PRELIMINARY
DRAINAGE REPORT

MIDWAY RISING

City of San Diego, CA
December 19, 2024
TM PRJ #1106734

APN #: 441-590-04
Project Address: 3500 Sports Arena Blvd San Diego, CA 92110
Legal Description: PARCEL 2 OF PARCEL MAP NO. 21332

Prepared For:

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Prepared By:

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APPENDICES

1. INTRODUCTION

This preliminary drainage report has been prepared in support of the Tentative Map (TM) package associated with the proposed Midway Rising development project (Project). The Midway Rising Project is a re-development project consisting of a new sports/entertainment arena and mixed-use development with residential including affordable housing and commercial uses. Additional construction includes restaurants, a hotel, multi-acre urban park space and plazas throughout the project. Total Project area within the Tentative Map boundary is 49.23 acres that is currently an existing sports/entertainment arena, surrounding parking lot, a gas station and two restaurants. The project is located south of Interstate 8 and west of Interstate 5, and is bounded on the south by Sports Arena Boulevard, on the northeast by Kurtz Street. The Tentative Map project proposes ~4,250 new housing units with ~2,000 of them being affordable housing units. Refer to the Vicinity Map below: Figure 1 for the Project location.

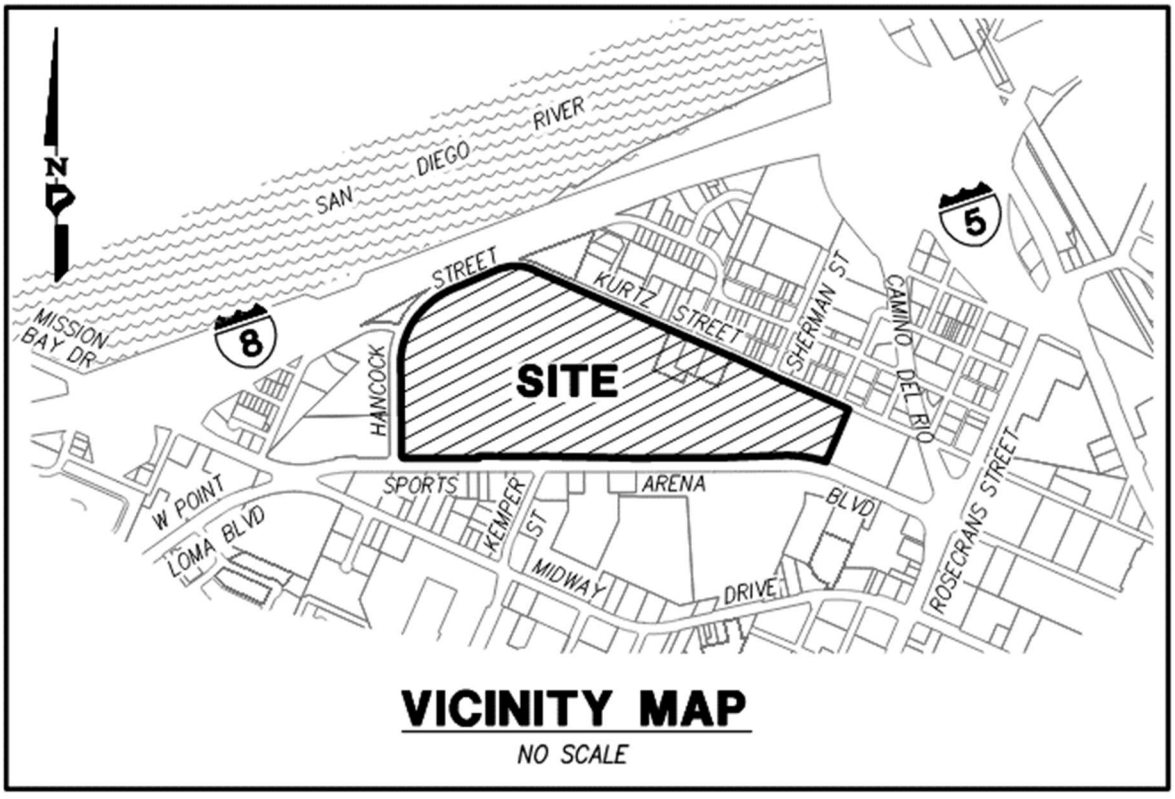


Figure 1: Vicinity Map

Presently runoff flows across the site in three main directions which mostly sheet flows to the surrounding streets and then enters the public storm drain system connecting to the downstream San Diego River channel. The proposed project will continue to send all runoff to these points with a proposed upgraded storm drain that will be constructed to convey water from the site to the connection points downstream. The storm drain system to which the majority of the site discharges outlets into the downstream storm drain and is then pumped into the San Diego River channel via a regional pump house (Pump Station H), located north of Interstate 8, per Drawing Number 3460-D.

The proposed buildings onsite are set at elevations higher than the existing surrounding streets due to potential existing condition flooding in the surrounding area. The surrounding area is both very flat and has low-lying elevations that drain to existing downstream storm drains that are very flat. Multiple biofiltration basins and other BMPs will be implemented to manage water quality. For water quality management concerns refer to the Storm Water Quality Management Plan (SWQMP) prepared by Project Design Consultants for the proposed project treatment BMPs.

The project is not subject to the Clean Water Act (CWA) Sections 401 and 404 as there will be no fill or dredging discharged into an aquatic environment since the project is located in urban land. The project's storm drain will tie into existing downstream storm drain systems and will not include grading in any downstream aquatic environment.

2. EXISTING AND PROPOSED DRAINAGE PATTERNS AND IMPROVEMENTS

The following sections provide descriptions of the existing and proposed drainage patterns and improvements for the project.

2.1 Existing Drainage Patterns

There are currently on-site drainage facilities including inlets and stormdrain pipes with much of the site developed with asphalt surfacing and structures. The existing site sheet flows in three general directions, with approximately 50% of the site towards the north and into existing stormdrain in Kurtz Street. Approximately 40% of the site drains south to storm drain in Sports Arena Blvd and drains to the west. Both of these systems eventually drain to the existing pump

house north of I-8 and are pumped into the San Diego River Flood Control Channel. The remaining 10% of the site area flows southeast towards Rosecrans Street which eventually outlets to the same channel as the above two areas of the site above through the existing City of San Diego Pump station D. There are three different discharge locations, but all eventually outlet to the San Diego River. The project site and the surrounding blocks are prone to flooding due to very flat street slopes and shallow and storm drain system with pipes with less than 0.5%. Offsite drainage areas surrounding the project in the northeast were delineating utilizing GIS topography and SanGIS stormdrain information to assist with the delineations as well as site visits to locate drainage inlets and existing drainage patterns. Refer to Exhibit A in Appendix 4 for the existing condition drainage map.

There are also a couple fragments of area outside the project boundary which drains onto the site, but generally there is not a significant amount of runon from the other sides of the project site.

2.2 Proposed Drainage Improvements

The site will continue to discharge to various outlet points to generally preserve the existing condition drainage patterns. The proposed drainage improvements include private storm drains collecting rooftop and surface drainage, a public storm drain in Kemper Street and Frontier Drive, biofiltrations planters and modular wetland units. As mentioned in the Existing Drainage Patterns section, the project site and multiple blocks surrounding the project are extremely flat and have shallow and storm drain pipe slopes less than 0.5%. A storm drain that drains through the northwest corner of the site is a 42” storm drain at 0.3% slope per Drawing 4227-D. Due to the proposed building at the northwest corner that conflicts with the existing storm drain alignment, the project proposes to realign the portion that cuts through the site with a replacement 54” storm drain. This realignment reduces the slope to 0.23% from 0.30%, but the increased pipe size allows for more capacity. A deviation from the City of San Diego Drainage Design Manual will be requested as there is not a feasible solution to increase the slope of the storm drain while tying into the existing system.

Frontage improvements require replacement of inlets along Sports Arena Boulevard and due the shallow groundwater conditions, all proposed storm drain systems will be built with water tight joints. Refer to Exhibit B in Appendix 4 for the proposed condition drainage map.

3. HYDROLOGY CRITERIA, METHODOLOGY, AND RESULTS

Hydrologic modeling was performed per City of San Diego Drainage Design Manual criteria to provide the design flows for storm drain design and improvements.

3.1 Hydrology Criteria

Table 1 summarizes the hydrology assumptions and criteria used for hydrologic modeling.

Table 1: Hydrology Criteria

Existing and Proposed Hydrology:	100-year storm frequency
Soil Type:	Hydrologic Soil Group D
Land Use / Runoff Coefficients:	Based on criteria presented in the 2017 City of San Diego Drainage Design Manual.
Rainfall intensity:	Based on intensity duration frequency relationships presented in the January 2017 City of San Diego Drainage Design Manual, see Appendix 1.

3.2 Hydrologic Methodology

The Rational Method was used to determine the onsite 100-year storm flow for the design of the Project storm drainpipe improvements. The goal of this analysis was to:

- Determine the design flows for the sizing of any proposed storm drain improvements.
- Determine the differences in the drainage conditions between existing and proposed conditions to confirm there are no significant downstream impacts.

The Civil-D Rational Method program was used to calculate onsite and offsite runoff for the 100-year storm event. The runoff coefficient for industrial land type of 0.95 was used for the existing onsite conditions while similar runoff coefficients were used in conjunction with multi-family residential development, and commercial development were used for the proposed onsite condition. Offsite hydrology runoff coefficients were based on land uses apparent from aerial photography, which includes mostly industrial/commercial development.

3.3 Description of Hydrologic Modeling Software

The Civil-D Rational Method Program was used to perform the Rational Method hydrologic calculations. This section provides a brief explanation of the computational procedure used in the computer model.

The Civil-D Modified Rational Method Hydrology Program is a computer-aided design program where the user simulates the hydrology with a link-node model. The sub-watersheds are represented by a pair of nodes and the conduits connecting them are assigned channel properties. The intensity-duration-frequency relationships are applied to each of the drainage areas in the model to yield peak flow rates at each point of interest per the methodology in the *City of San Diego Drainage Design Manual*.

3.4 Hydrology Results

The Rational Method as presented in the City of San Diego Drainage Design Manual was used to calculate the existing and proposed conditions peak storm flows. Table 2 below summarizes the Rational Method results for the comparison of the existing and proposed project site.

Table 2: Hydrology Results

	MIDWAY RISING HYDROLOGY SUMMARY							
	EXISTING CONDITION				PROPOSED CONDITION			
OUTFALL OF INTEREST	SYSTEM	AREA (ac)	TC (min)	Q100 (cfs)	SYSTEM	AREA (ac)	TC (min)	Q100 (cfs)
To Outfall 1 (Southwest Corner)	100	8.8	10.1	31.2	1000	10.7	12.6	30.3
	120	6.1	5.0	25.3	1100	6.6	8.3	18.2
	TOTAL	***14.9***		***56.5***	***TOTAL***	***17.3***		***48.5***
To Outfall 2 (Northwest Corner)	200	30.0	12.7	93.3	2000	51.3	23.4	120.4
	250	25.2	8.5	73.0	2100	1.3	5.7	5.3
	280	10.3	6.0	43.0	2200	14.7	11.0	45.9
	TOTAL	***65.5***		***209.3***	***TOTAL***	***67.3***		***171.6***
To Outfall 3 (Southeast Corner)	300	10.0	8.4	38.4	3000	4.5	5.2	11.0
	320	2.8	6.4	10.6	3100	3.9	5.0	15.2
	TOTAL	***12.8***		***49.0***	***TOTAL***	***8.4***		***26.2***
	GRAND TOTAL	**93.2**		**314.8**	**GRAND TOTAL**	**93.0**		**246.3**

The proposed 100-year flows were found to be less than pre-project 100-year flows with an increase in landscaping, park area and plazas. The project site's goal is to maintain existing flow patterns throughout the site, but minor areas were shifted to accommodate the grading of the site. In the post-project condition, less flow sheet flows to Kurtz Avenue, and runoff is directed into the larger of the two Kurtz Street storm drains, in order to minimize potential flooding due to minimal storm drain capacity. The flow rate in the proposed condition decreases due increase in landscape areas and longer time of concentrations in areas of urban park and paseos through the project.

4. HYDRAULIC CRITERIA, METHODOLOGY, AND RESULTS

4.1 Existing Hydraulic Conditions

As mentioned earlier, the project site and the surrounding blocks are prone to flooding due to very flat street slopes and storm drain system with flat slopes. Although the project will decrease peak flows compared to pre-project conditions, the site development may be affected by the surrounding undersized storm drain infrastructure. The project cannot be designed to eliminate these existing deficiencies; however, the drainage conditions onsite can be improved if the proposed site grading is elevated from surrounding grades. The project proposes to elevate the site above surrounding grades. The existing levee and downstream pump protects the site against potential sea level rise effects and backwater effects of the riverine flooding of the San Diego River. However, the downstream pumps are under capacity. Some of the downstream storm drains draining to the pump station are under capacity as well, so even if pumps are upgraded in the future as a part of the City's capital improvement plan, the regional drainage capacities may still not meet current drainage standards. It is beyond the scope of this project to provide a full hydraulic model all the way to the existing stormwater pump, since the pipes are likely surcharged during peak events and the flows are unknown. The City of San Diego Stormwater Pump Operation staff has provided some previous studies from other consultants that have been contracted with the City to study some of the regional drainage issues near the project. The project team reviewed the information from these previous studies in order to gather information about the regional drainage system. See below for a summary:

1) *Updated Hydraulic Analysis for the City of San Diego Pump Stations B,D,F,H, and L*, dated June 18, 2018, and prepared by Michael Baker International.

2) *Pump Station H Hydrologic Analysis (TO 066 FY23 Pump Station H Feasibility Study)*, dated April 21, 2023, and prepared by Tetra Tech.

The Michael Baker study summarized the existing deficiencies of Pump Station H, which collects drainage from the majority of the site and a larger regional drainage area of the Midway area. The report mentions that the current pumping capacity is approximately 147 cfs, based on information provided by the City. Michael Baker's study also summarized previous analysis work for the drainage area performed by O'Day Consultants. O'Day Consultants had estimated the Pump Station H drainage area to be 426.7 acres, and the 2-year peak flow based on the Rational Method to be 367.7 cfs and the 100-year peak flow based on the Rational Method to be 768.7 cfs. Based on this analysis, since the pump capacity is less than the 2-year peak flow rate, flooding is therefore expected to occur in this basin for all but the smallest low-intensity storm events. Refer to report excerpts in Appendix 6.

The TetraTech study also analyzed the Pump Station H drainage area and estimated it to be approximately 394 acres. The excerpts of their model and drainage exhibit are provided for reference in Appendix 6. The flow rates that they estimated for certain pipe segments are helpful in determining the expected flow amounts in various locations throughout the watershed. Because they analyzed the full drainage area to the Pump, whereas this Midway Rising drainage study only analyzed the onsite area plus some of the onsite runon, these flow values are helpful in determining the segments of pipe downstream of the project that may be undersized in the pre-project condition. For example, from Node 607 to Node 111, the 100-year flow rate per their study is 360.1 cfs. This represents a 54-inch concrete pipe with a slope of 0.3% per Drawing 3460 (Appendix 6). The full flow capacity of a 54-inch pipe at that slope is only 107.7 cfs, therefore, there is limited existing capacity, and flows are likely to surcharge and pond in low-lying areas during peak flow events.

After review of the above previous studies and existing conditions, PDC created exhibits displaying the 9- and 10-foot contours and elevations in the project vicinity. The intent was to show a conservative inundation scenario. The exhibit displays the approximate inundation limits if the surrounding areas were to pond up to the 10-foot contour elevation (NGVD29), the proposed

project site would not be inundated. The project proposes to elevate onsite existing grades above surrounding grades. The hatched exhibits for both pre-project and post-project conditions are found in Appendix 4. Subsequent to preparation of this exhibit, PDC received further information from the City of San Diego Stormwater Engineering Division with documentation showing that in the January 22, 2024 storm, the wet weather water level at Pump Station H was recorded as approximately 10.4 NGVD29. For further information and explanation regarding the 10.4' elevation, see City of San Diego documentation in Attachment 6. It should be noted that during that storm, the station lost power during a portion of the storm. Additionally, photos were taken surrounding the site showing shallow ponding on surrounding streets, with some locations in areas that eventually drain to Pump Station H, and other areas that eventually drain to Pump Station D. By visual inspection of the provided photos, ponding elevations were estimated as less than elevation 10. From the understanding of the undersized pump and coordination with the City of San Diego Stormwater Pump Operations staff, it is expected that some ponding occurs in surrounding streets during large storms. The project team has been informed from the City of San Diego that a master plan regional analysis for the San Diego River watershed that may be able to provide additional information pertaining to the existing flooding conditions sometime in the future, but the work is not currently ongoing or under contract, so results may not be available anytime soon. Because the timing of the regional drainage analysis is unknown, this project proposes to refine the onsite project-specific hydraulic conditions in final engineering based on a conservative assumption of a tailwater of 10.4 surrounding the site, unless updated information becomes available prior to the start of final engineering for this project.

4.2 Proposed Hydraulic Conditions

Hydraulic analyses provided during final engineering will include inlet calculations and HGL determination in onsite storm drain pipes. During final engineering, all proposed onsite storm drain pipes will be designed to conform to the minimum requirements outlined in Chapter 4.1.7 of the City of San Diego Drainage Design Manual regarding water-tight joints. As noted in Section 4.1 above, the tailwater condition for the points of connection to surrounding existing storm drain pipes surrounding the project may have a high tailwater condition during peak events. It is proposed that a hydraulic analysis be completed during final engineering for the post-project condition to show that the combination of street capacity and/or pipe capacity is adequate to

convey onsite flows to the perimeter of the site without inundating any proposed finished floors of any onsite proposed buildings. One way that this could be accomplished would be create a HEC-RAS model of the onsite streets and model the onsite flows in the street sections assuming that the onsite pipes have little or no capacity. This is a "worst case" scenario that would show that even if the onsite storm drain was affected by a high tailwater, the proposed buildings would still be protected from flooding. A detailed hydraulic analysis for the project will be performed at final engineering.

As discussed in Section 2.2 above, the project proposes to upsize and realign an existing storm drain that drains through the northwest corner of the site from a 42" storm drain with a replacement 54" storm drain.

PDC performed a Culvertmaster model for the existing and proposed conditions of the northwest corner of the project site. In the existing condition, the existing 42" stormdrain was modeled with overland flow modeled as a weir of any excess flow that is not contained within the stormdrain pipe. The proposed condition was modeled similarly, but included the upgraded 54" SD in addition to the proposed condition flows. It was observed that the starting water surface elevation of the model influenced the results, due to this, two scenarios were modeled. The first scenario was modeled utilizing the soffit elevation of where the proposed stormdrain ties into the existing 42" SD pipe (4227-D) and another scenario with the water surface elevation set at the rim of the proposed cleanout where the project ties into. This was done to simulate backflow from the pump up to this rim elevation. In the existing conditions, both scenarios indicate that the 100-year flow would surcharge the pipe and overflow in the existing parking lot. The first scenario results indicate that the proposed 100-year condition flows are contained entirely within the pipe, while the second scenario has some flow in the roadway, but less than the existing condition. Exhibits have been provided in Appendix 4 for the existing and proposed conditions of this preliminary analysis with a tabular summary of the scenarios.

5. CONCLUSION

This drainage report was prepared for the Midway Rising project. From the hydrologic calculations it is determined there is no increase of overall peak flow rate in the proposed conditions compared to the pre-project conditions.

APPENDIX 1

Supplemental Information (Intensity Duration Frequency Curve, Runoff Coefficients)

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
	Soil Type [1]
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

Note:
[1] Type D soil to be used for all areas.
[2] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%
Tabulated imperviousness = 80%
Revised C = (50/80) x 0.85 = 0.53

The values in Table A–1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_C for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_C calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).

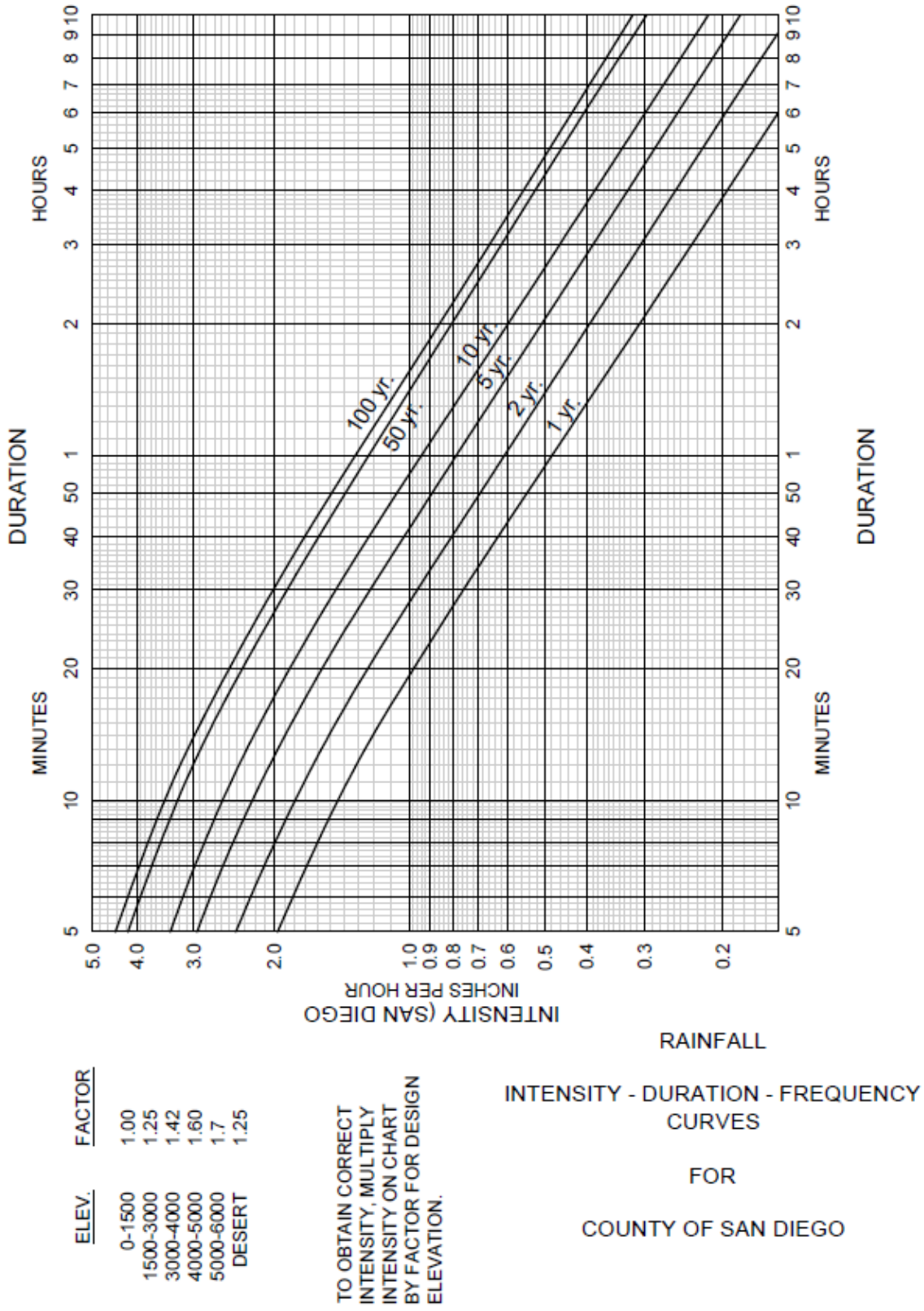


Figure A-1. Intensity-Duration-Frequency Design Chart

Map Projection:
Universal Transverse Mercator Zone 11N; North American Datum 1983;
Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 250 500 750 1,000 2,000 feet

0 125 250 500 meters

EXHIBIT 7.1: ANNOTATED FIRM

VERSION NUMBER
2.3.3.3

MAP NUMBER
06073C1614H

MAP REVISED
DECEMBER 20, 2019

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

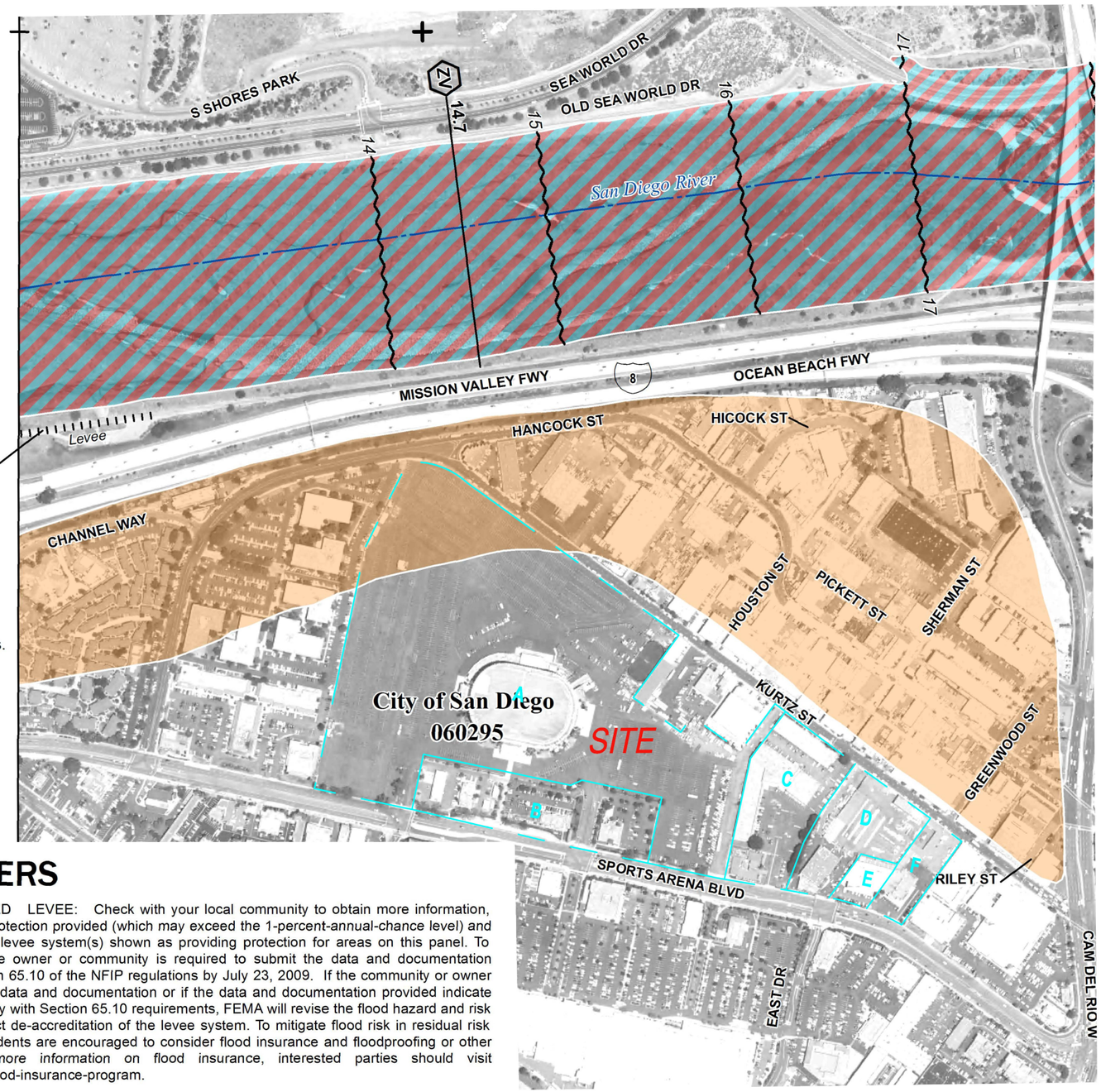
SAN DIEGO COUNTY, CALIFORNIA
and Incorporated Areas

PANEL 1614 OF 2375

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1614	H



Note: This area is shown as being protected from the 1-percent-annual-chance or greater flood hazard by a levee system that has been provisionally accredited. Overtopping or failure of any levee system is possible. For additional information see the "Provisionally Accredited Levee Note" in Notes to Users.

NOTES TO USERS

PROVISIONALLY ACCREDITED LEVEE: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations by July 23, 2009. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit https://www.fema.gov/national-flood-insurance-program.

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A,V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- E 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

APPENDIX 2

Existing Conditions Rational Method Computer Output

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/26/23
--------------------------------------------------------------------------
4443.10 MIDWAY RISING
EXISTING CONDITIONS
S100 E100

--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4049

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  181.000(Ft.)
Highest elevation =   16.000(Ft.)
Lowest elevation =   15.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     4.43 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 181.000^.5)/(   0.552^(1/3)]=   4.43
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      8.089(CFS)
Total initial stream area =        1.940(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =    14.700(Ft.)
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Downstream point elevation =     9.000(Ft.)
Channel length thru subarea  =   400.000(Ft.)
Channel base width      =  100.000(Ft.)
Slope or 'Z' of left channel bank =  20.000
Slope or 'Z' of right channel bank =  20.000
Estimated mean flow rate at midpoint of channel =     16.115(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =     16.115(CFS)
Depth of flow =   0.076(Ft.), Average velocity =   2.096(Ft/s)
Channel flow top width =  103.029(Ft.)
Flow Velocity =    2.10(Ft/s)
Travel time  =    3.18 min.
Time of concentration =    8.18 min.
Critical depth =      0.093(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Rainfall intensity =      3.630(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     13.276(CFS) for    3.850(Ac.)
Total runoff =     21.365(CFS)  Total area =        5.79(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =     6.000(Ft.)
Downstream point/station elevation =     5.000(Ft.)
Pipe length  =   320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.365(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    21.365(CFS)
Normal flow depth in pipe =   22.92(In.)
Flow top width inside pipe =   25.47(In.)
Critical Depth =   18.87(In.)
Pipe flow velocity =      5.31(Ft/s)
Travel time through pipe =    1.01 min.
Time of concentration (TC) =     9.19 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     9.19 min.
Rainfall intensity =      3.480(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      3.140(CFS) for    0.950(Ac.)
Total runoff =     24.505(CFS)  Total area =        6.74(Ac.)


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Process from Point/Station      102.000 to Point/Station      104.000
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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =     6.000(Ft.)
Downstream point/station elevation =     5.000(Ft.)
Pipe length  =   320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    24.505(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    24.505(CFS)
Normal flow depth in pipe =   22.92(In.)
Flow top width inside pipe =   30.40(In.)
Critical Depth =   19.67(In.)
Pipe flow velocity =      5.56(Ft/s)
Travel time through pipe =    0.96 min.
Time of concentration (TC) =    10.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =    10.14 min.
Rainfall intensity =      3.357(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      6.665(CFS) for    2.090(Ac.)
Total runoff =     31.170(CFS)  Total area =        8.83(Ac.)
End of computations, total study area =          8.830 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/26/23
--------------------------------------------------------------------------
4443.10 MIDWAY RISING
EXISTING CONDITIONS
S120 E100

--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4049

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      120.000 to Point/Station      121.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   16.000(Ft.)
Lowest elevation =   15.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.70 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 100.000^.5)/(   1.000^(1/3)]=   2.70
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      2.168(CFS)
Total initial stream area =        0.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      121.000 to Point/Station      122.000
**** SUBAREA FLOW ADDITION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     20.514(CFS) for    4.920(Ac.)
Total runoff =     22.683(CFS)  Total area =        5.44(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      123.000 to Point/Station      122.000
**** SUBAREA FLOW ADDITION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.627(CFS) for    0.630(Ac.)
Total runoff =     25.309(CFS)  Total area =        6.07(Ac.)
End of computations, total study area =           6.070 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 03/01/24
------------------------------------------------------------------------
4443.10 MIDWAY RISING
EXISTING CONDITIONS
S200 E100

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4049

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =  110.000(Ft.)
Highest elevation =   11.700(Ft.)
Lowest elevation =   11.500(Ft.)
Elevation difference =    0.200(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.00 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 110.000^.5)/(   0.182^(1/3)]=   5.00
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.709(CFS)
Total initial stream area =        0.170(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =     9.700(Ft.)
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End of street segment elevation =     8.000(Ft.)
Length of street segment  =   294.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      5.316(CFS)
Depth of flow =   0.312(Ft.), Average velocity =   1.943(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.000(Ft.)
Flow velocity =   1.94(Ft/s)
Travel time =    2.52 min.     TC =    7.52  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.744(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      7.861(CFS) for    2.210(Ac.)
Total runoff =      8.569(CFS)  Total area =        2.38(Ac.)
Street flow at end of street =      8.569(CFS)
Half street flow at end of street =      8.569(CFS)
Depth of flow =   0.369(Ft.), Average velocity =   2.349(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  16.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     7.52 min.
Rainfall intensity =      3.744(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      6.794(CFS) for    1.910(Ac.)
Total runoff =     15.363(CFS)  Total area =        4.29(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     6.000(Ft.)
Downstream point/station elevation =     5.040(Ft.)
Pipe length  =   320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.363(CFS)
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```
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    15.363(CFS)
Normal flow depth in pipe =   20.13(In.)
Flow top width inside pipe =   23.52(In.)
Critical Depth =   16.39(In.)
Pipe flow velocity =      4.83(Ft/s)
Travel time through pipe =    1.10 min.
Time of concentration (TC) =     8.63 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      204.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.290(Ac.)
Runoff from this stream =     15.363(CFS)
Time of concentration =    8.63 min.
Rainfall intensity =     3.560(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =  112.000(Ft.)
Highest elevation =   12.700(Ft.)
Lowest elevation =   12.200(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.74 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 112.000^.5)/(   0.446^(1/3)]=   3.74
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.542(CFS)
Total initial stream area =        0.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      207.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =    12.200(Ft.)
End of street segment elevation =     8.600(Ft.)
Length of street segment  =   615.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
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```
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      9.507(CFS)
Depth of flow =   0.383(Ft.), Average velocity =   2.457(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.000(Ft.)
Flow velocity =   2.46(Ft/s)
Travel time =    4.17 min.     TC =    9.17  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.481(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     14.221(CFS) for    4.300(Ac.)
Total runoff =     14.763(CFS)  Total area =        4.43(Ac.)
Street flow at end of street =     14.763(CFS)
Half street flow at end of street =     14.763(CFS)
Depth of flow =   0.457(Ft.), Average velocity =   2.925(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  16.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      208.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =     6.600(Ft.)
Downstream point/station elevation =     6.500(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.763(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    14.763(CFS)
Normal flow depth in pipe =   19.88(In.)
Flow top width inside pipe =   23.80(In.)
Critical Depth =   16.05(In.)
Pipe flow velocity =      4.71(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =     9.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      208.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     9.30 min.
Rainfall intensity =      3.464(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     13.955(CFS) for    4.240(Ac.)
Total runoff =     28.718(CFS)  Total area =        8.67(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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Upstream point/station elevation =     6.500(Ft.)
Downstream point/station elevation =     6.000(Ft.)
Pipe length  =    62.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.718(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    28.718(CFS)
Normal flow depth in pipe =   23.02(In.)
Flow top width inside pipe =   19.15(In.)
Critical Depth =   22.34(In.)
Pipe flow velocity =      7.95(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     9.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      204.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.670(Ac.)
Runoff from this stream =     28.718(CFS)
Time of concentration =    9.43 min.
Rainfall intensity =     3.447(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1       15.363      8.63                3.560
2       28.718      9.43                3.447
Qmax(1) =
           1.000 *    1.000 *    15.363) +
           1.000 *    0.915 *    28.718) + =      41.644
Qmax(2) =
           0.968 *    1.000 *    15.363) +
           1.000 *    1.000 *    28.718) + =      43.594

Total of 2 streams to confluence:
Flow rates before confluence point:
      15.363      28.718
Maximum flow rates at confluence using above data:
       41.644       43.594
Area of streams before confluence:
        4.290        8.670
Results of confluence:
Total flow rate =     43.594(CFS)
Time of concentration =     9.426 min.
Effective stream area after confluence =     12.960(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      210.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =     6.000(Ft.)
Downstream point/station elevation =     5.500(Ft.)
Pipe length  =   290.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    43.594(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    43.594(CFS)
Normal flow depth in pipe =   36.38(In.)
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```
Flow top width inside pipe =   28.61(In.)
Critical Depth =   24.71(In.)
Pipe flow velocity =      4.93(Ft/s)
Travel time through pipe =    0.98 min.
Time of concentration (TC) =    10.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      210.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     12.960(Ac.)
Runoff from this stream =     43.594(CFS)
Time of concentration =   10.41 min.
Rainfall intensity =     3.326(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      212.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  132.000(Ft.)
Highest elevation =   12.800(Ft.)
Lowest elevation =   11.000(Ft.)
Elevation difference =    1.800(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.80 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 132.000^.5)/(   1.364^(1/3)]=   2.80
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.500(CFS)
Total initial stream area =        0.120(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      210.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =    11.000(Ft.)
End of street segment elevation =     9.500(Ft.)
Length of street segment  =   375.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      8.756(CFS)
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Depth of flow =   0.311(Ft.), Average velocity =   1.609(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.000(Ft.)
Flow velocity =   1.61(Ft/s)
Travel time =    3.88 min.     TC =    8.88  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.522(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     13.250(CFS) for    3.960(Ac.)
Total runoff =     13.750(CFS)  Total area =        4.08(Ac.)
Street flow at end of street =     13.750(CFS)
Half street flow at end of street =      6.875(CFS)
Depth of flow =   0.364(Ft.), Average velocity =   1.926(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  16.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      213.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     5.500(Ft.)
Downstream point/station elevation =     5.400(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.750(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    13.750(CFS)
Normal flow depth in pipe =   20.70(In.)
Flow top width inside pipe =   27.75(In.)
Critical Depth =   14.98(In.)
Pipe flow velocity =      3.81(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =     9.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      210.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      4.080(Ac.)
Runoff from this stream =     13.750(CFS)
Time of concentration =    9.15 min.
Rainfall intensity =     3.485(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1       43.594     10.41                3.326
2       13.750      9.15                3.485
Qmax(1) =
           1.000 *    1.000 *    43.594) +
           0.954 *    1.000 *    13.750) + =      56.716
Qmax(2) =
           1.000 *    0.879 *    43.594) +
```



```
           1.000 *    1.000 *    13.750) + =      52.062

Total of 2 streams to confluence:
Flow rates before confluence point:
      43.594      13.750
Maximum flow rates at confluence using above data:
       56.716       52.062
Area of streams before confluence:
       12.960        4.080
Results of confluence:
Total flow rate =     56.716(CFS)
Time of concentration =    10.407 min.
Effective stream area after confluence =     17.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      213.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     17.040(Ac.)
Runoff from this stream =     56.716(CFS)
Time of concentration =   10.41 min.
Rainfall intensity =     3.326(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      215.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =  114.000(Ft.)
Highest elevation =   12.000(Ft.)
Lowest elevation =   11.500(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.79 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 114.000^.5)/(   0.439^(1/3)]=   3.79
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.876(CFS)
Total initial stream area =        0.210(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      215.000 to Point/Station      216.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =    11.500(Ft.)
End of street segment elevation =    10.000(Ft.)
Length of street segment  =   598.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
```

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Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      7.943(CFS)
Depth of flow =   0.422(Ft.), Average velocity =   1.772(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.000(Ft.)
Flow velocity =   1.77(Ft/s)
Travel time =    5.63 min.     TC =   10.63  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.301(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     10.631(CFS) for    3.390(Ac.)
Total runoff =     11.506(CFS)  Total area =       3.60(Ac.)
Street flow at end of street =     11.506(CFS)
Half street flow at end of street =     11.506(CFS)
Depth of flow =   0.492(Ft.), Average velocity =   2.052(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  16.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      215.000 to Point/Station      216.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.600(Ac.)
Runoff from this stream =     11.506(CFS)
Time of concentration =   10.63 min.
Rainfall intensity =     3.301(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      223.000 to Point/Station      224.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   52.000(Ft.)
Lowest elevation =   12.000(Ft.)
Elevation difference =   40.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.42 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 100.000^.5)/(  40.000^(1/3)]=   3.42
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
```



```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.494(CFS)
Total initial stream area =        0.250(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      224.000 to Point/Station      216.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =    12.000(Ft.)
Downstream point elevation =    10.000(Ft.)
Channel length thru subarea  =   848.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =      1.787(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.787(CFS)
Depth of flow =   0.263(Ft.), Average velocity =   1.679(Ft/s)
Channel flow top width =    5.103(Ft.)
Flow Velocity =    1.68(Ft/s)
Travel time  =    8.42 min.
Time of concentration =   13.42 min.
Critical depth =      0.203(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.030(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.786(CFS) for    1.310(Ac.)
Total runoff =      2.280(CFS)  Total area =        1.56(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      224.000 to Point/Station      216.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.560(Ac.)
Runoff from this stream =      2.280(CFS)
Time of concentration =   13.42 min.
Rainfall intensity =     3.030(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       11.506     10.63                3.301
2        2.280     13.42                3.030
Qmax(1) =
           1.000 *    1.000 *    11.506) +
           1.000 *    0.792 *     2.280) + =      13.312
Qmax(2) =
           0.918 *    1.000 *    11.506) +
           1.000 *    1.000 *     2.280) + =      12.843

Total of 2 streams to confluence:
Flow rates before confluence point:
```

```
      11.506       2.280
Maximum flow rates at confluence using above data:
       13.312       12.843
Area of streams before confluence:
        3.600        1.560
Results of confluence:
Total flow rate =     13.312(CFS)
Time of concentration =    10.625 min.
Effective stream area after confluence =      5.160(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      213.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     5.500(Ft.)
Downstream point/station elevation =     5.400(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.312(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    13.312(CFS)
Normal flow depth in pipe =   23.72(In.)
Flow top width inside pipe =   17.64(In.)
Critical Depth =   15.21(In.)
Pipe flow velocity =      3.60(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =    10.90 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      213.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.160(Ac.)
Runoff from this stream =     13.312(CFS)
Time of concentration =   10.90 min.
Rainfall intensity =     3.270(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       56.716     10.41                3.326
2       13.312     10.90                3.270
Qmax(1) =
           1.000 *    1.000 *    56.716) +
           1.000 *    0.955 *    13.312) + =      69.422
Qmax(2) =
           0.983 *    1.000 *    56.716) +
           1.000 *    1.000 *    13.312) + =      69.080

Total of 2 main streams to confluence:
Flow rates before confluence point:
      56.716      13.312
Maximum flow rates at confluence using above data:
       69.422       69.080
Area of streams before confluence:
       17.040        5.160
```



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Results of confluence:
Total flow rate =     69.422(CFS)
Time of concentration =    10.407 min.
Effective stream area after confluence  =     22.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      213.000 to Point/Station      217.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     5.400(Ft.)
Downstream point/station elevation =     4.000(Ft.)
Pipe length  =   470.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    69.422(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    69.422(CFS)
Normal flow depth in pipe =   39.47(In.)
Flow top width inside pipe =   29.55(In.)
Critical Depth =   30.76(In.)
Pipe flow velocity =      6.76(Ft/s)
Travel time through pipe =    1.16 min.
Time of concentration (TC) =    11.57 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      213.000 to Point/Station      217.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     22.200(Ac.)
Runoff from this stream =     69.422(CFS)
Time of concentration =   11.57 min.
Rainfall intensity =     3.201(In/Hr)


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Process from Point/Station      218.000 to Point/Station      219.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   13.000(Ft.)
Lowest elevation =   12.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.70 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 100.000^.5)/(   1.000^(1/3)]=   2.70
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.834(CFS)
Total initial stream area =        0.200(Ac.)


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Process from Point/Station      219.000 to Point/Station      220.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
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Top of street segment elevation =    12.000(Ft.)
End of street segment elevation =     8.000(Ft.)
Length of street segment  =   666.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  24.000(Ft.)
Distance from crown to crossfall grade break  =  22.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =     10.799(CFS)
Depth of flow =   0.414(Ft.), Average velocity =   2.305(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  21.677(Ft.)
Flow velocity =   2.31(Ft/s)
Travel time =    4.81 min.     TC =    9.81  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.397(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     15.426(CFS) for    4.780(Ac.)
Total runoff =     16.260(CFS)  Total area =        4.98(Ac.)
Street flow at end of street =     16.260(CFS)
Half street flow at end of street =     16.260(CFS)
Depth of flow =   0.481(Ft.), Average velocity =   2.605(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  24.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      220.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     9.81 min.
Rainfall intensity =      3.397(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      9.133(CFS) for    2.830(Ac.)
Total runoff =     25.393(CFS)  Total area =        7.81(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      217.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      7.810(Ac.)
Runoff from this stream =     25.393(CFS)
Time of concentration =    9.81 min.
```



```
Rainfall intensity =     3.397(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       69.422     11.57                 3.201
2       25.393      9.81                 3.397
Qmax(1) =
           1.000 *    1.000 *    69.422) +
           0.942 *    1.000 *    25.393) + =      93.349
Qmax(2) =
           1.000 *    0.849 *    69.422) +
           1.000 *    1.000 *    25.393) + =      84.306

Total of 2 streams to confluence:
Flow rates before confluence point:
      69.422      25.393
Maximum flow rates at confluence using above data:
       93.349       84.306
Area of streams before confluence:
       22.200        7.810
Results of confluence:
Total flow rate =     93.349(CFS)
Time of concentration =    11.565 min.
Effective stream area after confluence =     30.010(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      222.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =     4.000(Ft.)
Downstream point/station elevation =     2.440(Ft.)
Pipe length  =   521.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    93.349(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =    93.349(CFS)
Normal flow depth in pipe =   42.28(In.)
Flow top width inside pipe =   38.40(In.)
Critical Depth =   34.58(In.)
Pipe flow velocity =      7.42(Ft/s)
Travel time through pipe =    1.17 min.
Time of concentration (TC) =    12.74 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      225.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =     2.440(Ft.)
Downstream point/station elevation =     0.000(Ft.)
Pipe length  =  1900.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    93.349(CFS)
Nearest computed pipe diameter  =     60.00(In.)
Calculated individual pipe flow  =    93.349(CFS)
Normal flow depth in pipe =   49.22(In.)
Flow top width inside pipe =   46.07(In.)
Critical Depth =   32.95(In.)
Pipe flow velocity =      5.42(Ft/s)
Travel time through pipe =    5.84 min.
Time of concentration (TC) =    18.58 min.
```

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End of computations, total study area =          30.010 (Ac.)
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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 12/20/23
------------------------------------------------------------------------------
4443.10 MIDWAY RISING
EXISTING CONDITIONS
S250 E100

------------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------------


Program License Serial Number 4049

------------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      250.000 to Point/Station      251.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =  110.000(Ft.)
Highest elevation =   12.700(Ft.)
Lowest elevation =   12.500(Ft.)
Elevation difference =    0.200(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.00 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 110.000^.5)/(   0.182^(1/3)]=   5.00
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.542(CFS)
Total initial stream area =        0.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      251.000 to Point/Station      252.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =    12.500(Ft.)
```



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End of street segment elevation =     7.600(Ft.)
Length of street segment  =  1158.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =     10.903(CFS)
Depth of flow =   0.431(Ft.), Average velocity =   2.352(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.000(Ft.)
Flow velocity =   2.35(Ft/s)
Travel time =    8.20 min.     TC =   13.20  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.049(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     14.394(CFS) for    4.970(Ac.)
Total runoff =     14.936(CFS)  Total area =        5.10(Ac.)
Street flow at end of street =     14.936(CFS)
Half street flow at end of street =     14.936(CFS)
Depth of flow =   0.492(Ft.), Average velocity =   2.665(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  16.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      253.000 to Point/Station      252.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =    13.20 min.
Rainfall intensity =      3.049(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     16.537(CFS) for    5.710(Ac.)
Total runoff =     31.474(CFS)  Total area =       10.81(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      254.000 to Point/Station      252.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
```

```
[INDUSTRIAL area type                        ]
Time of concentration =    13.20 min.
Rainfall intensity =      3.049(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     11.237(CFS) for    3.880(Ac.)
Total runoff =     42.711(CFS)  Total area =       14.69(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      252.000 to Point/Station      255.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     6.400(Ft.)
Downstream point/station elevation =     6.200(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    42.711(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    42.711(CFS)
Normal flow depth in pipe =   25.43(In.)
Flow top width inside pipe =   32.79(In.)
Critical Depth =   25.57(In.)
Pipe flow velocity =      8.00(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    13.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      256.000 to Point/Station      255.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =    13.28 min.
Rainfall intensity =      3.042(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     30.290(CFS) for   10.480(Ac.)
Total runoff =     73.001(CFS)  Total area =       25.17(Ac.)
End of computations, total study area =          25.170 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/26/23
--------------------------------------------------------------------------
4443.10 MIDWAY RISING
EXISTING CONDITIONS
S280 E100

--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4049

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      280.000 to Point/Station      281.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   16.000(Ft.)
Lowest elevation =   15.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.70 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 100.000^.5)/(   1.000^(1/3)]=   2.70
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.584(CFS)
Total initial stream area =        0.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      281.000 to Point/Station      282.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     34.149(CFS) for    8.190(Ac.)
Total runoff =     34.733(CFS)  Total area =        8.33(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      284.000 to Point/Station      282.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      8.256(CFS) for    1.980(Ac.)
Total runoff =     42.989(CFS)  Total area =       10.31(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      282.000 to Point/Station      283.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     4.000(Ft.)
Downstream point/station elevation =     3.000(Ft.)
Pipe length  =   352.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    42.989(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    42.989(CFS)
Normal flow depth in pipe =   31.17(In.)
Flow top width inside pipe =   31.24(In.)
Critical Depth =   25.08(In.)
Pipe flow velocity =      6.05(Ft/s)
Travel time through pipe =    0.97 min.
Time of concentration (TC) =     5.97 min.
End of computations, total study area =          10.310 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/26/23
------------------------------------------------------------------------
4443.10 MIDWAY RISING
EXISTING CONDITIONS
S300 E100

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4049

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  189.000(Ft.)
Highest elevation =   15.000(Ft.)
Lowest elevation =   12.600(Ft.)
Elevation difference =    2.400(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.43 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 189.000^.5)/(   1.270^(1/3)]=   3.43
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      1.001(CFS)
Total initial stream area =        0.240(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
```



```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     23.225(CFS) for    5.570(Ac.)
Total runoff =     24.225(CFS)  Total area =        5.81(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =    10.500(Ft.)
End of street segment elevation =     8.400(Ft.)
Length of street segment  =   489.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  36.000(Ft.)
Distance from crown to crossfall grade break  =  34.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   8.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =     25.726(CFS)
Depth of flow =   0.627(Ft.), Average velocity =   2.375(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    6.34(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  32.318(Ft.)
Flow velocity =   2.38(Ft/s)
Travel time =    3.43 min.     TC =    8.43  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Rainfall intensity =      3.590(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.455(CFS) for    0.720(Ac.)
Total runoff =     26.681(CFS)  Total area =        6.53(Ac.)
Street flow at end of street =     26.681(CFS)
Half street flow at end of street =     26.681(CFS)
Depth of flow =   0.635(Ft.), Average velocity =   2.391(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    6.76(Ft.)
Flow width (from curb towards crown)=  32.736(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      303.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      6.530(Ac.)
```

```
Runoff from this stream =     26.681(CFS)
Time of concentration =    8.43 min.
Rainfall intensity =     3.590(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      306.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  155.900(Ft.)
Highest elevation =   13.000(Ft.)
Lowest elevation =   12.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.91 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 155.900^.5)/(   0.641^(1/3)]=   3.91
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      1.167(CFS)
Total initial stream area =        0.280(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      303.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     11.091(CFS) for    2.660(Ac.)
Total runoff =     12.259(CFS)  Total area =        2.94(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      307.000 to Point/Station      303.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.085(CFS) for    0.500(Ac.)
Total runoff =     14.343(CFS)  Total area =        3.44(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      307.000 to Point/Station      303.000
```



```
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.440(Ac.)
Runoff from this stream =     14.343(CFS)
Time of concentration =    5.00 min.
Rainfall intensity =     4.389(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       26.681      8.43                 3.590
2       14.343      5.00                 4.389
Qmax(1) =
           1.000 *    1.000 *    26.681) +
           0.818 *    1.000 *    14.343) + =      38.412
Qmax(2) =
           1.000 *    0.593 *    26.681) +
           1.000 *    1.000 *    14.343) + =      30.166

Total of 2 streams to confluence:
Flow rates before confluence point:
      26.681      14.343
Maximum flow rates at confluence using above data:
       38.412       30.166
Area of streams before confluence:
        6.530        3.440
Results of confluence:
Total flow rate =     38.412(CFS)
Time of concentration =     8.431 min.
Effective stream area after confluence =      9.970(Ac.)
End of computations, total study area =           9.970 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/26/23
--------------------------------------------------------------------------
4443.10 MIDWAY RISING
EXISTING CONDITIONS
S320 E100

--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4049

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      320.000 to Point/Station      321.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =  107.000(Ft.)
Highest elevation =   11.300(Ft.)
Lowest elevation =   10.900(Ft.)
Elevation difference =    0.400(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.88 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 107.000^.5)/(   0.374^(1/3)]=   3.88
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.876(CFS)
Total initial stream area =        0.210(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      321.000 to Point/Station      322.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =    10.600(Ft.)
```



```
Downstream point elevation =     9.600(Ft.)
Channel length thru subarea  =   150.000(Ft.)
Channel base width      =   20.000(Ft.)
Slope or 'Z' of left channel bank =  20.000
Slope or 'Z' of right channel bank =  20.000
Estimated mean flow rate at midpoint of channel =      4.378(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      4.378(CFS)
Depth of flow =   0.112(Ft.), Average velocity =   1.761(Ft/s)
Channel flow top width =   24.473(Ft.)
Flow Velocity =    1.76(Ft/s)
Travel time  =    1.42 min.
Time of concentration =    6.42 min.
Critical depth =      0.109(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.975(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      6.344(CFS) for    1.680(Ac.)
Total runoff =      7.220(CFS)  Total area =        1.89(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      323.000 to Point/Station      322.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     6.42 min.
Rainfall intensity =      3.975(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      3.437(CFS) for    0.910(Ac.)
Total runoff =     10.656(CFS)  Total area =        2.80(Ac.)
End of computations, total study area =          2.800 (Ac.)
```

APPENDIX 3

Proposed Conditions Rational Method Computer Output

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/27/23
--------------------------------------------------------------------------------
4443.10 MIDWAY RISING
PROPOSED CONDITIONS
S1000P100

--------------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------------


Program License Serial Number 4049

--------------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1000.000 to Point/Station     1001.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   11.500(Ft.)
Lowest elevation =   11.000(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.40 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 100.000^.5)/(   0.500^(1/3)]=   3.40
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.459(CFS)
Total initial stream area =        0.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1001.000 to Point/Station     1002.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
```



```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      6.588(CFS) for    1.580(Ac.)
Total runoff =      7.047(CFS)  Total area =        1.69(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1002.000 to Point/Station     1003.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =     5.500(Ft.)
Downstream point/station elevation =     5.190(Ft.)
Pipe length  =    63.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.047(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.047(CFS)
Normal flow depth in pipe =   14.09(In.)
Flow top width inside pipe =   14.85(In.)
Critical Depth =   12.33(In.)
Pipe flow velocity =      4.75(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     5.22 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1004.000 to Point/Station     1003.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.22 min.
Rainfall intensity =      4.312(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.369(CFS) for    0.090(Ac.)
Total runoff =      7.415(CFS)  Total area =        1.78(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1005.000 to Point/Station     1003.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.22 min.
Rainfall intensity =      4.312(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.696(CFS) for    0.170(Ac.)
Total runoff =      8.112(CFS)  Total area =        1.95(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1005.000
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =     5.190(Ft.)
Downstream point/station elevation =     4.950(Ft.)
Pipe length  =    18.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.112(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.112(CFS)
Normal flow depth in pipe =   10.77(In.)
Flow top width inside pipe =   17.65(In.)
Critical Depth =   13.23(In.)
Pipe flow velocity =      7.35(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     5.26 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1006.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.950(Ac.)
Runoff from this stream =      8.112(CFS)
Time of concentration =    5.26 min.
Rainfall intensity =     4.299(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1007.000 to Point/Station     1008.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =   87.000(Ft.)
Highest elevation =   12.360(Ft.)
Lowest elevation =   12.110(Ft.)
Elevation difference =    0.250(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.82 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  87.000^.5)/(   0.287^(1/3)]=   3.82
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.375(CFS)
Total initial stream area =        0.090(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1008.000 to Point/Station     1009.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________
Top of street segment elevation =    12.110(Ft.)
End of street segment elevation =     9.600(Ft.)
Length of street segment  =   386.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  20.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
```



```
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.435(CFS)
Depth of flow =   0.110(Ft.), Average velocity =   1.077(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.472(Ft.)
Flow velocity =   1.08(Ft/s)
Travel time =    5.97 min.     TC =   10.97  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Rainfall intensity =      3.263(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.887(CFS) for    0.320(Ac.)
Total runoff =      1.263(CFS)  Total area =        0.41(Ac.)
Street flow at end of street =      1.263(CFS)
Half street flow at end of street =      1.263(CFS)
Depth of flow =   0.172(Ft.), Average velocity =   1.399(Ft/s)
Flow width (from curb towards crown)=   9.576(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1010.000 to Point/Station     1006.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Time of concentration =    10.97 min.
Rainfall intensity =      3.263(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      2.829(CFS) for    1.020(Ac.)
Total runoff =      4.091(CFS)  Total area =        1.43(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1010.000 to Point/Station     1006.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.430(Ac.)
Runoff from this stream =      4.091(CFS)
Time of concentration =   10.97 min.
Rainfall intensity =     3.263(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)               (In/Hr)


1        8.112      5.26                4.299
2        4.091     10.97                3.263
```

```
Qmax(1) =
          1.000 *    1.000 *     8.112) +
          1.000 *    0.480 *     4.091) + =      10.074
Qmax(2) =
          0.759 *    1.000 *     8.112) +
          1.000 *    1.000 *     4.091) + =      10.248

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.112       4.091
Maximum flow rates at confluence using above data:
      10.074      10.248
Area of streams before confluence:
       1.950       1.430
Results of confluence:
Total flow rate =     10.248(CFS)
Time of concentration =    10.973 min.
Effective stream area after confluence =      3.380(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1006.000 to Point/Station     1011.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     6.000(Ft.)
Downstream point/station elevation =     5.500(Ft.)
Pipe length  =   290.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.248(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    10.248(CFS)
Normal flow depth in pipe =   18.21(In.)
Flow top width inside pipe =   25.30(In.)
Critical Depth =   13.27(In.)
Pipe flow velocity =      3.59(Ft/s)
Travel time through pipe =    1.35 min.
Time of concentration (TC) =    12.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1012.000 to Point/Station     1011.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =    12.32 min.
Rainfall intensity =      3.128(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.099(CFS) for    0.370(Ac.)
Total runoff =     11.347(CFS)  Total area =        3.75(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1013.000 to Point/Station     1011.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
```



```
Time of concentration =    12.32 min.
Rainfall intensity =      3.128(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.070(CFS) for    0.360(Ac.)
Total runoff =     12.417(CFS)  Total area =        4.11(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1014.000 to Point/Station     1011.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =    12.32 min.
Rainfall intensity =      3.128(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.437(CFS) for    0.820(Ac.)
Total runoff =     14.854(CFS)  Total area =        4.93(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1011.000 to Point/Station     1015.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     5.500(Ft.)
Downstream point/station elevation =     5.400(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.854(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    14.854(CFS)
Normal flow depth in pipe =   21.98(In.)
Flow top width inside pipe =   26.55(In.)
Critical Depth =   15.59(In.)
Pipe flow velocity =      3.85(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =    12.58 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1011.000 to Point/Station     1015.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      4.930(Ac.)
Runoff from this stream =     14.854(CFS)
Time of concentration =   12.58 min.
Rainfall intensity =     3.104(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1016.000 to Point/Station     1017.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
```

```
Initial subarea flow distance  =  122.000(Ft.)
Highest elevation =   12.000(Ft.)
Lowest elevation =   11.500(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     4.01 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 122.000^.5)/(   0.410^(1/3)]=   4.01
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.709(CFS)
Total initial stream area =        0.170(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1017.000 to Point/Station     1018.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      4.045(CFS) for    0.970(Ac.)
Total runoff =      4.753(CFS)  Total area =        1.14(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1019.000 to Point/Station     1018.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      4.962(CFS) for    1.190(Ac.)
Total runoff =      9.715(CFS)  Total area =        2.33(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1018.000 to Point/Station     1020.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     5.950(Ft.)
Downstream point/station elevation =     5.110(Ft.)
Pipe length  =    83.50(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.715(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     9.715(CFS)
Normal flow depth in pipe =   13.64(In.)
Flow top width inside pipe =   15.42(In.)
Critical Depth =   14.44(In.)
Pipe flow velocity =      6.77(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =     5.21 min.
```



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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1021.000 to Point/Station     1020.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =     5.21 min.
Rainfall intensity =      4.318(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.723(CFS) for    0.420(Ac.)
Total runoff =     11.438(CFS)  Total area =        2.75(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1022.000 to Point/Station     1020.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =     5.21 min.
Rainfall intensity =      4.318(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      3.281(CFS) for    0.800(Ac.)
Total runoff =     14.719(CFS)  Total area =        3.55(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1023.000 to Point/Station     1020.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =     5.21 min.
Rainfall intensity =      4.318(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.871(CFS) for    0.700(Ac.)
Total runoff =     17.590(CFS)  Total area =        4.25(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1024.000 to Point/Station     1020.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =     5.21 min.
Rainfall intensity =      4.318(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.313(CFS) for    0.320(Ac.)
```

```
Total runoff =     18.903(CFS)  Total area =        4.57(Ac.)


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Process from Point/Station     1024.000 to Point/Station     1020.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      4.570(Ac.)
Runoff from this stream =     18.903(CFS)
Time of concentration =    5.21 min.
Rainfall intensity =     4.318(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1026.000 to Point/Station     1027.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                    ]
Initial subarea flow distance  =   71.000(Ft.)
Highest elevation =   12.000(Ft.)
Lowest elevation =   11.500(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     6.82 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7000)*(  71.000^.5)/( 0.704^(1/3)]=   6.82
Rainfall intensity (I) =      3.885(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      0.218(CFS)
Total initial stream area =        0.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1027.000 to Point/Station     1020.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                    ]
Time of concentration =     6.82 min.
Rainfall intensity =     3.885(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      2.230(CFS) for    0.820(Ac.)
Total runoff =      2.447(CFS)  Total area =        0.90(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1027.000 to Point/Station     1020.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     7.000(Ft.)
Downstream point/station elevation =     5.110(Ft.)
Pipe length  =   175.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.447(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.447(CFS)
```



```
Normal flow depth in pipe =    7.13(In.)
Flow top width inside pipe =   11.79(In.)
Critical Depth =    8.03(In.)
Pipe flow velocity =      5.04(Ft/s)
Travel time through pipe =    0.58 min.
Time of concentration (TC) =     7.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1027.000 to Point/Station     1020.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.900(Ac.)
Runoff from this stream =      2.447(CFS)
Time of concentration =    7.40 min.
Rainfall intensity =     3.767(In/Hr)
Summary of stream data:

Stream   Flow rate      TC             Rainfall Intensity
 No.       (CFS)       (min)                  (In/Hr)


1       18.903      5.21                 4.318
2        2.447      7.40                 3.767
Qmax(1) =
           1.000 *    1.000 *    18.903) +
           1.000 *    0.704 *     2.447) + =      20.625
Qmax(2) =
           0.873 *    1.000 *    18.903) +
           1.000 *    1.000 *     2.447) + =      18.941

Total of 2 streams to confluence:
Flow rates before confluence point:
      18.903       2.447
Maximum flow rates at confluence using above data:
       20.625       18.941
Area of streams before confluence:
        4.570        0.900
Results of confluence:
Total flow rate =     20.625(CFS)
Time of concentration =     5.206 min.
Effective stream area after confluence =      5.470(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1020.000 to Point/Station     1025.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     4.110(Ft.)
Downstream point/station elevation =     1.700(Ft.)
Pipe length  =   241.50(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.625(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    20.625(CFS)
Normal flow depth in pipe =   18.00(In.)
Flow top width inside pipe =   20.78(In.)
Critical Depth =   19.54(In.)
Pipe flow velocity =      8.15(Ft/s)
Travel time through pipe =    0.49 min.
Time of concentration (TC) =     5.70 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1028.000 to Point/Station     1025.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.70 min.
Rainfall intensity =      4.164(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.108(CFS) for    0.280(Ac.)
Total runoff =     21.733(CFS)  Total area =        5.75(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1025.000 to Point/Station     1015.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =     1.700(Ft.)
Downstream point/station elevation =     1.300(Ft.)
Pipe length  =    28.50(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.733(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    21.733(CFS)
Normal flow depth in pipe =   16.41(In.)
Flow top width inside pipe =   22.32(In.)
Critical Depth =   20.01(In.)
Pipe flow velocity =      9.50(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     5.75 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1025.000 to Point/Station     1015.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.750(Ac.)
Runoff from this stream =     21.733(CFS)
Time of concentration =    5.75 min.
Rainfall intensity =     4.150(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       14.854     12.58                 3.104
2       21.733      5.75                 4.150
Qmax(1) =
           1.000 *    1.000 *    14.854) +
           0.748 *    1.000 *    21.733) + =      31.110
Qmax(2) =
           1.000 *    0.457 *    14.854) +
           1.000 *    1.000 *    21.733) + =      28.522

Total of 2 main streams to confluence:
Flow rates before confluence point:
      14.854      21.733
Maximum flow rates at confluence using above data:
```



```
       31.110       28.522
Area of streams before confluence:
        4.930        5.750


Results of confluence:
Total flow rate =     31.110(CFS)
Time of concentration =    12.579 min.
Effective stream area after confluence  =     10.680(Ac.)
End of computations, total study area =          10.680 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/26/23
--------------------------------------------------------------------------------
4443.10 MIDWAY RISING
PROPOSED CONDITIONS
S1100P100

--------------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------------


Program License Serial Number 4049

--------------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1100.000 to Point/Station     1101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   11.500(Ft.)
Lowest elevation =   11.000(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.40 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 100.000^.5)/(   0.500^(1/3)]=   3.40
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.709(CFS)
Total initial stream area =        0.170(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1101.000 to Point/Station     1102.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
```



```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      4.503(CFS) for    1.080(Ac.)
Total runoff =      5.212(CFS)  Total area =        1.25(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1102.000 to Point/Station     1103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =     5.230(Ft.)
Downstream point/station elevation =     3.070(Ft.)
Pipe length  =   213.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.212(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.212(CFS)
Normal flow depth in pipe =   10.16(In.)
Flow top width inside pipe =   14.02(In.)
Critical Depth =   11.10(In.)
Pipe flow velocity =      5.89(Ft/s)
Travel time through pipe =    0.60 min.
Time of concentration (TC) =     5.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1104.000 to Point/Station     1103.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.60 min.
Rainfall intensity =      4.192(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      4.700(CFS) for    1.180(Ac.)
Total runoff =      9.912(CFS)  Total area =        2.43(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1103.000 to Point/Station     1105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =     3.070(Ft.)
Downstream point/station elevation =     1.030(Ft.)
Pipe length  =   270.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.912(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     9.912(CFS)
Normal flow depth in pipe =   13.20(In.)
Flow top width inside pipe =   20.30(In.)
Critical Depth =   14.06(In.)
Pipe flow velocity =      6.23(Ft/s)
Travel time through pipe =    0.72 min.
Time of concentration (TC) =     6.32 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1106.000 to Point/Station     1105.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =     6.32 min.
Rainfall intensity =      3.998(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.241(CFS) for    0.690(Ac.)
Total runoff =     11.153(CFS)  Total area =        3.12(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1105.000 to Point/Station     1107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =     1.030(Ft.)
Downstream point/station elevation =     0.750(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.153(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    11.153(CFS)
Normal flow depth in pipe =   14.04(In.)
Flow top width inside pipe =   19.77(In.)
Critical Depth =   14.95(In.)
Pipe flow velocity =      6.53(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     6.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1105.000 to Point/Station     1107.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.120(Ac.)
Runoff from this stream =     11.153(CFS)
Time of concentration =    6.41 min.
Rainfall intensity =     3.977(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1108.000 to Point/Station     1109.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =   76.000(Ft.)
Highest elevation =   13.300(Ft.)
Lowest elevation =   12.600(Ft.)
Elevation difference =    0.700(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =    10.48 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*(  76.000^.5)/( 0.921^(1/3)]=  10.48
Rainfall intensity (I) =      3.317(In/Hr) for a   100.0 year storm
```



```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.134(CFS)
Total initial stream area =        0.090(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1109.000 to Point/Station     1110.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =    12.600(Ft.)
Downstream point elevation =    12.000(Ft.)
Channel length thru subarea  =   191.000(Ft.)
Channel base width      =   20.000(Ft.)
Slope or 'Z' of left channel bank =  10.000
Slope or 'Z' of right channel bank =  10.000
Estimated mean flow rate at midpoint of channel =      0.851(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      0.851(CFS)
Depth of flow =   0.096(Ft.), Average velocity =   0.423(Ft/s)
Channel flow top width =   21.918(Ft.)
Flow Velocity =    0.42(Ft/s)
Travel time  =    7.52 min.
Time of concentration =   18.00 min.
Critical depth =      0.038(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      2.700(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.166(CFS) for    0.960(Ac.)
Total runoff =      1.301(CFS)  Total area =        1.05(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1110.000 to Point/Station     1111.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =     3.930(Ft.)
Downstream point/station elevation =     3.300(Ft.)
Pipe length  =    63.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.301(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.301(CFS)
Normal flow depth in pipe =    6.01(In.)
Flow top width inside pipe =    8.48(In.)
Critical Depth =    6.31(In.)
Pipe flow velocity =      4.15(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =    18.26 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1111.000 to Point/Station     1107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =     3.300(Ft.)
Downstream point/station elevation =     2.000(Ft.)
Pipe length  =   146.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.301(CFS)
```

```
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.301(CFS)
Normal flow depth in pipe =    6.28(In.)
Flow top width inside pipe =    8.26(In.)
Critical Depth =    6.31(In.)
Pipe flow velocity =      3.95(Ft/s)
Travel time through pipe =    0.62 min.
Time of concentration (TC) =    18.87 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1111.000 to Point/Station     1107.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.050(Ac.)
Runoff from this stream =      1.301(CFS)
Time of concentration =   18.87 min.
Rainfall intensity =     2.647(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       11.153      6.41                3.977
2        1.301     18.87                2.647
Qmax(1) =
           1.000 *    1.000 *    11.153) +
           1.000 *    0.340 *     1.301) + =      11.595
Qmax(2) =
           0.666 *    1.000 *    11.153) +
           1.000 *    1.000 *     1.301) + =       8.724

Total of 2 streams to confluence:
Flow rates before confluence point:
      11.153       1.301
Maximum flow rates at confluence using above data:
       11.595        8.724
Area of streams before confluence:
        3.120        1.050
Results of confluence:
Total flow rate =     11.595(CFS)
Time of concentration =     6.414 min.
Effective stream area after confluence =      4.170(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1107.000 to Point/Station     1112.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =     2.000(Ft.)
Downstream point/station elevation =     1.500(Ft.)
Pipe length  =    76.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.595(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    11.595(CFS)
Normal flow depth in pipe =   15.61(In.)
Flow top width inside pipe =   18.35(In.)
Critical Depth =   15.24(In.)
Pipe flow velocity =      6.05(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =     6.62 min.
```



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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1107.000 to Point/Station     1112.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.170(Ac.)
Runoff from this stream =     11.595(CFS)
Time of concentration =     6.62 min.
Rainfall intensity =     3.928(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1113.000 to Point/Station     1114.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Initial subarea flow distance  =   58.000(Ft.)
Highest elevation =   13.000(Ft.)
Lowest elevation =   12.700(Ft.)
Elevation difference =    0.300(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     4.27 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*(  58.000^.5)/(   0.517^(1/3)]=   4.27
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.224(CFS)
Total initial stream area =        0.060(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1114.000 to Point/Station     1112.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =    12.700(Ft.)
End of street segment elevation =    12.000(Ft.)
Length of street segment  =   251.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  20.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.262(CFS)
Depth of flow =   0.106(Ft.), Average velocity =   0.691(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.275(Ft.)
Flow velocity =   0.69(Ft/s)
Travel time =    6.06 min.     TC =   11.06  min.
```

```
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Rainfall intensity =      3.254(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.940(CFS) for    0.340(Ac.)
Total runoff =      1.164(CFS)  Total area =        0.40(Ac.)
Street flow at end of street =      1.164(CFS)
Half street flow at end of street =      1.164(CFS)
Depth of flow =   0.198(Ft.), Average velocity =   0.997(Ft/s)
Flow width (from curb towards crown)=  10.875(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1115.000 to Point/Station     1112.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Note: user entry of impervious value, Ap = 0.900
Time of concentration =    11.06 min.
Rainfall intensity =      3.254(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.956
Subarea runoff =      1.431(CFS) for    0.460(Ac.)
Total runoff =      2.595(CFS)  Total area =        0.86(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1115.000 to Point/Station     1112.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.860(Ac.)
Runoff from this stream =      2.595(CFS)
Time of concentration =   11.06 min.
Rainfall intensity =     3.254(In/Hr)
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)


1       11.595      6.62                3.928
2        2.595     11.06                3.254
Qmax(1) =
           1.000 *    1.000 *    11.595) +
           1.000 *    0.599 *     2.595) + =      13.150
Qmax(2) =
           0.828 *    1.000 *    11.595) +
           1.000 *    1.000 *     2.595) + =      12.200

Total of 2 streams to confluence:
Flow rates before confluence point:
      11.595       2.595
Maximum flow rates at confluence using above data:
       13.150       12.200
Area of streams before confluence:
```



```
       4.170        0.860
Results of confluence:
Total flow rate =     13.150(CFS)
Time of concentration =     6.623 min.
Effective stream area after confluence =      5.030(Ac.)


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Process from Point/Station     1112.000 to Point/Station     1116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     2.000(Ft.)
Downstream point/station elevation =     1.200(Ft.)
Pipe length  =   280.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.150(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    13.150(CFS)
Normal flow depth in pipe =   18.16(In.)
Flow top width inside pipe =   25.34(In.)
Critical Depth =   15.12(In.)
Pipe flow velocity =      4.62(Ft/s)
Travel time through pipe =    1.01 min.
Time of concentration (TC) =     7.63 min.


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Process from Point/Station     1117.000 to Point/Station     1116.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Time of concentration =     7.63 min.
Rainfall intensity =      3.724(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.760(CFS) for    0.240(Ac.)
Total runoff =     13.909(CFS)  Total area =        5.27(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1118.000 to Point/Station     1116.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     7.63 min.
Rainfall intensity =      3.724(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.405(CFS) for    0.680(Ac.)
Total runoff =     16.315(CFS)  Total area =        5.95(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1116.000 to Point/Station     1119.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     1.200(Ft.)
Downstream point/station elevation =     0.300(Ft.)
```

```
Pipe length  =   232.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.315(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    16.315(CFS)
Normal flow depth in pipe =   19.05(In.)
Flow top width inside pipe =   24.61(In.)
Critical Depth =   16.90(In.)
Pipe flow velocity =      5.44(Ft/s)
Travel time through pipe =    0.71 min.
Time of concentration (TC) =     8.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1120.000 to Point/Station     1119.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Time of concentration =     8.34 min.
Rainfall intensity =      3.603(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.930(CFS) for    0.630(Ac.)
Total runoff =     18.245(CFS)  Total area =        6.58(Ac.)
End of computations, total study area =           6.580 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 06/10/24
------------------------------------------------------------------------
4443.10 MIDWAY RISING
PROPOSED CONDITIONS
S2000P100

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4049

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2000.000 to Point/Station     2001.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  110.000(Ft.)
Highest elevation =   11.700(Ft.)
Lowest elevation =   11.500(Ft.)
Elevation difference =    0.200(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.00 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 110.000^.5)/(   0.182^(1/3)]=   5.00
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.709(CFS)
Total initial stream area =        0.170(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2001.000 to Point/Station     2002.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =    11.200(Ft.)
```



```
End of street segment elevation =     9.000(Ft.)
Length of street segment  =   294.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      5.254(CFS)
Depth of flow =   0.298(Ft.), Average velocity =   2.096(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.879(Ft.)
Flow velocity =   2.10(Ft/s)
Travel time =    2.34 min.     TC =    7.34  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Rainfall intensity =      3.779(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      7.826(CFS) for    2.180(Ac.)
Total runoff =      8.535(CFS)  Total area =        2.35(Ac.)
Street flow at end of street =      8.535(CFS)
Half street flow at end of street =      8.535(CFS)
Depth of flow =   0.352(Ft.), Average velocity =   2.534(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  16.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2003.000 to Point/Station     2002.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     7.34 min.
Rainfall intensity =      3.779(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      6.857(CFS) for    1.910(Ac.)
Total runoff =     15.392(CFS)  Total area =        4.26(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2003.000 to Point/Station     2004.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     6.000(Ft.)
Downstream point/station elevation =     5.040(Ft.)
Pipe length  =   320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.392(CFS)
Nearest computed pipe diameter  =     27.00(In.)
```

```
Calculated individual pipe flow  =    15.392(CFS)
Normal flow depth in pipe =   20.16(In.)
Flow top width inside pipe =   23.49(In.)
Critical Depth =   16.39(In.)
Pipe flow velocity =      4.83(Ft/s)
Travel time through pipe =    1.10 min.
Time of concentration (TC) =     8.44 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2003.000 to Point/Station     2004.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.260(Ac.)
Runoff from this stream =     15.392(CFS)
Time of concentration =    8.44 min.
Rainfall intensity =     3.588(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2005.000 to Point/Station     2006.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =   80.000(Ft.)
Highest elevation =   11.300(Ft.)
Lowest elevation =   10.800(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.82 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  80.000^.5)/(   0.625^(1/3)]=   2.82
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.584(CFS)
Total initial stream area =        0.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2006.000 to Point/Station     2007.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =    10.800(Ft.)
Downstream point elevation =     9.700(Ft.)
Channel length thru subarea  =    90.000(Ft.)
Channel base width      =   20.000(Ft.)
Slope or 'Z' of left channel bank =  20.000
Slope or 'Z' of right channel bank =  20.000
Estimated mean flow rate at midpoint of channel =      1.334(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      1.334(CFS)
Depth of flow =   0.046(Ft.), Average velocity =   1.374(Ft/s)
Channel flow top width =   21.856(Ft.)
Flow Velocity =    1.37(Ft/s)
Travel time  =    1.09 min.
Time of concentration =    6.09 min.
```



```
Critical depth =      0.051(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      4.057(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.387(CFS) for    0.360(Ac.)
Total runoff =      1.971(CFS)  Total area =        0.50(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2007.000 to Point/Station     2004.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =     5.990(Ft.)
Downstream point/station elevation =     4.190(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.971(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.971(CFS)
Normal flow depth in pipe =    5.64(In.)
Flow top width inside pipe =    8.71(In.)
Critical Depth =    7.66(In.)
Pipe flow velocity =      6.78(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     6.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2007.000 to Point/Station     2004.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.500(Ac.)
Runoff from this stream =      1.971(CFS)
Time of concentration =    6.25 min.
Rainfall intensity =     4.016(In/Hr)
Summary of stream data:

Stream   Flow rate       TC             Rainfall Intensity
 No.       (CFS)        (min)                 (In/Hr)


1       15.392      8.44                  3.588
2        1.971      6.25                  4.016
Qmax(1) =
           1.000 *    1.000 *    15.392) +
           0.893 *    1.000 *     1.971) + =      17.153
Qmax(2) =
           1.000 *    0.741 *    15.392) +
           1.000 *    1.000 *     1.971) + =      13.370

Total of 2 streams to confluence:
Flow rates before confluence point:
      15.392       1.971
Maximum flow rates at confluence using above data:
       17.153       13.370
Area of streams before confluence:
        4.260        0.500
Results of confluence:
```

```
Total flow rate =     17.153(CFS)
Time of concentration =     8.442 min.
Effective stream area after confluence =      4.760(Ac.)


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Process from Point/Station     2004.000 to Point/Station     2008.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =     4.190(Ft.)
Downstream point/station elevation =     4.000(Ft.)
Pipe length  =    66.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.153(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    17.153(CFS)
Normal flow depth in pipe =   23.02(In.)
Flow top width inside pipe =   19.15(In.)
Critical Depth =   17.36(In.)
Pipe flow velocity =      4.75(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =     8.67 min.


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Process from Point/Station     2004.000 to Point/Station     2008.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.760(Ac.)
Runoff from this stream =     17.153(CFS)
Time of concentration =    8.67 min.
Rainfall intensity =     3.553(In/Hr)


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Process from Point/Station     2009.000 to Point/Station     2010.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                  ]
Initial subarea flow distance  =   75.000(Ft.)
Highest elevation =   10.600(Ft.)
Lowest elevation =   10.500(Ft.)
Elevation difference =    0.100(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     7.63 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*(  75.000^.5)/( 0.133^(1/3)]=   7.63
Rainfall intensity (I) =      3.725(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      1.773(CFS)
Total initial stream area =        0.560(Ac.)


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Process from Point/Station     2010.000 to Point/Station     2011.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =    10.500(Ft.)
End of street segment elevation =     8.700(Ft.)
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Length of street segment  =   491.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  20.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      2.659(CFS)
Depth of flow =   0.262(Ft.), Average velocity =   1.354(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.065(Ft.)
Flow velocity =   1.35(Ft/s)
Travel time =    6.04 min.     TC =   13.67  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                  ]
Rainfall intensity =      3.009(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.432(CFS) for    0.560(Ac.)
Total runoff =      3.205(CFS)  Total area =        1.12(Ac.)
Street flow at end of street =      3.205(CFS)
Half street flow at end of street =      3.205(CFS)
Depth of flow =   0.282(Ft.), Average velocity =   1.418(Ft/s)
Flow width (from curb towards crown)=  15.083(Ft.)


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Process from Point/Station     2011.000 to Point/Station     2013.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =     6.190(Ft.)
Downstream point/station elevation =     6.000(Ft.)
Pipe length  =    36.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.205(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     3.205(CFS)
Normal flow depth in pipe =    9.09(In.)
Flow top width inside pipe =   14.66(In.)
Critical Depth =    8.66(In.)
Pipe flow velocity =      4.12(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    13.82 min.


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Process from Point/Station     2013.000 to Point/Station     2012.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                  ]
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Time of concentration =    13.82 min.
Rainfall intensity =      2.997(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     12.074(CFS) for    4.240(Ac.)
Total runoff =     15.279(CFS)  Total area =        5.36(Ac.)


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Process from Point/Station     2012.000 to Point/Station     2008.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     6.000(Ft.)
Downstream point/station elevation =     5.500(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.279(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    15.279(CFS)
Normal flow depth in pipe =   15.35(In.)
Flow top width inside pipe =   23.04(In.)
Critical Depth =   16.89(In.)
Pipe flow velocity =      7.19(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    13.96 min.


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Process from Point/Station     2012.000 to Point/Station     2008.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.360(Ac.)
Runoff from this stream =     15.279(CFS)
Time of concentration =   13.96 min.
Rainfall intensity =     2.986(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1       17.153      8.67                3.553
2       15.279     13.96                2.986
Qmax(1) =
           1.000 *    1.000 *    17.153) +
           1.000 *    0.621 *    15.279) + =      26.648
Qmax(2) =
           0.840 *    1.000 *    17.153) +
           1.000 *    1.000 *    15.279) + =      29.695

Total of 2 streams to confluence:
Flow rates before confluence point:
      17.153      15.279
Maximum flow rates at confluence using above data:
       26.648       29.695
Area of streams before confluence:
        4.760        5.360
Results of confluence:
Total flow rate =     29.695(CFS)
Time of concentration =    13.956 min.
Effective stream area after confluence =     10.120(Ac.)


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Process from Point/Station     2008.000 to Point/Station     2014.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     6.000(Ft.)
Downstream point/station elevation =     5.500(Ft.)
Pipe length  =   290.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.695(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    29.695(CFS)
Normal flow depth in pipe =   28.03(In.)
Flow top width inside pipe =   35.07(In.)
Critical Depth =   20.66(In.)
Pipe flow velocity =      4.65(Ft/s)
Travel time through pipe =    1.04 min.
Time of concentration (TC) =    14.99 min.


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Process from Point/Station     2008.000 to Point/Station     2014.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     10.120(Ac.)
Runoff from this stream =     29.695(CFS)
Time of concentration =   14.99 min.
Rainfall intensity =     2.905(In/Hr)


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Process from Point/Station     2015.000 to Point/Station     2016.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  132.000(Ft.)
Highest elevation =   12.800(Ft.)
Lowest elevation =   11.000(Ft.)
Elevation difference =    1.800(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.80 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 132.000^.5)/(   1.364^(1/3)]=   2.80
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.500(CFS)
Total initial stream area =        0.120(Ac.)


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Process from Point/Station     2016.000 to Point/Station     2014.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =    11.000(Ft.)
End of street segment elevation =     9.500(Ft.)
Length of street segment  =   275.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
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Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      8.756(CFS)
Depth of flow =   0.295(Ft.), Average velocity =   1.779(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.735(Ft.)
Flow velocity =   1.78(Ft/s)
Travel time =    2.58 min.     TC =    7.58  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.734(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     14.047(CFS) for    3.960(Ac.)
Total runoff =     14.548(CFS)  Total area =        4.08(Ac.)
Street flow at end of street =     14.548(CFS)
Half street flow at end of street =      7.274(CFS)
Depth of flow =   0.352(Ft.), Average velocity =   2.162(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  16.000(Ft.)


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Process from Point/Station     2016.000 to Point/Station     2014.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      4.080(Ac.)
Runoff from this stream =     14.548(CFS)
Time of concentration =    7.58 min.
Rainfall intensity =     3.734(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1       29.695     14.99                2.905
2       14.548      7.58                3.734
Qmax(1) =
           1.000 *    1.000 *    29.695) +
           0.778 *    1.000 *    14.548) + =      41.015
Qmax(2) =
           1.000 *    0.505 *    29.695) +
           1.000 *    1.000 *    14.548) + =      29.553

Total of 2 streams to confluence:
Flow rates before confluence point:
      29.695      14.548
Maximum flow rates at confluence using above data:
       41.015       29.553
Area of streams before confluence:
       10.120        4.080
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Results of confluence:
Total flow rate =     41.015(CFS)
Time of concentration =    14.995 min.
Effective stream area after confluence =     14.200(Ac.)


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Process from Point/Station     2014.000 to Point/Station     2017.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =     5.500(Ft.)
Downstream point/station elevation =     5.400(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    41.015(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    41.015(CFS)
Normal flow depth in pipe =   34.41(In.)
Flow top width inside pipe =   32.33(In.)
Critical Depth =   23.92(In.)
Pipe flow velocity =      4.87(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    15.20 min.


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Process from Point/Station     2014.000 to Point/Station     2017.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     14.200(Ac.)
Runoff from this stream =     41.015(CFS)
Time of concentration =   15.20 min.
Rainfall intensity =     2.890(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station     2018.000 to Point/Station     2019.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  114.000(Ft.)
Highest elevation =   12.000(Ft.)
Lowest elevation =   11.500(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =    16.44 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 114.000^.5)/( 0.439^(1/3)]=  16.44
Rainfall intensity (I) =      2.802(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.265(CFS)
Total initial stream area =        0.210(Ac.)


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Process from Point/Station     2019.000 to Point/Station     2020.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
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_____________________________________________________________________
Top of street segment elevation =    11.500(Ft.)
End of street segment elevation =    10.000(Ft.)
Length of street segment  =   598.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      2.402(CFS)
Depth of flow =   0.271(Ft.), Average velocity =   1.145(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.536(Ft.)
Flow velocity =   1.14(Ft/s)
Travel time =    8.71 min.     TC =   25.15  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      2.313(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      7.449(CFS) for    3.390(Ac.)
Total runoff =      7.714(CFS)  Total area =        3.60(Ac.)
Street flow at end of street =      7.714(CFS)
Half street flow at end of street =      7.714(CFS)
Depth of flow =   0.417(Ft.), Average velocity =   1.751(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  16.000(Ft.)


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Process from Point/Station     2019.000 to Point/Station     2020.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.600(Ac.)
Runoff from this stream =      7.714(CFS)
Time of concentration =   25.15 min.
Rainfall intensity =     2.313(In/Hr)


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Process from Point/Station     2021.000 to Point/Station     2022.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                 ]
Initial subarea flow distance  =  112.000(Ft.)
Highest elevation =   52.000(Ft.)
Lowest elevation =   12.000(Ft.)
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Elevation difference =   40.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.31 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7000)*( 112.000^.5)/(  35.714^(1/3)]=   2.31
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      0.768(CFS)
Total initial stream area =        0.250(Ac.)


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Process from Point/Station     2022.000 to Point/Station     2020.000
**** IMPROVED CHANNEL TRAVEL TIME ****
_____________________________________________________________________
Upstream point elevation =    12.000(Ft.)
Downstream point elevation =    10.000(Ft.)
Channel length thru subarea  =   848.000(Ft.)
Channel base width      =    4.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =      2.780(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =      2.780(CFS)
Depth of flow =   0.293(Ft.), Average velocity =   1.837(Ft/s)
Channel flow top width =    6.342(Ft.)
Flow Velocity =    1.84(Ft/s)
Travel time  =    7.69 min.
Time of concentration =   12.69 min.
Critical depth =      0.227(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                 ]
Rainfall intensity =      3.094(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      2.837(CFS) for    1.310(Ac.)
Total runoff =      3.605(CFS)  Total area =        1.56(Ac.)


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Process from Point/Station     2022.000 to Point/Station     2020.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.560(Ac.)
Runoff from this stream =      3.605(CFS)
Time of concentration =   12.69 min.
Rainfall intensity =     3.094(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        7.714     25.15                2.313
2        3.605     12.69                3.094
Qmax(1) =
           1.000 *    1.000 *     7.714) +
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           0.748 *    1.000 *     3.605) + =      10.409
Qmax(2) =
           1.000 *    0.505 *     7.714) +
           1.000 *    1.000 *     3.605) + =       7.499

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.714       3.605
Maximum flow rates at confluence using above data:
      10.409       7.499
Area of streams before confluence:
       3.600       1.560
Results of confluence:
Total flow rate =     10.409(CFS)
Time of concentration =    25.148 min.
Effective stream area after confluence =      5.160(Ac.)


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Process from Point/Station     2020.000 to Point/Station     2017.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     5.500(Ft.)
Downstream point/station elevation =     5.400(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.409(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    10.409(CFS)
Normal flow depth in pipe =   18.66(In.)
Flow top width inside pipe =   24.95(In.)
Critical Depth =   13.35(In.)
Pipe flow velocity =      3.55(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =    25.43 min.


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Process from Point/Station     2020.000 to Point/Station     2017.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.160(Ac.)
Runoff from this stream =     10.409(CFS)
Time of concentration =   25.43 min.
Rainfall intensity =     2.300(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       41.015     15.20                2.890
2       10.409     25.43                2.300
Qmax(1) =
           1.000 *    1.000 *    41.015) +
           1.000 *    0.598 *    10.409) + =      47.237
Qmax(2) =
           0.796 *    1.000 *    41.015) +
           1.000 *    1.000 *    10.409) + =      43.047

Total of 2 main streams to confluence:
Flow rates before confluence point:
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      41.015      10.409
Maximum flow rates at confluence using above data:
       47.237       43.047
Area of streams before confluence:
       14.200        5.160


Results of confluence:
Total flow rate =     47.237(CFS)
Time of concentration =    15.200 min.
Effective stream area after confluence  =     19.360(Ac.)


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Process from Point/Station     2017.000 to Point/Station     2023.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     5.400(Ft.)
Downstream point/station elevation =     4.000(Ft.)
Pipe length  =   470.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    47.237(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    47.237(CFS)
Normal flow depth in pipe =   33.94(In.)
Flow top width inside pipe =   26.22(In.)
Critical Depth =   26.29(In.)
Pipe flow velocity =      6.16(Ft/s)
Travel time through pipe =    1.27 min.
Time of concentration (TC) =    16.47 min.


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Process from Point/Station     2017.000 to Point/Station     2023.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     19.360(Ac.)
Runoff from this stream =     47.237(CFS)
Time of concentration =   16.47 min.
Rainfall intensity =     2.800(In/Hr)


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Process from Point/Station     2024.000 to Point/Station     2025.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   13.000(Ft.)
Lowest elevation =   12.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.70 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 100.000^.5)/(   1.000^(1/3)]=   2.70
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.834(CFS)
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Total initial stream area =        0.200(Ac.)


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Process from Point/Station     2025.000 to Point/Station     2026.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =    12.000(Ft.)
End of street segment elevation =     8.000(Ft.)
Length of street segment  =   666.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  24.000(Ft.)
Distance from crown to crossfall grade break  =  22.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =     10.799(CFS)
Depth of flow =   0.414(Ft.), Average velocity =   2.305(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  21.677(Ft.)
Flow velocity =   2.31(Ft/s)
Travel time =    4.81 min.     TC =    9.81  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.397(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     15.426(CFS) for    4.780(Ac.)
Total runoff =     16.260(CFS)  Total area =        4.98(Ac.)
Street flow at end of street =     16.260(CFS)
Half street flow at end of street =     16.260(CFS)
Depth of flow =   0.481(Ft.), Average velocity =   2.605(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  24.000(Ft.)


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Process from Point/Station     2027.000 to Point/Station     2026.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     9.81 min.
Rainfall intensity =      3.397(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      9.133(CFS) for    2.830(Ac.)
Total runoff =     25.393(CFS)  Total area =        7.81(Ac.)


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Process from Point/Station     2026.000 to Point/Station     2023.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     4.300(Ft.)
Downstream point/station elevation =     4.000(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.393(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    25.393(CFS)
Normal flow depth in pipe =   18.61(In.)
Flow top width inside pipe =   24.99(In.)
Critical Depth =   21.11(In.)
Pipe flow velocity =      8.69(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     9.87 min.


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Process from Point/Station     2026.000 to Point/Station     2023.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      7.810(Ac.)
Runoff from this stream =     25.393(CFS)
Time of concentration =    9.87 min.
Rainfall intensity =     3.390(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       47.237     16.47                 2.800
2       25.393      9.87                 3.390
Qmax(1) =
           1.000 *    1.000 *    47.237) +
           0.826 *    1.000 *    25.393) + =      68.211
Qmax(2) =
           1.000 *    0.599 *    47.237) +
           1.000 *    1.000 *    25.393) + =      53.703

Total of 2 streams to confluence:
Flow rates before confluence point:
      47.237      25.393
Maximum flow rates at confluence using above data:
       68.211       53.703
Area of streams before confluence:
       19.360        7.810
Results of confluence:
Total flow rate =     68.211(CFS)
Time of concentration =    16.472 min.
Effective stream area after confluence =     27.170(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2023.000 to Point/Station     2028.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     4.000(Ft.)
Downstream point/station elevation =     1.150(Ft.)
Pipe length  =   950.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    68.211(CFS)
Nearest computed pipe diameter  =     45.00(In.)
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Calculated individual pipe flow  =    68.211(CFS)
Normal flow depth in pipe =   38.25(In.)
Flow top width inside pipe =   32.14(In.)
Critical Depth =   30.48(In.)
Pipe flow velocity =      6.82(Ft/s)
Travel time through pipe =    2.32 min.
Time of concentration (TC) =    18.79 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2023.000 to Point/Station     2028.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     27.170(Ac.)
Runoff from this stream =     68.211(CFS)
Time of concentration =   18.79 min.
Rainfall intensity =     2.651(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station     2029.000 to Point/Station     2030.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                    ]
Initial subarea flow distance  =   75.000(Ft.)
Highest elevation =   11.500(Ft.)
Lowest elevation =   11.200(Ft.)
Elevation difference =    0.300(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     8.46 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7000)*(  75.000^.5)/( 0.400^(1/3)]=   8.46
Rainfall intensity (I) =      3.585(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      0.251(CFS)
Total initial stream area =        0.100(Ac.)


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Process from Point/Station     2030.000 to Point/Station     2031.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =    11.200(Ft.)
End of street segment elevation =    10.800(Ft.)
Length of street segment  =   283.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  12.000(Ft.)
Distance from crown to crossfall grade break  =  10.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
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 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.878(CFS)
Depth of flow =   0.152(Ft.), Average velocity =   0.607(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.591(Ft.)
Flow velocity =   0.61(Ft/s)
Travel time =    7.77 min.     TC =   16.23  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                    ]
Rainfall intensity =      2.816(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      0.986(CFS) for    0.500(Ac.)
Total runoff =      1.237(CFS)  Total area =        0.60(Ac.)
Street flow at end of street =      1.237(CFS)
Half street flow at end of street =      0.618(CFS)
Depth of flow =   0.175(Ft.), Average velocity =   0.660(Ft/s)
Flow width (from curb towards crown)=   9.753(Ft.)


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Process from Point/Station     2030.000 to Point/Station     2031.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.600(Ac.)
Runoff from this stream =      1.237(CFS)
Time of concentration =   16.23 min.
Rainfall intensity =     2.816(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2032.000 to Point/Station     2033.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Initial subarea flow distance  =  110.000(Ft.)
Highest elevation =   11.500(Ft.)
Lowest elevation =   11.000(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.68 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 110.000^.5)/(   0.455^(1/3)]=   3.68
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.584(CFS)
Total initial stream area =        0.140(Ac.)


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Process from Point/Station     2033.000 to Point/Station     2034.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      6.338(CFS) for    1.520(Ac.)
Total runoff =      6.922(CFS)  Total area =        1.66(Ac.)


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Process from Point/Station     2033.000 to Point/Station     2034.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     8.000(Ft.)
Downstream point/station elevation =     6.000(Ft.)
Pipe length  =   114.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.922(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.922(CFS)
Normal flow depth in pipe =   10.23(In.)
Flow top width inside pipe =   13.97(In.)
Critical Depth =   12.67(In.)
Pipe flow velocity =      7.76(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     5.24 min.


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Process from Point/Station     2035.000 to Point/Station     2034.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Time of concentration =     5.24 min.
Rainfall intensity =      4.305(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      2.634(CFS) for    0.720(Ac.)
Total runoff =      9.556(CFS)  Total area =        2.38(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2034.000 to Point/Station     2031.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     4.970(Ft.)
Downstream point/station elevation =     4.220(Ft.)
Pipe length  =    64.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.556(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     9.556(CFS)
Normal flow depth in pipe =   12.63(In.)
Flow top width inside pipe =   16.47(In.)
Critical Depth =   14.33(In.)
Pipe flow velocity =      7.21(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     5.39 min.
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Process from Point/Station     2034.000 to Point/Station     2031.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.380(Ac.)
Runoff from this stream =      9.556(CFS)
Time of concentration =    5.39 min.
Rainfall intensity =     4.257(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        1.237     16.23                2.816
2        9.556      5.39                4.257
Qmax(1) =
           1.000 *    1.000 *     1.237) +
           0.662 *    1.000 *     9.556) + =       7.559
Qmax(2) =
           1.000 *    0.332 *     1.237) +
           1.000 *    1.000 *     9.556) + =       9.967

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.237       9.556
Maximum flow rates at confluence using above data:
        7.559        9.967
Area of streams before confluence:
        0.600        2.380
Results of confluence:
Total flow rate =      9.967(CFS)
Time of concentration =     5.393 min.
Effective stream area after confluence =      2.980(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2031.000 to Point/Station     2036.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     4.220(Ft.)
Downstream point/station elevation =     2.660(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.967(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     9.967(CFS)
Normal flow depth in pipe =   11.74(In.)
Flow top width inside pipe =   12.37(In.)
Critical Depth =   14.19(In.)
Pipe flow velocity =      9.66(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     5.50 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2036.000 to Point/Station     2037.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     2.660(Ft.)
Downstream point/station elevation =     1.340(Ft.)
Pipe length  =   260.00(Ft.)   Manning's N = 0.013
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No. of pipes = 1  Required pipe flow  =     9.967(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     9.967(CFS)
Normal flow depth in pipe =   15.33(In.)
Flow top width inside pipe =   18.65(In.)
Critical Depth =   14.11(In.)
Pipe flow velocity =      5.30(Ft/s)
Travel time through pipe =    0.82 min.
Time of concentration (TC) =     6.31 min.


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Process from Point/Station     2036.000 to Point/Station     2037.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.980(Ac.)
Runoff from this stream =      9.967(CFS)
Time of concentration =    6.31 min.
Rainfall intensity =     4.001(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2038.000 to Point/Station     2039.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   12.000(Ft.)
Lowest elevation =   11.500(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.40 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 100.000^.5)/(   0.500^(1/3)]=   3.40
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.417(CFS)
Total initial stream area =        0.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2039.000 to Point/Station     2040.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.501(CFS) for    0.360(Ac.)
Total runoff =      1.918(CFS)  Total area =        0.46(Ac.)


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Process from Point/Station     2040.000 to Point/Station     2041.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =     6.430(Ft.)
Downstream point/station elevation =     5.930(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.918(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.918(CFS)
Normal flow depth in pipe =    6.27(In.)
Flow top width inside pipe =   11.99(In.)
Critical Depth =    7.08(In.)
Pipe flow velocity =      4.62(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     5.18 min.


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Process from Point/Station     2042.000 to Point/Station     2041.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     5.18 min.
Rainfall intensity =      4.326(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.425(CFS) for    0.590(Ac.)
Total runoff =      4.343(CFS)  Total area =        1.05(Ac.)


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Process from Point/Station     2043.000 to Point/Station     2041.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     5.18 min.
Rainfall intensity =      4.326(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      5.672(CFS) for    1.380(Ac.)
Total runoff =     10.014(CFS)  Total area =        2.43(Ac.)


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Process from Point/Station     2044.000 to Point/Station     2041.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                 ]
Time of concentration =     5.18 min.
Rainfall intensity =      4.326(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      1.261(CFS) for    0.530(Ac.)
Total runoff =     11.275(CFS)  Total area =        2.96(Ac.)
```

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Process from Point/Station     2041.000 to Point/Station     2037.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =     5.900(Ft.)
Downstream point/station elevation =     1.300(Ft.)
Pipe length  =   296.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.275(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    11.275(CFS)
Normal flow depth in pipe =   12.88(In.)
Flow top width inside pipe =   16.24(In.)
Critical Depth =   15.40(In.)
Pipe flow velocity =      8.33(Ft/s)
Travel time through pipe =    0.59 min.
Time of concentration (TC) =     5.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2046.000 to Point/Station     2037.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                  ]
Time of concentration =     5.77 min.
Rainfall intensity =      4.143(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.551(CFS) for    0.140(Ac.)
Total runoff =     11.827(CFS)  Total area =        3.10(Ac.)


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Process from Point/Station     2046.000 to Point/Station     2037.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      3.100(Ac.)
Runoff from this stream =     11.827(CFS)
Time of concentration =    5.77 min.
Rainfall intensity =     4.143(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        9.967      6.31                4.001
2       11.827      5.77                4.143
Qmax(1) =
           1.000 *    1.000 *     9.967) +
           0.966 *    1.000 *    11.827) + =      21.387
Qmax(2) =
           1.000 *    0.914 *     9.967) +
           1.000 *    1.000 *    11.827) + =      20.938

Total of 2 streams to confluence:
Flow rates before confluence point:
       9.967      11.827
```



```
Maximum flow rates at confluence using above data:
       21.387       20.938
Area of streams before confluence:
        2.980        3.100
Results of confluence:
Total flow rate =     21.387(CFS)
Time of concentration =     6.314 min.
Effective stream area after confluence =      6.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2037.000 to Point/Station     2028.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =     1.340(Ft.)
Downstream point/station elevation =     0.500(Ft.)
Pipe length  =   377.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.387(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    21.387(CFS)
Normal flow depth in pipe =   23.53(In.)
Flow top width inside pipe =   29.85(In.)
Critical Depth =   18.33(In.)
Pipe flow velocity =      4.72(Ft/s)
Travel time through pipe =    1.33 min.
Time of concentration (TC) =     7.64 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2037.000 to Point/Station     2028.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.080(Ac.)
Runoff from this stream =     21.387(CFS)
Time of concentration =    7.64 min.
Rainfall intensity =     3.722(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       68.211     18.79                2.651
2       21.387      7.64                3.722
Qmax(1) =
           1.000 *    1.000 *    68.211) +
           0.712 *    1.000 *    21.387) + =      83.446
Qmax(2) =
           1.000 *    0.407 *    68.211) +
           1.000 *    1.000 *    21.387) + =      49.131

Total of 2 main streams to confluence:
Flow rates before confluence point:
      68.211      21.387
Maximum flow rates at confluence using above data:
       83.446       49.131
Area of streams before confluence:
       27.170        6.080


Results of confluence:
```

```
Total flow rate =     83.446(CFS)
Time of concentration =    18.793 min.
Effective stream area after confluence  =     33.250(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2028.000 to Point/Station     2047.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =     0.500(Ft.)
Downstream point/station elevation =     0.350(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    83.446(CFS)
Nearest computed pipe diameter  =     60.00(In.)
Calculated individual pipe flow  =    83.446(CFS)
Normal flow depth in pipe =   46.41(In.)
Flow top width inside pipe =   50.23(In.)
Critical Depth =   31.08(In.)
Pipe flow velocity =      5.12(Ft/s)
Travel time through pipe =    0.42 min.
Time of concentration (TC) =    19.22 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2028.000 to Point/Station     2047.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     33.250(Ac.)
Runoff from this stream =     83.446(CFS)
Time of concentration =   19.22 min.
Rainfall intensity =     2.626(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2048.000 to Point/Station     2049.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   12.000(Ft.)
Lowest elevation =   11.500(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.40 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 100.000^.5)/(   0.500^(1/3)]=   3.40
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =       0.500(CFS)
Total initial stream area =        0.120(Ac.)


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Process from Point/Station     2049.000 to Point/Station     2050.000
**** SUBAREA FLOW ADDITION ****
```



```
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.792(CFS) for    0.190(Ac.)
Total runoff =      1.293(CFS)  Total area =        0.31(Ac.)


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Process from Point/Station     2045.000 to Point/Station     2050.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      4.670(CFS) for    1.120(Ac.)
Total runoff =      5.963(CFS)  Total area =        1.43(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2051.000 to Point/Station     2050.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.869(CFS) for    0.360(Ac.)
Total runoff =      6.832(CFS)  Total area =        1.79(Ac.)


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Process from Point/Station     2050.000 to Point/Station     2052.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =     5.800(Ft.)
Downstream point/station elevation =     4.400(Ft.)
Pipe length  =   123.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.832(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.832(CFS)
Normal flow depth in pipe =   12.19(In.)
Flow top width inside pipe =   11.71(In.)
Critical Depth =   12.60(In.)
Pipe flow velocity =      6.40(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =     5.32 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2055.000 to Point/Station     2052.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.790(Ac.)
Runoff from this stream =       6.832(CFS)
Time of concentration =    5.32 min.
Rainfall intensity =     4.280(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2053.000 to Point/Station     2054.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  110.000(Ft.)
Highest elevation =   13.000(Ft.)
Lowest elevation =   12.500(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =    15.96 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 110.000^.5)/( 0.455^(1/3)]=  15.96
Rainfall intensity (I) =      2.835(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.179(CFS)
Total initial stream area =        0.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2054.000 to Point/Station     2055.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =    12.500(Ft.)
Downstream point elevation =    12.000(Ft.)
Channel length thru subarea  =   357.000(Ft.)
Channel base width      =   20.000(Ft.)
Slope or 'Z' of left channel bank =  10.000
Slope or 'Z' of right channel bank =  10.000
Estimated mean flow rate at midpoint of channel =      0.874(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      0.874(CFS)
Depth of flow =   0.124(Ft.), Average velocity =   0.332(Ft/s)
Channel flow top width =   22.476(Ft.)
Flow Velocity =    0.33(Ft/s)
Travel time  =   17.90 min.
Time of concentration =   33.86 min.
Critical depth =      0.039(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      1.953(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      0.958(CFS) for    1.090(Ac.)
```



```
Total runoff =      1.137(CFS)  Total area =        1.23(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2056.000 to Point/Station     2055.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =    33.86 min.
Rainfall intensity =      1.953(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.299(CFS) for    0.700(Ac.)
Total runoff =      2.436(CFS)  Total area =        1.93(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2055.000 to Point/Station     2052.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =     4.700(Ft.)
Downstream point/station elevation =     4.440(Ft.)
Pipe length  =    12.50(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.436(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.436(CFS)
Normal flow depth in pipe =    5.81(In.)
Flow top width inside pipe =   11.99(In.)
Critical Depth =    8.02(In.)
Pipe flow velocity =      6.45(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    33.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2056.000 to Point/Station     2052.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.930(Ac.)
Runoff from this stream =      2.436(CFS)
Time of concentration =   33.89 min.
Rainfall intensity =     1.952(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        6.832      5.32                4.280
2        2.436     33.89                1.952
Qmax(1) =
           1.000 *    1.000 *     6.832) +
           1.000 *    0.157 *     2.436) + =       7.214
Qmax(2) =
           0.456 *    1.000 *     6.832) +
           1.000 *    1.000 *     2.436) + =       5.552

Total of 2 streams to confluence:
Flow rates before confluence point:
```

```
       6.832       2.436
Maximum flow rates at confluence using above data:
       7.214       5.552
Area of streams before confluence:
       1.790       1.930
Results of confluence:
Total flow rate =      7.214(CFS)
Time of concentration =     5.320 min.
Effective stream area after confluence =      3.720(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2052.000 to Point/Station     2057.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =     4.400(Ft.)
Downstream point/station elevation =     1.500(Ft.)
Pipe length  =   393.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.214(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.214(CFS)
Normal flow depth in pipe =   12.16(In.)
Flow top width inside pipe =   16.85(In.)
Critical Depth =   12.47(In.)
Pipe flow velocity =      5.67(Ft/s)
Travel time through pipe =    1.15 min.
Time of concentration (TC) =     6.48 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2052.000 to Point/Station     2057.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.720(Ac.)
Runoff from this stream =      7.214(CFS)
Time of concentration =    6.48 min.
Rainfall intensity =     3.962(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2058.000 to Point/Station     2059.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Initial subarea flow distance  =   75.000(Ft.)
Highest elevation =   12.400(Ft.)
Lowest elevation =   12.100(Ft.)
Elevation difference =    0.300(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.29 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*(  75.000^.5)/( 0.400^(1/3)]=   5.29
Rainfall intensity (I) =      4.290(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.219(CFS)
Total initial stream area =        0.060(Ac.)
```



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Process from Point/Station     2059.000 to Point/Station     2060.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =    12.100(Ft.)
End of street segment elevation =     9.000(Ft.)
Length of street segment  =   284.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  20.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.247(CFS)
Depth of flow =   0.077(Ft.), Average velocity =   1.139(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   4.815(Ft.)
Flow velocity =   1.14(Ft/s)
Travel time =    4.16 min.     TC =    9.45  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Note: user entry of impervious value, Ap = 0.900
Rainfall intensity =      3.444(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.956
Subarea runoff =      0.856(CFS) for    0.260(Ac.)
Total runoff =      1.075(CFS)  Total area =        0.32(Ac.)
Street flow at end of street =      1.075(CFS)
Half street flow at end of street =      1.075(CFS)
Depth of flow =   0.144(Ft.), Average velocity =   1.635(Ft/s)
Flow width (from curb towards crown)=   8.199(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2060.000 to Point/Station     2057.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =     1.500(Ft.)
Downstream point/station elevation =     1.200(Ft.)
Pipe length  =    13.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.075(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.075(CFS)
Normal flow depth in pipe =    4.11(In.)
Flow top width inside pipe =    8.97(In.)
Critical Depth =    5.72(In.)
Pipe flow velocity =      5.47(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     9.49 min.


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Process from Point/Station     2061.000 to Point/Station     2057.000
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**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Time of concentration =     9.49 min.
Rainfall intensity =      3.439(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.877(CFS) for    0.300(Ac.)
Total runoff =      1.952(CFS)  Total area =        0.62(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2061.000 to Point/Station     2057.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.620(Ac.)
Runoff from this stream =      1.952(CFS)
Time of concentration =    9.49 min.
Rainfall intensity =     3.439(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        7.214      6.48                3.962
2        1.952      9.49                3.439
Qmax(1) =
           1.000 *    1.000 *     7.214) +
           1.000 *    0.683 *     1.952) + =       8.547
Qmax(2) =
           0.868 *    1.000 *     7.214) +
           1.000 *    1.000 *     1.952) + =       8.214

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.214       1.952
Maximum flow rates at confluence using above data:
       8.547       8.214
Area of streams before confluence:
       3.720       0.620
Results of confluence:
Total flow rate =      8.547(CFS)
Time of concentration =     6.475 min.
Effective stream area after confluence =      4.340(Ac.)


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Process from Point/Station     2057.000 to Point/Station     2047.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =     1.500(Ft.)
Downstream point/station elevation =     1.000(Ft.)
Pipe length  =    64.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.547(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.547(CFS)
Normal flow depth in pipe =   13.62(In.)
Flow top width inside pipe =   15.45(In.)
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Critical Depth =   13.58(In.)
Pipe flow velocity =      5.96(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     6.65 min.


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Process from Point/Station     2057.000 to Point/Station     2047.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.340(Ac.)
Runoff from this stream =      8.547(CFS)
Time of concentration =    6.65 min.
Rainfall intensity =     3.921(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       83.446     19.22                2.626
2        8.547      6.65                3.921
Qmax(1) =
           1.000 *    1.000 *    83.446) +
           0.670 *    1.000 *     8.547) + =      89.170
Qmax(2) =
           1.000 *    0.346 *    83.446) +
           1.000 *    1.000 *     8.547) + =      37.442

Total of 2 main streams to confluence:
Flow rates before confluence point:
      83.446       8.547
Maximum flow rates at confluence using above data:
       89.170       37.442
Area of streams before confluence:
       33.250        4.340


Results of confluence:
Total flow rate =     89.170(CFS)
Time of concentration =    19.216 min.
Effective stream area after confluence  =     37.590(Ac.)


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Process from Point/Station     2047.000 to Point/Station     2062.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =     1.500(Ft.)
Downstream point/station elevation =     0.500(Ft.)
Pipe length  =   411.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    89.170(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =    89.170(CFS)
Normal flow depth in pipe =   40.78(In.)
Flow top width inside pipe =   46.44(In.)
Critical Depth =   33.20(In.)
Pipe flow velocity =      6.92(Ft/s)
Travel time through pipe =    0.99 min.
Time of concentration (TC) =    20.21 min.
```

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Process from Point/Station     2047.000 to Point/Station     2062.000
**** CONFLUENCE OF MINOR STREAMS ****
_______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     37.590(Ac.)
Runoff from this stream =     89.170(CFS)
Time of concentration =   20.21 min.
Rainfall intensity =     2.569(In/Hr)


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Process from Point/Station     2063.000 to Point/Station     2064.000
**** INITIAL AREA EVALUATION ****
_______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   12.000(Ft.)
Lowest elevation =   11.500(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.40 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 100.000^.5)/(   0.500^(1/3)]=   3.40
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.500(CFS)
Total initial stream area =        0.120(Ac.)


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Process from Point/Station     2064.000 to Point/Station     2065.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      5.837(CFS) for    1.400(Ac.)
Total runoff =      6.338(CFS)  Total area =        1.52(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2066.000 to Point/Station     2065.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
```



```
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      7.547(CFS) for    1.810(Ac.)
Total runoff =     13.885(CFS)  Total area =        3.33(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2065.000 to Point/Station     2067.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_______________________________________________________________________________
Upstream point/station elevation =     2.500(Ft.)
Downstream point/station elevation =     2.000(Ft.)
Pipe length  =   191.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.885(CFS)
Nearest computed pipe diameter  =    27.00(In.)
Calculated individual pipe flow  =    13.885(CFS)
Normal flow depth in pipe =   19.59(In.)
Flow top width inside pipe =   24.09(In.)
Critical Depth =   15.55(In.)
Pipe flow velocity =      4.49(Ft/s)
Travel time through pipe =    0.71 min.
Time of concentration (TC) =     5.71 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2068.000 to Point/Station     2067.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.71 min.
Rainfall intensity =      4.161(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      3.835(CFS) for    0.970(Ac.)
Total runoff =     17.719(CFS)  Total area =        4.30(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2069.000 to Point/Station     2067.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.71 min.
Rainfall intensity =      4.161(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      5.851(CFS) for    1.480(Ac.)
Total runoff =     23.570(CFS)  Total area =        5.78(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2070.000 to Point/Station     2067.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
```

```
[SINGLE FAMILY area type                    ]
Time of concentration =     5.71 min.
Rainfall intensity =      4.161(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      3.387(CFS) for    1.480(Ac.)
Total runoff =     26.958(CFS)  Total area =        7.26(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2067.000 to Point/Station     2062.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     2.000(Ft.)
Downstream point/station elevation =     1.000(Ft.)
Pipe length  =   280.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.958(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    26.958(CFS)
Normal flow depth in pipe =   23.44(In.)
Flow top width inside pipe =   29.94(In.)
Critical Depth =   20.68(In.)
Pipe flow velocity =      5.98(Ft/s)
Travel time through pipe =    0.78 min.
Time of concentration (TC) =     6.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2067.000 to Point/Station     2062.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      7.260(Ac.)
Runoff from this stream =     26.958(CFS)
Time of concentration =    6.49 min.
Rainfall intensity =     3.959(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       89.170     20.21                2.569
2       26.958      6.49                3.959
Qmax(1) =
           1.000 *    1.000 *    89.170) +
           0.649 *    1.000 *    26.958) + =     106.662
Qmax(2) =
           1.000 *    0.321 *    89.170) +
           1.000 *    1.000 *    26.958) + =      55.594

Total of 2 streams to confluence:
Flow rates before confluence point:
      89.170      26.958
Maximum flow rates at confluence using above data:
     106.662       55.594
Area of streams before confluence:
       37.590        7.260
Results of confluence:
Total flow rate =    106.662(CFS)
Time of concentration =    20.206 min.
Effective stream area after confluence =     44.850(Ac.)
```



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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2062.000 to Point/Station     2072.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     1.500(Ft.)
Downstream point/station elevation =     0.500(Ft.)
Pipe length  =   478.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   106.662(CFS)
Nearest computed pipe diameter  =     57.00(In.)
Calculated individual pipe flow  =   106.662(CFS)
Normal flow depth in pipe =   48.19(In.)
Flow top width inside pipe =   41.21(In.)
Critical Depth =   35.85(In.)
Pipe flow velocity =      6.67(Ft/s)
Travel time through pipe =    1.19 min.
Time of concentration (TC) =    21.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2062.000 to Point/Station     2072.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     44.850(Ac.)
Runoff from this stream =    106.662(CFS)
Time of concentration =   21.40 min.
Rainfall intensity =     2.503(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2073.000 to Point/Station     2074.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                       ]
Initial subarea flow distance  =   62.000(Ft.)
Highest elevation =   12.000(Ft.)
Lowest elevation =   11.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.02 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*(  62.000^.5)/(   1.613^(1/3)]=   3.02
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.261(CFS)
Total initial stream area =        0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2074.000 to Point/Station     2075.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =    11.000(Ft.)
End of street segment elevation =     9.000(Ft.)
Length of street segment  =   137.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  20.500(Ft.)
```

```
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.286(CFS)
Depth of flow =   0.077(Ft.), Average velocity =   1.317(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   4.815(Ft.)
Flow velocity =   1.32(Ft/s)
Travel time =    1.73 min.     TC =    6.73  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Rainfall intensity =      3.903(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.630(CFS) for    0.190(Ac.)
Total runoff =      0.892(CFS)  Total area =       0.26(Ac.)
Street flow at end of street =      0.892(CFS)
Half street flow at end of street =      0.892(CFS)
Depth of flow =   0.126(Ft.), Average velocity =   1.743(Ft/s)
Flow width (from curb towards crown)=   7.254(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2075.000 to Point/Station     2072.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =     1.500(Ft.)
Downstream point/station elevation =     1.000(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.892(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.892(CFS)
Normal flow depth in pipe =    4.05(In.)
Flow top width inside pipe =    8.96(In.)
Critical Depth =    5.18(In.)
Pipe flow velocity =      4.62(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     6.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2075.000 to Point/Station     2072.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.260(Ac.)
Runoff from this stream =      0.892(CFS)
Time of concentration =    6.84 min.
Rainfall intensity =     3.880(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)
```



```
1      106.662     21.40                 2.503
2        0.892      6.84                 3.880
Qmax(1) =
           1.000 *    1.000 *   106.662) +
           0.645 *    1.000 *     0.892) + =     107.237
Qmax(2) =
           1.000 *    0.320 *   106.662) +
           1.000 *    1.000 *     0.892) + =      34.994

Total of 2 streams to confluence:
Flow rates before confluence point:
     106.662       0.892
Maximum flow rates at confluence using above data:
      107.237       34.994
Area of streams before confluence:
       44.850        0.260
Results of confluence:
Total flow rate =    107.237(CFS)
Time of concentration =    21.400 min.
Effective stream area after confluence =     45.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2072.000 to Point/Station     2077.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =     1.000(Ft.)
Downstream point/station elevation =     0.500(Ft.)
Pipe length  =   270.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   107.237(CFS)
Nearest computed pipe diameter  =     60.00(In.)
Calculated individual pipe flow  =   107.237(CFS)
Normal flow depth in pipe =   46.97(In.)
Flow top width inside pipe =   49.48(In.)
Critical Depth =   35.39(In.)
Pipe flow velocity =      6.50(Ft/s)
Travel time through pipe =    0.69 min.
Time of concentration (TC) =    22.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2078.000 to Point/Station     2077.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Time of concentration =    22.09 min.
Rainfall intensity =      2.466(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.901(CFS) for    0.430(Ac.)
Total runoff =    108.138(CFS)  Total area =       45.54(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2079.000 to Point/Station     2077.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Time of concentration =    22.09 min.
Rainfall intensity =      2.466(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      0.985(CFS) for    0.470(Ac.)
Total runoff =    109.123(CFS)  Total area =       46.01(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2077.000 to Point/Station     2080.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     0.500(Ft.)
Downstream point/station elevation =     0.400(Ft.)
Pipe length  =   140.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   109.123(CFS)
Nearest computed pipe diameter  =     72.00(In.)
Calculated individual pipe flow  =   109.123(CFS)
Normal flow depth in pipe =   56.81(In.)
Flow top width inside pipe =   58.75(In.)
Critical Depth =   33.81(In.)
Pipe flow velocity =      4.56(Ft/s)
Travel time through pipe =    0.51 min.
Time of concentration (TC) =    22.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2077.000 to Point/Station     2080.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     46.010(Ac.)
Runoff from this stream =    109.123(CFS)
Time of concentration =   22.60 min.
Rainfall intensity =     2.439(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2081.000 to Point/Station     2082.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   13.000(Ft.)
Lowest elevation =   12.500(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.40 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 100.000^.5)/(   0.500^(1/3)]=   3.40
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.709(CFS)
Total initial stream area =        0.170(Ac.)
```



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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2082.000 to Point/Station     2083.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      9.215(CFS) for    2.210(Ac.)
Total runoff =      9.924(CFS)  Total area =        2.38(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2083.000 to Point/Station     2080.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     4.000(Ft.)
Downstream point/station elevation =     0.200(Ft.)
Pipe length  =   430.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.924(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     9.924(CFS)
Normal flow depth in pipe =   14.84(In.)
Flow top width inside pipe =   13.70(In.)
Critical Depth =   14.58(In.)
Pipe flow velocity =      6.37(Ft/s)
Travel time through pipe =    1.13 min.
Time of concentration (TC) =     6.13 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2084.000 to Point/Station     2080.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                 ]
Time of concentration =     6.13 min.
Rainfall intensity =      4.048(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      3.295(CFS) for    1.480(Ac.)
Total runoff =     13.219(CFS)  Total area =        3.86(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2084.000 to Point/Station     2080.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.860(Ac.)
Runoff from this stream =     13.219(CFS)
Time of concentration =    6.13 min.
Rainfall intensity =     4.048(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
```

```
 No.       (CFS)        (min)                  (In/Hr)


1      109.123     22.60                 2.439
2       13.219      6.13                 4.048
Qmax(1) =
           1.000 *    1.000 *   109.123) +
           0.603 *    1.000 *    13.219) + =     117.087
Qmax(2) =
           1.000 *    0.271 *   109.123) +
           1.000 *    1.000 *    13.219) + =      42.788

Total of 2 streams to confluence:
Flow rates before confluence point:
     109.123      13.219
Maximum flow rates at confluence using above data:
      117.087       42.788
Area of streams before confluence:
       46.010        3.860
Results of confluence:
Total flow rate =    117.087(CFS)
Time of concentration =    22.604 min.
Effective stream area after confluence =     49.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2080.000 to Point/Station     2085.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     1.500(Ft.)
Downstream point/station elevation =     0.200(Ft.)
Pipe length  =   341.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   117.087(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   117.087(CFS)
Normal flow depth in pipe =   42.66(In.)
Flow top width inside pipe =   43.99(In.)
Critical Depth =   38.22(In.)
Pipe flow velocity =      8.70(Ft/s)
Travel time through pipe =    0.65 min.
Time of concentration (TC) =    23.26 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2086.000 to Point/Station     2085.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =    50.000(Ft.)
Downstream point/station elevation =     1.000(Ft.)
Pipe length  =     1.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   117.087(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =   117.087(CFS)
Normal flow depth in pipe =    5.78(In.)
Flow top width inside pipe =   11.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =    312.54(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =    23.26 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2086.000 to Point/Station     2085.000
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**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =    23.26 min.
Rainfall intensity =      2.406(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      3.291(CFS) for    1.440(Ac.)
Total runoff =    120.378(CFS)  Total area =       51.31(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2085.000 to Point/Station     2087.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     0.200(Ft.)
Downstream point/station elevation =     0.000(Ft.)
Pipe length  =    70.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   120.378(CFS)
Nearest computed pipe diameter  =     57.00(In.)
Calculated individual pipe flow  =   120.378(CFS)
Normal flow depth in pipe =   46.31(In.)
Flow top width inside pipe =   44.50(In.)
Critical Depth =   38.16(In.)
Pipe flow velocity =      7.81(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    23.41 min.
End of computations, total study area =          51.310 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 06/10/24
--------------------------------------------------------------------------
4443.10 MIDWAY RISING
PROPOSED CONDITIONS
S2200P100

--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4049

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2200.000 to Point/Station     2201.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                          ]
Initial subarea flow distance  =  110.000(Ft.)
Highest elevation =   12.300(Ft.)
Lowest elevation =   11.000(Ft.)
Elevation difference =    1.300(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.68 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 110.000^.5)/(   1.182^(1/3)]=   2.68
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.584(CFS)
Total initial stream area =        0.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2201.000 to Point/Station     2202.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =    11.000(Ft.)
```



```
End of street segment elevation =     8.000(Ft.)
Length of street segment  =   759.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  16.000(Ft.)
Distance from crown to crossfall grade break  =  14.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      9.173(CFS)
Depth of flow =   0.408(Ft.), Average velocity =   2.152(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.000(Ft.)
Flow velocity =   2.15(Ft/s)
Travel time =    5.88 min.     TC =   10.88  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                          ]
Rainfall intensity =      3.273(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     12.810(CFS) for    4.120(Ac.)
Total runoff =     13.394(CFS)  Total area =        4.26(Ac.)
Street flow at end of street =     13.394(CFS)
Half street flow at end of street =     13.394(CFS)
Depth of flow =   0.476(Ft.), Average velocity =   2.500(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  16.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2202.000 to Point/Station     2203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =     6.400(Ft.)
Downstream point/station elevation =     6.200(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.394(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    13.394(CFS)
Normal flow depth in pipe =   15.98(In.)
Flow top width inside pipe =   22.64(In.)
Critical Depth =   15.81(In.)
Pipe flow velocity =      6.02(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    10.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2204.000 to Point/Station     2203.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =    10.98 min.
Rainfall intensity =      3.262(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =     32.480(CFS) for   10.480(Ac.)
Total runoff =     45.873(CFS)  Total area =       14.74(Ac.)
End of computations, total study area =          14.740 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/27/23
------------------------------------------------------------------------
4443.10 MIDWAY RISING
PROPOSED CONDITIONS
S3000P100

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4049

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3000.000 to Point/Station     3001.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   11.500(Ft.)
Lowest elevation =   11.000(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.40 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 100.000^.5)/(   0.500^(1/3)]=   3.40
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.500(CFS)
Total initial stream area =        0.120(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3001.000 to Point/Station     3002.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
```



```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      4.503(CFS) for    1.080(Ac.)
Total runoff =      5.004(CFS)  Total area =        1.20(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3002.000 to Point/Station     3003.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =     5.760(Ft.)
Downstream point/station elevation =     5.240(Ft.)
Pipe length  =    58.40(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.004(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.004(CFS)
Normal flow depth in pipe =   10.35(In.)
Flow top width inside pipe =   13.88(In.)
Critical Depth =   10.89(In.)
Pipe flow velocity =      5.54(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     5.18 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3002.000 to Point/Station     3003.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.200(Ac.)
Runoff from this stream =      5.004(CFS)
Time of concentration =    5.18 min.
Rainfall intensity =     4.328(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3004.000 to Point/Station     3005.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                     ]
Initial subarea flow distance  =   97.000(Ft.)
Highest elevation =   11.700(Ft.)
Lowest elevation =   11.200(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =    12.16 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*(  97.000^.5)/( 0.515^(1/3)]=  12.16
Rainfall intensity (I) =      3.143(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.173(CFS)
Total initial stream area =        0.100(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3005.000 to Point/Station     3003.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =    11.200(Ft.)
Downstream point elevation =    10.500(Ft.)
Channel length thru subarea  =   228.000(Ft.)
Channel base width      =   20.000(Ft.)
Slope or 'Z' of left channel bank =  20.000
Slope or 'Z' of right channel bank =  20.000
Estimated mean flow rate at midpoint of channel =      1.366(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      1.366(CFS)
Depth of flow =   0.071(Ft.), Average velocity =   0.900(Ft/s)
Channel flow top width =   22.833(Ft.)
Flow Velocity =    0.90(Ft/s)
Travel time  =    4.22 min.
Time of concentration =   16.38 min.
Critical depth =      0.052(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                ]
Rainfall intensity =      2.806(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      2.130(CFS) for    1.380(Ac.)
Total runoff =      2.303(CFS)  Total area =        1.48(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3005.000 to Point/Station     3003.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.480(Ac.)
Runoff from this stream =      2.303(CFS)
Time of concentration =   16.38 min.
Rainfall intensity =     2.806(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        5.004      5.18                4.328
2        2.303     16.38                2.806
Qmax(1) =
           1.000 *    1.000 *     5.004) +
           1.000 *    0.316 *     2.303) + =       5.731
Qmax(2) =
           0.648 *    1.000 *     5.004) +
           1.000 *    1.000 *     2.303) + =       5.547

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.004       2.303
Maximum flow rates at confluence using above data:
        5.731       5.547
Area of streams before confluence:
        1.200       1.480
```



```
Results of confluence:
Total flow rate =      5.731(CFS)
Time of concentration =     5.176 min.
Effective stream area after confluence =      2.680(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3003.000 to Point/Station     3006.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =     5.240(Ft.)
Downstream point/station elevation =     4.800(Ft.)
Pipe length  =    12.50(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.731(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.731(CFS)
Normal flow depth in pipe =    8.55(In.)
Flow top width inside pipe =   10.86(In.)
Critical Depth =   11.37(In.)
Pipe flow velocity =      9.57(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     5.20 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3003.000 to Point/Station     3006.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.680(Ac.)
Runoff from this stream =      5.731(CFS)
Time of concentration =    5.20 min.
Rainfall intensity =     4.320(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3007.000 to Point/Station     3008.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                   ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   11.800(Ft.)
Lowest elevation =   11.300(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.67 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*( 100.000^.5)/( 0.500^(1/3)]=   5.67
Rainfall intensity (I) =      4.173(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      0.851(CFS)
Total initial stream area =        0.240(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3008.000 to Point/Station     3009.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =    11.300(Ft.)
```

```
End of street segment elevation =    10.500(Ft.)
Length of street segment  =   183.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  20.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   5.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      1.844(CFS)
Depth of flow =   0.164(Ft.), Average velocity =   1.115(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   9.174(Ft.)
Flow velocity =   1.12(Ft/s)
Travel time =    2.74 min.     TC =    8.40  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Rainfall intensity =      3.594(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      1.711(CFS) for    0.560(Ac.)
Total runoff =      2.562(CFS)  Total area =        0.80(Ac.)
Street flow at end of street =      2.562(CFS)
Half street flow at end of street =      1.281(CFS)
Depth of flow =   0.188(Ft.), Average velocity =   1.209(Ft/s)
Flow width (from curb towards crown)=  10.365(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3009.000 to Point/Station     3006.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =     6.580(Ft.)
Downstream point/station elevation =     4.960(Ft.)
Pipe length  =   318.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.562(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     2.562(CFS)
Normal flow depth in pipe =    7.99(In.)
Flow top width inside pipe =   14.97(In.)
Critical Depth =    7.70(In.)
Pipe flow velocity =      3.86(Ft/s)
Travel time through pipe =    1.37 min.
Time of concentration (TC) =     9.78 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3009.000 to Point/Station     3006.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.800(Ac.)
Runoff from this stream =      2.562(CFS)
Time of concentration =    9.78 min.
```



```
Rainfall intensity =     3.402(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        5.731      5.20                 4.320
2        2.562      9.78                 3.402
Qmax(1) =
           1.000 *    1.000 *     5.731) +
           1.000 *    0.531 *     2.562) + =       7.093
Qmax(2) =
           0.787 *    1.000 *     5.731) +
           1.000 *    1.000 *     2.562) + =       7.074

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.731       2.562
Maximum flow rates at confluence using above data:
       7.093        7.074
Area of streams before confluence:
       2.680        0.800
Results of confluence:
Total flow rate =      7.093(CFS)
Time of concentration =     5.197 min.
Effective stream area after confluence =      3.480(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3006.000 to Point/Station     3010.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =     4.960(Ft.)
Downstream point/station elevation =     4.800(Ft.)
Pipe length  =    13.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.093(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.093(CFS)
Normal flow depth in pipe =   12.16(In.)
Flow top width inside pipe =   11.75(In.)
Critical Depth =   12.79(In.)
Pipe flow velocity =      6.66(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     5.23 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3011.000 to Point/Station     3010.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                    ]
Time of concentration =     5.23 min.
Rainfall intensity =      4.310(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      3.883(CFS) for    1.060(Ac.)
Total runoff =     10.976(CFS)  Total area =        4.54(Ac.)
End of computations, total study area =          4.540 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/26/23
--------------------------------------------------------------------------
4443.10 MIDWAY RISING
PROPOSED CONDITIONS
S3100P100

--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4049

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3100.000 to Point/Station     3100.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =   11.500(Ft.)
Lowest elevation =   11.000(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.40 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 100.000^.5)/(   0.500^(1/3)]=   3.40
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.584(CFS)
Total initial stream area =        0.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3101.000 to Point/Station     3102.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
```



```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.00 min.
Rainfall intensity =      4.389(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      7.297(CFS) for    1.750(Ac.)
Total runoff =      7.881(CFS)  Total area =        1.89(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3102.000 to Point/Station     3103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =     7.000(Ft.)
Downstream point/station elevation =     5.590(Ft.)
Pipe length  =    21.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.881(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     7.881(CFS)
Normal flow depth in pipe =    8.53(In.)
Flow top width inside pipe =   10.88(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.20(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     5.03 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3104.000 to Point/Station     3103.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Time of concentration =     5.03 min.
Rainfall intensity =      4.380(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      3.499(CFS) for    0.940(Ac.)
Total runoff =     11.380(CFS)  Total area =        2.83(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3105.000 to Point/Station     3103.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
Time of concentration =     5.03 min.
Rainfall intensity =      4.380(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      3.834(CFS) for    1.030(Ac.)
Total runoff =     15.214(CFS)  Total area =        3.86(Ac.)
End of computations, total study area =           3.860 (Ac.)
```

APPENDIX 4

Drainage Exhibits

SAN DIEGO RIVER

OUTFALL TO SAN DIEGO RIVER

PUMP HOUSE 'H' PER DWG 3460-D

INTERSTATE 8 (WEST BOUND)

INTERSTATE 8 (EAST BOUND)

OUTFALL TO SAN DIEGO RIVER PER DWG 2254-D

PUMP HOUSE 'D' PER DWG 2253-D

PROJECT SITE

HANCOCK ST

KURTZ ST

SHERMAN ST

SPORTS ARENA BLVD

EAST DR

TAYLOR ST

ROSECRANS ST

GREENWOOD ST

CHATCOLET DR

EXISTING SYSTEM 280
PROPOSED SYSTEM 2100

EXISTING SYSTEM 200
PROPOSED SYSTEM 2000

EXISTING SYSTEM 250
PROPOSED SYSTEM 2200

EXISTING SYSTEM 120
PROPOSED SYSTEM 1100

EXISTING SYSTEM 100
PROPOSED SYSTEM 1000

EXISTING SYSTEM 300
PROPOSED SYSTEM 3000

EXISTING SYSTEM 350
PROPOSED SYSTEM 3100

N

150 75 0 150 300 450

SCALE: 1"=150'

SCALE:	1"=150'
JOB #:	4443.10
CREATED:	8/10/23

PREPARED BY:

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey
701 B Street, Suite 800
San Diego, CA 92101
619.235.6471 Tel
619.234.0349 Fax

CITY OF SAN DIEGO

MIDWAY RISING

REGIONAL DRAINAGE MAP

SYSTEM 280
TOTAL Q100 = 43.0 CFS
TOTAL AREA = 10.3 AC

SYSTEM 200
TOTAL Q100 = 93.3 CFS
TOTAL AREA = 30.0 AC

SYSTEM 250
TOTAL Q100 = 73.0 CFS
TOTAL AREA = 25.2 AC

SYSTEM 120
TOTAL Q100 = 25.3 CFS
TOTAL AREA = 6.1 AC

SYSTEM 100
TOTAL Q100 = 31.2 CFS
TOTAL AREA = 8.8 AC

SYSTEM 300
TOTAL Q100 = 38.4 CFS
TOTAL AREA = 10.0 AC

HANCOCK ST

KURTZ ST

SHERMAN ST

SPORTS ARENA BLVD

KEMPER ST

EAST DR

PECHANGA ARENA

CHICK FIL-A

CHILIS

10.48 AC
8.19 AC
3.88 AC
3.88 AC
5.71 AC
4.97 AC
1.98 AC
0.14 AC
0.52 AC
1.94 AC
0.24 AC
0.13 AC
0.13 AC
0.28 AC
2.66 AC
5.57 AC
4.92 AC
2.09 AC
3.85 AC
0.50 AC
0.21
0.63 AC
0.92 AC
0.72 AC
0.91 AC

FOR CONTINUATION SEE SHEET A-2

LEGEND:

- PROPERTY BOUNDARY
- DRAINAGE SUBAREA FROM UPSTREAM TO DOWNSTREAM NODE
- OVERLAND FLOW DIRECTION
- DRAINAGE FLOW PATH
- 0.17 AC — DRAINAGE AREA
- 5001 — DRAINAGE NODE

N

60 30 0 60 120 180

SCALE: 1"=60'

SCALE: 1"=60'
JOB #: 4443.10
CREATED: 10/18/23

PREPARED BY:
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CITY OF SAN DIEGO
MIDWAY RISING
DRAINAGE MAP
EXISTING CONDITIONS
EXHIBIT A-1

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FOR CONTINUATION SEE SHEET A-1

HANCOCK ST

KURTZ ST

SHERMAN ST

EAST DR

0.25 AC
0.20 AC
1.31 AC
0.21 AC
4.78 AC
2.83 AC
3.39 AC
0.12 AC
3.96 AC
4.24 AC
1.91 AC
4.97 AC
0.13 AC
0.13 AC
0.28 AC
5.57 AC
2.66 AC
4.30 AC
2.21 AC
0.21 AC
0.50 AC
1.68 AC
0.17 AC
0.72 AC
0.91 AC

SYSTEM 300
TOTAL Q100 = 38.4 CFS
TOTAL AREA = 10.0 AC

SYSTEM 320
TOTAL Q100 = 10.6 CFS
TOTAL AREA = 2.8 AC

LEGEND:

- PROPERTY BOUNDARY
- DRAINAGE SUBAREA FROM UPSTREAM TO DOWNSTREAM NODE
- OVERLAND FLOW DIRECTION
- DRAINAGE FLOW PATH
- 0.17 AC — DRAINAGE AREA
- 5001 — DRAINAGE NODE

60 30 0 60 120 180
SCALE: 1"=60'

SCALE:	1"=60'
JOB #:	4443.10
CREATED:	8/10/23

PREPARED BY:

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CITY OF SAN DIEGO
MIDWAY RISING
DRAINAGE MAP
EXISTING CONDITIONS
EXHIBIT A-2

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B-4

B-3

B-2

HANCOCK ST

KURTZ ST

KEMPER ST (PUBLIC)

FRONTIER DR (PUBLIC)

SHERMAN ST

EAST DR

SPORTS ARENA BLVD

PRIVATE DRIVE "A"

PRIVATE DRIVE "B"

PRIVATE DRIVE "C"

PRIVATE DRIVE "D"

PRIVATE DRIVE "E"

PRIVATE DRIVE "F"

PRIVATE DRIVE "G"

PRIVATE DRIVE "H"

PRIVATE DRIVE "I"

PRIVATE DRIVE "J"

PRIVATE DRIVE "K"

PRIVATE DRIVE "L"

PRIVATE DRIVE "M"

PRIVATE DRIVE "N"

PRIVATE DRIVE "O"

PRIVATE DRIVE "P"

PRIVATE DRIVE "Q"

PRIVATE DRIVE "R"

PRIVATE DRIVE "S"

PRIVATE DRIVE "T"

PRIVATE DRIVE "U"

PRIVATE DRIVE "V"

PRIVATE DRIVE "W"

PRIVATE DRIVE "X"

PRIVATE DRIVE "Y"

PRIVATE DRIVE "Z"

PRIVATE DRIVE "Z1"

PRIVATE DRIVE "Z2"

50

N

100 50 0 100 200 300

SCALE: 1"=100'

LEGEND:

- PROPERTY BOUNDARY
- DRAINAGE SUBAREA FROM UPSTREAM TO DOWNSTREAM NODE
- OVERLAND FLOW DIRECTION
- DRAINAGE FLOW PATH
- 0.17 AC — DRAINAGE AREA
- 5001 — DRAINAGE NODE

SCALE: 1"=100'

JOB #: 4443.10

CREATED: 8/10/23

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CITY OF SAN DIEGO

MIDWAY RISING

DRAINAGE MAP-KEY MAP
PROPOSED CONDITIONS
EXHIBIT B-1

FOR CONTINUATION SEE SHEET B-3

FOR CONTINUATION SEE SHEET B-4

PRIVATE DRIVE 'A-2'
PRIVATE DRIVE 'A-1'
PRIVATE DRIVE 'C-1'
PRIVATE DRIVE 'C-2'
PRIVATE DRIVE 'B-1'
PRIVATE DRIVE 'B-2'
PRIVATE DRIVE 'D'
KEMPER ST (PUBLIC)
FRONTIER DR (PUBLIC)
KURTZ ST
SPORTS ARENA BLVD
KEMPER ST

1.48 AC
0.43 AC
0.47 AC
1.81 AC
1.40 AC
D1
FF=13.0
1.48 AC
H2
FF=11.0
0.26 AC
0.12 AC
D2
0.97 AC
FF=13.0
0.14 AC
0.06 AC
0.09 AC
0.96 AC
1.09 AC
0.06 AC
0.30 AC
0.12 AC
H2
0.19 AC
0.14 AC
0.10 AC
H2
0.36 AC
FF=12.5
A2
2.21 AC
FF=13.0
0.34 AC
0.17 AC
0.69 AC
0.46 AC
0.17 AC
C1
FF=13.0
0.97 AC
0.08 AC
0.32 AC
0.70 AC
C2
FF=13.0
0.70 AC
0.17 AC
0.09 AC
0.36 AC
0.53 AC
0.24 AC
1.12 AC
F
FF=12.5
1.18 AC
A1
FF=12.5
0.82 AC
0.80 AC
0.32 AC
0.11 AC
0.12 AC
0.56 AC
1.58 AC
1.08 AC
0.24 AC
0.68 AC
1.19 AC
0.42 AC
B2
FF=12.0
0.36 AC
0.09 AC
0.37 AC
0.28 AC
1.02 AC
0.17 AC
0.63 AC
0.82 AC
1.02 AC

SYSTEM 1100
TOTAL Q100 = 18.2 CFS
TOTAL AREA = 6.6 AC

SYSTEM 1000
TOTAL Q100 = 29.1 CFS
TOTAL AREA = 10.7 AC

PVT SD CO 18" RCP IE=2.40
PVT SD CO 18" RCP IE=0.00
PVT SD CO 18" RCP IE=4.18
PVT SD CO 24" RCP IE=3.07
18" RCP IE=3.67
PVT SD CO 24" RCP IE=1.03
PVT SD CO 18" RCP IE=5.23
SD CO 36" RCP IE=2.30
24" RCP IE=3.30
SD CO 36" RCP IE=4.12
SD CO 24" RCP IE=3.66
SD CO 24" RCP IE=3.16
SD CO 24" RCP IE=5.66
SD CO 24" RCP IE=4.93
18" RCP IE=3.93
PVT SD CO 24" RCP IE=3.89
PVT SD CO 24" RCP IE=4.71
SD CO 36" RCP IE=3.44
PVT SD CO 24" RCP IE=4.97
PVT SD CO 24" RCP IE=5.78
PVT SD CO 18" RCP IE=5.93
36" RCP IE=4.43
PVT SD CO 18" RCP IE=6.43
PVT SD CO 18" RCP IE=6.30
PVT SD CO 36" RCP IE=4.11
24" RCP IE=5.11
PVT SD CO 24" RCP IE=6.52
PVT SD CO 24" RCP IE=5.19
SD CO 36" RCP IE=4.95
SD CO 36" RCP IE=4.05
PVT SD CO 24" RCP IE=5.46
PVT SD CO 36" RCP IE=1.70
PUB TYPE-B SD INLET 36" RCP SD (IE=3.82)
CONNECT TO EXIST. 36" RCP SD (IE=3.97)
PUB TYPE-B SD INLET 18" RCP SD (IE=3.14)
CONNECT TO EXIST. 36" RCP SD IE=1.29
PVT TYPE-B SD INLET 24" RCP IE=6.58
CONNECT TO EXIST. 36" RCP SD IE=-1.28
CONNECT TO EXIST. 36" RCP SD IE=-0.93
SD CO 36" RCP IE=0.55
PVT SD CO 18" RCP IE=0.54
EXIST. R/W
PROP. R/W

LEGEND:

- PROPERTY BOUNDARY
- DRAINAGE SUBAREA FROM UPSTREAM TO DOWNSTREAM NODE
- OVERLAND FLOW DIRECTION
- DRAINAGE FLOW PATH
- 0.17 AC — DRAINAGE AREA
- 5001 — DRAINAGE NODE

N

40 20 0 40 80 120
SCALE: 1"=40'

SCALE: 1"=40'
JOB #: 4443.10
CREATED: 8/10/23

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CITY OF SAN DIEGO
MIDWAY RISING
DRAINAGE MAP
PROPOSED CONDITIONS
EXHIBIT B-2

HANCOCK ST

KURTZ ST

SYSTEM 2100
TOTAL Q100 = 5.3 CFS
TOTAL AREA = 1.3 AC

SYSTEM 2000
TOTAL Q100 = 120.4 CFS
TOTAL AREA = 51.3 AC

SYSTEM 2200
TOTAL Q100 = 45.9 CFS
TOTAL AREA = 14.7 AC

PRIVATE DRIVE 'A-1'

PRIVATE DRIVE 'A-2'

PRIVATE DRIVE 'C-1'

PRIVATE DRIVE 'C-2'

KEMPER ST (PUBLIC)

FRONTIER DR (PUBLIC)

1.14 AC
1.44 AC
0.13 AC
0.22 AC
0.19 AC
10.48 AC
0.07 AC
1.81 AC
1.48 AC
0.43 AC
0.47 AC
1.48 AC
1.40 AC
0.12 AC
0.97 AC
0.14 AC
0.06 AC
0.09 AC
0.96 AC
1.09 AC
0.34 AC
0.17 AC
0.08 AC
0.32 AC
0.70 AC
0.69 AC
2.21 AC
0.26 AC
0.30 AC
0.12 AC
0.14 AC
0.10 AC
0.19 AC
0.09 AC
0.36 AC

A3 FF=12.5
E1 FF=11.0
D1 FF=13.0
D2 FF=13.0
A2 FF=13.0
H2

FOR CONTINUATION SEE SHEET B-4

FOR CONTINUATION SEE SHEET B-2

LEGEND:

- PROPERTY BOUNDARY
- DRAINAGE SUBAREA FROM UPSTREAM TO DOWNSTREAM NODE
- OVERLAND FLOW DIRECTION
- DRAINAGE FLOW PATH
- 0.17 AC — DRAINAGE AREA
- 5001 — DRAINAGE NODE

SCALE: 1"=40'

SCALE:	1"=40'
JOB #:	4443.10
CREATED:	8/10/23

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CITY OF SAN DIEGO
MIDWAY RISING
DRAINAGE MAP
PROPOSED CONDITIONS
EXHIBIT B-3

FOR CONTINUATION SEE SHEETS B-2 & B-3

HANCOCK ST

KURTZ ST

SHERMAN ST

SPORTS ARENA BLVD

EAST DR

PVT. DRIVE

EXIST. R/W

PROP. R/W

SD

0.25 AC
1.31 AC
2.83 AC
4.78 AC
3.39 AC
0.21 AC
0.12 AC
3.96 AC
4.24 AC
0.06 AC
0.14 AC
1.38 AC
0.36 AC
0.53 AC
0.72 AC
0.56 AC
0.10 AC
0.50 AC
0.59 AC
1.52 AC
0.36 AC
0.14 AC
1.91 AC
1.08 AC
1.75 AC
2.18 AC
0.94 AC
1.06 AC
1.03 AC
0.17 AC

SYSTEM 3000
TOTAL Q100 = 11.0 CFS
TOTAL AREA = 4.5 AC

SYSTEM 3100
TOTAL Q100 = 15.2 CFS
TOTAL AREA = 3.9 AC

N

60 30 0 60 120 180
SCALE: 1"=60'

LEGEND:

- PROPERTY BOUNDARY
- DRAINAGE SUBAREA FROM UPSTREAM TO DOWNSTREAM NODE
- OVERLAND FLOW DIRECTION
- DRAINAGE FLOW PATH
- 0.17 AC — DRAINAGE AREA
- 5001 — DRAINAGE NODE

SCALE:	1"=60'
JOB #:	4443.10
CREATED:	8/10/23

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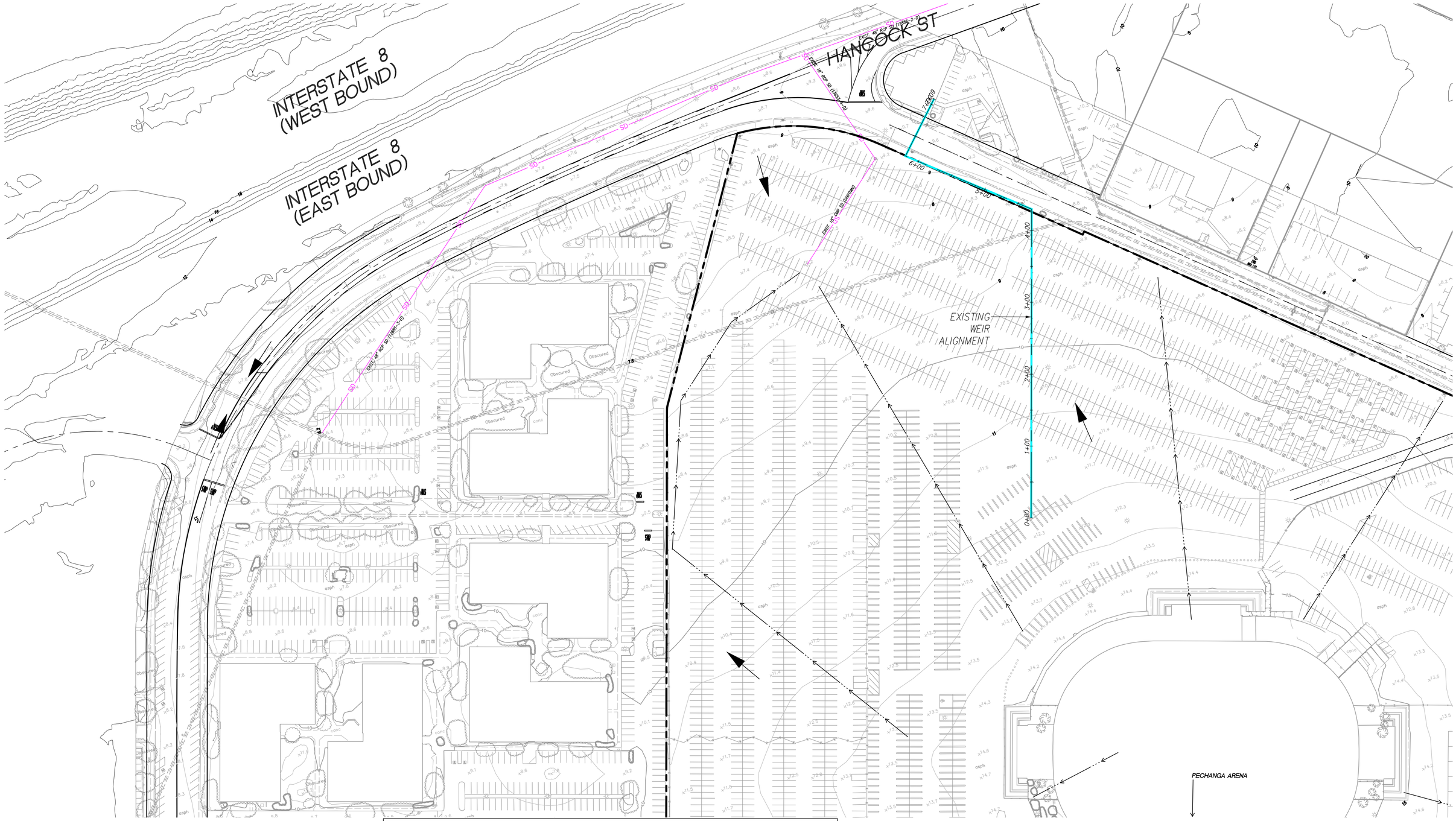
CITY OF SAN DIEGO

MIDWAY RISING

DRAINAGE MAP
PROPOSED CONDITIONS
EXHIBIT B-4



EXISTING/PROPOSED COMPARISON					
EXISTING CONDITION			PROPOSED CONDITION		
TAILWATER	SOFFIT (-2.33')	CLEANOUT RIM (7.8')	TAILWATER	SOFFIT (-2.33')	CLEANOUT RIM (7.8')
42" PIPE FLOW (CFS)	83.5	28.1	54" PIPE FLOW (CFS)	120.4	81
WEIR (CFS)	37	92	WEIR (CFS)	0	39.5
HEADWATER ELEV	8.9'	9.1'	HEADWATER ELEV	2.9'	10.1'

N

60 30 0 60 120 180

SCALE: 1"=60'

SCALE:	1"=60'
JOB #:	4443.10
CREATED:	12/6/23

PREPARED BY:

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CITY OF SAN DIEGO

MIDWAY RISING

IRREGULAR WEIR DRAINAGE ANALYSIS
EXISTING CONDITIONS

EXISTING/PROPOSED COMPARISON					
EXISTING CONDITION			PROPOSED CONDITION		
TAILWATER	SOFFIT	CLEANOUT RIM	TAILWATER	SOFFIT	CLEANOUT RIM
42" PIPE FLOW (CFS)	83.4	27.9	54" PIPE FLOW (CFS)	120.4	81.0
WEIR (CFS)	32.7	87.9	WEIR (CFS)	0	39.5
HEADWATER ELEV	8.9'	9.1'	HEADWATER ELEV	2.9'	10.1'

N

40 20 0 40 80 120

SCALE: 1"=40'

SCALE:	1"=40'
JOB #:	4443.10
CREATED:	12/6/23

PREPARED BY:

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CITY OF SAN DIEGO

MIDWAY RISING

IRREGULAR WEIR DRAINAGE ANALYSIS
PROPOSED CONDITIONS

SAN DIEGO RIVER

CITY OF SAN DIEGO
PUMP STATION 'H'

I-8 WB

I-8 EB

HANCOCK STREET

KURTZ STREET

PROJECT BOUNDARY

SPORTS ARENA BLVD

SD

MIDWAY RISING WATER SURFACE ELEVATION EXHIBIT
EXISTING CONDITION

February 27, 2024

N

LEGEND

- PROJECT BOUNDARY
- RIGHT OF WAY
- 9 FT WATER SURFACE ELEVATION
- 10 FT WATER SURFACE ELEVATION
- STORM DRAIN FACILITIES — SD

100 50 0 100 200 300

SCALE: 1"=100'

NOTE:
ELVATIONS SHOWN ARE ON NGVD29 DATUM. EXHIBIT WAS PREPARED FOR ILLUSTRATION PURPOSES ONLY TO SHOW SITE IN RELATION TO SURROUNDING GRADES. INUNDATION LIMITS WERE NOT CALCULATED.

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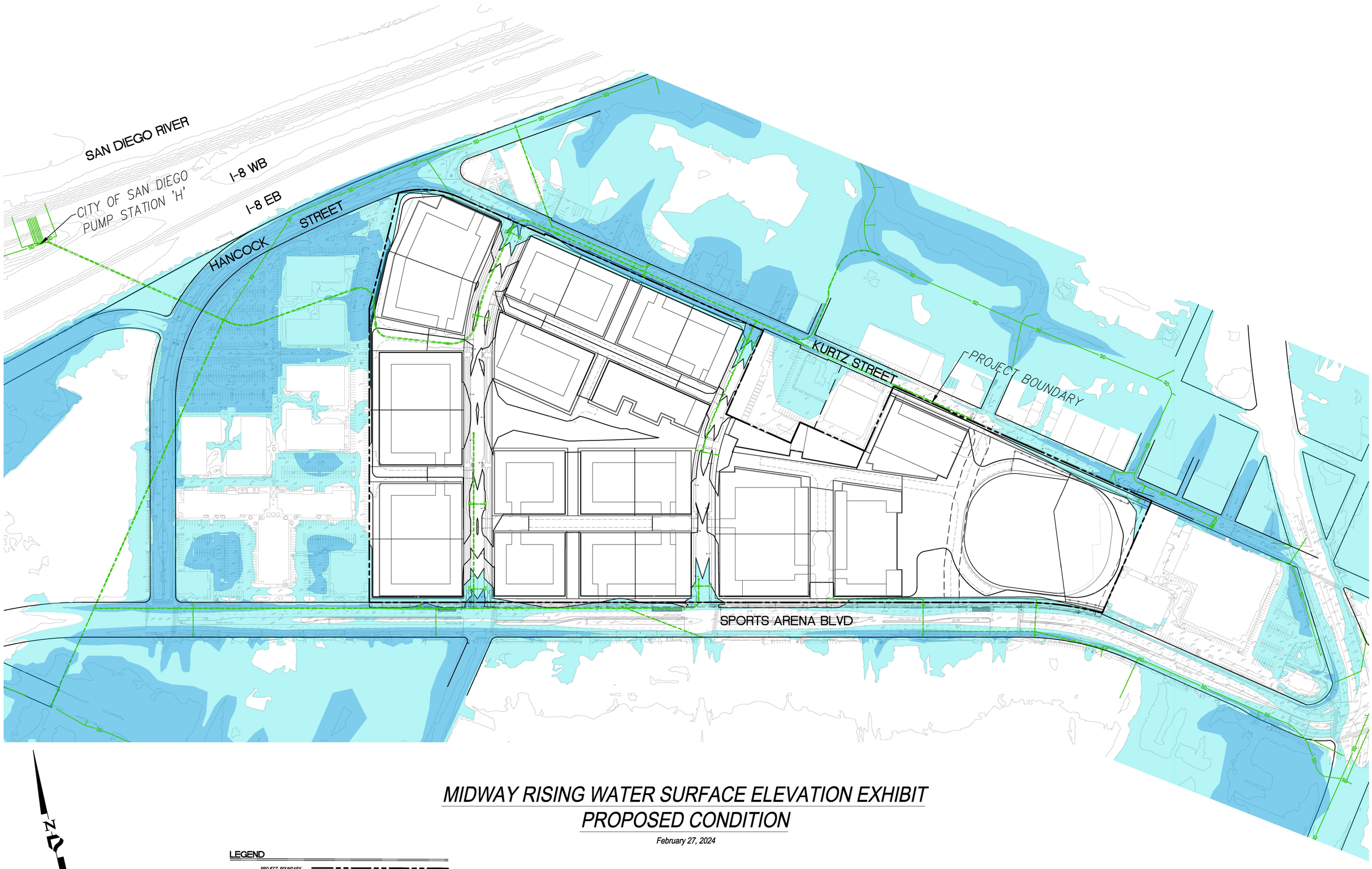

MIDWAY RISING WATER SURFACE ELEVATION EXHIBIT
PROPOSED CONDITION

February 27, 2024

N

LEGEND

- PROJECT BOUNDARY
- RIGHT OF WAY
- 9 FT WATER SURFACE ELEVATION
- 10 FT WATER SURFACE ELEVATION
- STORM DRAIN FACILITIES — SD

100 50 0 100 200 300

SCALE: 1"=100'

NOTE:
ELVATIONS SHOWN ARE ON NGVD29 DATUM. EXHIBIT WAS PREPARED FOR ILLUSTRATION PURPOSES ONLY TO SHOW SITE IN RELATION TO SURROUNDING GRADES. INUNDATION LIMITS WERE NOT CALCULATED.

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APPENDIX 5

Hydraulic Calculations

Culvert Analysis Report
Existing Condition 42" EX Alignment Tailwater- CO Rim Elev

Analysis Component			
Storm Event	Design	Discharge	120.40 cfs

Peak Discharge Method: User-Specified			
Design Discharge	120.40 cfs	Check Discharge	120.40 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	7.80 ft

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-42 inch Circular	28.01 cfs	9.06 ft	2.91 ft/s
Weir	Roadway	92.18 cfs	9.06 ft	N/A
Total	----------	120.19 cfs	9.06 ft	N/A

Culvert Analysis Report
Existing Condition 42" EX Alignment Tailwater- CO Rim Elev

Component:Culvert-1

Culvert Summary					
Computed Headwater Elevation	9.06	ft	Discharge	28.01	cfs
Inlet Control HW Elev.	7.80	ft	Tailwater Elevation	7.80	ft
Outlet Control HW Elev.	9.06	ft	Control Type	Outlet Control	
Headwater Depth/Height	3.45				

Grades					
Upstream Invert	-3.00	ft	Downstream Invert	-7.38	ft
Length	1,426.92	ft	Constructed Slope	0.003070	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	15.18	ft
Slope Type	N/A		Normal Depth	1.76	ft
Flow Regime	N/A		Critical Depth	1.63	ft
Velocity Downstream	2.91	ft/s	Critical Slope	0.003938	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.50	ft
Section Size	42 inch		Rise	3.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	9.06	ft	Upstream Velocity Head	0.13	ft
Ke	0.20		Entrance Loss	0.03	ft

Inlet Control Properties					
Inlet Control HW Elev.	7.80	ft	Flow Control	Unsubmerged	
Inlet Type	Beveled ring, 33.7° bevels		Area Full	9.6	ft²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

Culvert Analysis Report
Existing Condition 42" EX Alignment Tailwater- CO Rim Elev

Component:Weir

Hydraulic Component(s): Roadway					
Discharge	92.18	cfs	Allowable HW Elevation	9.06	ft
Roadway Width	708.60	ft	Overtopping Coefficient	2.92	US
Low Point	8.52	ft	Headwater Elevation	9.06	ft
Discharge Coefficient (Cr)	2.92		Submergence Factor (Kt)	1.00	
Tailwater Elevation	7.80	ft			

Sta (ft)	Elev. (ft)
0.00	12.18
10.41	11.98
26.29	11.73
45.74	11.69
85.72	11.52
125.34	11.20
152.67	10.88
167.47	10.74
179.35	10.63
252.44	9.83
288.96	9.59
305.19	9.49
353.62	9.18
402.20	8.96
446.07	8.76
512.85	8.52
528.83	8.70
551.20	8.86
577.15	9.19
579.25	9.14
590.72	9.23
593.54	9.25
605.51	9.37
619.67	9.44
630.33	8.97
630.37	8.97
630.44	9.12
630.52	9.26
631.42	8.98
636.75	9.26
637.33	9.29
656.96	9.88
669.67	9.70
672.53	9.99
675.76	10.15
689.93	10.94
703.63	11.00
708.60	10.88

Culvert Analysis Report
Existing Condition 42" EX Alignment Tailwater-Pipe Soffit

Analysis Component			
Storm Event	Design	Discharge	120.40 cfs

Peak Discharge Method: User-Specified			
Design Discharge	120.40 cfs	Check Discharge	116.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	-2.33 ft

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-42 inch Circular	83.48 cfs	8.90 ft	8.68 ft/s
Weir	Roadway	37.03 cfs	8.90 ft	N/A
Total	----------	120.50 cfs	8.90 ft	N/A

Culvert Analysis Report
Existing Condition 42" EX Alignment Tailwater-Pipe Soffit

Component:Culvert-1

Culvert Summary					
Computed Headwater Elevation	8.90	ft	Discharge	83.48	cfs
Inlet Control HW Elev.	1.73	ft	Tailwater Elevation	-2.33	ft
Outlet Control HW Elev.	8.90	ft	Control Type	Outlet Control	
Headwater Depth/Height	3.40				

Grades					
Upstream Invert	-3.00	ft	Downstream Invert	-7.38	ft
Length	1,426.92	ft	Constructed Slope	0.003070	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	5.05	ft
Slope Type	N/A		Normal Depth	N/A	ft
Flow Regime	N/A		Critical Depth	2.85	ft
Velocity Downstream	8.68	ft/s	Critical Slope	0.006971	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.50	ft
Section Size	42 inch		Rise	3.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	8.90	ft	Upstream Velocity Head	1.17	ft
Ke	0.20		Entrance Loss	0.23	ft

Inlet Control Properties					
Inlet Control HW Elev.	1.73	ft	Flow Control	Submerged	
Inlet Type	Beveled ring, 33.7° bevels		Area Full	9.6	ft²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

Culvert Analysis Report
Existing Condition 42" EX Alignment Tailwater-Pipe Soffit

Component:Weir

Hydraulic Component(s): Roadway					
Discharge	37.03	cfs	Allowable HW Elevation	8.90	ft
Roadway Width	708.60	ft	Overtopping Coefficient	2.91	US
Low Point	8.52	ft	Headwater Elevation	8.90	ft
Discharge Coefficient (Cr)	2.91		Submergence Factor (Kt)	1.00	
Tailwater Elevation	-2.33	ft			

Sta (ft)	Elev. (ft)
0.00	12.18
10.41	11.98
26.29	11.73
45.74	11.69
85.72	11.52
125.34	11.20
152.67	10.88
167.47	10.74
179.35	10.63
252.44	9.83
288.96	9.59
305.19	9.49
353.62	9.18
402.20	8.96
446.07	8.76
512.85	8.52
528.83	8.70
551.20	8.86
577.15	9.19
579.25	9.14
590.72	9.23
593.54	9.25
605.51	9.37
619.67	9.44
630.33	8.97
630.37	8.97
630.44	9.12
630.52	9.26
631.42	8.98
636.75	9.26
637.33	9.29
656.96	9.88
669.67	9.70
672.53	9.99
675.76	10.15
689.93	10.94
703.63	11.00
708.60	10.88

Culvert Analysis Report
Proposed 54" SD Alignment Tailwater- CO Rim Elev

Analysis Component			
Storm Event	Design	Discharge	120.40 cfs

Peak Discharge Method: User-Specified			
Design Discharge	120.40 cfs	Check Discharge	120.40 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	7.80 ft

Name	Description	Discharge	HW Elev.	Velocity
Culvert-2	1-54 inch Circular	81.00 cfs	10.07 ft	5.09 ft/s
Weir	Roadway	39.47 cfs	10.07 ft	N/A
Total	----------	120.47 cfs	10.07 ft	N/A

Culvert Analysis Report
Proposed 54" SD Alignment Tailwater- CO Rim Elev

Component:Culvert-2

Culvert Summary					
Computed Headwater Elevation	10.07	ft	Discharge	81.00	cfs
Inlet Control HW Elev.	7.80	ft	Tailwater Elevation	7.80	ft
Outlet Control HW Elev.	10.07	ft	Control Type	Outlet Control	
Headwater Depth/Height	3.04				

Grades					
Upstream Invert	-3.60	ft	Downstream Invert	-5.83	ft
Length	1,050.67	ft	Constructed Slope	0.002122	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	13.63	ft
Slope Type	N/A		Normal Depth	3.32	ft
Flow Regime	N/A		Critical Depth	2.63	ft
Velocity Downstream	5.09	ft/s	Critical Slope	0.004060	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	4.50	ft
Section Size	54 inch		Rise	4.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	10.07	ft	Upstream Velocity Head	0.40	ft
Ke	0.20		Entrance Loss	0.08	ft

Inlet Control Properties					
Inlet Control HW Elev.	7.80	ft	Flow Control	N/A	
Inlet Type	Beveled ring, 33.7° bevels		Area Full	15.9	ft²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

Culvert Analysis Report
Proposed 54" SD Alignment Tailwater- CO Rim Elev

Component:Weir

Hydraulic Component(s): Roadway					
Discharge	39.47	cfs	Allowable HW Elevation	10.07	ft
Roadway Width	862.00	ft	Overtopping Coefficient	2.94	US
Low Point	9.20	ft	Headwater Elevation	10.07	ft
Discharge Coefficient (Cr)	2.94		Submergence Factor (Kt)	1.00	
Tailwater Elevation	7.80	ft			

Sta (ft)	Elev. (ft)
0.00	13.00
100.00	13.00
200.00	12.00
250.00	12.00
272.00	12.00
310.00	12.50
754.00	12.50
784.00	9.70
786.00	9.20
824.00	10.00
862.00	10.50

Culvert Analysis Report
Proposed 54" SD Alignment Tailwater- Pipe Soffit

Analysis Component			
Storm Event	Design	Discharge	120.40 cfs

Peak Discharge Method: User-Specified			
Design Discharge	120.40 cfs	Check Discharge	128.50 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	-2.33 ft

Name	Description	Discharge	HW Elev.	Velocity
Culvert-2	1-54 inch Circular	120.41 cfs	2.93 ft	9.07 ft/s
Weir	Roadway	0.00 cfs	2.93 ft	N/A
Total	----------	120.41 cfs	2.93 ft	N/A

Culvert Analysis Report
Proposed 54" SD Alignment Tailwater- Pipe Soffit

Component:Culvert-2

Culvert Summary					
Computed Headwater Elevation	2.93	ft	Discharge	120.41	cfs
Inlet Control HW Elev.	1.35	ft	Tailwater Elevation	-2.33	ft
Outlet Control HW Elev.	2.93	ft	Control Type	Outlet Control	
Headwater Depth/Height	1.45				

Grades					
Upstream Invert	-3.60	ft	Downstream Invert	-5.83	ft
Length	1,050.67	ft	Constructed Slope	0.002122	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	3.50	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	3.23	ft
Velocity Downstream	9.07	ft/s	Critical Slope	0.005013	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	4.50	ft
Section Size	54 inch		Rise	4.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	2.93	ft	Upstream Velocity Head	0.89	ft
Ke	0.20		Entrance Loss	0.18	ft

Inlet Control Properties					
Inlet Control HW Elev.	1.35	ft	Flow Control	Transition	
Inlet Type	Beveled ring, 33.7° bevels		Area Full	15.9	ft²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

Culvert Analysis Report
Proposed 54" SD Alignment Tailwater- Pipe Soffit

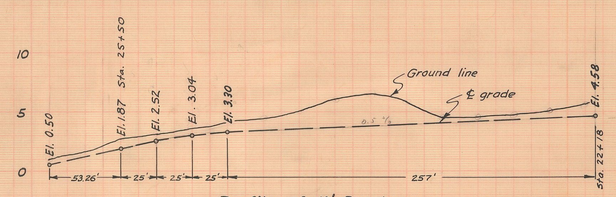
Component:Weir

Hydraulic Component(s): Roadway					
Discharge	0.00	cfs	Allowable HW Elevation	2.93	ft
Roadway Width	862.00	ft	Overtopping Coefficient	2.90	US
Low Point	9.20	ft	Headwater Elevation	N/A	ft
Discharge Coefficient (Cr)	2.90		Submergence Factor (Kt)	1.00	
Tailwater Elevation	-2.33	ft			

Sta (ft)	Elev. (ft)
0.00	13.00
100.00	13.00
200.00	13.00
250.00	12.00
272.00	12.00
310.00	12.50
754.00	12.50
784.00	9.70
786.00	9.20
824.00	10.00
862.00	10.50

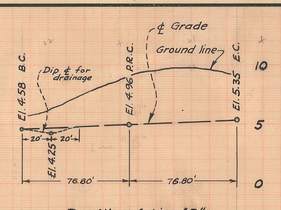
APPENDIX 6

Supplemental Information for Downstream Storm Drain Capacity



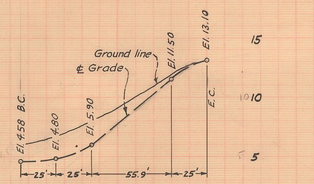
Profile of 18' Roadway

Scale: Horiz. 1" = 50'
Vert. 1" = 6'



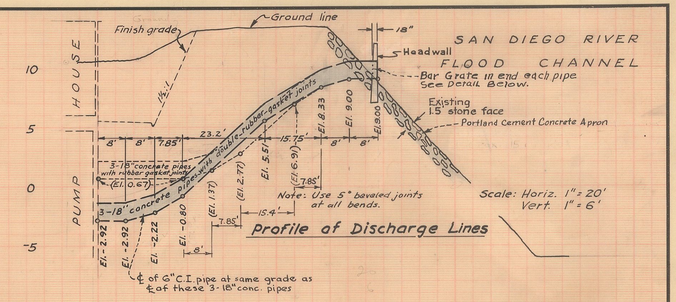
Profile of Line "B"

Scale: Horiz. 1" = 50'
Vert. 1" = 6'

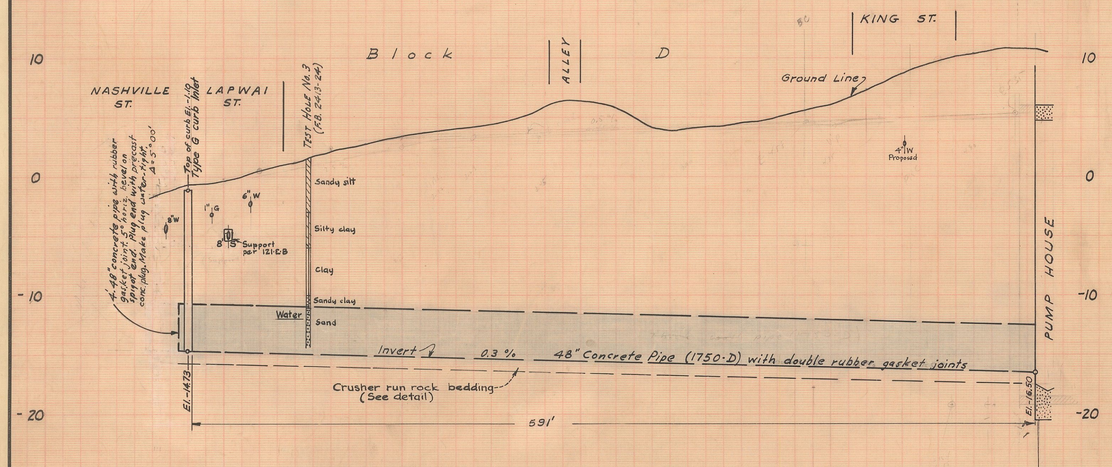


Profile of Line "A"

Scale: Horiz. 1" = 50'
Vert. 1" = 6'



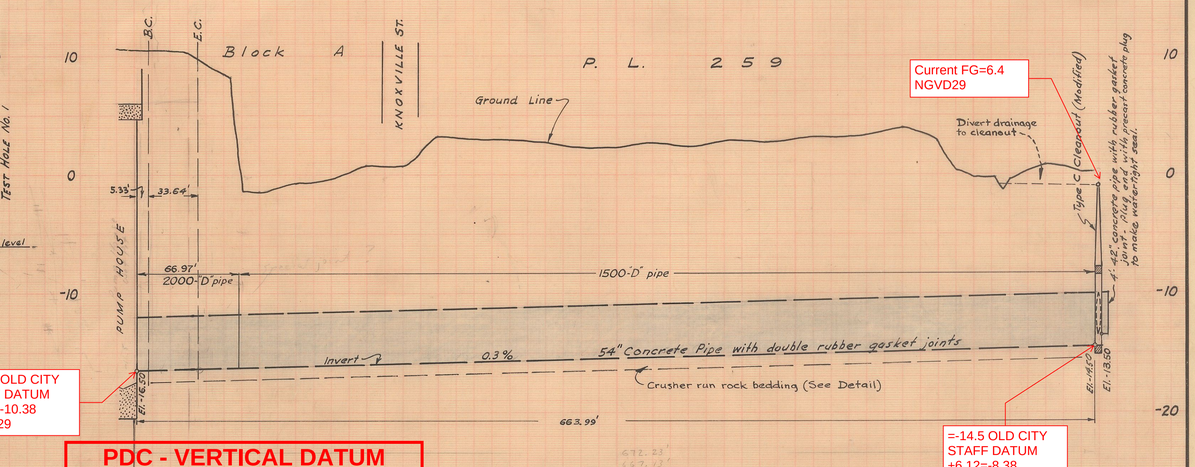
Profile of Discharge Lines



Profile of 48" Storm Drain

Scale: Horiz. 1" = 50'
Vert. 1" = 6'

=-16.5 OLD CITY STAFF DATUM +6.12=-10.38 NGVD29



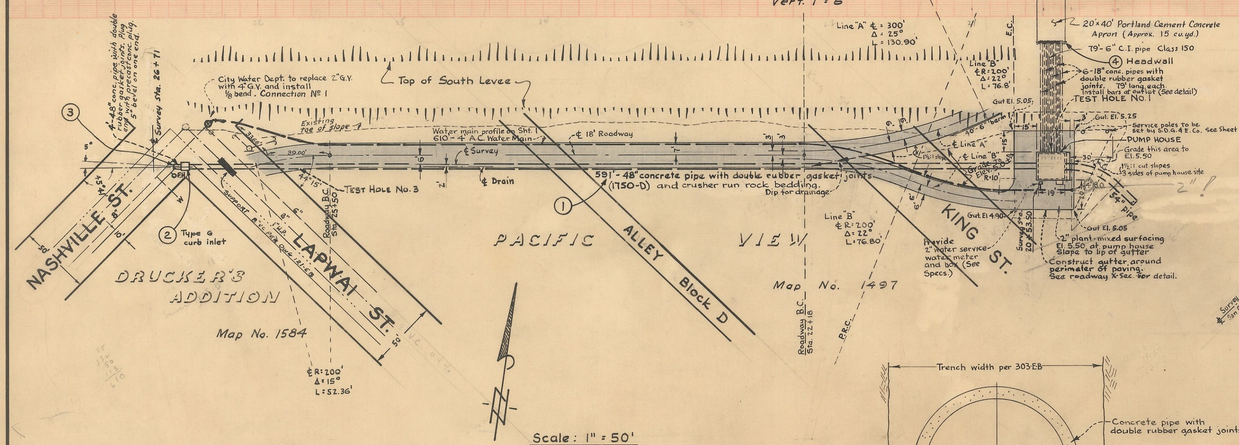
=-14.5 OLD CITY STAFF DATUM +6.12=-8.38 NGVD29

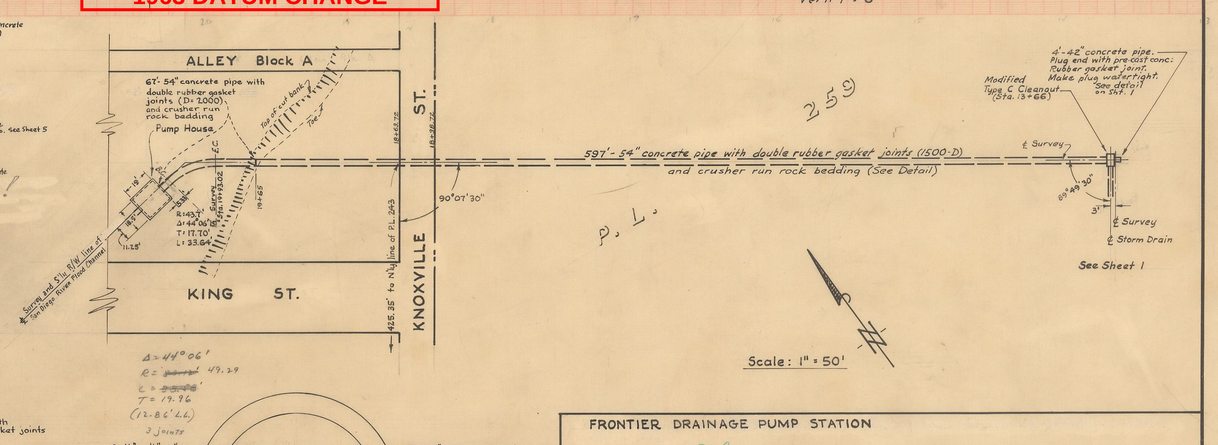
PDC - VERTICAL DATUM SHIFT OF +6.12 PER MARCH 1963 DATUM CHANGE

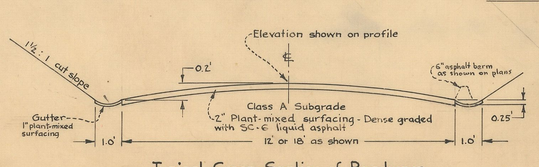
City Datum

Profile of 54" Storm Drain

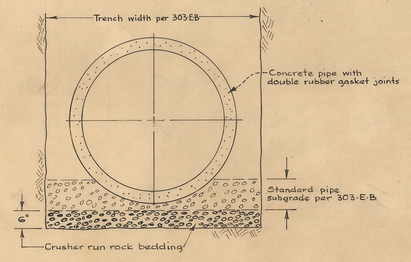
Scale: Horiz. 1" = 50'
Vert. 1" = 6'





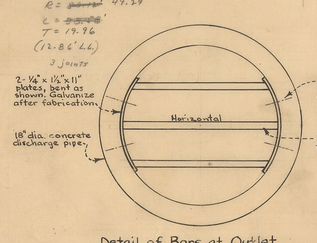


Typical Cross-Section of Roadways



Detail of Crusher Run Rock Bedding

Scale: ½" = 1'-0"



Detail of Bars at Outlet

Typical 6 places

Scale: 1½" = 1'-0"

Place 1st Block From Discharge End, Each Pipe.

FRONTIER DRAINAGE PUMP STATION

D-18

CITY OF SAN DIEGO
ENGINEERING DEPARTMENT

SHEET 2 OF 6 SHEETS

W.O. NO. 20936

PLAN REVISION

	CHANGE	BY	DATE	APPROVAL
1	614' to 591'	R.E.S.	5-21-57	As Built
2	Type G curb inlet	R.E.S.	5-21-57	5-22-57 E.W.E.
3	Omitted Type B cleanout, Type K inlet, 11-18" pipe	R.E.S.	5-21-57	
4	Headwall	R.E.S.	5-21-57	

CONSTRUCTION RECORD

6-26-56 DATE STARTED	4-26-57 DATE COMPLETED
CONTR. Castillo & Tnibodo	INSP. Waddel
FIELD BOOK 2328-46	

CITY ENGINEER — DATE 4/15/56

APPROVALS FOR

WATER DEPT.	SEWERAGE
PLANNING DEPT.	DRAINAGE
ELECTRICAL	HIGHWAY
STRUCTURAL	GRADES
TRAFFIC	CONTROL

ASS'T CITY ENGINEER AND OFFICE ENGINEER

SUPERVISOR

Paul Sta. 3-1-56 CHECKED

H. Remington 3-1-56 DESIGNED

3460-D

UPDATED HYDRAULIC ANALYSIS

FOR THE

CITY OF SAN DIEGO PUMP STATIONS B, D, F, H, AND L

MBI JN 163401

June 18, 2018
Revised Final Report

Prepared by:

Michael Baker
INTERNATIONAL

9755 Clairemont Mesa Blvd
San Diego, CA 92124

858.614.5000 Telephone
858.614.5001 Fax

Project Contact:

Joel E. Bowdan III, PE, RCE 71693
Aharon Weintraub, EIT

Signature

June 18, 2018
Date

Baker 163401

on record drawings and field investigation, PS-F is a reinforced concrete structure having a main floor and building above grade for the dry well and a lower wet which extends approximately 12-feet below ground. 15-inch and 24-inch drainage sewers enter the influent channel of the wet well. The influent channel is separate by a 6-inch thick, 12-foot tall weir wall. The weir wall contains an integral bar screen to allow flow directly from the influent channel to the larger wet well area; therefore the volumes of the influent channel and wet well are considered together.

The facility once accommodated cantilevered submersible, drive-shaft driven pumps with motors located on the main floor. However, the original pumps have been removed and replaced with submersible pumps and motors. With a total of three (3) pumping units, PS-F consists of the following pumps and capacities:

- One (1) 4-inch Barnes Submersible Non-Clog Pump, rated at 450 gpm @ 22' TDH, 7.5HP
- Two (2) 6-inch Barnes Submersible Non-Clog Pump, each rated at 1,250 gpm @ 20' TDH, 18HP
- One (1) recently installed 6-inch Barnes Submersible Non-Clog Pump with discharge hose, rated at 1,000 gpm @ 20' TDH, 18HP

The flow from each of the three (3) 6-inch submersible pumps discharges directly via separate 8-inch discharge piping and discharge hosing to a drainage box. The drainage box drains by gravity through a 24-inch storm drain outfall into Mission Bay. The smaller 4-inch submersible pump, which is used primarily for dewatering and dry weather flows, currently discharges to the drainage box via a 4-inch pump hose. For the purpose of this study, all four pumps are included in the hydraulic analysis.

2.1.4 Pump Station H

The official address for Pump Station H is 3930 King Street in San Diego. However, King Street no longer exists. The location of PS-H can be more accurately described as the south bank of the San Diego River levee, north of I-8, just south of the pedestrian walkway/bikeway approximately 1,900 feet east of the Sports Arena Blvd overpass. PS-H was constructed in 1956 and is responsible for servicing approximately 426 acres in the Sports Arena and Loma Portal area south of I-8. Based on record drawings and field investigation, PS-H is a 20-feet x 22-feet rectangular reinforced concrete structure having a main floor and building above grade for the dry well and a lower wet which extends approximately 23-feet below ground. The main influent drainage sewers into the structure include the following:

- 54-inch drainage sewer from east
- 48-inch drainage sewer from the west

Based on information from the City of San Diego, this station has a current pumping capacity of approximately 66,000 gpm. With a total of six (6) main pumping units and one (1) dry weather flow pump, PS-H consists of the following pumps: ~147 cfs

- One (1) 4-inch Barnes Submersible Pump, rated at 750 gpm @ 30' TDH, 15HP

Drainage Study

For:

Pump Stations B, L, D, F, H

Prepared for:
City of San Diego
Public Works Department
Engineering & Capital Projects
525 B Street, Ste 700
San Diego, CA 92101

Prepared by:

O'Day Consultants, Inc.
2710 Loker Avenue West, Suite 100
Carlsbad, CA 92010
(760) 931-7700

March 30, 2016

George O'Day **RCE 32014**

Section 4.1

APPENDIX A

Pump Station H Hydrologic Calculations

Basin	C	Area (ac)	% of Total	C x % of Total
Commercial	0.85	322.6	0.76	0.64
Single Family Residential	0.55	104.1	0.24	0.13
	Total Area	426.7	C	0.78

Initial area travel path = 0.29 mi

H = 74 ft

Time of Concentration = $T_c = (11.9L^3/H)^{.385}$

Add 10 minutes

Initial Time of Concentration =	17.11	minutes
Tc = Ti + 5 mins (time through pipe)=	22.11	minutes
(Drainage Design Manual) I (100yr) =	2.30	in/hr
(Drainage Design Manual) I (2yr) =	1.10	in/hr
Q (100yr) =	CIA	
A =	426.70	ac
1 ac =	43,560	ft^2
1 hr =	3,600	secs
Q =	**768.72**	**ft^3/sec**

Q (2yr) =	CIA	
A =	426.70	ac
1 ac =	43,560	ft^2
1 hr =	3,600	secs
Q =	**367.65**	**ft^3/sec**

SHEET 1 OF 1 SHEET

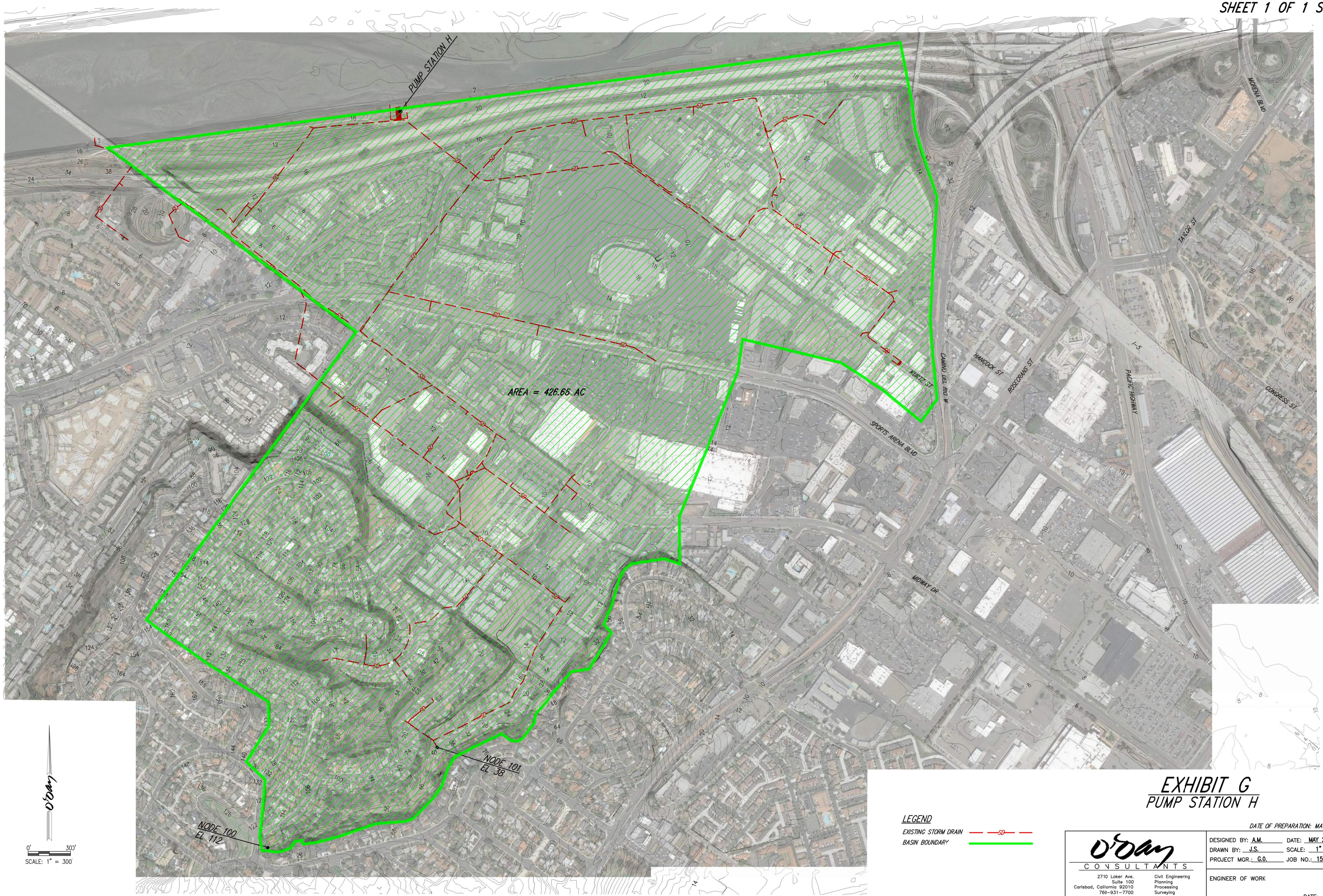


EXHIBIT G
PUMP STATION H

LEGEND

EXISTING STORM DRAIN —— SD ——

BASIN BOUNDARY

DATE OF PREPARATION: MAY 20, 2016

O'Day CONSULTANTS
2710 Loker Ave.
Suite 100
Carlsbad, California 92010
760-931-7700
Fax: 760-931-8680
ODayConsultants.com

Civil Engineering
Planning
Processing
Surveying

DESIGNED BY: A.M. DATE: MAY 2016
DRAWN BY: J.S. SCALE: 1" = 300'
PROJECT MGR.: G.O. JOB NO.: 151033

ENGINEER OF WORK

DATE:

GEORGE O'DAY RCE: 32014

G:\151033\DRAINAGE\PS-H\1533_DS_PSH.dwg Jun 16, 2016 9:58am
Xrefs: 1533A-GIS-Topo_1999_2ft-SDCity-3D; PSH

TETRA TECH

MEMO

Date:	April 21, 2023
To:	Sara Dastgheibi, P.E., CFM, Senior Civil Engineer, City of San Diego
From:	Ben Whitehead, P.E., Project Manager
Author:	Steve Parker, Project Manager | Chung-Cheng Yen, P.E., Ph.D.
Project:	TO 066 FY23 Pump Station H Feasibility Study
Project Number:	DIV 100-T39294.066.23 / IEW 200-012917-22013
Subject:	Pump Station H Hydrologic Analysis

1.0 INTRODUCTION

The City of San Diego is conducting assessments of its pump station facilities and looking for preliminary design concepts for potential system upgrades that meet their design standards. This memo details the hydrology and flow analysis, methodology and results, for the Pump Station H watershed. This analysis assumes that drainage facilities within and outside the watershed are maintained to City design standards to handle flows as appropriate, thus the analysis does not include any existing storm drain facility (pipe or inlet) capacity analyses.

The City will be considering climate change impacts in all future pump station infrastructure projects. Changing climate is projected to result in sea level rise and changing precipitation patterns. Findings from a review of several climate change studies are summarized in Attachment B – Pump Station Climate Change Considerations.

2.0 MBI 2018 REPORT AND MODEL REVIEW

This section is a review of existing analyses for Pump Station H, specifically a review of the Michael Baker International (MBI) report titled “Hydraulic Analysis for the City of San Diego Pump Stations B, D, F, H, and L”, dated June 18, 2018.

2.1 PUMP STATION H OVERVIEW

Pump Station H is located on the south bank of the San Diego River Levee, 2 miles from the River’s outlet at the Pacific Ocean. It is between the levee and the Interstate 8 freeway, 2000-ft upstream of the Mission Bay Drive/Sports Arena Boulevard bridge. See **Figure 1** for the location map. The site accumulates flow from storm drains to the south and east, in a low-lying area between Loma Portal and Midway District. The Pump Station H watershed is 394 acres.

Tetra Tech, Inc.
9444 Balboa Ave Suite 215, San Diego, CA, 92123
Tel 517.316.3930 Fax 517.484.8140 tetratech.com

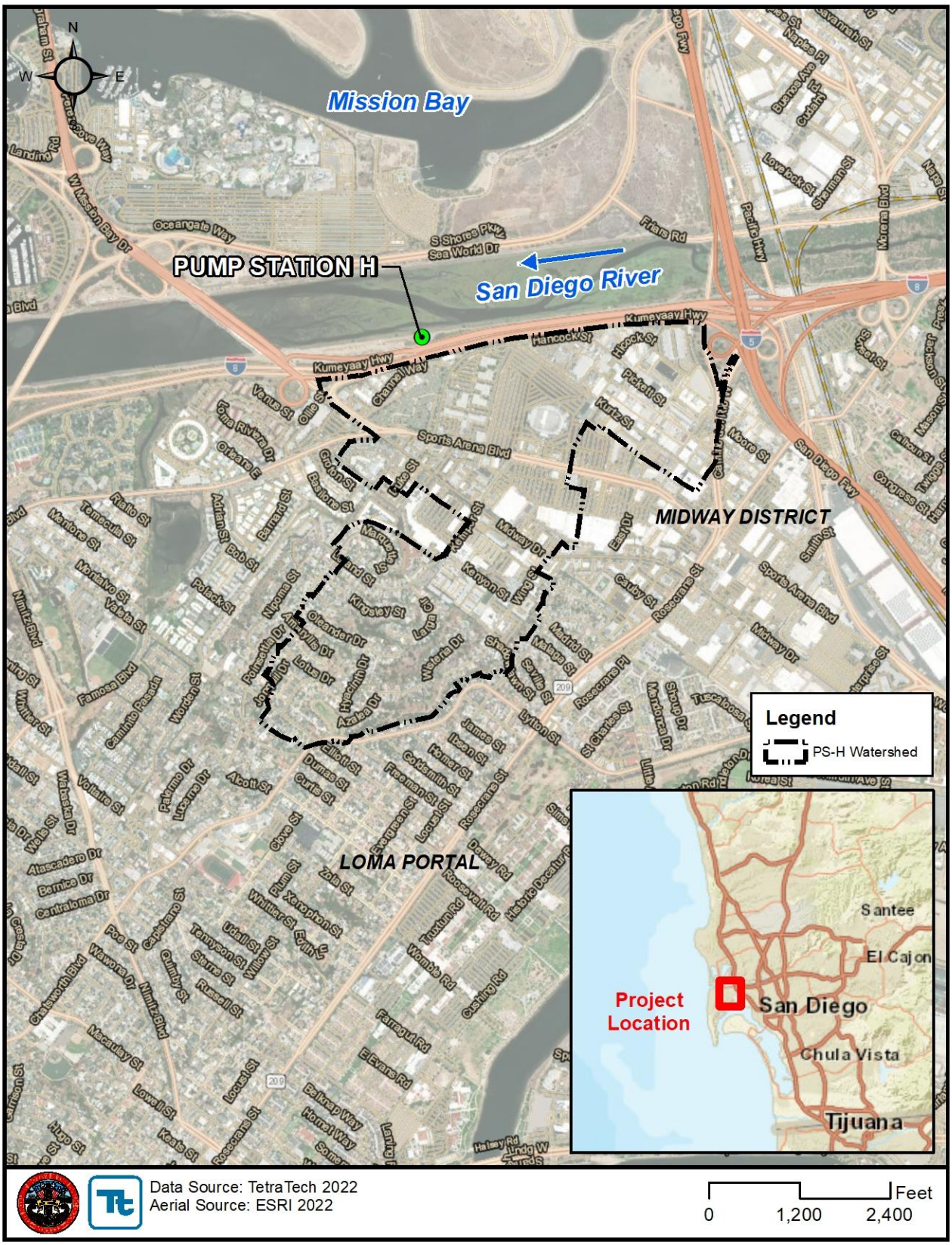


Figure 1. Project Overview Map

This value is different from the MBI report of approximately 426 acres as this analysis has found some areas south of Midway Drive, south of Sports Arena Boulevard and south of the I-8 interchange flow to a gravity outlet just west of the bridge.

Flows received from the watershed are discharged into the San Diego River. A cursory review of the outlet structure provides an elevation of approximately 15-ft, which is higher than the 13-14 foot 100-year base flood elevation of San Diego River per FEMAs National Flood Hazard Layer. Due to the outlet inverts likely being higher than the 100-year River elevation, no joint probability analysis should be required for sizing pumps. The outlet elevation however should be confirmed before final design of the pump station.

2.2 MODELING APPROACH

The 2018 Study by Michael Baker utilized a regional model used for water quality studies called the San Diego Hydrology Model, developed by Clear Creek Solutions Inc. It is a pre-packaged model with data and is described as “a tool for analyzing the hydromodification effects of land development projects and sizing solutions to mitigate the increased runoff from these projects”, geared toward addressing requirements by the California Regional Water Quality Control Board (RWQCB) that address increases in runoff rate and volume from new developments. The model is based on a tool adapted from another model, the Western Washington Hydrology Model.

The San Diego Hydrology Model uses historical rainfall data rather than design rainfall data such as that found in the San Diego County Hydrology Manual or the City of San Diego Design manual. As such, getting the model to adhere to local design guidance is difficult as the historical rainfall data does not correlate cleanly with the design rainfalls and routing methodology.

2.3 STORM SELECTION

As noted in the approach, aligning the San Diego Hydrology Model (SDMH) with local methodology is difficult. The SDHM manual states the model is primed to generate 2-year through 10-year flood frequency results. In this particular study, MBI selected rainfall events from the model database of historical storm events and associated them to represent corresponding frequencies per below:

- 100yr-1hr, 50yr-3hr (December 10, 1965)
- 10yr-3hr (January 31, 1979)
- 5yr-1hr (February 23, 1998)
- 15yr-12hr (January 14, 1978)

None of these events line up with the City Design manual which generates 10, 25, and 100-year events of 6-hr and 24-hr durations. Additionally, the hydrographs that are generated in the SDHM do not align with the City Design approach which specifies utilization of the Natural Resources Conservation Service (NRCS) Method.

2.4 RESULTS & ANALYSIS

2.4.1 Storm Selection Issues

The primary concern with the MBI approach, though useful for a quick analysis, is that the SDHM computed values are not readily compatible with the peak flows based on the hydrologic procedures outlined in the City of San Diego Drainage Design Manual (2017).

Though the SDHM is supposed to only generate 2- to 10- year flood frequency, the MBI report does not indicate how the 15-, 50-, and 100-year flood frequency values were estimated or generated. There were no detailed basis procedures to relate the storm events selected to the frequency and duration (it is not clear why the December 10, 1965 event is assigned as the 100-year 1-hr as well as 50-year-3hr event)

Lastly, there is no association of the events and results with the City of San Diego Drainage Design Manual procedures. It is unclear if the peak flows for the five selected events are compatible to the results based on the City’s procedures. The report does not detail this.

2.4.2 Comparison

To highlight potential differences in the SDHM approach, versus the Rational Method approach in the City's Design Manual, a single analysis was performed to compare the peak flow rates as follows:

- Drainage area, A = 426 ac (per MBI 2018 report)
- Runoff coefficient, C = 0.78 (per MBI 2018 report)
- Time of concentration assumed to be between 20 and 30 minutes for flat ground slope
- Rainfall Intensity, I (in/hr) obtained from Figure A-1 of City of San Diego Drainage Design Manual (2017)

The computed Rational Method peak flow rates and MBI peak flow rates are listed in the following table for comparison.

Table 1. Companion of Peak Flow Rates

T-year	C	Tc (min)	I (in/hr)	A (ac)	Q = CIA (cfs)	MBI Q(cfs)
5	0.78	20	1.56	426	518.4	225.3
	0.78	30	1.25	426	415.4	
15	0.78	20	1.93	426	641.3	108.2
	0.78	30	1.56	426	518.4	

As can be seen, the SDHM methodology results in discharges significantly less than the expected similar results used in a Rational Method approach like that in the City's Design Manual.

To conclude, the SDHM methodology was appropriate as a screening tool to evaluate a large number of pump stations against each other in order to prioritize development of solutions for those pump stations that may require the most attention to resolve capacity or other issues. However, for design purposes, using the City's Design Manual is the appropriate approach for design solutions. This not only provides for more robust design criteria in terms of runoff estimates, but it also aligns future results with all other facilities designed to handle the City's flood control requirements.

3.0 PUMP STATION H: CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL HYDROLOGY

For the determination of runoff for given rainfall events within the interior drainage watershed of Pump Station H, the watershed of Pump Station H, being less than 1 square mile, was analyzed with the Rational Method approach per the City of San Diego Drainage Design Manual to estimate the time of concentration (Tc) and determine peak flow values for the 10-, 25-, and 100- year storm events.

To generate a hydrograph for the pump station analysis, an additional methodology was required per the design manual. The NRCS Method was utilized to generate a hydrograph that could be scaled to have its peak match the results of the Rational Method approach. The input parameters for the models were developed using the City's Drainage Design Manual (City of San Diego, 2017).

3.1 DRAINAGE AREA

The first step in the interior hydrology analysis was to delineate the watershed boundaries and pipe connections to determine sub-areas. The drainage area for Pump Station H was determined using a combination of LiDAR data from the USGS National Map LiDAR in 2005. Boundaries were refined with parcel data, storm drain network data, and guided by aerial imagery observations and the total drainage area is approximately 394 acres. The primary watershed was subsequently sub-delineated into sub-basins based on flow paths to the pump station.

The longest watershed course for each basin was determined, as well as additional flow paths from other areas of the watershed to the pump station. This was used to guide the delineation of sub-basins and to determine additional flow paths for the analysis. Pump Station H exhibited a few convoluted flow paths as a pair of pipe systems diverted flow down to confluences while bypassing picking up additional flow area. This was noted where drainage area 1000/1100 are directed to the downstream end of 600, bypassing picking up the 800 subareas. The storm drain system GIS data was highly scrutinized and compared to street view imagery of inlet structures and manholes to construct the system. Lastly, the creation of the sub-basins and flow paths allowed the creation of the model concentration point nodes and elevations at those nodes from the LiDAR data. The watershed boundaries, flow paths, and nodes are found in **Figure 2** and **Figure 3**.

3.2 SOILS & LAND USE

In the process to transform rainfall into effective rainfall for the Rational Method model, GIS data for land use were processed within each sub-basin, then associated with curve numbers and permeability by land use type classified by the SD Hydrology Manual parameters. Table 2 lists the SANDAG land use categories (SANDAG 2020) in the SANDAG Land Use GIS spatial data (shapefile) and their associated hydrology land cover (per the City Design Manual), soil permeability, and curve numbers. Per available soil data and Design Manual guidelines, all soil types in the watershed were soil class D. Figure 4 show the Land Use Cover used within each watershed.

A large area of City owned property between Kurtz Street and Sports Arena Blvd is proposed to be redeveloped. The property currently includes commercial offices and parking to the west, the San Diego Pechanga Sports arena and associated parking, and additional commercial and/or light industrial use to the east. The Pump Station H watershed does not include the eastern portion of the property where the topography and adjacent drainage systems take discharges south to San Diego Bay (see Figure 5). The area identified in Figure 5 as potential additional drainage area represents a 1.7% increase in the watershed area and potential additional flow would not exceed that increase to the peak flow estimate of this memo's evaluation. Overall, the sports arena city owned property has proposed re-development initiatives that currently suggest much of the sports arena parking will be developed primarily into multiple-unit housing with a central urban park as well as other mixed uses such as an entertainment, arts, and culture district, while upgrading the arena itself. The current parking lot and arena splits runoff to the north and south drains that lead to Pump Station H.

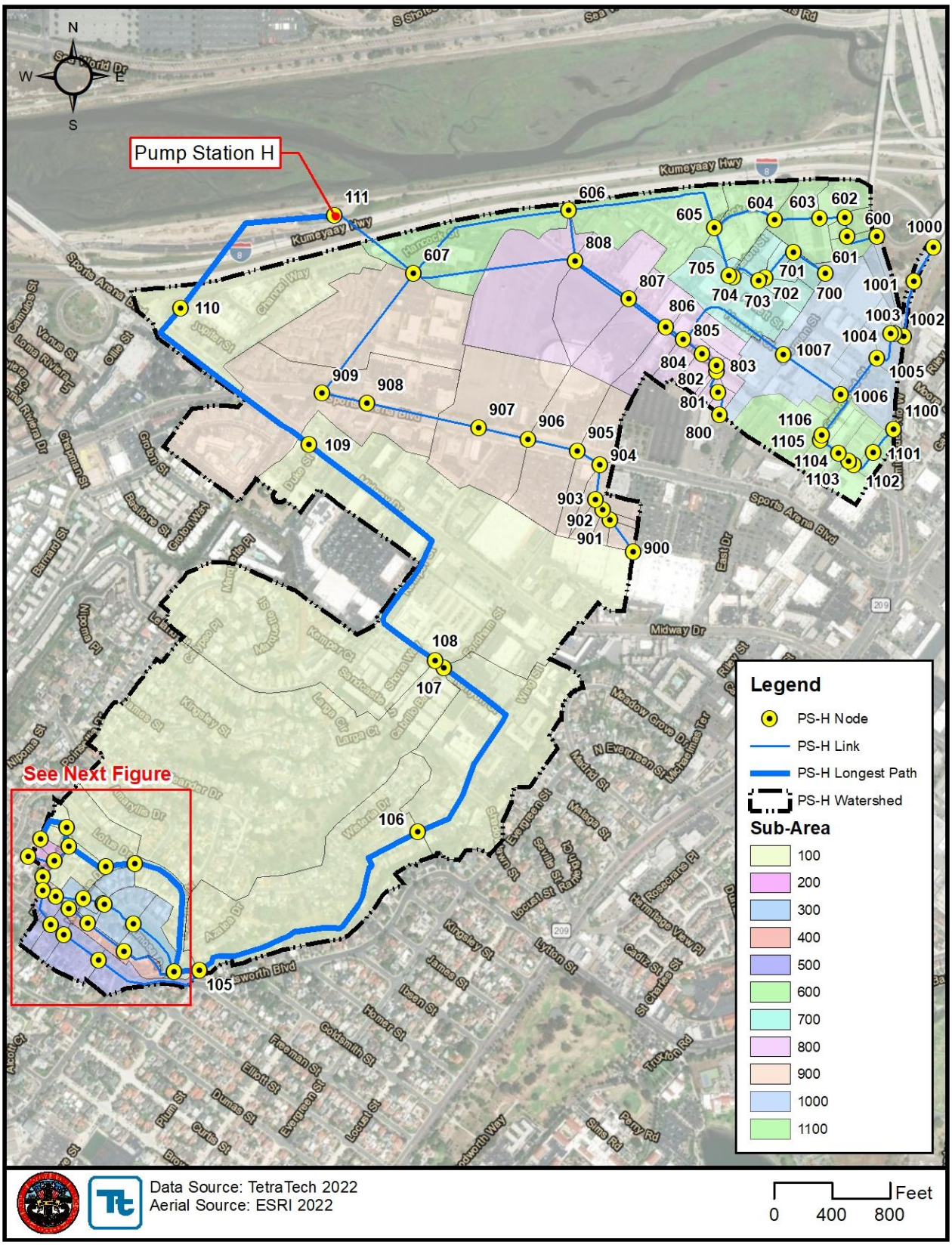


Figure 2. Pump Station H Watershed

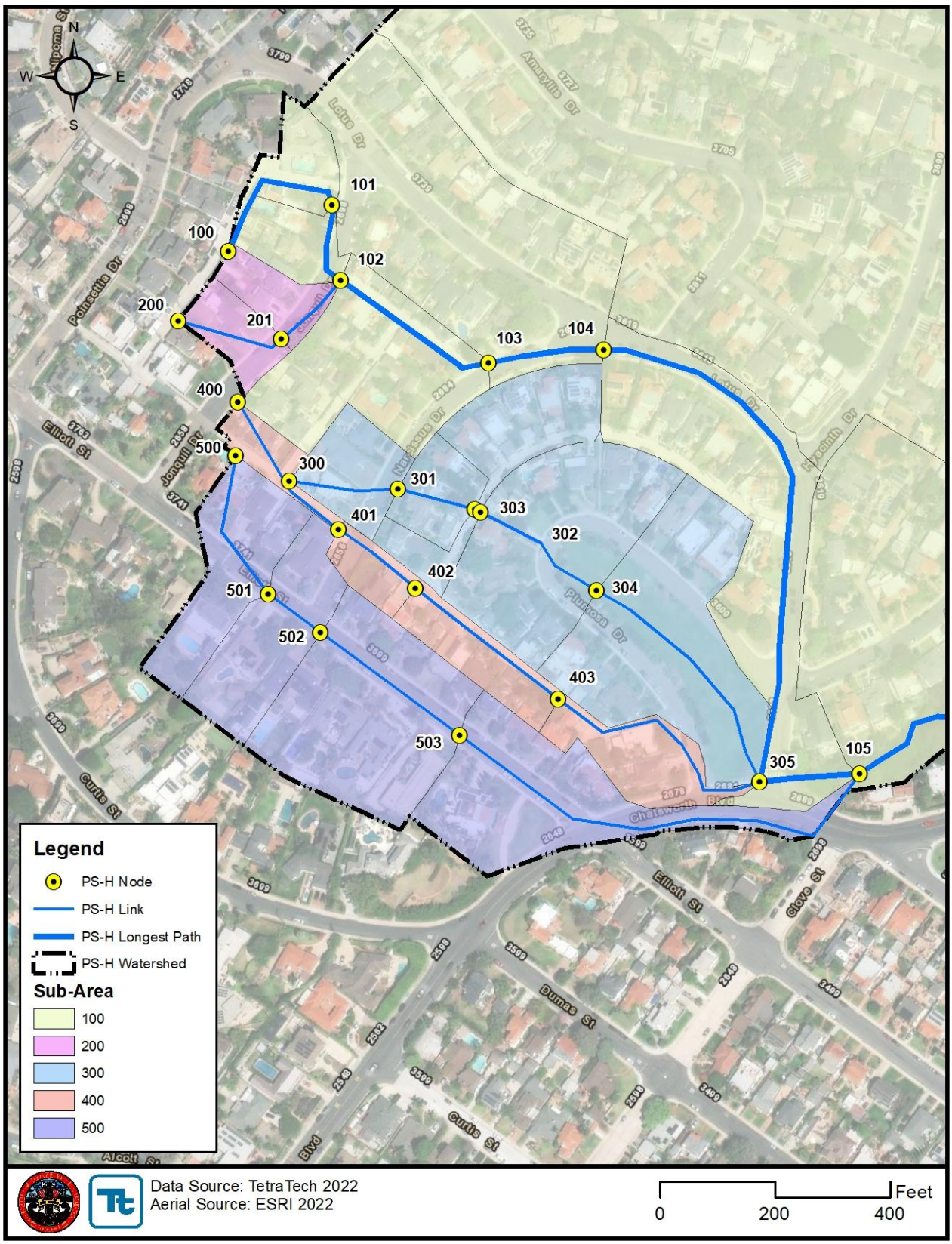


Figure 3. Pump Station H Upper Watershed

Q = CIA

C - runoff coefficient
I - rainfall intensity in in/hr as a function of Tc
A - drainage area in acres

Frequency Event: 10 Year

U/S Node	D/S Node	Area #	Acre	∑ A	"C"	CA	∑ CA	Ti (min)	Tt (min)	Tc = Ti + Tt	I (Tc)	Q =(∑CA)I
100	101	101	0.49	0.49	0.68	0.33	0.33	8.15		8.15	2.80	0.93
101	102	102	0.45	0.94	0.65	0.29	0.63		1.30	9.44	2.63	1.65
200	201	201	0.40	0.40	0.67	0.27	0.27	6.41		6.41	3.07	0.83
201	102	202	0.40	0.79	0.69	0.27	0.54		0.96	7.37	2.91	1.58
Confluence Analysis												
100	102			0.94			0.63			9.44		3.08
200	102			0.79			0.54			7.37		2.87
102	**102**			**1.74**			**1.17**			**9.44**		**3.08**
102	103	103	1.80	3.54	0.66	1.18	2.35		1.14	10.58	2.50	5.87
103	104	104	3.80	7.33	0.68	2.57	4.92		1.01	11.59	2.40	11.80
104	305	105	3.11	10.44	0.75	2.33	7.25		3.23	14.83	2.12	15.36
300	301	301	0.61	0.61	0.68	0.41	0.41	6.34		6.34	3.08	1.27
301	302	302	0.47	1.07	0.56	0.26	0.67		0.42	6.76	3.01	2.03
302	303	303	1.09	2.16	0.62	0.67	1.35		0.09	6.85	3.00	4.04
303	304	304	2.10	4.26	0.62	1.29	2.64		0.81	7.66	2.86	7.56
304	305	305	2.52	6.79	0.64	1.61	4.25		2.08	9.74	2.60	11.04
400	401	401	0.31	0.31	0.71	0.22	0.22	7.48		7.48	2.89	0.64
401	402	402	0.31	0.62	0.73	0.22	0.45		0.79	8.27	2.78	1.24
402	403	403	0.59	1.21	0.63	0.37	0.82		1.38	9.65	2.61	2.13
403	305	404	0.73	1.94	0.70	0.51	1.33		1.75	11.39	2.42	3.23
Confluence Analysis												
104	305			10.44			7.25			14.83		27.20

300	305			6.79			4.25			9.74		23.89
400	305			1.94			1.33			9.65		22.01
305	**305**			**19.17**			**12.83**			**14.83**		**27.20**
305	105			19.17			12.83		0.13	14.96	2.11	27.10
500	501	501	1.09	1.09	0.62	0.68	0.68	12.00		12.00	2.36	1.60
501	502	502	1.08	2.18	0.64	0.70	1.38		0.79	12.80	2.29	3.15
502	503	503	2.18	4.35	0.63	1.36	2.74		1.38	14.17	2.17	5.95
503	105	504	1.94	6.29	0.73	1.41	4.15		1.75	15.92	2.05	8.50
Confluence Analysis												
305	105			19.17			12.83			14.96		35.08
503	105			6.29			4.15			15.92		34.79
105	**105**			**25.46**			**16.98**			**14.96**		**35.08**
105	106	106	23.30	48.77	0.62	14.34	31.32		2.09	17.05	1.98	61.86
106	107	107	22.80	71.56	0.71	16.09	47.41		2.31	19.36	1.84	87.30
107	108	108	58.53	130.09	0.63	36.75	84.16		0.21	19.57	1.83	153.97
108	109	109	70.24	200.33	0.79	55.43	139.59		5.06	24.63	1.62	225.50
109	110	110	15.68	216.01	0.85	13.33	152.92		3.27	27.89	1.50	228.92
110	111			216.01			152.92		2.79	30.68	1.41	216.16
600	601	601	1.00	1.00	0.87	0.87	0.87	5.00		5.00	3.35	2.92
601	602	602	0.97	1.97	0.88	0.85	1.72		0.88	5.88	3.17	5.44
602	603	603	1.92	3.88	0.87	1.66	3.38		1.45	7.33	2.92	9.87
603	604	604	3.63	7.51	0.85	3.09	6.47		2.37	9.70	2.60	16.83
604	605	605	4.45	11.96	0.94	4.16	10.64		1.84	11.54	2.41	25.59
700	701	701	0.86	0.86	0.95	0.81	0.81	6.58		6.58	3.04	2.47
701	702	702	0.85	1.70	0.95	0.80	1.62		2.95	9.53	2.62	4.23
702	703	703	1.09	2.80	0.95	1.04	2.66		0.52	10.06	2.56	6.81
703	704	704	1.25	4.05	0.95	1.18	3.84		1.39	11.45	2.42	9.28
704	705	705	6.72	10.76	0.93	6.27	10.11		0.14	11.59	2.40	24.28
705	605			10.76			10.11			11.59	2.28	23.08

Confluence Analysis												
600	605			11.96			10.64			11.54		48.57
700	605			10.76			10.11			11.59		47.35
605	**605**			**22.72**			**20.75**			**11.54**		**48.57**
605	606	606	8.56	31.28	0.94	8.01	28.76	11.54	3.84	15.39	2.09	59.97
800	801	801	0.42	0.42	0.85	0.36	0.42	8.57		8.57	2.74	1.15
801	802	802	0.43	0.85	0.85	0.37	0.79		1.37	9.94	2.58	2.02
802	803	803	0.82	1.67	0.91	0.74	1.53		0.30	10.24	2.54	3.89
803	804	804	1.10	2.77	0.94	1.03	2.56		1.25	11.49	2.41	6.18
804	805	805	1.41	4.18	0.88	1.25	3.81		1.34	12.83	2.28	8.71
805	806	806	4.08	8.26	0.93	3.78	7.59		1.18	14.01	2.19	16.59
806	807	807	6.18	14.44	0.84	5.21	12.80		2.27	16.28	2.02	25.89
807	808	808	8.26	22.70	0.90	7.40	20.20		1.59	17.86	1.93	38.94
808	606	809	11.90	34.60	0.86	10.22	30.42		1.38	19.25	1.85	56.21
Confluence Analysis												
605	606			31.28			28.76			15.39		104.91
800	606			34.60			30.42			19.25		109.35
606	**606**			**65.88**			**59.18**			**19.25**		**109.35**
606	607	607	8.98	74.86	0.88	7.86	67.04	19.25	1.84	11.54	1.71	114.38
900	901	901	0.74	0.74	0.85	0.63	0.74	10.00		10.00	2.57	1.91
901	902	902	0.74	1.48	0.85	0.63	1.37		0.89	10.88	2.46	3.37
902	903	903	1.46	2.94	0.85	1.24	2.61		0.84	11.72	2.39	6.23
903	904	904	1.07	4.01	0.85	0.91	3.52		1.61	13.33	2.24	7.88
904	905	905	3.93	7.94	0.86	3.37	6.89		0.87	14.20	2.17	14.95
905	906	906	8.32	16.26	0.86	7.11	14.01		1.40	15.60	2.07	29.04
906	907	907	14.21	30.47	0.86	12.19	26.20		1.17	16.77	1.99	52.18
907	908			30.47			26.20		2.35	19.12	1.86	48.59
908	909	909	24.75	55.22	0.78	19.39	45.58		0.95	20.08	1.80	82.23
909	607	910	15.88	71.10	0.79	12.58	58.16		2.76	22.83	1.68	97.66

1000	1001	1001	0.26	0.26	0.90	0.23	0.26	5.00		5.00	3.35	0.86
1001	1002	1002	0.31	0.56	0.90	0.28	0.53		1.59	6.59	3.04	1.62
1002	1003	1003	0.68	1.24	0.90	0.61	1.14		0.53	7.12	2.96	3.39
1003	1004	1004	0.88	2.13	0.90	0.79	1.94		0.05	7.17	2.95	5.72
1004	1005	1005	1.74	3.87	0.92	1.59	3.53		1.66	8.83	2.71	9.56
1005	1006	1006	4.04	7.90	0.87	3.50	7.04		1.66	10.49	2.51	17.66
1100	1101	1101	0.52	0.52	0.89	0.46	0.52	5.69		5.69	3.21	1.66
1101	1102	1102	0.51	1.02	0.88	0.44	0.96		2.16	7.85	2.83	2.72
1102	1103	1103	1.08	2.11	0.86	0.93	1.89		0.26	8.11	2.80	5.29
1103	1104	1104	1.50	3.60	0.90	1.34	3.23		0.46	8.57	2.74	8.87
1104	1105	1105	1.73	5.33	0.89	1.54	4.77		0.71	9.28	2.65	12.65
1105	1106	1106	4.46	9.79	0.88	3.93	8.70		0.16	9.44	2.63	22.88
1106	1006	1107	1.29	11.08	0.91	1.17	9.87		1.31	10.75	2.48	24.46
Confluence Analysis												
1000	1006			7.90			7.04			10.49		41.55
1100	1006			11.08			9.87			10.75		41.90
1006	**1006**			**18.98**			**16.91**			**10.75**		**41.90**
1006	1007	1007	12.56	31.55	0.91	11.40	28.31	10.75	1.50	12.25	2.34	66.19
1007	607			31.55			28.31		8.49	20.74	1.77	50.15
Confluence Analysis												
606	607			74.86			67.04			11.54		191.66
909	607			71.10			58.16			22.83		173.10
1007	607			31.55			28.31			20.74		257.66
607	**607**			**177.50**			**153.51**			**20.74**		**257.66**
607	111			177.50			153.51	20.74	1.38	22.12	1.71	262.74
Confluence Analysis												
110	111			216.01			152.92			30.68		433.14
607	111			177.50			153.51			22.12		418.61
111	**111**			**393.51**			**306.42**			**30.68**		**433.14**
								Watershed lag (0.6Tc) =		18.41		

Q = CIA

C - runoff coefficient
I - rainfall intensity in in/hr as a function of Tc
A - drainage area in acres

Frequency Event: 25 Year

U/S Node	D/S Node	Area #	Acre	∑ A	"C"	CA	∑ CA	Ti (min)	Tt (min)	Tc = Ti + Tt	I (Tc)	Q =(∑CA)I
100	101	101	0.49	0.49	0.68	0.33	0.33	8.15		8.15	3.17	1.06
101	102	102	0.45	0.94	0.65	0.29	0.63		1.26	9.41	2.99	1.88
200	201	201	0.40	0.40	0.67	0.27	0.27	6.41		6.41	3.47	0.93
201	102	202	0.40	0.79	0.69	0.27	0.54		0.98	7.39	3.29	1.79
Confluence Analysis												
100	102			0.94			0.63			9.41		3.51
200	102			0.79			0.54			7.39		3.27
102	**102**			**1.74**			**1.17**			**9.41**		**3.51**
102	103	103	1.80	3.54	0.66	1.18	2.35		1.07	10.48	2.87	6.74
103	104	104	3.80	7.33	0.68	2.57	4.92		1.01	11.49	2.75	13.54
104	305	105	3.11	10.44	0.75	2.33	7.25		3.23	14.72	2.44	17.69
300	301	301	0.61	0.61	0.68	0.41	0.41	6.34		6.34	3.48	1.44
301	302	302	0.47	1.07	0.56	0.26	0.67		0.40	6.74	3.41	2.29
302	303	303	1.09	2.16	0.62	0.67	1.35		0.09	6.83	3.40	4.57
303	304	304	2.10	4.26	0.62	1.29	2.64		0.79	7.63	3.25	8.58
304	305	305	2.52	6.79	0.64	1.61	4.25		1.97	9.60	2.97	12.62
400	401	401	0.31	0.31	0.71	0.22	0.22	7.48		7.48	3.28	0.73
401	402	402	0.31	0.62	0.73	0.22	0.45		0.75	8.23	3.16	1.41
402	403	403	0.59	1.21	0.63	0.37	0.82		1.38	9.60	2.97	2.43
403	305	404	0.73	1.94	0.70	0.51	1.33		1.71	11.31	2.78	3.70
Confluence Analysis												
104	305			10.44			7.25			14.72		31.32

300	305			6.79			4.25			9.60		27.30
400	305			1.94			1.33			9.60		25.20
305	**305**			**19.17**			**12.83**			**14.72**		**31.32**
305	105			19.17			12.83		0.13	14.85	2.43	31.20
500	501	501	1.09	1.09	0.62	0.68	0.68	12.00		12.00	2.69	1.83
501	502	502	1.08	2.18	0.64	0.70	1.38		0.75	12.75	2.62	3.61
502	503	503	2.18	4.35	0.63	1.36	2.74		1.38	14.13	2.49	6.82
503	105	504	1.94	6.29	0.73	1.41	4.15		1.71	15.84	2.35	9.76
Confluence Analysis												
305	105			19.17			12.83			14.85		40.35
503	105			6.29			4.15			15.84		39.98
105	**105**			**25.46**			**16.98**			**14.85**		**40.35**
105	106	106	23.30	48.77	0.62	14.34	31.32		2.03	16.87	2.28	71.35
106	107	107	22.80	71.56	0.71	16.09	47.41		2.24	19.12	2.13	100.87
107	108	108	58.53	130.09	0.63	36.75	84.16		0.21	19.32	2.11	177.97
108	109	109	70.24	200.33	0.79	55.43	139.59		4.94	24.26	1.87	260.97
109	110	110	15.68	216.01	0.85	13.33	152.92		3.05	27.32	1.74	266.01
110	111			216.01			152.92		2.72	30.04	1.65	251.95
600	601	601	1.00	1.00	0.87	0.87	0.87	5.00		5.00	3.79	3.30
601	602	602	0.97	1.97	0.88	0.85	1.72		0.86	5.86	3.59	6.16
602	603	603	1.92	3.88	0.87	1.66	3.38		1.38	7.24	3.32	11.22
603	604	604	3.63	7.51	0.85	3.09	6.47		2.32	9.56	2.97	19.25
604	605	605	4.45	11.96	0.94	4.16	10.64		1.85	11.41	2.76	29.39
700	701	701	0.86	0.86	0.95	0.81	0.81	6.58		6.58	3.44	2.80
701	702	702	0.85	1.70	0.95	0.80	1.62		2.95	9.53	2.98	4.81
702	703	703	1.09	2.80	0.95	1.04	2.66		0.52	10.06	2.91	7.74
703	704	704	1.25	4.05	0.95	1.18	3.84		1.32	11.38	2.77	10.63
704	705	705	6.72	10.76	0.93	6.27	10.11		0.14	11.52	2.75	27.80
705	605			10.76			10.11			11.52	2.63	26.55

Confluence Analysis												
600	605			11.96			10.64			11.41		55.69
700	605			10.76			10.11			11.52		54.48
605	**605**			**22.72**			**20.75**			**11.41**		**55.69**
605	606	606	8.56	31.28	0.94	8.01	28.76	11.41	3.56	14.97	2.42	69.62
800	801	801	0.42	0.42	0.85	0.36	0.42	8.57		8.57	3.11	1.30
801	802	802	0.43	0.85	0.85	0.37	0.79		1.37	9.94	2.93	2.30
802	803	803	0.82	1.67	0.91	0.74	1.53		0.29	10.23	2.90	4.43
803	804	804	1.10	2.77	0.94	1.03	2.56		1.21	11.45	2.76	7.07
804	805	805	1.41	4.18	0.88	1.25	3.81		1.34	12.78	2.62	9.99
805	806	806	4.08	8.26	0.93	3.78	7.59		1.13	13.91	2.51	19.07
806	807	807	6.18	14.44	0.84	5.21	12.80		2.18	16.09	2.33	29.87
807	808	808	8.26	22.70	0.90	7.40	20.20		1.57	17.65	2.22	44.87
808	606	809	11.90	34.60	0.86	10.22	30.42		1.38	19.04	2.13	64.88
Confluence Analysis												
605	606			31.28			28.76			14.97		120.64
800	606			34.60			30.42			19.04		126.21
606	**606**			**65.88**			**59.18**			**19.04**		**126.21**
606	607	607	8.98	74.86	0.88	7.86	67.04	19.04	1.85	11.41	1.97	131.97
900	901	901	0.74	0.74	0.85	0.63	0.74	10.00		10.00	2.92	2.17
901	902	902	0.74	1.48	0.85	0.63	1.37		0.86	10.86	2.82	3.86
902	903	903	1.46	2.94	0.85	1.24	2.61		0.84	11.70	2.73	7.12
903	904	904	1.07	4.01	0.85	0.91	3.52		1.61	13.30	2.56	9.04
904	905	905	3.93	7.94	0.86	3.37	6.89		0.85	14.15	2.49	17.16
905	906	906	8.32	16.26	0.86	7.11	14.01		1.37	15.52	2.38	33.31
906	907	907	14.21	30.47	0.86	12.19	26.20		1.16	16.68	2.29	60.00
907	908			30.47			26.20		2.26	18.94	2.14	56.03
908	909	909	24.75	55.22	0.78	19.39	45.58		0.92	19.86	2.08	94.96
909	607	910	15.88	71.10	0.79	12.58	58.16		2.66	22.52	1.95	113.14

1000	1001	1001	0.26	0.26	0.90	0.23	0.26	5.00		5.00	3.79	0.98
1001	1002	1002	0.31	0.56	0.90	0.28	0.53		1.63	6.63	3.43	1.83
1002	1003	1003	0.68	1.24	0.90	0.61	1.14		0.53	7.16	3.33	3.82
1003	1004	1004	0.88	2.13	0.90	0.79	1.94		0.05	7.21	3.32	6.45
1004	1005	1005	1.74	3.87	0.92	1.59	3.53		1.54	8.76	3.08	10.89
1005	1006	1006	4.04	7.90	0.87	3.50	7.04		1.58	10.33	2.89	20.32
1100	1101	1101	0.52	0.52	0.89	0.46	0.52	5.69		5.69	3.62	1.87
1101	1102	1102	0.51	1.02	0.88	0.44	0.96		2.16	7.85	3.21	3.09
1102	1103	1103	1.08	2.11	0.86	0.93	1.89		0.25	8.11	3.17	5.99
1103	1104	1104	1.50	3.60	0.90	1.34	3.23		0.44	8.55	3.11	10.06
1104	1105	1105	1.73	5.33	0.89	1.54	4.77		0.70	9.24	3.02	14.40
1105	1106	1106	4.46	9.79	0.88	3.93	8.70		0.16	9.41	2.99	26.06
1106	1006	1107	1.29	11.08	0.91	1.17	9.87		1.25	10.65	2.84	28.07
Confluence Analysis												
1000	1006			7.90			7.04			10.33		47.54
1100	1006			11.08			9.87			10.65		48.08
1006	**1006**			**18.98**			**16.91**			**10.65**		**48.08**
1006	1007	1007	12.56	31.55	0.91	11.40	28.31	10.65	1.52	12.18	2.67	75.70
1007	607			31.55			28.31		8.14	20.32	2.06	58.32
Confluence Analysis												
606	607			74.86			67.04			11.41		222.02
909	607			71.10			58.16			22.52		200.94
1007	607			31.55			28.31			20.32		298.52
607	**607**			**177.50**			**153.51**			**20.32**		**298.52**
607	111			177.50			153.51	20.32	1.35	21.67	1.98	304.65
Confluence Analysis												
110	111			216.01			152.92			30.04		504.87
607	111			177.50			153.51			21.67		486.40
111	**111**			**393.51**			**306.42**			**30.04**		**504.87**
									Watershed lag (0.6Tc) =	18.02		

Q = CIA

C - runoff coefficient
I - rainfall intensity in in/hr as a function of Tc
A - drainage area in acres

Frequency Event: 100 Year

U/S Node	D/S Node	Area #	Acre	∑ A	"C"	CA	∑ CA	Ti (min)	Tt (min)	Tc = Ti + Tt	I (Tc)	Q =(∑CA)I
100	101	101	0.49	0.49	0.68	0.33	0.33	8.15		8.15	3.73	1.24
101	102	102	0.45	0.94	0.65	0.29	0.63		1.26	9.41	3.52	2.21
200	201	201	0.40	0.40	0.67	0.27	0.27	6.41		6.41	4.05	1.09
201	102	202	0.40	0.79	0.69	0.27	0.54		0.98	7.39	3.87	2.10
Confluence Analysis												
100	102			0.94			0.63			9.41		4.12
200	102			0.79			0.54			7.39		3.84
102	**102**			**1.74**			**1.17**			**9.41**		**4.12**
102	103	103	1.80	3.54	0.66	1.18	2.35		1.14	10.55	3.36	7.90
103	104	104	3.80	7.33	0.68	2.57	4.92		0.93	11.48	3.25	16.00
104	305	105	3.11	10.44	0.75	2.33	7.25		3.17	14.64	2.89	20.95
300	301	301	0.61	0.61	0.68	0.41	0.41	6.34		6.34	4.07	1.68
301	302	302	0.47	1.07	0.56	0.26	0.67		0.42	6.76	3.97	2.67
302	303	303	1.09	2.16	0.62	0.67	1.35		0.09	6.85	3.96	5.33
303	304	304	2.10	4.26	0.62	1.29	2.64		0.81	7.66	3.81	10.06
304	305	305	2.52	6.79	0.64	1.61	4.25		1.97	9.63	3.49	14.84
400	401	401	0.31	0.31	0.71	0.22	0.22	7.48		7.48	3.85	0.85
401	402	402	0.31	0.62	0.73	0.22	0.45		0.79	8.27	3.70	1.65
402	403	403	0.59	1.21	0.63	0.37	0.82		1.38	9.65	3.49	2.86
403	305	404	0.73	1.94	0.70	0.51	1.33		1.71	11.35	3.27	4.36
Confluence Analysis												
104	305			10.44			7.25			14.64		37.09

300	305			6.79			4.25			9.63		32.31
400	305			1.94			1.33			9.65		29.76
305	**305**			**19.17**			**12.83**			**14.64**		**37.09**
305	105			19.17			12.83		0.12	14.76	2.88	37.00
500	501	501	1.09	1.09	0.62	0.68	0.68	12.00		12.00	3.19	2.17
501	502	502	1.08	2.18	0.64	0.70	1.38		0.79	12.80	3.09	4.26
502	503	503	2.18	4.35	0.63	1.36	2.74		1.38	14.17	2.94	8.04
503	105	504	1.94	6.29	0.73	1.41	4.15		1.71	15.88	2.78	11.51
Confluence Analysis												
305	105			19.17			12.83			14.76		47.70
503	105			6.29			4.15			15.88		47.13
105	**105**			**25.46**			**16.98**			**14.76**		**47.70**
105	106	106	23.30	48.77	0.62	14.34	31.32		1.96	16.72	2.70	84.60
106	107	107	22.80	71.56	0.71	16.09	47.41		2.20	18.92	2.54	120.38
107	108	108	58.53	130.09	0.63	36.75	84.16		0.20	19.12	2.52	212.38
108	109	109	70.24	200.33	0.79	55.43	139.59		4.64	23.75	2.25	313.46
109	110	110	15.68	216.01	0.85	13.33	152.92		2.91	26.67	2.11	323.22
110	111			216.01			152.92		2.60	29.26	2.00	305.17
600	601	601	1.00	1.00	0.87	0.87	0.87	5.00		5.00	4.44	3.86
601	602	602	0.97	1.97	0.88	0.85	1.72		0.85	5.85	4.19	7.20
602	603	603	1.92	3.88	0.87	1.66	3.38		1.31	7.16	3.90	13.17
603	604	604	3.63	7.51	0.85	3.09	6.47		2.32	9.48	3.51	22.71
604	605	605	4.45	11.96	0.94	4.16	10.64		1.72	11.20	3.29	34.96
700	701	701	0.86	0.86	0.95	0.81	0.81	6.58		6.58	4.01	3.26
701	702	702	0.85	1.70	0.95	0.80	1.62		2.95	9.53	3.50	5.66
702	703	703	1.09	2.80	0.95	1.04	2.66		0.52	10.06	3.42	9.10
703	704	704	1.25	4.05	0.95	1.18	3.84		1.24	11.29	3.28	12.58
704	705	705	6.72	10.76	0.93	6.27	10.11		0.13	11.42	3.26	32.97
705	605			10.76			10.11			11.42	3.13	31.61

Confluence Analysis												
600	605			11.96			10.64			11.20		65.96
700	605			10.76			10.11			11.42		64.85
605	**605**			**22.72**			**20.75**			**11.20**		**65.96**
605	606	606	8.56	31.28	0.94	8.01	28.76	11.20	3.41	14.62	2.89	83.15
800	801	801	0.42	0.42	0.85	0.36	0.42	8.57		8.57	3.64	1.52
801	802	802	0.43	0.85	0.85	0.37	0.79		1.31	9.88	3.45	2.72
802	803	803	0.82	1.67	0.91	0.74	1.53		0.29	10.17	3.41	5.21
803	804	804	1.10	2.77	0.94	1.03	2.56		1.21	11.39	3.26	8.36
804	805	805	1.41	4.18	0.88	1.25	3.81		1.30	12.69	3.11	11.85
805	806	806	4.08	8.26	0.93	3.78	7.59		1.13	13.81	2.98	22.58
806	807	807	6.18	14.44	0.84	5.21	12.80		2.13	15.95	2.77	35.46
807	808	808	8.26	22.70	0.90	7.40	20.20		1.49	17.44	2.65	53.57
808	606	809	11.90	34.60	0.86	10.22	30.42		1.29	18.73	2.56	77.81
Confluence Analysis												
605	606			31.28			28.76			14.62		143.88
800	606			34.60			30.42			18.73		151.36
606	**606**			**65.88**			**59.18**			**18.73**		**151.36**
606	607	607	8.98	74.86	0.88	7.86	67.04	18.73	1.72	11.20	2.37	159.03
900	901	901	0.74	0.74	0.85	0.63	0.74	10.00		10.00	3.43	2.55
901	902	902	0.74	1.48	0.85	0.63	1.37		0.68	10.67	3.36	4.59
902	903	903	1.46	2.94	0.85	1.24	2.61		0.79	11.47	3.25	8.50
903	904	904	1.07	4.01	0.85	0.91	3.52		1.55	13.01	3.07	10.81
904	905	905	3.93	7.94	0.86	3.37	6.89		0.85	13.87	2.97	20.46
905	906	906	8.32	16.26	0.86	7.11	14.01		1.30	15.17	2.85	39.94
906	907	907	14.21	30.47	0.86	12.19	26.20		1.10	16.27	2.74	71.82
907	908			30.47			26.20		2.17	18.44	2.59	67.78
908	909	909	24.75	55.22	0.78	19.39	45.58		0.88	19.31	2.51	114.38
909	607	910	15.88	71.10	0.79	12.58	58.16		2.56	21.88	2.35	136.90

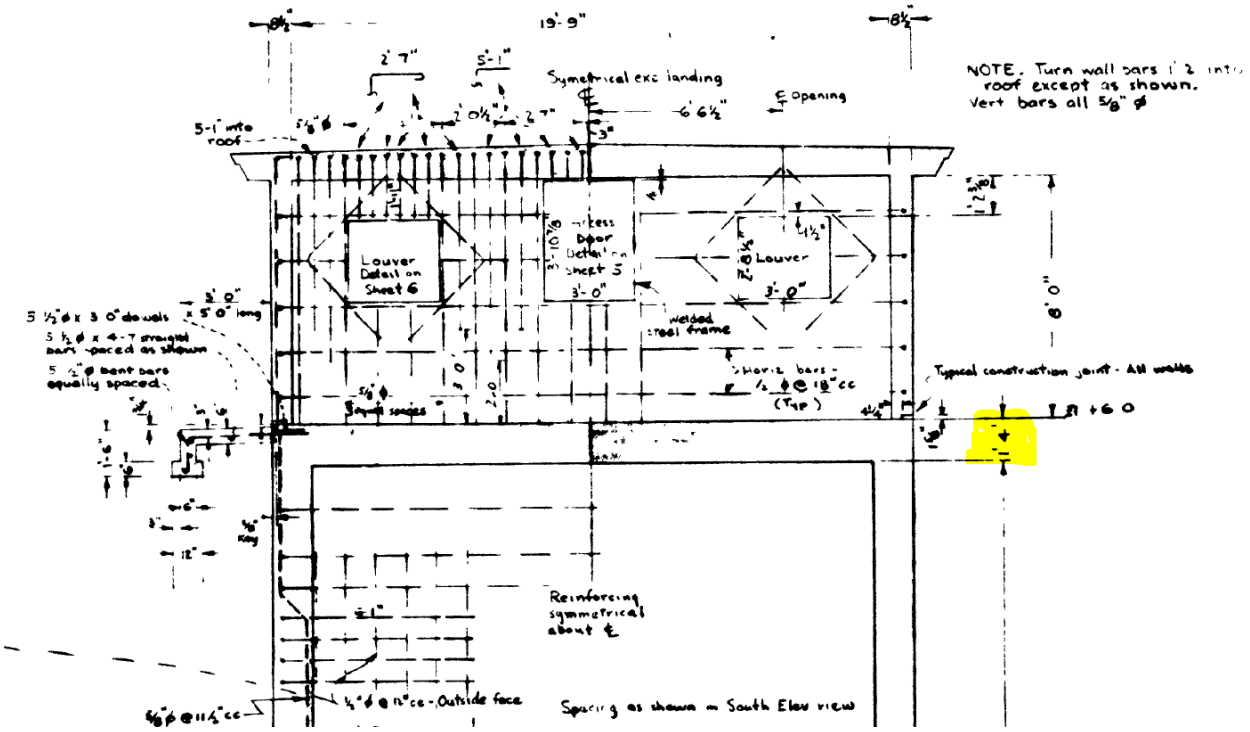
1000	1001	1001	0.26	0.26	0.90	0.23	0.26	5.00		5.00	4.44	1.14
1001	1002	1002	0.31	0.56	0.90	0.28	0.53		1.55	6.55	4.01	2.14
1002	1003	1003	0.68	1.24	0.90	0.61	1.14		0.49	7.05	3.92	4.49
1003	1004	1004	0.88	2.13	0.90	0.79	1.94		0.05	7.10	3.90	7.57
1004	1005	1005	1.74	3.87	0.92	1.59	3.53		1.54	8.64	3.63	12.83
1005	1006	1006	4.04	7.90	0.87	3.50	7.04		1.54	10.18	3.40	23.95
1100	1101	1101	0.52	0.52	0.89	0.46	0.52	5.69		5.69	4.25	2.19
1101	1102	1102	0.51	1.02	0.88	0.44	0.96		2.16	7.85	3.78	3.63
1102	1103	1103	1.08	2.11	0.86	0.93	1.89		0.24	8.10	3.74	7.05
1103	1104	1104	1.50	3.60	0.90	1.34	3.23		0.43	8.52	3.65	11.81
1104	1105	1105	1.73	5.33	0.89	1.54	4.77		0.65	9.18	3.55	16.94
1105	1106	1106	4.46	9.79	0.88	3.93	8.70		0.15	9.33	3.53	30.70
1106	1006	1107	1.29	11.08	0.91	1.17	9.87		1.23	10.56	3.36	33.20
Confluence Analysis												
1000	1006			7.90			7.04			10.18		55.94
1100	1006			11.08			9.87			10.56		56.86
1006	**1006**			**18.98**			**16.91**			**10.56**		**56.86**
1006	1007	1007	12.56	31.55	0.91	11.40	28.31	10.56	1.44	12.01	3.19	90.28
1007	607			31.55			28.31		7.85	19.85	2.47	70.03
Confluence Analysis												
606	607			74.86			67.04			11.20		268.67
909	607			71.10			58.16			21.88		243.04
1007	607			31.55			28.31			19.85		360.12
607	**607**			**177.50**			**153.51**			**19.85**		**360.12**
607	111			177.50			153.51	19.85	1.29	21.15	2.40	368.30
Confluence Analysis												
110	111			216.01			152.92			29.26		611.51
607	111			177.50			153.51			21.15		588.83
111	**111**			**393.51**			**306.42**			**29.26**		**611.51**
								Watershed lag (0.6Tc) =		17.56		

Supporting calculations provided 11/21/24 from City of San Diego for Pump Station H Depth

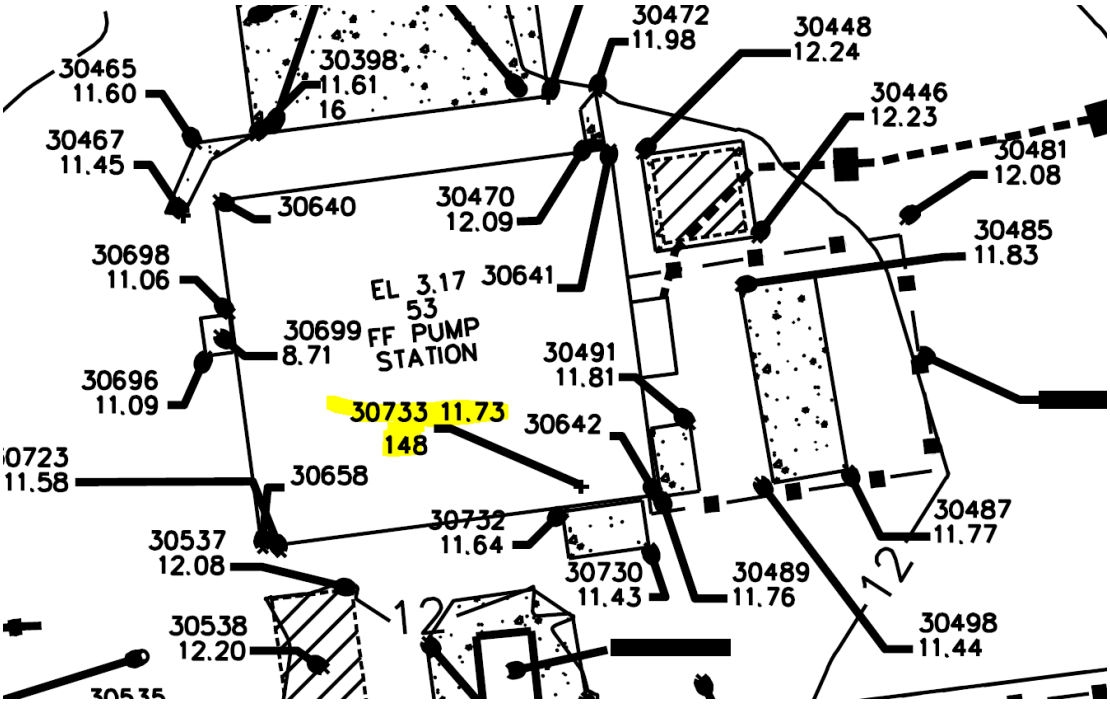
Pump Station H

Wetwell Depth Calculations During January 22nd Storm

Item 1 – Original 1956 PS-H As-Builts (3461-D) – Slab thickness is shown to be 1’4”(16”) thick.

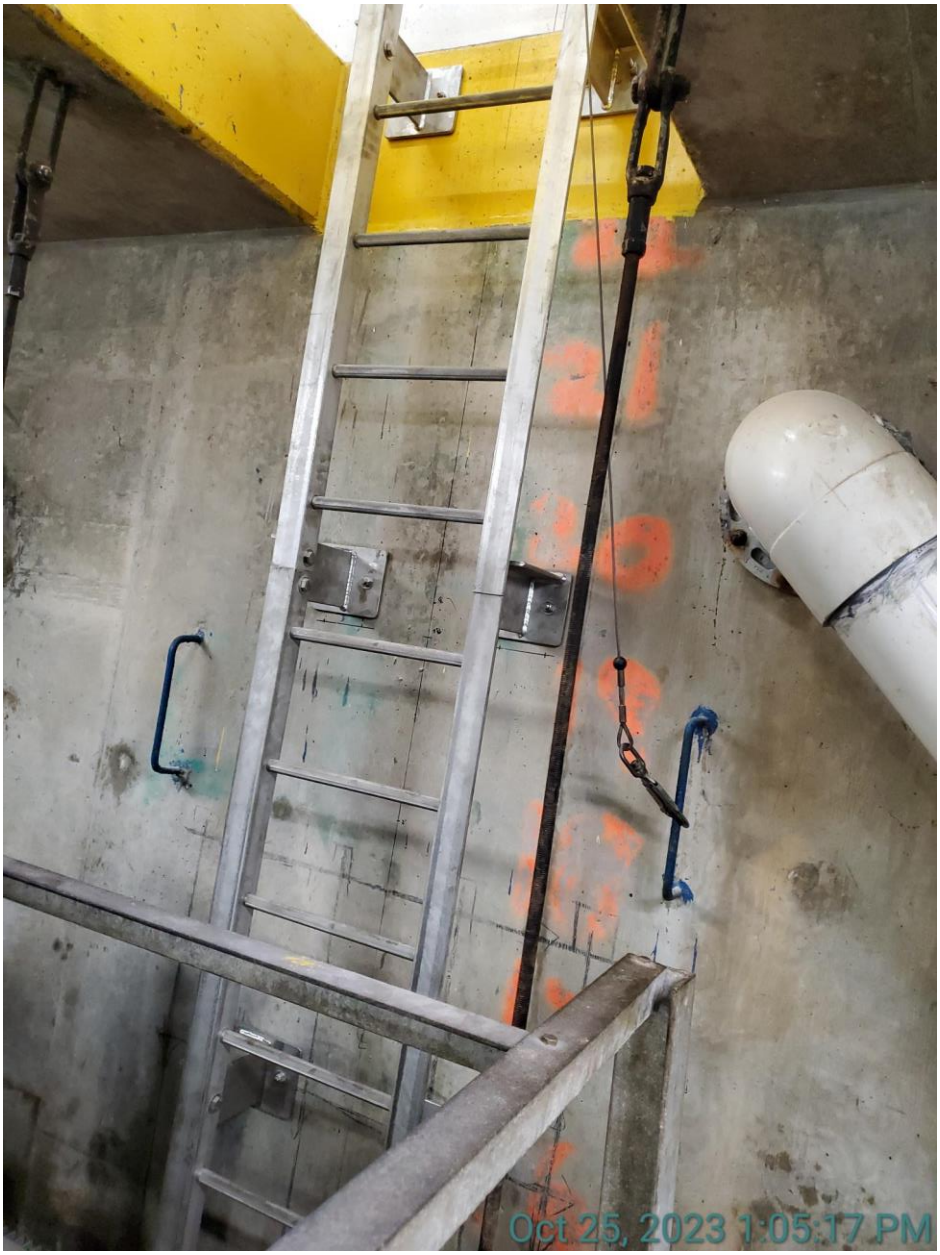


Item 2 – Nov 2022 PS-H site survey produced by O’Day Consultants. Shows FF to be 11.73’ (NGVD29)

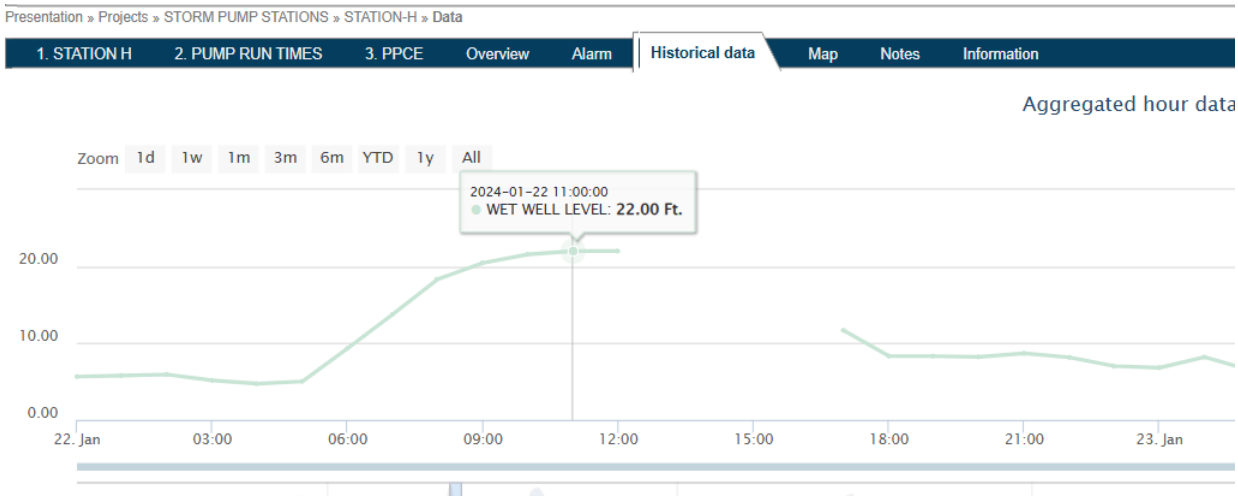


Items 3 & 4 – Photos taken of the front entrance of PS-H showing the FF

Item 5 – Photo taken from inside wetwell. Paint markings on wall are in one foot increments measured from the bottom of the wetwell. These markings were used to calibrate the wetwell sensor. The top of the yellow painted slab is the FF of the station (station's motor room floor slab).



Items 6 & 7 – Wetwell Levels January 22nd taken from Netbiter program in graphical and direct export.



Time	Wetwell Level
1/22/2024 6:00	9.325
1/22/2024 7:00	13.766667
1/22/2024 8:00	18.333333
1/22/2024 9:00	20.466667
1/22/2024 10:00	21.583333
1/22/2024 11:00	22
1/22/2024 12:00	22
1/22/2024 17:00	11.683333
1/22/2024 18:00	8.333333
1/22/2024 19:00	8.316667

Calculations:

FF per NGVD29 O'day Survey = 11.73'

Max Depth of Water per Netbiter data = 22' (Top of wetwell/Bottom of motor room floor slab)

Thickness of slab = 1.33'

11.73' – 1.33' = 10.40' (NGVD29) approximate maximum water depth observed.

Notes:

On Jan 22nd, field crews reported that wetwell water level was reaching the bottom of the station's motor room floor slab. Wetwell level data recorded via the ultrasonic sensor from our Netbiter SCADA system confirms this claim.

However, please note that at the max wetwell depth of 22 ft, the sensor can no longer record data due to it being submerged at this point. There were no reports of the water breaching into the pump station motor room but it is still possible that the water levels exceeded the 22 ft. For these calculations, we assumed the max wetwell depth of 22 ft.