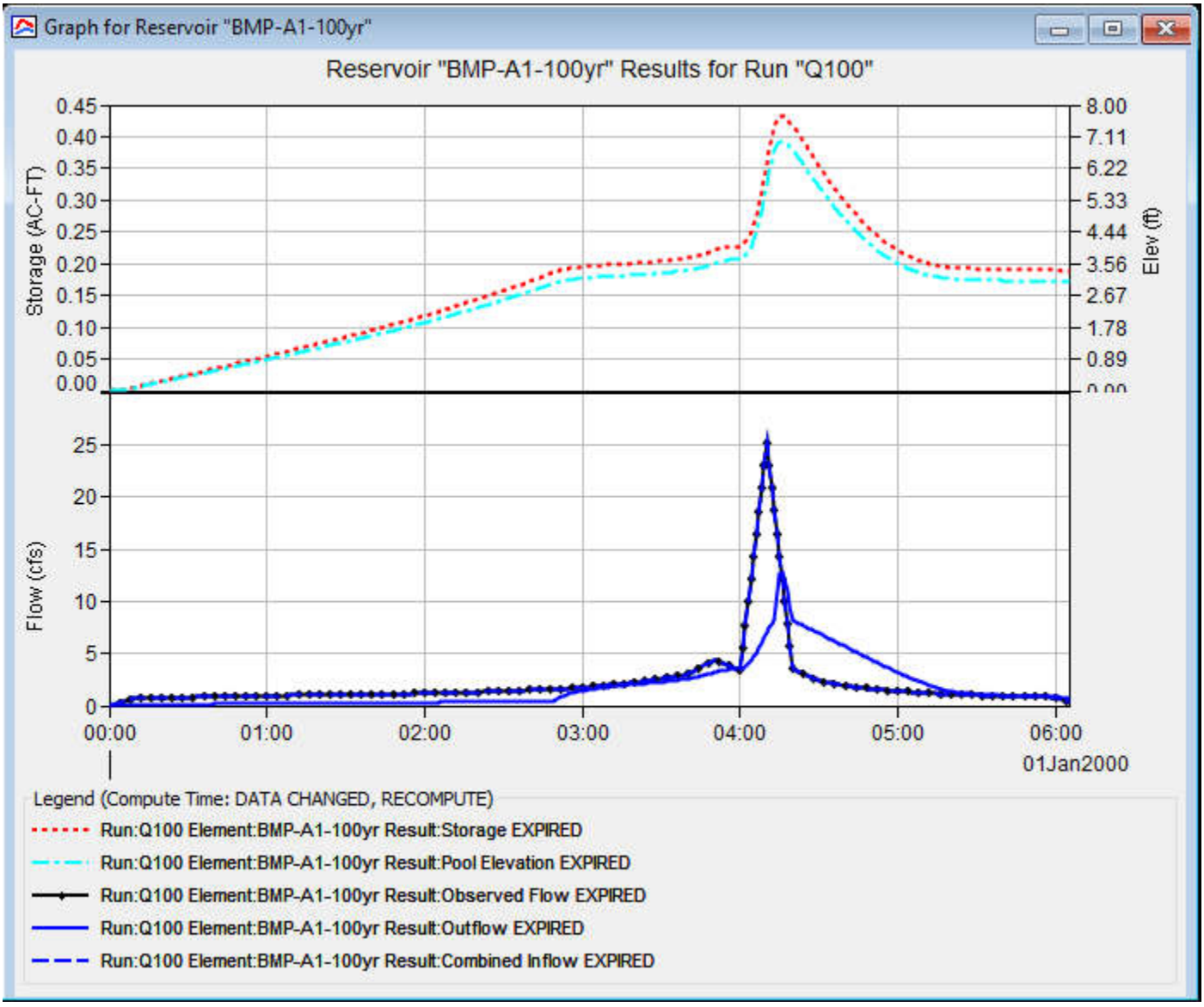
Computed Results

Peak Inflow:	25.13 (CFS)	Date/Time of Peak Inflow:	01Jan2000, 04:09
Peak Discharge:	12.79 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:16
Inflow Volume:	n/a	Peak Storage:	0.43311 (AC-FT)
Discharge Volume:	n/a	Peak Elevation:	6.987 (FT)

Observed Flow Gage BMP-A1-100yr

Peak Discharge:	25.13 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:10
Volume:	(IN)		
RMSE Std Dev:	0.80	Nash-Sutcliffe:	0.368
Percent Bias:	-17.17 %		

Graph for Reservoir "BMP-A1-100yr"



Summary Results for Reservoir "BMP-B1-100yr"

Project: Nirvana Simulation Run: Q100
Reservoir: BMP-B1-100yr

Start of Run:	01Jan2000, 00:00	Basin Model:	Post_Dev
End of Run:	01Jan2000, 06:05	Meteorologic Model:	Met 1
Compute Time:	DATA CHANGED, RECOMPUTE	Control Specifications:	Control 1

Volume Units: (•) IN ( ) AC-FT

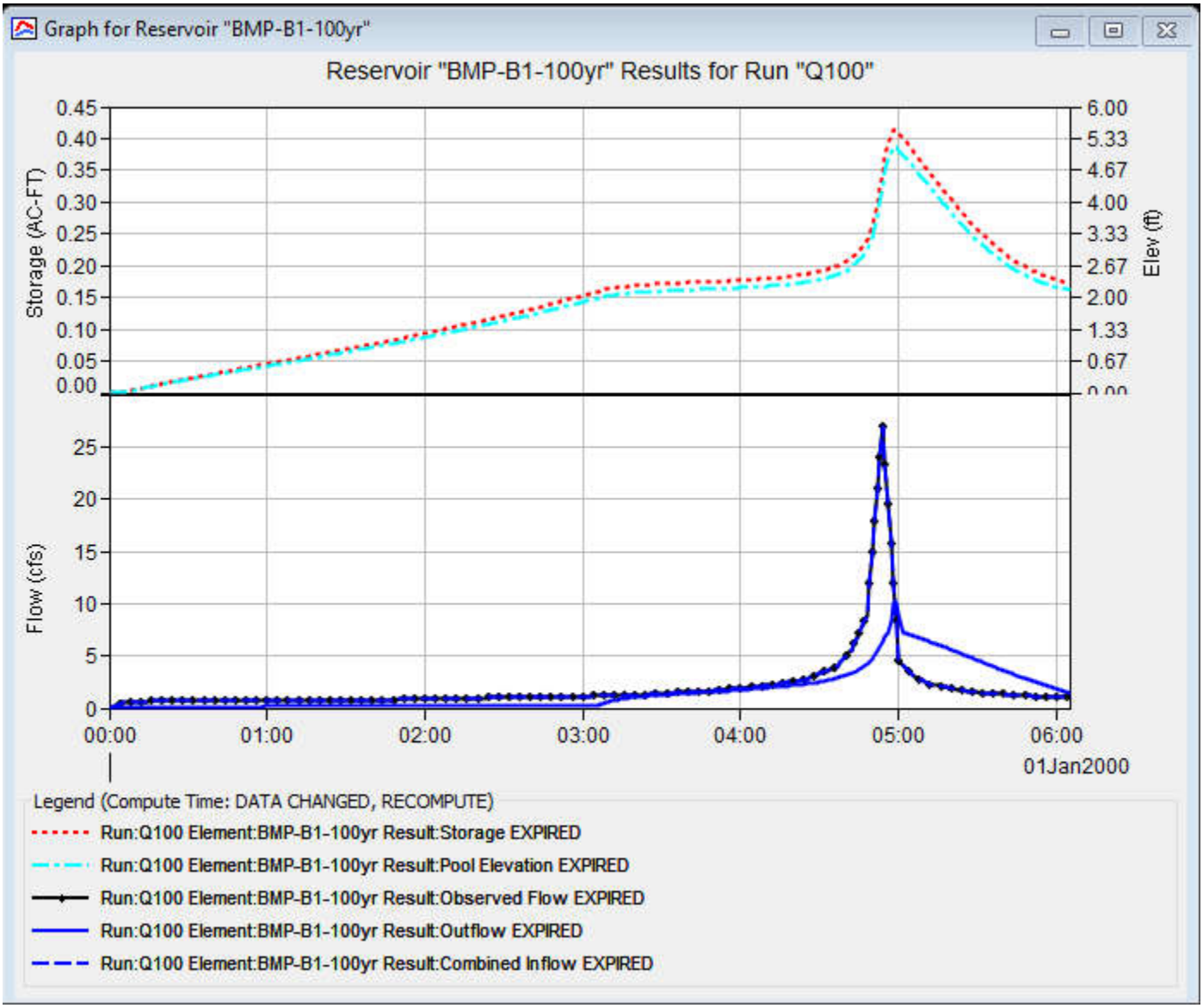
Computed Results

Peak Inflow:	27.00 (CFS)	Date/Time of Peak Inflow:	01Jan2000, 04:53
Peak Discharge:	9.98 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:59
Inflow Volume:	n/a	Peak Storage:	0.41288 (AC-FT)
Discharge Volume:	n/a	Peak Elevation:	5.139 (FT)

Observed Flow Gage BMP-B1-100yr

Peak Discharge:	27.00 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:54
Volume:	(IN)		
RMSE Std Dev:	0.83	Nash-Sutcliffe:	0.307
Percent Bias:	-17.61 %		

Graph for Reservoir "BMP-B1-100yr"



Summary Results for Reservoir "BMP-A1-50yr"

Project: Nirvana Simulation Run: Q100
Reservoir: BMP-A1-50yr

Start of Run:	01Jan2000, 00:00	Basin Model:	Post_Dev
End of Run:	01Jan2000, 06:05	Meteorologic Model:	Met 1
Compute Time:	DATA CHANGED, RECOMPUTE	Control Specifications:	Control 1

Volume Units: (•) IN ( ) AC-FT

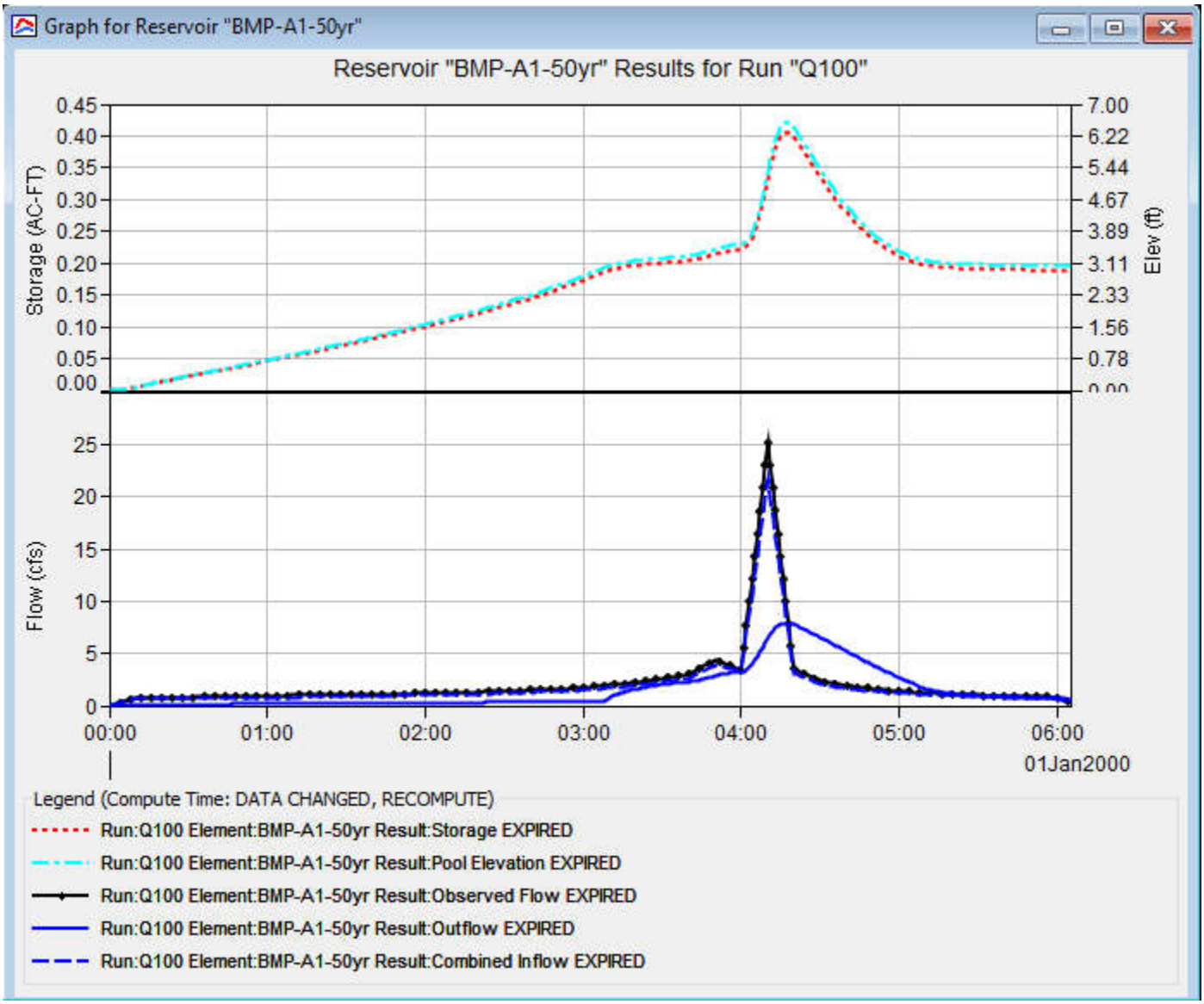
Computed Results

Peak Inflow:	21.67 (CFS)	Date/Time of Peak Inflow:	01Jan2000, 04:09
Peak Discharge:	7.91 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:17
Inflow Volume:	n/a	Peak Storage:	0.40593 (AC-FT)
Discharge Volume:	n/a	Peak Elevation:	6.549 (FT)

Observed Flow Gage BMP-A1-100yr

Peak Discharge:	25.13 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:10
Volume:	(IN)		
RMSE Std Dev:	0.82	Nash-Sutcliffe:	0.330
Percent Bias:	-29.85 %		

Graph for Reservoir "BMP-A1-50yr"



Summary Results for Reservoir "BMP-B1-50yr"

Project: Nirvana Simulation Run: Q100
Reservoir: BMP-B1-50yr

Start of Run:	01Jan2000, 00:00	Basin Model:	Post_Dev
End of Run:	01Jan2000, 06:05	Meteorologic Model:	Met 1
Compute Time:	DATA CHANGED, RECOMPUTE	Control Specifications:	Control 1

Volume Units: (•) IN ( ) AC-FT

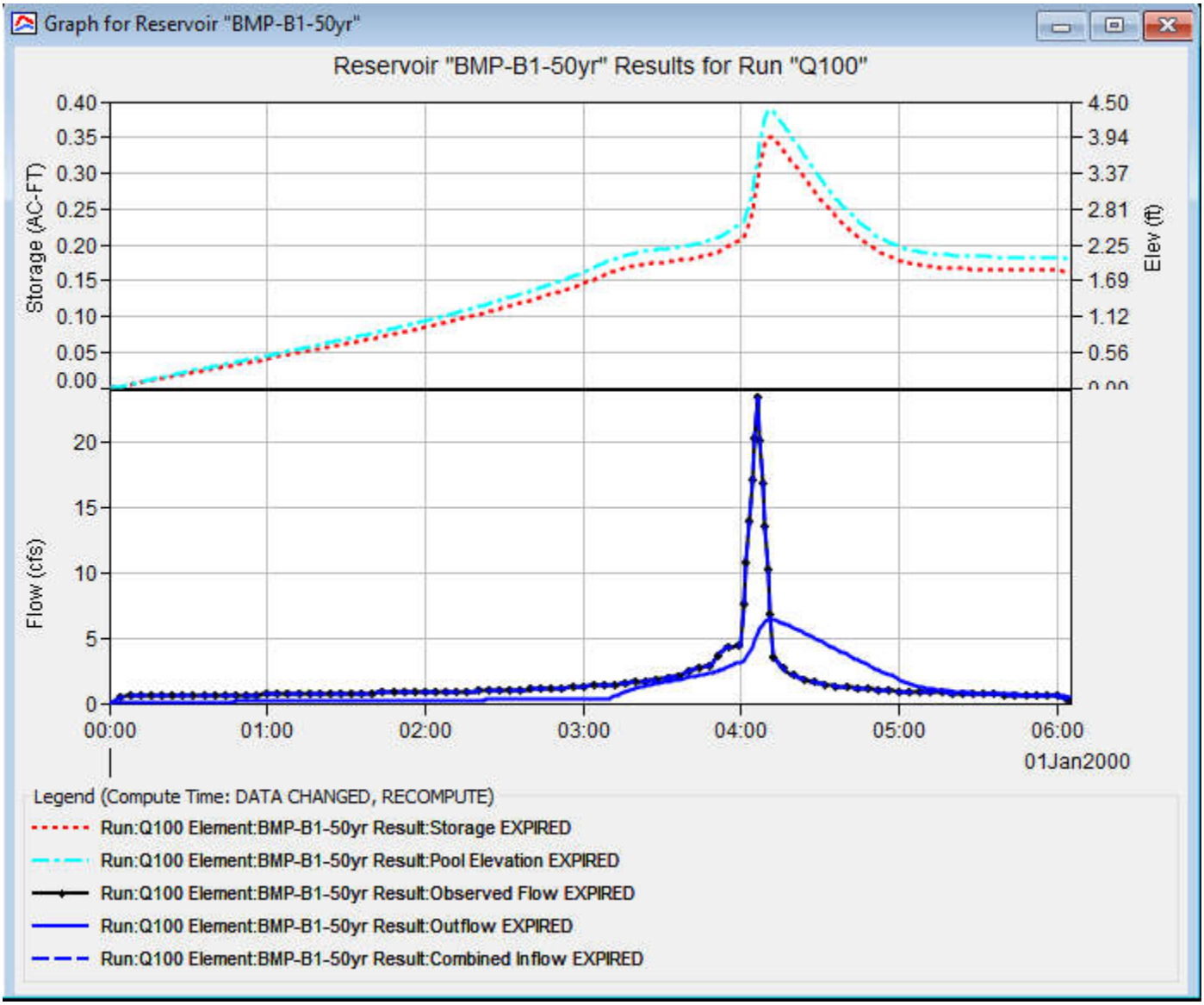
Computed Results

Peak Inflow:	23.47 (CFS)	Date/Time of Peak Inflow:	01Jan2000, 04:05
Peak Discharge:	6.44 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:11
Inflow Volume:	n/a	Peak Storage:	0.35158 (AC-FT)
Discharge Volume:	n/a	Peak Elevation:	4.375 (FT)

Observed Flow Gage BMP-B1-50yr

Peak Discharge:	23.47 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:06
Volume:	(IN)		
RMSE Std Dev:	0.85	Nash-Sutcliffe:	0.278
Percent Bias:	-21.04 %		

Graph for Reservoir "BMP-B1-50yr"



Outlet Structure for Discharge of BMP-A1

Discharge vs. Elevation Table

Low-flow orifice		Slot orifice		Emergency Overflow	
No.:	1	No.:	1	Invert:	6.75 ft
Invert:	0 ft	Invert:	3.00 ft	L:	12 ft
Dia:	3 in	Length:	3.25 ft	C_w:	3.1
Dia:	0.25 ft	Height	0.25 ft	Tank Dimensions	
A:	0.049 sq.ft.	A:	0.81 sq.ft	Area:	2,700 sq.ft.
C_o:	0.6	C_o:	0.6	Height:	7.50 ft
				Total Vol:	20,250 cu.ft.

***Note: h = head above the invert of the lowest surface discharge opening.**

Elev (ft)	h* (ft)	Volume (ac-ft)	$Q_{orifice-low}$ (cfs)	$Q_{slot-mid}$ (cfs)	Q_{emerg} (cfs)	Q_{total} (cfs)
170.50	0.00	0.0000	0.0000	0.000	0.000	0.0000
170.75	0.25	0.0155	0.0969	0.000	0.000	0.0969
171.00	0.50	0.0310	0.1563	0.000	0.000	0.1563
171.25	0.75	0.0465	0.1960	0.000	0.000	0.1960
171.50	1.00	0.0620	0.2288	0.000	0.000	0.2288
171.75	1.25	0.0775	0.2576	0.000	0.000	0.2576
172.00	1.50	0.0930	0.2834	0.000	0.000	0.2834
172.25	1.75	0.1085	0.3070	0.000	0.000	0.3070
172.50	2.00	0.1240	0.3290	0.000	0.000	0.3290
172.75	2.25	0.1395	0.3496	0.000	0.000	0.3496
173.00	2.50	0.1550	0.3690	0.000	0.000	0.3690
173.25	2.75	0.1705	0.3875	0.000	0.000	0.3875
173.50	3.00	0.1860	0.4051	0.000	0.000	0.4051
173.75	3.25	0.2014	0.4220	1.694	0.000	2.1160
174.00	3.50	0.2169	0.4382	2.588	0.000	3.0259
174.25	3.75	0.2324	0.4539	3.244	0.000	3.6977
174.50	4.00	0.2479	0.4690	3.788	0.000	4.2569
174.75	4.25	0.2634	0.4837	4.263	0.000	4.7468
175.00	4.50	0.2789	0.4979	4.691	0.000	5.1884
175.25	4.75	0.2944	0.5117	5.082	0.000	5.5938
175.50	5.00	0.3099	0.5252	5.446	0.000	5.9707
175.75	5.25	0.3254	0.5383	5.786	0.000	6.3245
176.00	5.50	0.3409	0.5511	6.108	0.000	6.6590
176.25	5.75	0.3564	0.5637	6.413	0.000	6.9771
176.50	6.00	0.3719	0.5759	6.705	0.000	7.2810
176.75	6.25	0.3874	0.5879	6.985	0.000	7.5725
177.00	6.50	0.4029	0.5997	7.253	0.000	7.8530
177.25	6.75	0.4184	0.6112	7.512	0.000	8.1237
177.50	7.00	0.4339	0.6225	7.763	4.650	13.0355
177.75	7.25	0.4494	0.6337	8.006	13.152	21.7915
178.00	7.50	0.4649	0.6446	8.241	24.162	33.0478

Note:

1. Weir equation, $Q=C_wL_e(h)^{3/2}$
2. Orifice equation, $Q=C_oA_e(2gh)^{1/2}$
3. Slot orifice acts as a weir when $h^* < h_{slot}$; slot orifice acts as an orifice when $h^* \geq h_{slot}$

Outlet Structure for Discharge of BMP-B1

Discharge vs. Elevation Table

Low-flow orifice		Slot orifice		Emergency Overflow	
No.:	1	No.:	1	Invert:	5.00 ft
Invert:	0 ft	Invert:	2.00 ft	L:	12 ft
Dia:	3 in	Length:	3.25 ft	C_w:	3.1
Dia:	0.25 ft	Height	0.25 ft	Tank Dimensions	
A:	0.049 sq.ft.	A:	0.81 sq.ft	Area:	3,500 sq.ft.
C_o:	0.6	C_o:	0.6	Height:	5.67 ft
				Total Vol:	19,845 cu.ft.

***Note: h = head above the invert of the lowest surface discharge opening.**

Elev (ft)	h* (ft)	Volume (ac-ft)	$Q_{orifice-low}$ (cfs)	$Q_{slot-mid}$ (cfs)	Q_{emerg} (cfs)	Q_{total} (cfs)
175.75	0.00	0.0000	0.0000	0.000	0.000	0.0000
176.00	0.25	0.0201	0.0969	0.000	0.000	0.0969
176.25	0.50	0.0402	0.1563	0.000	0.000	0.1563
176.50	0.75	0.0603	0.1960	0.000	0.000	0.1960
176.75	1.00	0.0803	0.2288	0.000	0.000	0.2288
177.00	1.25	0.1004	0.2576	0.000	0.000	0.2576
177.25	1.50	0.1205	0.2834	0.000	0.000	0.2834
177.50	1.75	0.1406	0.3070	0.000	0.000	0.3070
177.75	2.00	0.1607	0.3290	0.000	0.000	0.3290
178.00	2.25	0.1808	0.3496	1.694	0.000	2.0436
178.25	2.50	0.2009	0.3690	2.588	0.000	2.9567
178.50	2.75	0.2210	0.3875	3.244	0.000	3.6313
178.75	3.00	0.2410	0.4051	3.788	0.000	4.1930
179.00	3.25	0.2611	0.4220	4.263	0.000	4.6852
179.25	3.50	0.2812	0.4382	4.691	0.000	5.1287
179.50	3.75	0.3013	0.4539	5.082	0.000	5.5359
179.75	4.00	0.3214	0.4690	5.446	0.000	5.9145
180.00	4.25	0.3415	0.4837	5.786	0.000	6.2698
180.25	4.50	0.3616	0.4979	6.108	0.000	6.6058
180.50	4.75	0.3817	0.5117	6.413	0.000	6.9252
180.75	5.00	0.4017	0.5252	6.705	0.000	7.2303
181.00	5.25	0.4218	0.5383	6.985	4.650	12.1729
181.25	5.50	0.4419	0.5511	7.253	13.152	20.9567
181.42	5.67	0.4556	0.5597	7.431	20.401	28.3914

Note:

1. Weir equation, $Q=C_wL_e(h)^{3/2}$
2. Orifice equation, $Q=C_oA_e(2gh)^{1/2}$
3. Slot orifice acts as a weir when $h^* < h_{slot}$; slot orifice acts as an orifice when $h^* \geq h_{slot}$

RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 3/7/2022
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 10 MIN.
6 HOUR RAINFALL 2.4 INCHES
BASIN AREA 6.49 ACRES
RUNOFF COEFFICIENT 0.85
PEAK DISCHARGE 25.13 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 10	DISCHARGE (CFS) = 0.8
TIME (MIN) = 20	DISCHARGE (CFS) = 0.8
TIME (MIN) = 30	DISCHARGE (CFS) = 0.8
TIME (MIN) = 40	DISCHARGE (CFS) = 0.9
TIME (MIN) = 50	DISCHARGE (CFS) = 0.9
TIME (MIN) = 60	DISCHARGE (CFS) = 0.9
TIME (MIN) = 70	DISCHARGE (CFS) = 1
TIME (MIN) = 80	DISCHARGE (CFS) = 1
TIME (MIN) = 90	DISCHARGE (CFS) = 1
TIME (MIN) = 100	DISCHARGE (CFS) = 1.1
TIME (MIN) = 110	DISCHARGE (CFS) = 1.1
TIME (MIN) = 120	DISCHARGE (CFS) = 1.2
TIME (MIN) = 130	DISCHARGE (CFS) = 1.3
TIME (MIN) = 140	DISCHARGE (CFS) = 1.3
TIME (MIN) = 150	DISCHARGE (CFS) = 1.4
TIME (MIN) = 160	DISCHARGE (CFS) = 1.5
TIME (MIN) = 170	DISCHARGE (CFS) = 1.6
TIME (MIN) = 180	DISCHARGE (CFS) = 1.7
TIME (MIN) = 190	DISCHARGE (CFS) = 2
TIME (MIN) = 200	DISCHARGE (CFS) = 2.2
TIME (MIN) = 210	DISCHARGE (CFS) = 2.6
TIME (MIN) = 220	DISCHARGE (CFS) = 3
TIME (MIN) = 230	DISCHARGE (CFS) = 4.4
TIME (MIN) = 240	DISCHARGE (CFS) = 3.4
TIME (MIN) = 250	DISCHARGE (CFS) = 25.13
TIME (MIN) = 260	DISCHARGE (CFS) = 3.5
TIME (MIN) = 270	DISCHARGE (CFS) = 2.4
TIME (MIN) = 280	DISCHARGE (CFS) = 1.9
TIME (MIN) = 290	DISCHARGE (CFS) = 1.6
TIME (MIN) = 300	DISCHARGE (CFS) = 1.4
TIME (MIN) = 310	DISCHARGE (CFS) = 1.2
TIME (MIN) = 320	DISCHARGE (CFS) = 1.1
TIME (MIN) = 330	DISCHARGE (CFS) = 1
TIME (MIN) = 340	DISCHARGE (CFS) = 0.9
TIME (MIN) = 350	DISCHARGE (CFS) = 0.9
TIME (MIN) = 360	DISCHARGE (CFS) = 0.8
TIME (MIN) = 370	DISCHARGE (CFS) = 0

RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 3/7/2022
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 2.4 INCHES
BASIN AREA 5.22 ACRES
RUNOFF COEFFICIENT 0.85
PEAK DISCHARGE 27 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.6
TIME (MIN) = 10	DISCHARGE (CFS) = 0.6
TIME (MIN) = 15	DISCHARGE (CFS) = 0.7
TIME (MIN) = 20	DISCHARGE (CFS) = 0.7
TIME (MIN) = 25	DISCHARGE (CFS) = 0.7
TIME (MIN) = 30	DISCHARGE (CFS) = 0.7
TIME (MIN) = 35	DISCHARGE (CFS) = 0.7
TIME (MIN) = 40	DISCHARGE (CFS) = 0.7
TIME (MIN) = 45	DISCHARGE (CFS) = 0.7
TIME (MIN) = 50	DISCHARGE (CFS) = 0.7
TIME (MIN) = 55	DISCHARGE (CFS) = 0.7
TIME (MIN) = 60	DISCHARGE (CFS) = 0.7
TIME (MIN) = 65	DISCHARGE (CFS) = 0.8
TIME (MIN) = 70	DISCHARGE (CFS) = 0.8
TIME (MIN) = 75	DISCHARGE (CFS) = 0.8
TIME (MIN) = 80	DISCHARGE (CFS) = 0.8
TIME (MIN) = 85	DISCHARGE (CFS) = 0.8
TIME (MIN) = 90	DISCHARGE (CFS) = 0.8
TIME (MIN) = 95	DISCHARGE (CFS) = 0.9
TIME (MIN) = 100	DISCHARGE (CFS) = 0.9
TIME (MIN) = 105	DISCHARGE (CFS) = 0.9
TIME (MIN) = 110	DISCHARGE (CFS) = 0.9
TIME (MIN) = 115	DISCHARGE (CFS) = 0.9
TIME (MIN) = 120	DISCHARGE (CFS) = 1
TIME (MIN) = 125	DISCHARGE (CFS) = 1
TIME (MIN) = 130	DISCHARGE (CFS) = 1
TIME (MIN) = 135	DISCHARGE (CFS) = 1.1
TIME (MIN) = 140	DISCHARGE (CFS) = 1.1
TIME (MIN) = 145	DISCHARGE (CFS) = 1.1
TIME (MIN) = 150	DISCHARGE (CFS) = 1.1
TIME (MIN) = 155	DISCHARGE (CFS) = 1.2
TIME (MIN) = 160	DISCHARGE (CFS) = 1.2
TIME (MIN) = 165	DISCHARGE (CFS) = 1.3
TIME (MIN) = 170	DISCHARGE (CFS) = 1.3
TIME (MIN) = 175	DISCHARGE (CFS) = 1.4
TIME (MIN) = 180	DISCHARGE (CFS) = 1.5
TIME (MIN) = 185	DISCHARGE (CFS) = 1.6
TIME (MIN) = 190	DISCHARGE (CFS) = 1.6
TIME (MIN) = 195	DISCHARGE (CFS) = 1.8
TIME (MIN) = 200	DISCHARGE (CFS) = 1.9
TIME (MIN) = 205	DISCHARGE (CFS) = 2.1
TIME (MIN) = 210	DISCHARGE (CFS) = 2.2
TIME (MIN) = 215	DISCHARGE (CFS) = 2.5
TIME (MIN) = 220	DISCHARGE (CFS) = 2.7
TIME (MIN) = 225	DISCHARGE (CFS) = 3.3
TIME (MIN) = 230	DISCHARGE (CFS) = 3.8
TIME (MIN) = 235	DISCHARGE (CFS) = 5.6
TIME (MIN) = 240	DISCHARGE (CFS) = 8.9
TIME (MIN) = 245	DISCHARGE (CFS) = 27
TIME (MIN) = 250	DISCHARGE (CFS) = 4.5
TIME (MIN) = 255	DISCHARGE (CFS) = 3
TIME (MIN) = 260	DISCHARGE (CFS) = 2.3
TIME (MIN) = 265	DISCHARGE (CFS) = 2
TIME (MIN) = 270	DISCHARGE (CFS) = 1.7
TIME (MIN) = 275	DISCHARGE (CFS) = 1.5
TIME (MIN) = 280	DISCHARGE (CFS) = 1.4
TIME (MIN) = 285	DISCHARGE (CFS) = 1.3
TIME (MIN) = 290	DISCHARGE (CFS) = 1.2
TIME (MIN) = 295	DISCHARGE (CFS) = 1.1
TIME (MIN) = 300	DISCHARGE (CFS) = 1
TIME (MIN) = 305	DISCHARGE (CFS) = 1
TIME (MIN) = 310	DISCHARGE (CFS) = 0.9
TIME (MIN) = 315	DISCHARGE (CFS) = 0.9
TIME (MIN) = 320	DISCHARGE (CFS) = 0.8
TIME (MIN) = 325	DISCHARGE (CFS) = 0.8
TIME (MIN) = 330	DISCHARGE (CFS) = 0.8
TIME (MIN) = 335	DISCHARGE (CFS) = 0.8
TIME (MIN) = 340	DISCHARGE (CFS) = 0.7
TIME (MIN) = 345	DISCHARGE (CFS) = 0.7
TIME (MIN) = 350	DISCHARGE (CFS) = 0.7
TIME (MIN) = 355	DISCHARGE (CFS) = 0.7
TIME (MIN) = 360	DISCHARGE (CFS) = 0.6
TIME (MIN) = 365	DISCHARGE (CFS) = 0

RATIONAL METHOD HYDROGRAPH PROGRAM

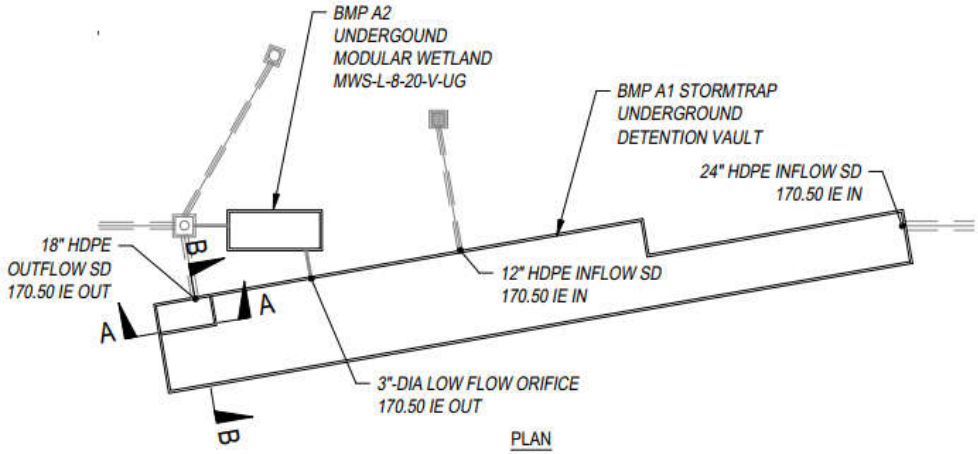
RUN DATE 3/18/2022
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 10 MIN.
6 HOUR RAINFALL 2.1 INCHES
BASIN AREA 6.49 ACRES
RUNOFF COEFFICIENT 0.85
PEAK DISCHARGE 21.67 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 10	DISCHARGE (CFS) = 0.7
TIME (MIN) = 20	DISCHARGE (CFS) = 0.7
TIME (MIN) = 30	DISCHARGE (CFS) = 0.7
TIME (MIN) = 40	DISCHARGE (CFS) = 0.7
TIME (MIN) = 50	DISCHARGE (CFS) = 0.8
TIME (MIN) = 60	DISCHARGE (CFS) = 0.8
TIME (MIN) = 70	DISCHARGE (CFS) = 0.8
TIME (MIN) = 80	DISCHARGE (CFS) = 0.9
TIME (MIN) = 90	DISCHARGE (CFS) = 0.9
TIME (MIN) = 100	DISCHARGE (CFS) = 0.9
TIME (MIN) = 110	DISCHARGE (CFS) = 1
TIME (MIN) = 120	DISCHARGE (CFS) = 1
TIME (MIN) = 130	DISCHARGE (CFS) = 1.1
TIME (MIN) = 140	DISCHARGE (CFS) = 1.1
TIME (MIN) = 150	DISCHARGE (CFS) = 1.2
TIME (MIN) = 160	DISCHARGE (CFS) = 1.3
TIME (MIN) = 170	DISCHARGE (CFS) = 1.4
TIME (MIN) = 180	DISCHARGE (CFS) = 1.5
TIME (MIN) = 190	DISCHARGE (CFS) = 1.7
TIME (MIN) = 200	DISCHARGE (CFS) = 1.9
TIME (MIN) = 210	DISCHARGE (CFS) = 2.3
TIME (MIN) = 220	DISCHARGE (CFS) = 2.6
TIME (MIN) = 230	DISCHARGE (CFS) = 3.9
TIME (MIN) = 240	DISCHARGE (CFS) = 3.3
TIME (MIN) = 250	DISCHARGE (CFS) = 21.67
TIME (MIN) = 260	DISCHARGE (CFS) = 3.1
TIME (MIN) = 270	DISCHARGE (CFS) = 2.1
TIME (MIN) = 280	DISCHARGE (CFS) = 1.6
TIME (MIN) = 290	DISCHARGE (CFS) = 1.4
TIME (MIN) = 300	DISCHARGE (CFS) = 1.2
TIME (MIN) = 310	DISCHARGE (CFS) = 1.1
TIME (MIN) = 320	DISCHARGE (CFS) = 1
TIME (MIN) = 330	DISCHARGE (CFS) = 0.9
TIME (MIN) = 340	DISCHARGE (CFS) = 0.8
TIME (MIN) = 350	DISCHARGE (CFS) = 0.8
TIME (MIN) = 360	DISCHARGE (CFS) = 0.7
TIME (MIN) = 370	DISCHARGE (CFS) = 0

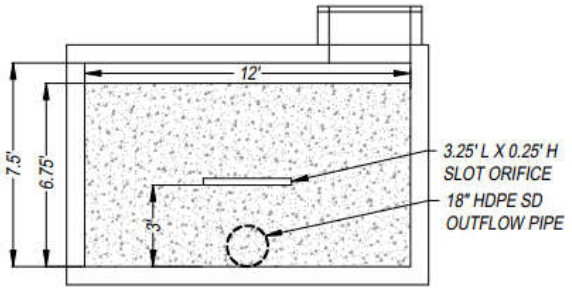
RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 3/18/2022
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 6 MIN.
6 HOUR RAINFALL 2.1 INCHES
BASIN AREA 5.22 ACRES
RUNOFF COEFFICIENT 0.85
PEAK DISCHARGE 23.47 CFS

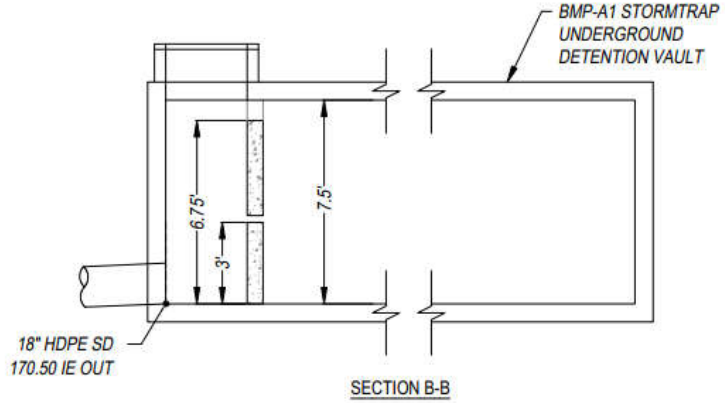
TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 6	DISCHARGE (CFS) = 0.6
TIME (MIN) = 12	DISCHARGE (CFS) = 0.6
TIME (MIN) = 18	DISCHARGE (CFS) = 0.6
TIME (MIN) = 24	DISCHARGE (CFS) = 0.6
TIME (MIN) = 30	DISCHARGE (CFS) = 0.6
TIME (MIN) = 36	DISCHARGE (CFS) = 0.6
TIME (MIN) = 42	DISCHARGE (CFS) = 0.6
TIME (MIN) = 48	DISCHARGE (CFS) = 0.6
TIME (MIN) = 54	DISCHARGE (CFS) = 0.6
TIME (MIN) = 60	DISCHARGE (CFS) = 0.7
TIME (MIN) = 66	DISCHARGE (CFS) = 0.7
TIME (MIN) = 72	DISCHARGE (CFS) = 0.7
TIME (MIN) = 78	DISCHARGE (CFS) = 0.7
TIME (MIN) = 84	DISCHARGE (CFS) = 0.7
TIME (MIN) = 90	DISCHARGE (CFS) = 0.7
TIME (MIN) = 96	DISCHARGE (CFS) = 0.7
TIME (MIN) = 102	DISCHARGE (CFS) = 0.8
TIME (MIN) = 108	DISCHARGE (CFS) = 0.8
TIME (MIN) = 114	DISCHARGE (CFS) = 0.8
TIME (MIN) = 120	DISCHARGE (CFS) = 0.8
TIME (MIN) = 126	DISCHARGE (CFS) = 0.9
TIME (MIN) = 132	DISCHARGE (CFS) = 0.9
TIME (MIN) = 138	DISCHARGE (CFS) = 0.9
TIME (MIN) = 144	DISCHARGE (CFS) = 1
TIME (MIN) = 150	DISCHARGE (CFS) = 1
TIME (MIN) = 156	DISCHARGE (CFS) = 1
TIME (MIN) = 162	DISCHARGE (CFS) = 1.1
TIME (MIN) = 168	DISCHARGE (CFS) = 1.1
TIME (MIN) = 174	DISCHARGE (CFS) = 1.2
TIME (MIN) = 180	DISCHARGE (CFS) = 1.3
TIME (MIN) = 186	DISCHARGE (CFS) = 1.4
TIME (MIN) = 192	DISCHARGE (CFS) = 1.4
TIME (MIN) = 198	DISCHARGE (CFS) = 1.6
TIME (MIN) = 204	DISCHARGE (CFS) = 1.7
TIME (MIN) = 210	DISCHARGE (CFS) = 1.9
TIME (MIN) = 216	DISCHARGE (CFS) = 2.1
TIME (MIN) = 222	DISCHARGE (CFS) = 2.6
TIME (MIN) = 228	DISCHARGE (CFS) = 2.9
TIME (MIN) = 234	DISCHARGE (CFS) = 4.3
TIME (MIN) = 240	DISCHARGE (CFS) = 4.4
TIME (MIN) = 246	DISCHARGE (CFS) = 23.47
TIME (MIN) = 252	DISCHARGE (CFS) = 3.5
TIME (MIN) = 258	DISCHARGE (CFS) = 2.3
TIME (MIN) = 264	DISCHARGE (CFS) = 1.8
TIME (MIN) = 270	DISCHARGE (CFS) = 1.5
TIME (MIN) = 276	DISCHARGE (CFS) = 1.3
TIME (MIN) = 282	DISCHARGE (CFS) = 1.2
TIME (MIN) = 288	DISCHARGE (CFS) = 1.1
TIME (MIN) = 294	DISCHARGE (CFS) = 1
TIME (MIN) = 300	DISCHARGE (CFS) = 0.9
TIME (MIN) = 306	DISCHARGE (CFS) = 0.9
TIME (MIN) = 312	DISCHARGE (CFS) = 0.8
TIME (MIN) = 318	DISCHARGE (CFS) = 0.8
TIME (MIN) = 324	DISCHARGE (CFS) = 0.7
TIME (MIN) = 330	DISCHARGE (CFS) = 0.7
TIME (MIN) = 336	DISCHARGE (CFS) = 0.7
TIME (MIN) = 342	DISCHARGE (CFS) = 0.6
TIME (MIN) = 348	DISCHARGE (CFS) = 0.6
TIME (MIN) = 354	DISCHARGE (CFS) = 0.6
TIME (MIN) = 360	DISCHARGE (CFS) = 0.6
TIME (MIN) = 366	DISCHARGE (CFS) = 0



PLAN



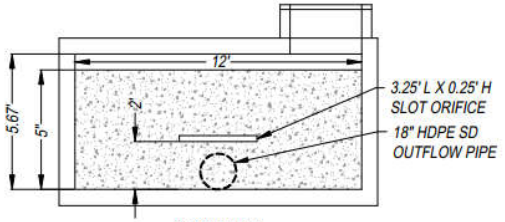
SECTION A-A



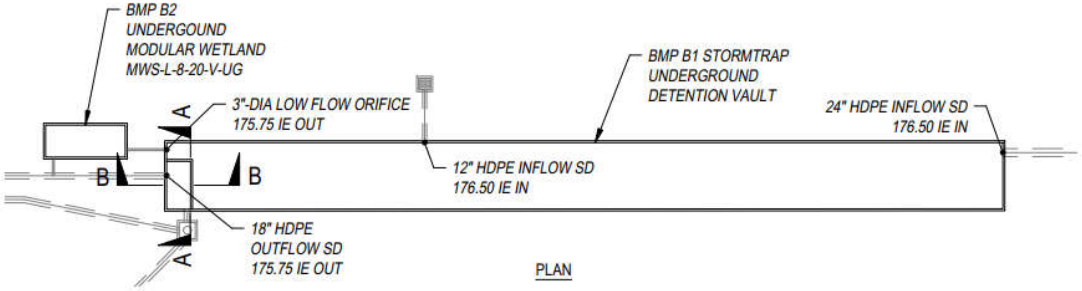
SECTION B-B

BMP A1: STORMTRAP UNDERGROUND DETENTION VAULT DETAIL

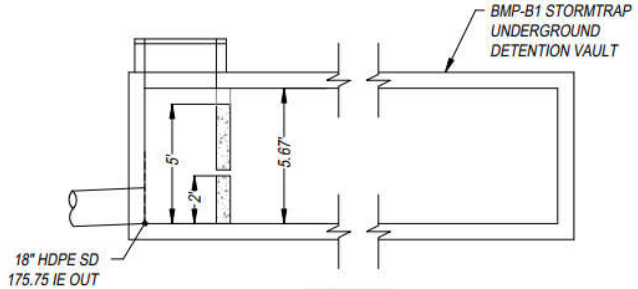
NOT TO SCALE



SECTION A-A



PLAN



SECTION B-B

BMP B1: STORMTRAP UNDERGROUND DETENTION VAULT DETAIL

NOT TO SCALE

Appendix 6

WSPGW Output

Program Package Serial Number: 7131

WATER SURFACE PROFILE LISTING Date: 3-24-2022 Time: 1:55:53

3668- HGL Analysis- SD-A

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
.000	118.800	1.442	120.242	190.89	23.40	8.50	128.74	.00	2.96	3.84	4.000	.000	.00	2 .0
4.979	.0061					.0585	.29	1.44	2.83	2.84	.013	.00	.00	PIPE
4.979	118.830	1.425	120.255	190.89	23.78	8.78	129.04	.00	2.96	3.83	4.000	.000	.00	2 .0
14.306	.0061					.0640	.92	1.42	2.89	2.84	.013	.00	.00	PIPE
19.285	118.917	1.376	120.292	190.89	24.94	9.66	129.95	.00	2.96	3.80	4.000	.000	.00	2 .0
13.715	.0061					.0731	1.00	1.38	3.10	2.84	.013	.00	.00	PIPE
33.000	119.000	1.329	120.329	190.89	26.16	10.62	130.95	.00	2.96	3.77	4.000	.000	.00	2 .0
JUNCT STR 1.0351						.0492	.38	1.33	3.31		.013	.00	.00	PIPE
---------- WARNING - Junction Analysis - Change in Channel Type ----------														
40.700	126.970	1.152	128.122	190.89	14.41	3.22	131.35	.00	2.05	12.00	2.500	12.000	.00	1 .5
3.978	.0047					.0210	.08	1.15	2.42	1.92	.013	.00	.00	BOX
44.678	126.989	1.138	128.127	190.89	14.59	3.30	131.43	.00	2.05	12.00	2.500	12.000	.00	1 .5
15.191	.0047					.0230	.35	1.14	2.46	1.92	.013	.00	.00	BOX
59.869	127.061	1.085	128.146	190.89	15.30	3.63	131.78	.00	2.05	12.00	2.500	12.000	.00	1 .5
14.382	.0047					.0265	.38	1.09	2.64	1.92	.013	.00	.00	BOX
74.251	127.129	1.035	128.164	190.89	16.04	4.00	132.16	.00	2.05	12.00	2.500	12.000	.00	1 .5
13.628	.0047					.0305	.42	1.03	2.84	1.92	.013	.00	.00	BOX

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
87.879	127.193	.986	128.180	190.89	16.83	4.40	132.58	.00	2.05	12.00	2.500	12.000	.00	1 .5
12.920	.0047					.0352	.45	.99	3.05	1.92	.013	.00	.00	BOX
100.799	127.255	.941	128.195	190.89	17.65	4.84	133.03	.00	2.05	12.00	2.500	12.000	.00	1 .5
12.253	.0047					.0406	.50	.94	3.28	1.92	.013	.00	.00	BOX
113.051	127.313	.897	128.209	190.89	18.51	5.32	133.53	.00	2.05	12.00	2.500	12.000	.00	1 .5
11.623	.0047					.0469	.55	.90	3.52	1.92	.013	.00	.00	BOX
124.674	127.368	.855	128.223	190.89	19.41	5.85	134.08	.00	2.05	12.00	2.500	12.000	.00	1 .5
11.026	.0047					.0542	.60	.86	3.78	1.92	.013	.00	.00	BOX
135.700	127.420	.815	128.235	190.89	20.36	6.44	134.67	2.50	2.05	12.00	2.500	12.000	.00	1 .5
JUNCT STR	.0050					.0605	.24	2.50	4.06		.013	.00	.00	BOX
139.700	127.440	.793	128.233	190.26	20.87	6.77	135.00	.00	2.04	12.00	2.500	12.000	.00	1 .5
1.515	.0050					.0636	.10	.79	4.22	1.88	.013	.00	.00	BOX
141.215	127.448	.787	128.235	190.26	21.02	6.86	135.10	.00	2.04	12.00	2.500	12.000	.00	1 .5
10.106	.0050					.0693	.70	.79	4.27	1.88	.013	.00	.00	BOX
151.321	127.498	.750	128.249	190.26	22.05	7.55	135.80	.00	2.04	12.00	2.500	12.000	.00	1 .5
9.580	.0050					.0802	.77	.75	4.58	1.88	.013	.00	.00	BOX
160.901	127.546	.716	128.262	190.26	23.12	8.30	136.56	.00	2.04	12.00	2.500	12.000	.00	1 .5
9.081	.0050					.0928	.84	.72	4.92	1.88	.013	.00	.00	BOX

3668- HGL Analysis- SD-A

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
169.983	127.592	.682	128.274	190.26	24.25	9.13	137.41	.00	2.04	12.00	2.500	12.000	.00	1 .5
8.607	.0050					.1074	.92	.68	5.29	1.88	.013	.00	.00	BOX
178.590	127.635	.650	128.286	190.26	25.43	10.05	138.33	.00	2.04	12.00	2.500	12.000	.00	1 .5
8.157	.0050					.1245	1.02	.65	5.68	1.88	.013	.00	.00	BOX
186.747	127.676	.620	128.296	190.26	26.68	11.05	139.35	.00	2.04	12.00	2.500	12.000	.00	1 .5
7.729	.0050					.1443	1.11	.62	6.10	1.88	.013	.00	.00	BOX
194.476	127.715	.591	128.306	190.26	27.98	12.15	140.46	.00	2.04	12.00	2.500	12.000	.00	1 .5
7.322	.0050					.1673	1.22	.59	6.55	1.88	.013	.00	.00	BOX
201.798	127.752	.564	128.315	190.26	29.34	13.37	141.69	.00	2.04	12.00	2.500	12.000	.00	1 .5
6.935	.0050					.1940	1.35	.56	7.03	1.88	.013	.00	.00	BOX
208.733	127.786	.538	128.324	190.26	30.78	14.71	143.03	.00	2.04	12.00	2.500	12.000	.00	1 .5
6.567	.0050					.2252	1.48	.54	7.56	1.88	.013	.00	.00	BOX
215.300	127.819	.513	128.332	190.26	32.28	16.18	144.51	.00	2.04	12.00	2.500	12.000	.00	1 .5
6.217	.0050					.2614	1.63	.51	8.12	1.88	.013	.00	.00	BOX
221.516	127.850	.489	128.339	190.26	33.85	17.80	146.14	.00	2.04	12.00	2.500	12.000	.00	1 .5
5.884	.0050					.3036	1.79	.49	8.72	1.88	.013	.00	.00	BOX
227.400	127.880	.466	128.346	190.26	35.51	19.58	147.92	2.50	2.04	12.00	2.500	12.000	.00	1 .5
JUNCT STR	.0825					.2189	.88	2.50	9.36		.013	.00	.00	BOX

---------- WARNING - Junction Analysis - Change in Channel Type ----------

3668- HGL Analysis- SD-A

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
231.400	128.210	1.588	129.798	190.26	35.48	19.54	149.34	.00	3.94	4.66	5.000	.000	.00	1 .0
84.896	.1205					.1070	9.09	1.59	5.83	1.56	.013	.00	.00	PIPE
316.296	138.440	1.624	140.064	190.26	34.41	18.39	158.45	.00	3.94	4.68	5.000	.000	.00	1 .0
66.315	.1205					.0962	6.38	1.62	5.58	1.56	.013	.00	.00	PIPE
382.611	146.432	1.681	148.113	190.26	32.81	16.72	164.83	.00	3.94	4.72	5.000	.000	.00	1 .0
40.280	.1205					.0843	3.39	1.68	5.22	1.56	.013	.00	.00	PIPE
422.891	151.285	1.741	153.026	190.26	31.28	15.20	168.22	.00	3.94	4.76	5.000	.000	.00	1 .0
28.282	.1205					.0738	2.09	1.74	4.88	1.56	.013	.00	.00	PIPE
451.173	154.694	1.803	156.497	190.26	29.83	13.82	170.31	.00	3.94	4.80	5.000	.000	.00	1 .0
21.365	.1205					.0647	1.38	1.80	4.56	1.56	.013	.00	.00	PIPE
472.538	157.268	1.868	159.136	190.26	28.44	12.56	171.70	.00	3.94	4.84	5.000	.000	.00	1 .0
16.862	.1205					.0568	.96	1.87	4.26	1.56	.013	.00	.00	PIPE
489.400	159.300	1.935	161.235	190.26	27.12	11.42	172.65	2.37	3.94	4.87	5.000	.000	.00	1 .0
JUNCT STR	.0825					.0583	.23	4.31	3.98		.013	.00	.00	PIPE
493.400	159.630	1.797	161.427	181.47	28.58	12.68	174.11	.00	3.86	4.80	5.000	.000	.00	1 .0
9.535	.0982					.0623	.59	1.80	4.38	1.60	.013	.00	.00	PIPE

3668- HGL Analysis- SD-A

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
502.935	160.566	1.816	162.382	181.47	28.18	12.33	174.71	.00	3.86	4.81	5.000	.000	.00	1 .0
25.844	.0982					.0573	1.48	1.82	4.29	1.60	.013	.00	.00	PIPE
528.779	163.104	1.881	164.985	181.47	26.86	11.21	176.19	.00	3.86	4.84	5.000	.000	.00	1 .0
19.856	.0982					.0503	1.00	1.88	4.01	1.60	.013	.00	.00	PIPE
548.635	165.053	1.949	167.002	181.47	25.61	10.19	177.19	.00	3.86	4.88	5.000	.000	.00	1 .0
15.825	.0982					.0441	.70	1.95	3.75	1.60	.013	.00	.00	PIPE
564.460	166.607	2.020	168.627	181.47	24.42	9.26	177.89	.00	3.86	4.91	5.000	.000	.00	1 .0
12.922	.0982					.0387	.50	2.02	3.50	1.60	.013	.00	.00	PIPE
577.382	167.876	2.093	169.969	181.47	23.29	8.42	178.39	.00	3.86	4.93	5.000	.000	.00	1 .0
10.729	.0982					.0340	.36	2.09	3.26	1.60	.013	.00	.00	PIPE
588.111	168.929	2.170	171.099	181.47	22.20	7.65	178.75	.00	3.86	4.96	5.000	.000	.00	1 .0
9.010	.0982					.0299	.27	2.17	3.05	1.60	.013	.00	.00	PIPE
597.122	169.814	2.251	172.064	181.47	21.17	6.96	179.02	.00	3.86	4.98	5.000	.000	.00	1 .0
7.628	.0982					.0263	.20	2.25	2.84	1.60	.013	.00	.00	PIPE
604.749	170.563	2.335	172.897	181.47	20.18	6.33	179.22	.00	3.86	4.99	5.000	.000	.00	1 .0
6.490	.0982					.0231	.15	2.33	2.65	1.60	.013	.00	.00	PIPE
611.239	171.200	2.422	173.622	181.47	19.24	5.75	179.37	.00	3.86	5.00	5.000	.000	.00	1 .0
5.532	.0982					.0203	.11	2.42	2.47	1.60	.013	.00	.00	PIPE

3668- HGL Analysis- SD-A

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
616.771	171.743	2.515	174.258	181.47	18.35	5.23	179.49	.00	3.86	5.00	5.000	.000	.00	1 .0
4.717	.0982					.0179	.08	2.51	2.30	1.60	.013	.00	.00	PIPE
621.488	172.206	2.611	174.817	181.47	17.49	4.75	179.57	.00	3.86	5.00	5.000	.000	.00	1 .0
4.012	.0982					.0158	.06	2.61	2.14	1.60	.013	.00	.00	PIPE
625.500	172.600	2.713	175.313	181.47	16.68	4.32	179.63	5.00	3.86	4.98	5.000	.000	.00	1 .0
JUNCT STR	.0925					.0151	.06	5.00	1.99		.013	.00	.00	PIPE
629.500	172.970	2.892	175.862	181.47	16.80	4.38	180.24	.00	3.90	4.31	4.500	.000	.00	1 .0
10.934	.0250					.0150	.16	2.89	1.87	2.47	.013	.00	.00	PIPE
640.434	173.243	2.937	176.180	181.47	16.51	4.23	180.41	.00	3.90	4.29	4.500	.000	.00	1 .0
23.314	.0250					.0139	.32	2.94	1.82	2.47	.013	.00	.00	PIPE
663.748	173.825	3.063	176.888	181.47	15.74	3.85	180.73	.00	3.90	4.20	4.500	.000	.00	1 .0
16.966	.0250					.0124	.21	3.06	1.67	2.47	.013	.00	.00	PIPE
680.714	174.249	3.199	177.448	181.47	15.01	3.50	180.94	.00	3.90	4.08	4.500	.000	.00	1 .0
12.259	.0250					.0111	.14	3.20	1.54	2.47	.013	.00	.00	PIPE
692.973	174.555	3.347	177.901	181.47	14.31	3.18	181.08	.00	3.90	3.93	4.500	.000	.00	1 .0
8.469	.0250					.0099	.08	3.35	1.40	2.47	.013	.00	.00	PIPE
701.442	174.766	3.508	178.274	181.47	13.64	2.89	181.16	.00	3.90	3.73	4.500	.000	.00	1 .0
5.138	.0250					.0090	.05	3.51	1.27	2.47	.013	.00	.00	PIPE

Program Package Serial Number: 7131

WATER SURFACE PROFILE LISTING Date: 3-24-2022 Time: 1:55:53

3668- HGL Analysis- SD-A

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
706.580	174.895	3.689	178.583	181.47	13.01	2.63	181.21	.00	3.90	3.46	4.500	.000	.00	1 .0
1.820	.0250					.0082	.01	3.69	1.14	2.47	.013	.00	.00	PIPE
708.400	174.940	3.898	178.838	181.47	12.40	2.39	181.22	.00	3.90	3.06	4.500	.000	.00	1 .0

Program Package Serial Number: 7131

WATER SURFACE PROFILE LISTING Date: 3-24-2022 Time: 1:56:26

3668- HGL Analysis- SD B

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
L/Elem	Ch Slope													
.000	128.050	1.648	129.698	320.22	21.86	7.42	137.12	.00	3.13	3.94	4.000	.000	.00	3 .0
16.041	.0165					.0457	.73	1.65	2.00	2.18	.013	.00	.00	PIPE
16.041	128.315	1.607	129.922	320.22	22.61	7.93	137.86	.00	3.13	3.92	4.000	.000	.00	3 .0
21.259	.0165					.0512	1.09	1.61	2.10	2.18	.013	.00	.00	PIPE
37.300	128.665	1.551	130.216	320.22	23.71	8.73	138.94	.00	3.13	3.90	4.000	.000	.00	3 .0
19.575	.0165					.0583	1.14	1.55	2.24	2.18	.013	.00	.00	PIPE
56.875	128.988	1.497	130.485	320.22	24.87	9.60	140.09	.00	3.13	3.87	4.000	.000	.00	3 .0
18.161	.0165					.0665	1.21	1.50	2.40	2.18	.013	.00	.00	PIPE
75.035	129.288	1.445	130.733	320.22	26.08	10.56	141.29	.00	3.13	3.84	4.000	.000	.00	3 .0
16.951	.0165					.0759	1.29	1.45	2.57	2.18	.013	.00	.00	PIPE
91.987	129.567	1.395	130.963	320.22	27.35	11.62	142.58	.00	3.13	3.81	4.000	.000	.00	3 .0
15.900	.0165					.0866	1.38	1.40	2.75	2.18	.013	.00	.00	PIPE
107.887	129.830	1.348	131.177	320.22	28.69	12.78	143.96	.00	3.13	3.78	4.000	.000	.00	3 .0
14.971	.0165					.0988	1.48	1.35	2.94	2.18	.013	.00	.00	PIPE
122.858	130.077	1.302	131.378	320.22	30.09	14.06	145.44	.00	3.13	3.75	4.000	.000	.00	3 .0
14.142	.0165					.1128	1.59	1.30	3.15	2.18	.013	.00	.00	PIPE
137.000	130.310	1.257	131.567	320.22	31.56	15.46	147.03	.00	3.13	3.71	4.000	.000	.00	3 .0
JUNCT STR	.0825					.0855	.34	3.81	3.36		.013	.00	.00	PIPE

3668- HGL Analysis- SD B

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
141.000	130.640	2.395	133.035	320.04	30.40	14.35	147.38	6.00	4.88	5.88	6.000	.000	.00	1 .0
53.900	.0521					.0505	2.72	6.00	4.00	2.38	.013	.00	.00	PIPE
194.900	133.450	2.400	135.850	320.04	30.30	14.26	150.11	6.00	4.88	5.88	6.000	.000	.00	1 .0
54.000	.0524					.0499	2.70	6.00	3.98	2.37	.013	.00	.00	PIPE
248.900	136.280	2.409	138.689	320.04	30.15	14.11	152.80	.00	4.88	5.88	6.000	.000	.00	1 .0
74.300	.0522					.0490	3.64	2.41	3.95	2.38	.013	.00	.00	PIPE
323.200	140.160	2.426	142.586	320.04	29.87	13.86	156.44	6.00	4.88	5.89	6.000	.000	.00	1 .0
32.600	.0521					.0480	1.57	6.00	3.90	2.38	.013	.00	.00	PIPE
355.800	141.860	2.435	144.295	320.04	29.72	13.71	158.01	.00	4.88	5.89	6.000	.000	.00	1 .0
JUNCT STR	.0825					.0494	.20	6.00	3.87		.013	.00	.00	PIPE
359.800	142.190	2.359	144.549	312.97	30.32	14.28	158.83	6.00	4.83	5.86	6.000	.000	.00	1 .0
2.658	.0859					.0510	.14	6.00	4.03	2.05	.013	.00	.00	PIPE
362.458	142.418	2.365	144.783	312.97	30.22	14.18	158.97	6.00	4.83	5.86	6.000	.000	.00	1 .0
31.442	.0859					.0476	1.50	6.00	4.01	2.05	.013	.00	.00	PIPE
393.900	145.120	2.451	147.571	312.97	28.82	12.89	160.46	.00	4.83	5.90	6.000	.000	.00	1 .0
14.643	.0857					.0430	.63	2.45	3.74	2.06	.013	.00	.00	PIPE
408.543	146.375	2.501	148.876	312.97	28.05	12.22	161.10	.00	4.83	5.92	6.000	.000	.00	1 .0
21.757	.0857					.0389	.85	2.50	3.60	2.06	.013	.00	.00	PIPE

3668- HGL Analysis- SD B

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
430.300	148.240	2.593	150.833	312.97	26.75	11.11	161.94	2.94	4.83	5.94	6.000	.000	.00	1 .0
17.413	.0858					.0342	.60	5.53	3.36	2.05	.013	.00	.00	PIPE
447.713	149.734	2.686	152.421	312.97	25.53	10.12	162.54	2.68	4.83	5.97	6.000	.000	.00	1 .0
14.722	.0858					.0301	.44	5.37	3.14	2.05	.013	.00	.00	PIPE
462.436	150.998	2.786	153.784	312.97	24.34	9.20	162.99	2.45	4.83	5.98	6.000	.000	.00	1 .0
12.333	.0858					.0265	.33	5.23	2.93	2.05	.013	.00	.00	PIPE
474.768	152.056	2.891	154.947	312.97	23.21	8.37	163.31	2.23	4.83	6.00	6.000	.000	.00	1 .0
10.411	.0858					.0233	.24	5.12	2.73	2.05	.013	.00	.00	PIPE
485.179	152.949	3.001	155.950	312.97	22.13	7.60	163.55	2.03	4.83	6.00	6.000	.000	.00	1 .0
8.826	.0858					.0205	.18	5.03	2.54	2.05	.013	.00	.00	PIPE
494.005	153.707	3.116	156.823	312.97	21.10	6.91	163.74	1.84	4.83	6.00	6.000	.000	.00	1 .0
7.495	.0858					.0181	.14	4.96	2.36	2.05	.013	.00	.00	PIPE
501.500	154.350	3.237	157.587	312.97	20.12	6.28	163.87	6.00	4.83	5.98	6.000	.000	.00	1 .0
JUNCT STR	.0825					.0199	.08	6.00	2.20		.013	.00	.00	PIPE
505.500	154.680	2.960	157.640	312.81	22.51	7.87	165.51	.00	4.83	6.00	6.000	.000	.00	1 .0
61.615	.0295					.0218	1.34	2.96	2.61	2.75	.013	.00	.00	PIPE
567.115	156.498	3.048	159.546	312.81	21.69	7.30	166.85	.00	4.83	6.00	6.000	.000	.00	1 .0
54.411	.0295					.0195	1.06	3.05	2.46	2.75	.013	.00	.00	PIPE

3668- HGL Analysis- SD B

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
621.527	158.103	3.165	161.268	312.81	20.68	6.64	167.91	.00	4.83	5.99	6.000	.000	.00	1 .0
38.884	.0295					.0172	.67	3.17	2.29	2.75	.013	.00	.00	PIPE
660.410	159.250	3.289	162.539	312.81	19.72	6.04	168.57	.00	4.83	5.97	6.000	.000	.00	1 .0
29.155	.0295					.0151	.44	3.29	2.13	2.75	.013	.00	.00	PIPE
689.565	160.110	3.419	163.529	312.81	18.80	5.49	169.02	.00	4.83	5.94	6.000	.000	.00	1 .0
22.426	.0295					.0134	.30	3.42	1.98	2.75	.013	.00	.00	PIPE
711.992	160.772	3.556	164.328	312.81	17.92	4.99	169.32	.00	4.83	5.90	6.000	.000	.00	1 .0
17.448	.0295					.0118	.21	3.56	1.84	2.75	.013	.00	.00	PIPE
729.440	161.287	3.701	164.988	312.81	17.09	4.53	169.52	.00	4.83	5.83	6.000	.000	.00	1 .0
13.570	.0295					.0105	.14	3.70	1.70	2.75	.013	.00	.00	PIPE
743.009	161.687	3.855	165.542	312.81	16.29	4.12	169.66	.00	4.83	5.75	6.000	.000	.00	1 .0
10.417	.0295					.0093	.10	3.86	1.57	2.75	.013	.00	.00	PIPE
753.426	161.994	4.020	166.014	312.81	15.54	3.75	169.76	.00	4.83	5.64	6.000	.000	.00	1 .0
7.747	.0295					.0083	.06	4.02	1.45	2.75	.013	.00	.00	PIPE
761.173	162.223	4.196	166.419	312.81	14.81	3.41	169.83	.00	4.83	5.50	6.000	.000	.00	1 .0
5.401	.0295					.0074	.04	4.20	1.33	2.75	.013	.00	.00	PIPE
766.573	162.382	4.386	166.769	312.81	14.12	3.10	169.87	.00	4.83	5.32	6.000	.000	.00	1 .0
3.228	.0295					.0066	.02	4.39	1.22	2.75	.013	.00	.00	PIPE

3668- HGL Analysis- SD B

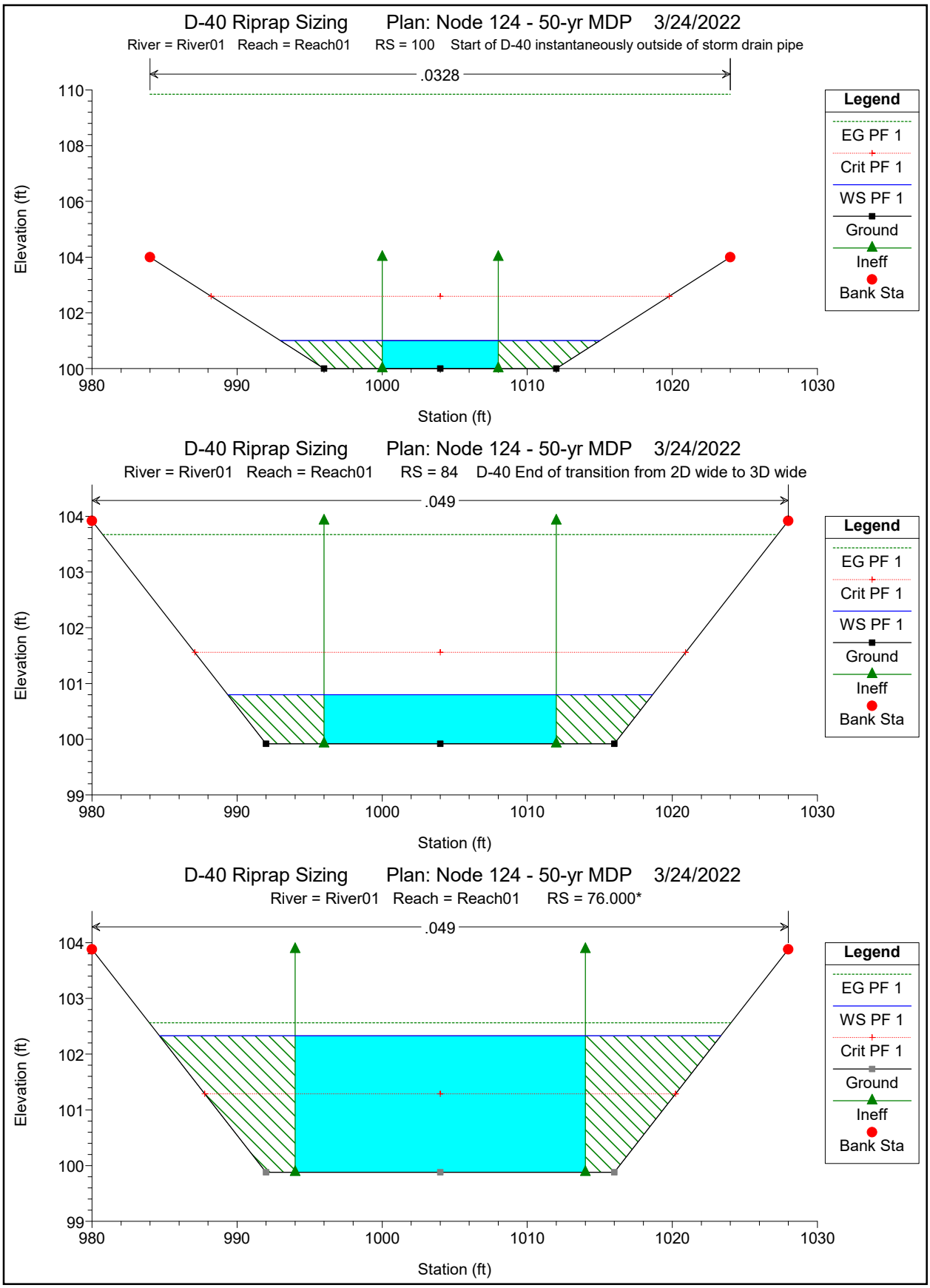
Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
769.801	162.478	4.594	167.071	312.81	13.47	2.82	169.89	.00	4.83	5.08	6.000	.000	.00	1 .0
1.099	.0295					.0060	.01	4.59	1.11	2.75	.013	.00	.00	PIPE
770.900	162.510	4.825	167.335	312.81	12.84	2.56	169.89	.00	4.83	4.76	6.000	.000	.00	1 .0

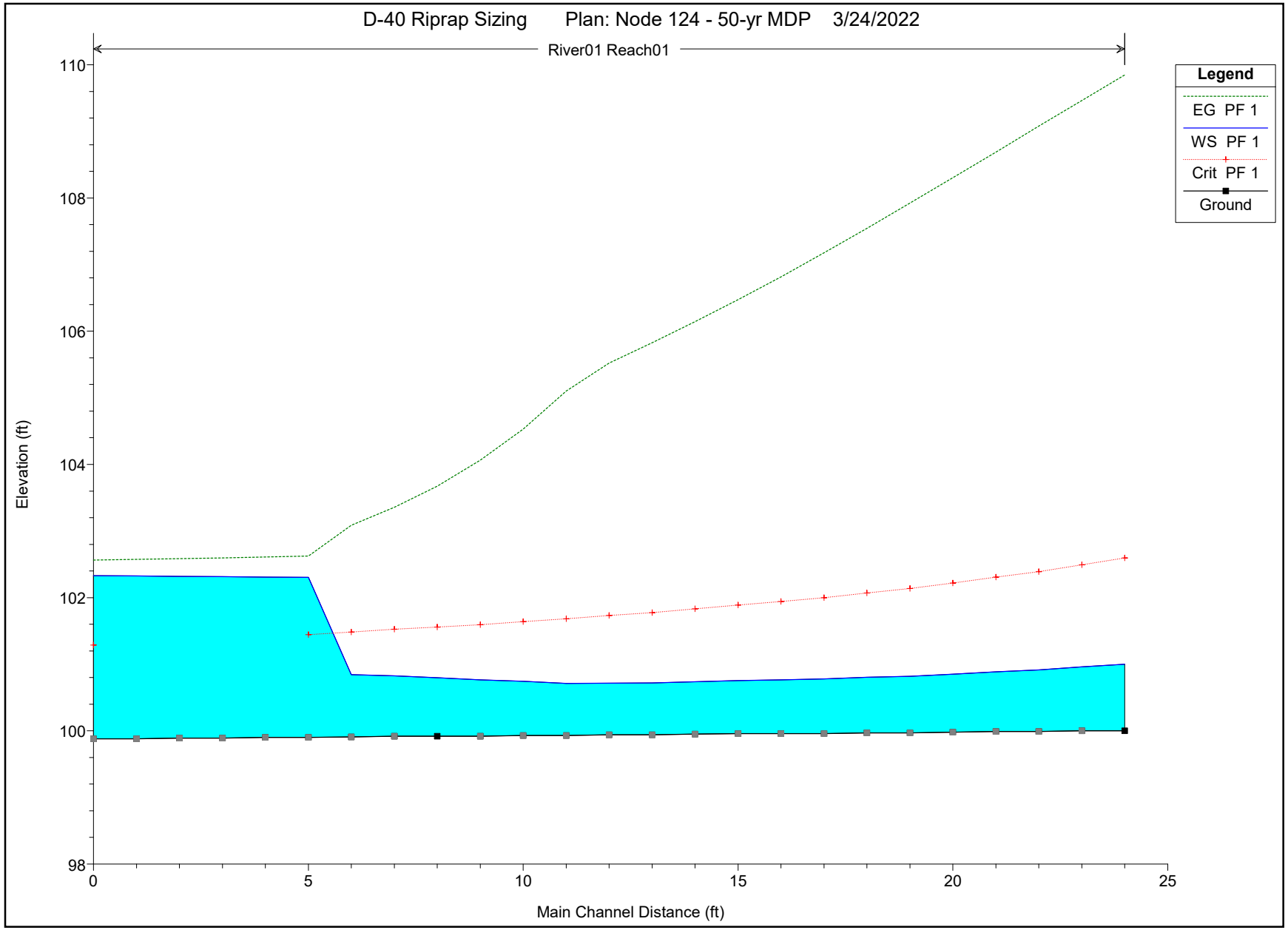
Appendix 7

HEC-RAS Output

HEC-RAS Plan: Node 124 -50yr River: River01 Reach: Reach01 Profile: PF 1

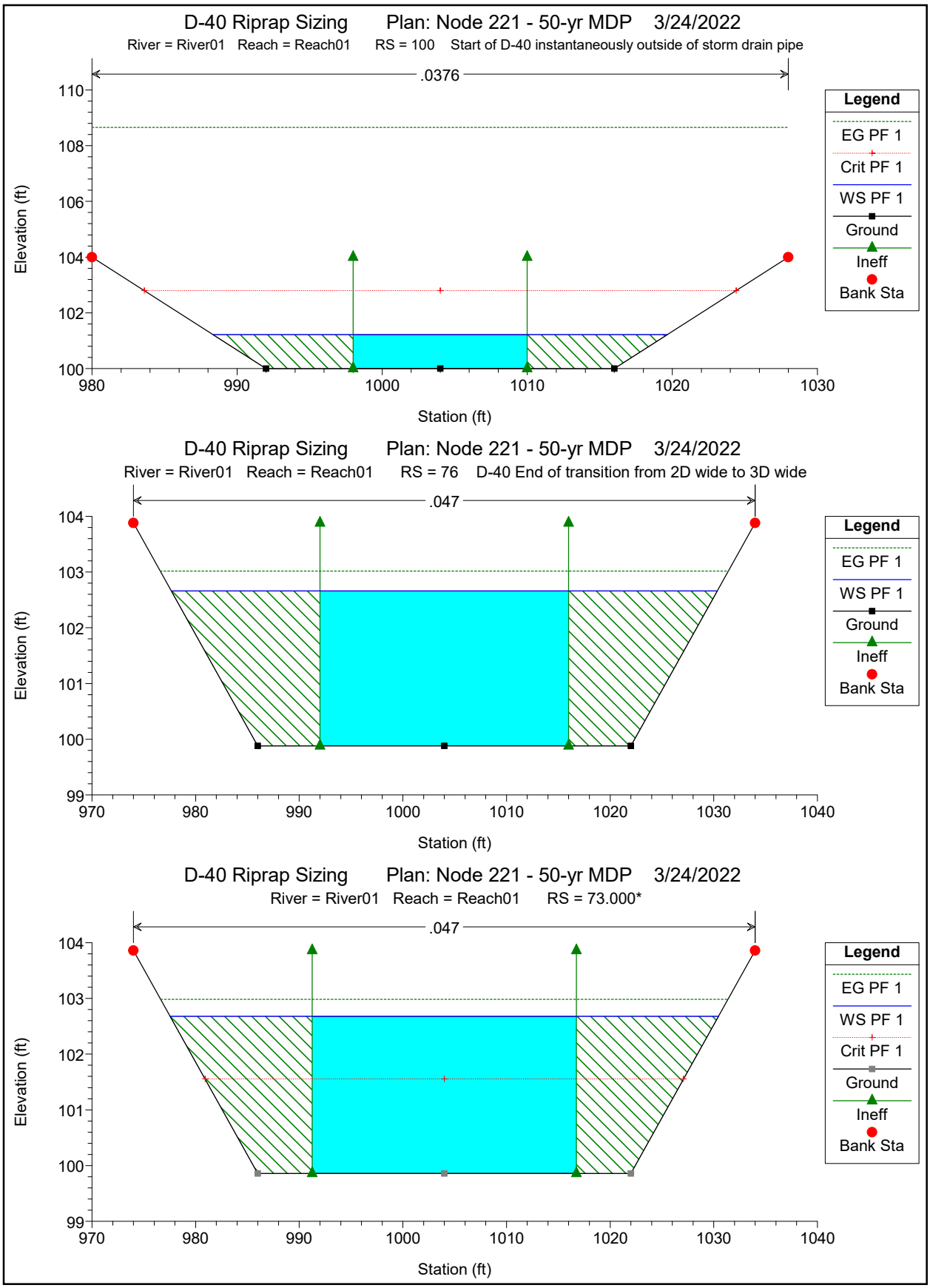
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Mann Wtd Chnl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		
Reach01	100	PF 1	190.89	100.00	101.00	102.60	109.85	0.277424	23.86	8.00	22.00	4.21	0.033
Reach01	99.000*	PF 1	190.89	100.00	100.96	102.49	109.46	0.281568	23.39	8.16	22.26	4.21	0.033
Reach01	98.000*	PF 1	190.89	99.99	100.92	102.39	109.08	0.283817	22.92	8.33	22.55	4.20	0.033
Reach01	97.000*	PF 1	190.89	99.99	100.89	102.31	108.69	0.282870	22.41	8.52	22.88	4.17	0.033
Reach01	96.000*	PF 1	190.89	99.98	100.85	102.22	108.30	0.280612	21.90	8.72	23.23	4.14	0.033
Reach01	95.000*	PF 1	190.89	99.97	100.82	102.14	107.92	0.276386	21.38	8.93	23.60	4.09	0.033
Reach01	94.000*	PF 1	190.89	99.97	100.80	102.07	107.54	0.269503	20.83	9.17	24.00	4.02	0.033
Reach01	93.000*	PF 1	190.89	99.96	100.78	102.00	107.18	0.262270	20.29	9.41	24.41	3.96	0.033
Reach01	92.000*	PF 1	190.89	99.96	100.77	101.94	106.82	0.252754	19.73	9.68	24.84	3.87	0.033
Reach01	91.000*	PF 1	190.89	99.96	100.76	101.89	106.47	0.242928	19.18	9.95	25.28	3.79	0.033
Reach01	90.000*	PF 1	190.89	99.95	100.74	101.83	106.14	0.233150	18.65	10.23	25.72	3.71	0.033
Reach01	89.000*	PF 1	190.89	99.94	100.72	101.78	105.83	0.223129	18.13	10.53	26.18	3.62	0.033
Reach01	88.000*	PF 1	190.89	99.94	100.72	101.73	105.52	0.211483	17.58	10.86	26.65	3.52	0.033
Reach01	87.000*	PF 1	190.89	99.93	100.71	101.68	105.10	0.425251	16.81	11.36	27.20	3.35	0.049
Reach01	86.000*	PF 1	190.89	99.93	100.75	101.64	104.53	0.347775	15.61	12.23	27.89	3.05	0.049
Reach01	85.000*	PF 1	190.89	99.92	100.77	101.59	104.06	0.288535	14.57	13.11	28.57	2.79	0.049
Reach01	84	PF 1	190.89	99.92	100.80	101.56	103.67	0.239589	13.60	14.03	29.26	2.56	0.049
Reach01	83.000*	PF 1	190.89	99.92	100.83	101.53	103.36	0.201659	12.76	14.96	29.44	2.36	0.049
Reach01	82.000*	PF 1	190.89	99.91	100.85	101.48	103.09	0.171369	12.01	15.90	29.61	2.19	0.049
Reach01	81.000*	PF 1	190.89	99.90	102.30	101.44	102.62	0.006957	4.54	42.06	38.42	0.52	0.049
Reach01	80.000*	PF 1	190.89	99.90	102.31		102.61	0.006524	4.40	43.37	38.46	0.50	0.049
Reach01	79.000*	PF 1	190.89	99.89	102.32		102.60	0.006036	4.25	44.88	38.56	0.48	0.049
Reach01	78.000*	PF 1	190.89	99.89	102.32		102.59	0.005695	4.14	46.16	38.58	0.47	0.049
Reach01	77.000*	PF 1	190.89	99.88	102.32		102.57	0.005295	4.00	47.67	38.67	0.45	0.049
Reach01	76.000*	PF 1	190.89	99.88	102.33	101.29	102.56	0.005010	3.90	48.96	38.69	0.44	0.049

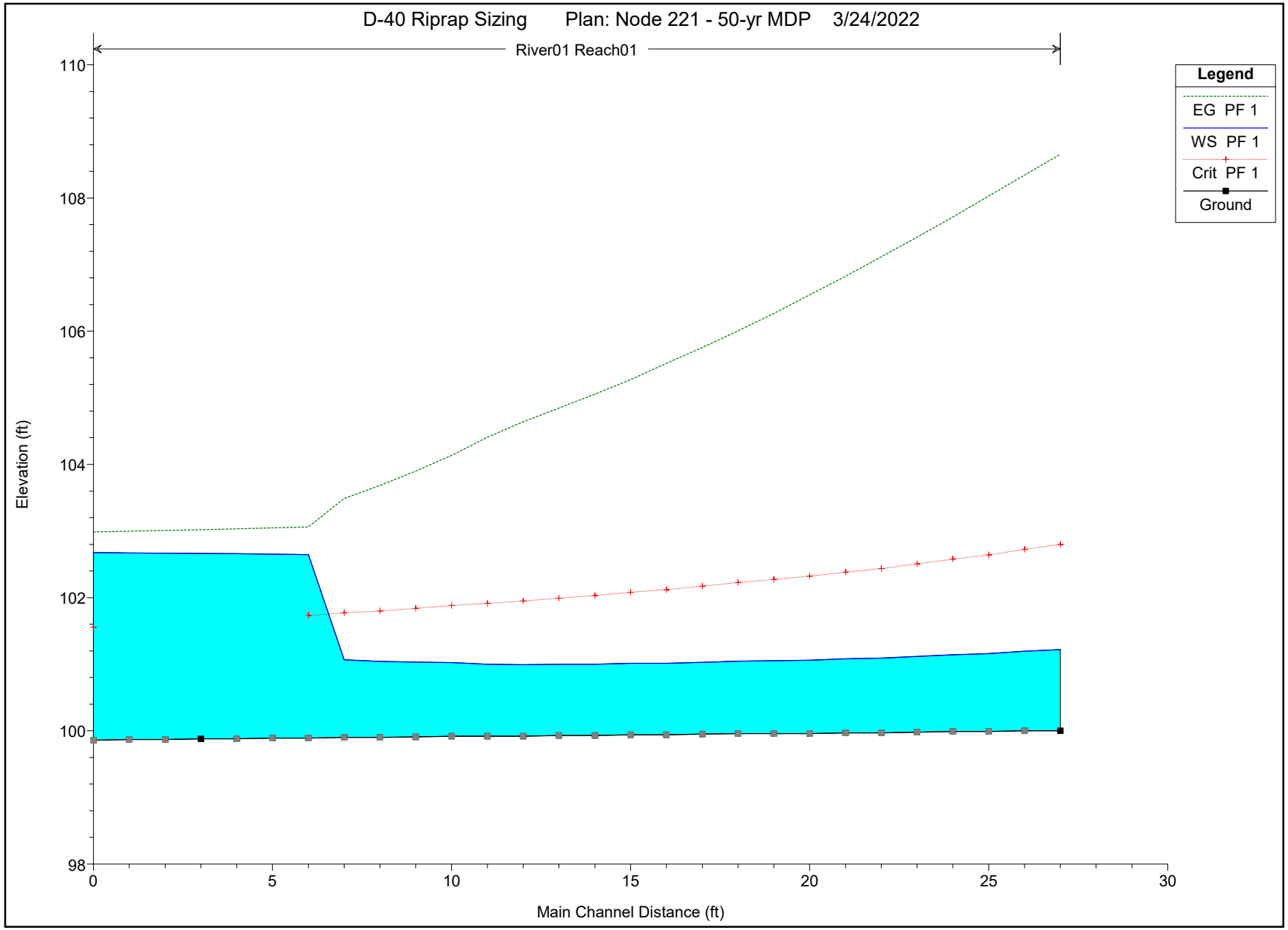

D-40 Riprap Sizing Plan: Node 124 - 50-yr MDP 3/24/2022
River = River01 Reach = Reach01 RS = 100 Start of D-40 instantaneously outside of storm drain pipe
.0328
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
D-40 Riprap Sizing Plan: Node 124 - 50-yr MDP 3/24/2022
River = River01 Reach = Reach01 RS = 84 D-40 End of transition from 2D wide to 3D wide
.049
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
D-40 Riprap Sizing Plan: Node 124 - 50-yr MDP 3/24/2022
River = River01 Reach = Reach01 RS = 76.000*
.049
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta


D-40 Riprap Sizing
Plan: Node 124 - 50-yr MDP
3/24/2022
River01 Reach01
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
110
108
106
104
102
100
98
0
5
10
15
20
25
Main Channel Distance (ft)

HEC-RAS Plan: Node 221 - 50 yr River: River01 Reach: Reach01 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Mann Wtd Chnl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		
Reach01	100	PF 1	320.22	100.00	101.22	102.80	108.66	0.234991	21.87	14.64	31.32	3.49	0.038
Reach01	99.000*	PF 1	320.22	100.00	101.19	102.72	108.35	0.232543	21.45	14.93	31.67	3.46	0.038
Reach01	98.000*	PF 1	320.22	99.99	101.16	102.64	108.03	0.229116	21.02	15.23	32.03	3.42	0.038
Reach01	97.000*	PF 1	320.22	99.99	101.14	102.58	107.72	0.223842	20.56	15.57	32.42	3.38	0.038
Reach01	96.000*	PF 1	320.22	99.98	101.12	102.51	107.41	0.218772	20.13	15.91	32.82	3.33	0.038
Reach01	95.000*	PF 1	320.22	99.97	101.09	102.44	107.12	0.213132	19.69	16.26	33.23	3.28	0.038
Reach01	94.000*	PF 1	320.22	99.97	101.08	102.38	106.82	0.205800	19.22	16.66	33.66	3.22	0.038
Reach01	93.000*	PF 1	320.22	99.96	101.06	102.32	106.54	0.199075	18.79	17.05	34.10	3.16	0.038
Reach01	92.000*	PF 1	320.22	99.96	101.05	102.27	106.27	0.191080	18.32	17.48	34.55	3.09	0.038
Reach01	91.000*	PF 1	320.22	99.96	101.05	102.23	106.01	0.182946	17.86	17.93	35.02	3.02	0.038
Reach01	90.000*	PF 1	320.22	99.95	101.03	102.17	105.76	0.175755	17.44	18.36	35.48	2.96	0.038
Reach01	89.000*	PF 1	320.22	99.94	101.01	102.12	105.52	0.168511	17.02	18.81	35.95	2.89	0.038
Reach01	88.000*	PF 1	320.22	99.94	101.01	102.08	105.27	0.159279	16.55	19.35	36.45	2.81	0.038
Reach01	87.000*	PF 1	320.22	99.93	101.00	102.03	105.06	0.152294	16.15	19.83	36.93	2.75	0.038
Reach01	86.000*	PF 1	320.22	99.93	101.00	101.99	104.85	0.144384	15.73	20.36	37.43	2.68	0.038
Reach01	85.000*	PF 1	320.22	99.92	100.99	101.95	104.64	0.137075	15.32	20.90	37.93	2.61	0.038
Reach01	84.000*	PF 1	320.22	99.92	101.00	101.91	104.41	0.197535	14.80	21.63	38.49	2.51	0.047
Reach01	83.000*	PF 1	320.22	99.92	101.02	101.88	104.13	0.175485	14.15	22.63	39.12	2.37	0.047
Reach01	82.000*	PF 1	320.22	99.91	101.03	101.84	103.90	0.158123	13.58	23.58	39.74	2.26	0.047
Reach01	81.000*	PF 1	320.22	99.90	101.04	101.80	103.68	0.142509	13.04	24.56	40.35	2.15	0.047
Reach01	80.000*	PF 1	320.22	99.90	101.07	101.77	103.49	0.127122	12.49	25.65	40.99	2.04	0.047
Reach01	79.000*	PF 1	320.22	99.89	102.65	101.73	103.06	0.006911	5.17	61.99	51.03	0.55	0.047
Reach01	78.000*	PF 1	320.22	99.89	102.65		103.05	0.006566	5.04	63.51	51.57	0.53	0.047
Reach01	77.000*	PF 1	320.22	99.88	102.66		103.03	0.006161	4.90	65.29	52.17	0.52	0.047
Reach01	76	PF 1	320.22	99.88	102.66		103.02	0.005880	4.80	66.77	52.69	0.51	0.047
Reach01	75.000*	PF 1	320.22	99.87	102.67		103.01	0.005535	4.67	68.56	52.79	0.49	0.047
Reach01	74.000*	PF 1	320.22	99.87	102.67		103.00	0.005296	4.57	70.03	52.81	0.48	0.047
Reach01	73.000*	PF 1	320.22	99.86	102.68	101.55	102.99	0.005000	4.46	71.82	52.90	0.47	0.047


D-40 Riprap Sizing Plan: Node 221 - 50-yr MDP 3/24/2022
River = River01 Reach = Reach01 RS = 100 Start of D-40 instantaneously outside of storm drain pipe
.0376
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
D-40 Riprap Sizing Plan: Node 221 - 50-yr MDP 3/24/2022
River = River01 Reach = Reach01 RS = 76 D-40 End of transition from 2D wide to 3D wide
.047
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Ineff
Bank Sta
D-40 Riprap Sizing Plan: Node 221 - 50-yr MDP 3/24/2022
River = River01 Reach = Reach01 RS = 73.000*
.047
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta


D-40 Riprap Sizing Plan: Node 221 - 50-yr MDP 3/24/2022
River01 Reach01
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
110
108
106
104
102
100
98
0
5
10
15
20
25
30
Main Channel Distance (ft)