Appendix I1
Preliminary Drainage Report

PRELIMINARY
DRAINAGE REPORT

YARDS AT THE BAY

City of Chula Vista, CA

City of Chula Vista Tentative Parcel Map and Coastal Development Permit_____

APN #: 571-330-36 Through 571-330-45
Project Address:
Marina Parkway and H Street,
Chula Vista, CA 91910

Prepared For:

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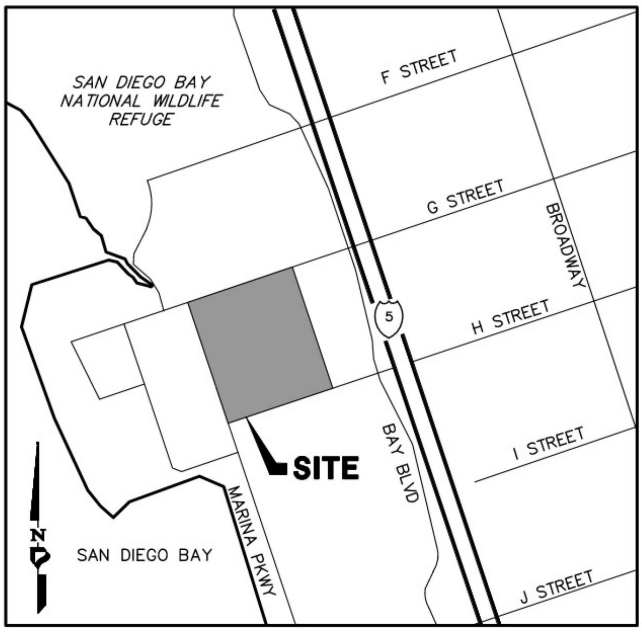
3 Proposed Conditions Rational Method Computer Output

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1. INTRODUCTION

This drainage report has been prepared in support of the preliminary design of the proposed storm drain improvements associated with the Yards at the Bay development project (Project) for a Tentative Parcel Map and Coastal Development Permit submittal. Total Project area is 35.91 acres and includes a development previously developed with two industrial buildings for manufacturing occupied by Rohr Aircraft Facility prior to 2020. The project is an active construction site for the demolition of the industrial buildings. The project is south of Sweetwater River, on the East side of Marina Parkway across from the Gaylord Resort development which is currently under construction. The project proposes commercial/light industrial uses with four large buildings, parking, and drive aisles. Fill will be imported in to the site to elevate the proposed buildings above existing grades. The additional fill will allow for additional protection against the effects of potential future sea level rise, as the site is close to the San Diego Bay. The southerly portion of the project consists of two undeveloped sloped pads which will not be developed with the project. A future development of the pads will likely consist of commercial uses; thus, we have treated these pads as commercial development for flow calculations.



VICINITY MAP
NOT TO SCALE

Figure 1: Vicinity Map

At present the site land consists mostly of parking and building roofs. There is very little if any natural terrain existing on the site. There is a small amount of runon 0.3 acres at the north easterly corner of the site where an SDG&E substation exists, the run-on sheet flows through the site for a short distance and then enters G Street.

Presently the urban run-off is split north and south of the site. There are various roof drain collections and grate inlets which direct the flow, splitting the north and south sides of the site. The proposed project will split the site in a similar way, however; minor grading adjustments will send more flow to the south, since the southerly storm drain has a higher capacity to handle the large flows conveyed on the site. One biofiltration basin and several Modular Wetland Units will be implemented to manage water. The proposed site's storm drain system will outlet into the existing storm drain facilities along the north and south end of the project respectively. Both north and south connections outlet to the San Diego Bay via pipe flow. 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.

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 (Pre-demolition Conditions)

There are on-site drainage facilities, including storm drain pipe with grate inlet and roof drain connections for the roofs and drive and parking aisles on the site which splits the site drainage between the North and South towards the San Diego Bay west of the site. The north system connects to an 36" RCP stub, and then outlets through an 54-inch RCP into a slough just northwest of the site. The slough is directly connect to the San Diego Bay. The south system connects to an 60" RCP stub, and then outlets through an 84-inch RCP that discharges into the San Diego Bay at the Chula Vista Marina. Refer to Exhibit A in Appendix 5 for the existing condition drainage map.

The Hydrologic Soil Group of the site consists of Soil Group D and an Unknown Soil Group. Per the NRCS Soil Map Survey, the easterly side of the site consists of HuC which is Soil Group D

and a portion of the westerly side of the site consists of Md which is Made Land and is not a known Soil Group. The NRCS Soil Map Survey is included in Appendix 1.

2.2 Proposed Drainage Improvements

The site will remove the existing site storm drain facilities and replace with similar facilities to meet the project needs, trench drains, grate and curb inlets will be used to pick up flow, and storm drain pipes to convey the site flow. Roof flow will be directed to the drive aisles and picked up with grate inlets or hard tied directly to the storm drain. The project maintains similar patterns to the existing conditions, discharging to north and south. However; the project site's drainage plan directs more flow south because there is more capacity in the on-site storm drain stub on the south site. As described in Section 2.1, the north storm drain system connects to a 36" stub. In contrast, the south system connect to an 60" stub. Directing more flow to the South stub was necessary in the proposed conditions, so that the Northerly 36" stub capacity is not over-burdened. Refer to Exhibit B in Appendix 5 for the proposed condition drainage map.

Water quality requirements will be managed with one biofiltration basin and several modular wetland units.

3. HYDROLOGY CRITERIA, METHODOLOGY, AND RESULTS

Hydrologic modeling was performed per City of Chula Vista Subdivision 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 & Unknown
Land Use / Runoff Coefficients:	Based on criteria presented in the Revised 2012 City of Chula Vista Subdivision Manual Section 3-200 Hydrology/Drainage/Urban Runoff.
Rainfall intensity:	Based on intensity duration frequency relationships presented in the 2017 Chula Vista Design Standards & Revised 2012 City of Chula Vista Subdivision Manual Section 3-200 Hydrology/Drainage/Urban Runoff, 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 AES Modified Rational Method program was used to calculate onsite and offsite runoff for the 100-year storm event. For the existing conditions model, a runoff coefficient of 0.90 ("Paved Surface") was used, since the entire site is nearly 100% impervious. For the proposed condition model, a representative runoff coefficient was assigned for each subarea. Therefore, a runoff

coefficient of 0.90 (“Paved Surface”) was used for areas that will be nearly 100% impervious, and other subareas were modeled as 0.85 runoff coefficient (“Commercial Areas”) and 0.45 (“Flat Vegetated Slopes”) was used only for the westerly large pervious area. For the two southerly undeveloped sloped pads on the project, a runoff coefficient of 0.85 (“Commercial Areas”) was used, because a future project may develop these areas in the future. However, these pads are not proposed to be developed with this project, and thus until the pads are developed the actual run-off from these areas will be more similar to Flat Vegetated Slopes 0.45 runoff coefficient which will contribute less runoff thus making the modeling included in this report conservative.

3.3 Description of Hydrologic Modeling Software

The Modified Rational Method was used to determine the 100-year storm flow for the design of the storm system. The Advanced Engineering Software (AES) Rational Method Program was used to perform the hydrologic calculations. This section provides a brief explanation of the computational procedure used in the computer model.

The AES Modified Rational Method Hydrology Program is a computer-aided design program where the user develops a node link model of the watershed. Developing independent node link models for each interior watershed and linking these sub-models together at confluence points creates the node link model. The intensity-duration-frequency relationships are applied to each of the drainage areas in the model to get the peak flow rates at each point of interest.

3.4 Hydrology Results

The Rational Method as presented in the City of Chula Vista Subdivision Manual and County of San Diego Hydrology 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. The total peak 100-year flows under the post-prjoect condition are less than the pre-project condition peak flows. The peak flow to the south outlet increases slightly in the post-project condition, in order to alleviate downstream pipe capacity concerns for the north outlet, since the stub for the outlet has more pipe conveyance capacity that the storm drain stub for the north outlet.

Table 2: Hydrology Results

YARDS AT THE BAY HYDROLOGY SUMMARY								
	EXISTING CONDITIONS				PROPOSED CONDITIONS			
OUTFALL OF INTEREST	SYSTEM	AREA (ac)	TC (min)	Q100 (cfs)	SYSTEM	AREA (ac)	TC (min)	Q100 (cfs)
#1 (South)	100	18.6	6.5	102.7	100	23.2	7.18	109.1
#2 (North)	200	17.8	5.97	98.1	200	13.2	6.29	69.0
	TOTAL	36.4		200.8		36.4		178.1

4. HYDRAULIC CRITERIA, METHODOLOGY, AND RESULTS

Hydraulic analyses shall be performed during final engineering will include grate and curb inlet sizing, and HGL determination.

5. CONCLUSION

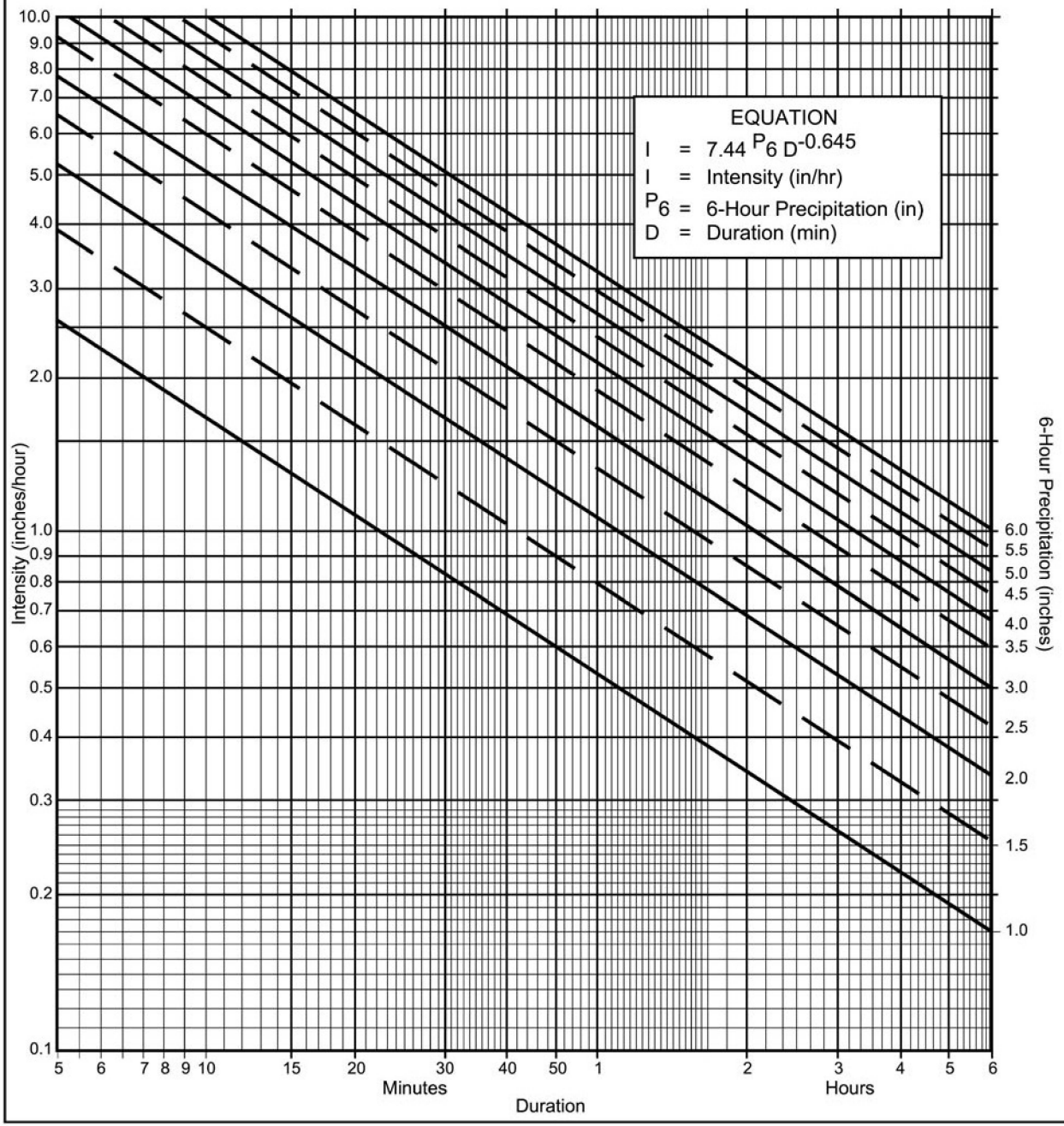
This drainage report has been prepared in support of the preliminary design of the storm drain improvements for the Tentative Parcel Map and Coastal Development Permit for the Yards at the Bay project. The purpose of this report is to provide peak discharges for use in designing the private storm drain systems for the project and to address issues regarding comparing the post-project flows to the pre-project flows. Table 2 indicates that the proposed conditions discharge

slightly more runoff to the south, but the overall total post-project 100-year flow is less compared to the existing condition.

The storm drain system will be sufficient to satisfy City of Chula Vista criteria in the post-development condition.

APPENDIX 1

Supplemental Information (Intensity Duration Frequency Curve, Runoff Coefficients)



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 2.6 in., P_{24} = 4.4, $\frac{P_6}{P_{24}}$ = 59.1 %(2)

(c) Adjusted $P_6^{(2)}$ = _____ in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1

3-203 Hydrology

Developers draining to a river or stream will be required to use the latest adopted County Hydrology Manual to determine the flows expected at a given frequency (Q10, Q50 Q100, etc,) Infill developments will use the following Hydrology requirements. The City Engineer will determine which projects may be considered "infill" projects.

3-203.1 Previously Approved Reports

Runoff quantities; as set forth or derived from the report prepared by Lawrence, Fogg, Florer and Smith titled "A Special Study of Storm Drain Facilities" on file in the office of the City Engineer may be used in the design of drainage facilities in Chula Vista. A hydrologic study prepared and approved at General Development Plan (GDP) or Specific Planning Area (SPA) plan may be used as determined by the City Engineer.

3-203.2

For local drainage basins, storm discharge flow may be estimated based on the Rational Method or the Modified Rational Method. For all lateral and major drainage basins the SCS method, U.S. Army Corps of Engineers HEC-1 computer method or other tabular or computer method may be used upon City Engineer approval.

3-203.3 Rational and Modified Rational Methods

(1) The rational method equation relates storm rainfall intensity (I), a selected runoff coefficient (C) and drainage area (A) to the peak runoff rate (Q):

$$Q = CIA \text{ (Empirical Units)}$$

where:

Q = Peak runoff in cubic feet per second
C = Runoff coefficient
I = Intensity, inches per hours
A = Drainage basin area in acres

Or

$$Q=0.278CIA \text{ (Metric Units)}$$

where:

Q = Peak runoff in cubic meters per second
C = Runoff coefficient
I = Intensity in millimeters per second
A = Drainage area in square kilometers

(2) Coefficient of Runoff: Consider probable development. Use highest number of the following values:

a)	Paved Surface	0.90
b)	Commercial Area	0.85
c)	Dense Residential (R2, R3)	0.75

d)	Normal Residential (R1)	0.65
e)	Suburban Property (RE)	0.55
f)	Barren Slopes Steep	0.80
g)	Barren Slopes Hilly	0.75
h)	" " Rolling	0.70
i)	" " Flat	0.65
j)	Vegetated Slopes Steep	0.60
k)	" " Hilly	0.55
l)	" " Rolling	0.50
m)	" " Flat	0.45
n)	Farm Land	0.35
o)	Parks, Golf Courses	0.30

NOTES:
Steep = Steep, rugged terrain with average slopes generally above 30%.
Hilly = Hilly terrain with average slopes of 10% to 30%.
Rolling = Rolling terrain with average slopes of 5% to 10%.
Flat = Relatively flat land, with average slopes of 0% to 5%.
Composite = Where drainage areas are composed of parts having different runoff characteristics, a weighted coefficient for the total drainage area may be used.

The runoff coefficient for a basin should be a composite coefficient made of the many different runoff coefficients for the sub-areas of the basin per equation:

$$\frac{CA_T = C_1A_1+C_2A_2+\ldots CnAn}{n}$$

(3) Time of Concentration (t_c = minutes) is the time required for runoff to flow from the most remote part of the watershed to the outlet point under consideration. With exceptions for limited natural watersheds, the time of concentration shall be calculated as follows:

a) $t_c = t_i + t_f$ where:

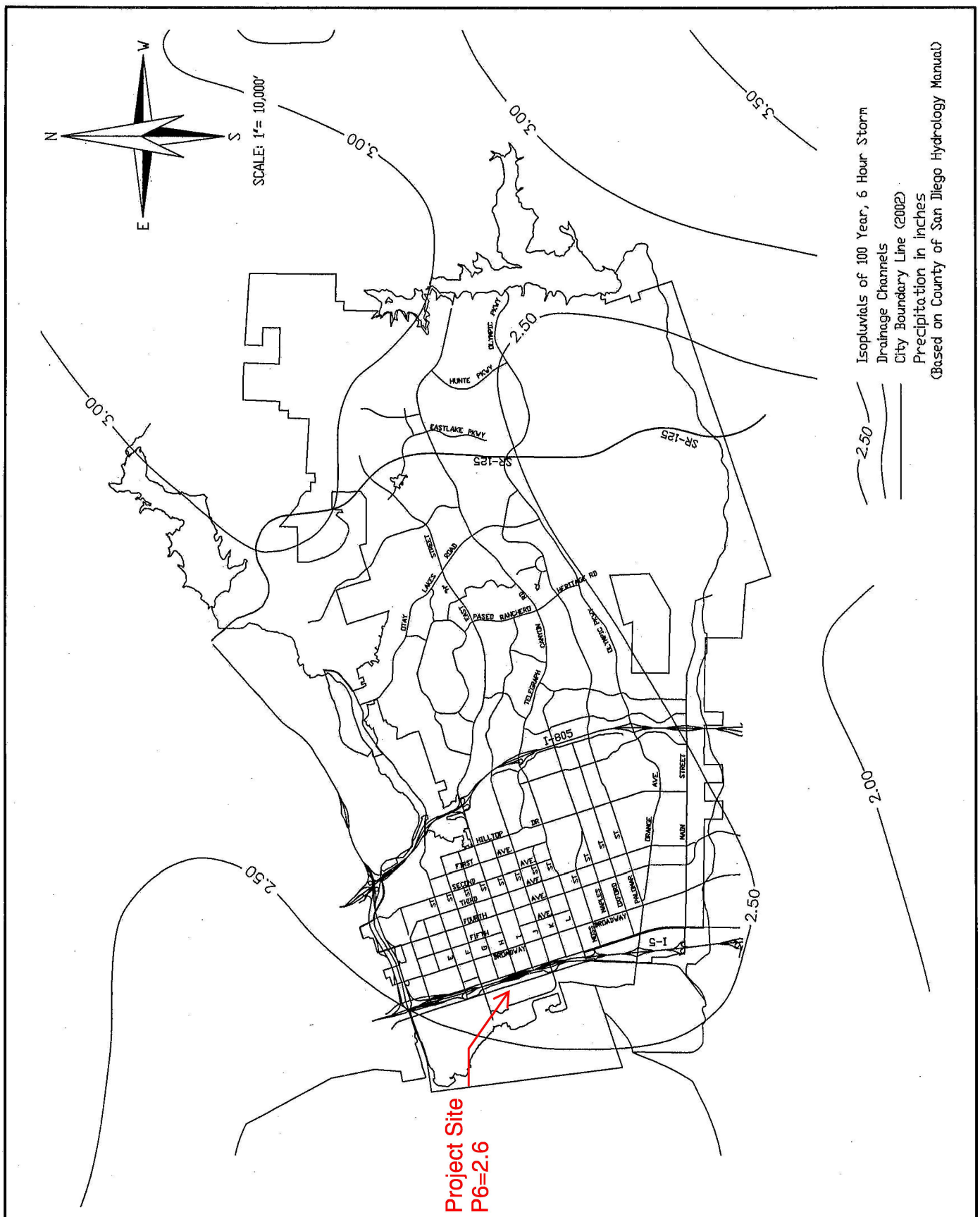
t_i = Initial time or overland flow time of concentration, the time required for runoff to flow to the first inlet or to the street gutter

t_f = Travel time of concentration, the time required for runoff to flow within street gutters to inlets, with channels or within storm drain pipes.

b) t_i may be calculated using the following natural watershed flow formula:

$$t_i = 60x\ [(11.9L^3)/H]^{0.385}$$

L = Length of water shed (miles)
H = Difference in elevation from furthermost point to the design point (feet).



REVISION	BY	APPROVED	DATE
ORIGINAL			01/02
REVISION	CVM	C. SWANSON	11/02
REVISION	DPH	W. VALLE	11/17

CITY OF CHULA VISTA
ENGINEERING & CAPITAL PROJECTS
STANDARD DRAWING

100-YEAR, 6-HOUR PRECIPITATION

WILLIAM S. VALLE 11/21/2017
CITY ENGINEER

DRN-04

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
SD

PROJECT SITE
P24=4.4

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

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N W E S

3 0 3 Miles



Map Scale: 1:4,140 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 18, Sep 14, 2022

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

Date(s) aerial images were photographed: Mar 24, 2022—Apr 29, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HuC	Huerhuero-Urban land complex, 2 to 9 percent slopes	D	30.9	69.4%
Md	Made land		13.6	30.6%
Totals for Area of Interest			**44.4**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

National Flood Hazard Layer FIRMette

FEMA

117°6'19"W 32°38'3"N



117°5'42"W 32°37'33"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

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*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

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

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

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/26/2023 at 10:54 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX 2

Existing Conditions Rational Method Computer Output

EXISTING 100-YEAR RATIONAL ANALYSIS SYSTEM 100

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            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1509

                              Analysis prepared by:




 ------------------------------------------------------------------------
-
   FILE NAME: S100E100.DAT
   TIME/DATE OF STUDY: 08:30 07/19/2023
 ------------------------------------------------------------------------
-
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
-
   2003 SAN DIEGO MANUAL CRITERIA

   USER SPECIFIED STORM EVENT(YEAR) = 100.00
   6-HOUR DURATION PRECIPITATION (INCHES) =   2.600
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
   SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
   NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:
MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== =====
=======
   1   30.0     20.0    0.018/0.018/0.020   0.67    1.50 0.0313 0.125 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  0.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*


**************************************************************************
   FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
 ------------------------------------------------------------------------
-
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

==========================================================================
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
```

```
   SOIL CLASSIFICATION IS "D"
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
   UPSTREAM ELEVATION(FEET) =      9.49
   DOWNSTREAM ELEVATION(FEET) =      9.38
   ELEVATION DIFFERENCE(FEET) =      0.11
   URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.207
   WARNING: THE MINIMUM OVERLAND FLOW SLOPE, 0.5%, IS USED IN Tc
CALCULATION!
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      0.55
   TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.55


****************************************************************************
   FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
   >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =      9.38  DOWNSTREAM(FEET) =      8.94
   CHANNEL LENGTH THRU SUBAREA(FEET) =    54.12   CHANNEL SLOPE =  0.0081
   CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  50.000
   MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.75
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.04
   AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   0.44
   Tc(MIN.) =    3.65
   SUBAREA AREA(ACRES) =     1.36       SUBAREA RUNOFF(CFS) =    8.38
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
   TOTAL AREA(ACRES) =        1.5         PEAK FLOW RATE(CFS) =       8.94

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.25   FLOW VELOCITY(FEET/SEC.) =   2.36
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     104.12 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     6.64  DOWNSTREAM(FEET) =     5.81
   FLOW LENGTH(FEET) =   166.76   MANNING'S N =  0.013
   DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.5 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   5.06
   ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =       8.94
```

```
   PIPE TRAVEL TIME(MIN.) =   0.55    Tc(MIN.) =    4.20
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     270.88 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    1.54   SUBAREA RUNOFF(CFS) =    9.49
   TOTAL AREA(ACRES) =        3.0   TOTAL RUNOFF(CFS) =      18.43
   TC(MIN.) =    4.20

****************************************************************************
   FLOW PROCESS FROM NODE    103.00 TO NODE    105.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     5.81  DOWNSTREAM(FEET) =     4.30
   FLOW LENGTH(FEET) =   302.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.4 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   6.04
   ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      18.43
   PIPE TRAVEL TIME(MIN.) =   0.83    Tc(MIN.) =    5.03
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     572.88 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.822
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    1.02   SUBAREA RUNOFF(CFS) =    6.26
   TOTAL AREA(ACRES) =        4.0   TOTAL RUNOFF(CFS) =      24.62
   TC(MIN.) =    5.03

****************************************************************************
   FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  81
```

```
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.822
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    1.66   SUBAREA RUNOFF(CFS) =   10.19
   TOTAL AREA(ACRES) =        5.7   TOTAL RUNOFF(CFS) =      34.81
   TC(MIN.) =    5.03


****************************************************************************
   FLOW PROCESS FROM NODE    114.00 TO NODE    105.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.822
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    1.80   SUBAREA RUNOFF(CFS) =   11.05
   TOTAL AREA(ACRES) =        7.5   TOTAL RUNOFF(CFS) =      45.86
   TC(MIN.) =    5.03


****************************************************************************
   FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     4.30  DOWNSTREAM(FEET) =     3.31
   FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  39.0 INCH PIPE IS  26.6 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   7.60
   ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      45.86
   PIPE TRAVEL TIME(MIN.) =   0.44    Tc(MIN.) =    5.47
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     772.88 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.464
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
```

```
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    0.79   SUBAREA RUNOFF(CFS) =    4.60
   TOTAL AREA(ACRES) =        8.3   TOTAL RUNOFF(CFS) =      48.05
   TC(MIN.) =    5.47


****************************************************************************
   FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
   TIME OF CONCENTRATION(MIN.) =    5.47
   RAINFALL INTENSITY(INCH/HR) =   6.46
   TOTAL STREAM AREA(ACRES) =     8.26
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     48.05


****************************************************************************
   FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  21
 ----------------------------------------------------------------------------
-
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

============================================================================
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
   UPSTREAM ELEVATION(FEET) =     13.83
   DOWNSTREAM ELEVATION(FEET) =     12.89
   ELEVATION DIFFERENCE(FEET) =      0.94
   URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.063
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      0.55
   TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.55


****************************************************************************
   FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  51
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
   >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     12.89  DOWNSTREAM(FEET) =     11.50
   CHANNEL LENGTH THRU SUBAREA(FEET) =   166.90   CHANNEL SLOPE =  0.0083
   CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  50.000
   MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
```

```
   SOIL CLASSIFICATION IS "D"
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.02
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.05
   AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   1.36
   Tc(MIN.) =    3.42
   SUBAREA AREA(ACRES) =     1.45       SUBAREA RUNOFF(CFS) =    8.94
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
   TOTAL AREA(ACRES) =        1.5         PEAK FLOW RATE(CFS) =       9.49

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.25   FLOW VELOCITY(FEET/SEC.) =   2.47
   LONGEST FLOWPATH FROM NODE    107.00 TO NODE    109.00 =     216.90 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     8.57  DOWNSTREAM(FEET) =     7.86
   FLOW LENGTH(FEET) =   112.90   MANNING'S N =  0.013
   DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.9 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   5.62
   ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =       9.49
   PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    3.76
   LONGEST FLOWPATH FROM NODE    107.00 TO NODE    110.00 =     329.80 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    0.88   SUBAREA RUNOFF(CFS) =    5.43
   TOTAL AREA(ACRES) =        2.4   TOTAL RUNOFF(CFS) =      14.92
   TC(MIN.) =    3.76


****************************************************************************
   FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
```

```
   ELEVATION DATA: UPSTREAM(FEET) =     7.86  DOWNSTREAM(FEET) =     7.05
   FLOW LENGTH(FEET) =   130.10   MANNING'S N =  0.013
   DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.1 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   6.22
   ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      14.92
   PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =    4.10
   LONGEST FLOWPATH FROM NODE    107.00 TO NODE    111.00 =     459.90 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    111.00 TO NODE    111.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    1.43   SUBAREA RUNOFF(CFS) =    8.82
   TOTAL AREA(ACRES) =        3.8   TOTAL RUNOFF(CFS) =      23.74
   TC(MIN.) =    4.10

****************************************************************************
   FLOW PROCESS FROM NODE    111.00 TO NODE    113.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     7.05  DOWNSTREAM(FEET) =     3.43
   FLOW LENGTH(FEET) =   578.20   MANNING'S N =  0.013
   DEPTH OF FLOW IN  27.0 INCH PIPE IS  22.0 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   6.85
   ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      23.74
   PIPE TRAVEL TIME(MIN.) =   1.41    Tc(MIN.) =    5.51
   LONGEST FLOWPATH FROM NODE    107.00 TO NODE    113.00 =    1038.10 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.433
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    1.99   SUBAREA RUNOFF(CFS) =   11.52
```

```
   TOTAL AREA(ACRES) =        5.8   TOTAL RUNOFF(CFS) =      33.81
   TC(MIN.) =    5.51

****************************************************************************
   FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.433
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    4.49   SUBAREA RUNOFF(CFS) =   26.00
   TOTAL AREA(ACRES) =       10.3   TOTAL RUNOFF(CFS) =      59.81
   TC(MIN.) =    5.51

****************************************************************************
   FLOW PROCESS FROM NODE    113.00 TO NODE    106.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     3.43  DOWNSTREAM(FEET) =     0.12
   FLOW LENGTH(FEET) =   529.50   MANNING'S N =  0.013
   DEPTH OF FLOW IN  39.0 INCH PIPE IS  30.0 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   8.72
   ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      59.81
   PIPE TRAVEL TIME(MIN.) =   1.01    Tc(MIN.) =    6.52
   LONGEST FLOWPATH FROM NODE    107.00 TO NODE    106.00 =    1567.60 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    113.00 TO NODE    106.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
   >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
   TIME OF CONCENTRATION(MIN.) =    6.52
   RAINFALL INTENSITY(INCH/HR) =   5.77
   TOTAL STREAM AREA(ACRES) =    10.33
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     59.81

   ** CONFLUENCE DATA **
   STREAM     RUNOFF       Tc      INTENSITY      AREA
   NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
       1       48.05     5.47        6.464          8.26
```

```
    2       59.81     6.52        5.770         10.33

   RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
   CONFLUENCE FORMULA USED FOR  2 STREAMS.

   ** PEAK FLOW RATE TABLE **
   STREAM     RUNOFF      Tc      INTENSITY
   NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
       1       98.21     5.47       6.464
       2      102.70     6.52       5.770

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =     102.70   Tc(MIN.) =    6.52
   TOTAL AREA(ACRES) =       18.6
   LONGEST FLOWPATH FROM NODE    107.00 TO NODE    106.00 =    1567.60 FEET.

============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)     =       18.6  TC(MIN.) =      6.52
   PEAK FLOW RATE(CFS)   =     102.70

============================================================================

============================================================================
   END OF RATIONAL METHOD ANALYSIS
```

EXISTING 100-YEAR RATIONAL ANALYSIS SYSTEM 200

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1509

                            Analysis prepared by:




 ----------------------------------------------------------------------------
-
   FILE NAME: S200E200.DAT
   TIME/DATE OF STUDY: 08:46 07/20/2023
 ----------------------------------------------------------------------------
-
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ----------------------------------------------------------------------------
-
   2003 SAN DIEGO MANUAL CRITERIA

   USER SPECIFIED STORM EVENT(YEAR) = 100.00
   6-HOUR DURATION PRECIPITATION (INCHES) =   2.600
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
   SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
   NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:
MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== =====
=======
   1   30.0     20.0    0.018/0.018/0.020   0.67    1.50 0.0313 0.125 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  0.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*


****************************************************************************
   FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
 ----------------------------------------------------------------------------
-
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

============================================================================
```

```
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
   UPSTREAM ELEVATION(FEET) =     14.16
   DOWNSTREAM ELEVATION(FEET) =     13.47
   ELEVATION DIFFERENCE(FEET) =      0.69
   URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.286
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      1.23
   TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      1.23


****************************************************************************
   FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
   >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     13.47  DOWNSTREAM(FEET) =     11.47
   CHANNEL LENGTH THRU SUBAREA(FEET) =   149.00   CHANNEL SLOPE =  0.0134
   CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  50.000
   MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.58
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.58
   AVERAGE FLOW DEPTH(FEET) =   0.18   TRAVEL TIME(MIN.) =   0.96
   Tc(MIN.) =    3.25
   SUBAREA AREA(ACRES) =     1.41       SUBAREA RUNOFF(CFS) =    8.69
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
   TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       9.93

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   2.94
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     199.00 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =    10.80  DOWNSTREAM(FEET) =    10.29
   FLOW LENGTH(FEET) =   147.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.7 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   4.55
   ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =       9.93
   PIPE TRAVEL TIME(MIN.) =   0.54    Tc(MIN.) =    3.79
```

```
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     346.00 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    2.70   SUBAREA RUNOFF(CFS) =   16.65
   TOTAL AREA(ACRES) =        4.3   TOTAL RUNOFF(CFS) =      26.57
   TC(MIN.) =    3.79

****************************************************************************
   FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =    10.29  DOWNSTREAM(FEET) =     9.50
   FLOW LENGTH(FEET) =   228.10   MANNING'S N =  0.013
   DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.9 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   5.76
   ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      26.57
   PIPE TRAVEL TIME(MIN.) =   0.66    Tc(MIN.) =    4.45
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     574.10 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    2.75   SUBAREA RUNOFF(CFS) =   16.95
   TOTAL AREA(ACRES) =        7.1   TOTAL RUNOFF(CFS) =      43.53
   TC(MIN.) =    4.45

****************************************************************************
   FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  31
```

```
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     9.50  DOWNSTREAM(FEET) =     6.61
   FLOW LENGTH(FEET) =   641.50   MANNING'S N =  0.013
   DEPTH OF FLOW IN  36.0 INCH PIPE IS  29.4 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   7.04
   ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      43.53
   PIPE TRAVEL TIME(MIN.) =   1.52    Tc(MIN.) =    5.97
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    205.00 =    1215.60 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    205.00 TO NODE    205.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.112
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    2.43   SUBAREA RUNOFF(CFS) =   13.37
   TOTAL AREA(ACRES) =        9.5   TOTAL RUNOFF(CFS) =      52.20
   TC(MIN.) =    5.97


****************************************************************************
   FLOW PROCESS FROM NODE    205.00 TO NODE    211.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
   TIME OF CONCENTRATION(MIN.) =    5.97
   RAINFALL INTENSITY(INCH/HR) =   6.11
   TOTAL STREAM AREA(ACRES) =     9.49
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     52.20


****************************************************************************
   FLOW PROCESS FROM NODE    206.00 TO NODE    207.00 IS CODE =  21
 ----------------------------------------------------------------------------
-
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

============================================================================
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
```

```
   UPSTREAM ELEVATION(FEET) =     10.00
   DOWNSTREAM ELEVATION(FEET) =      8.80
   ELEVATION DIFFERENCE(FEET) =      1.20
   URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.901
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      0.74
   TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.74


****************************************************************************
   FLOW PROCESS FROM NODE    207.00 TO NODE    208.00 IS CODE =  51
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
   >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =      8.80  DOWNSTREAM(FEET) =      8.30
   CHANNEL LENGTH THRU SUBAREA(FEET) =   127.10   CHANNEL SLOPE =  0.0039
   CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  50.000
   MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.32
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.51
   AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   1.40
   Tc(MIN.) =    3.30
   SUBAREA AREA(ACRES) =     1.16       SUBAREA RUNOFF(CFS) =    7.15
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
   TOTAL AREA(ACRES) =        1.3         PEAK FLOW RATE(CFS) =       7.89

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.27   FLOW VELOCITY(FEET/SEC.) =   1.75
   LONGEST FLOWPATH FROM NODE    206.00 TO NODE    208.00 =     177.10 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    209.00 TO NODE    209.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    2.64   SUBAREA RUNOFF(CFS) =   16.28
   TOTAL AREA(ACRES) =        3.9   TOTAL RUNOFF(CFS) =      24.17
   TC(MIN.) =    3.30


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

```
   FLOW PROCESS FROM NODE    208.00 TO NODE    210.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     5.90  DOWNSTREAM(FEET) =     2.96
   FLOW LENGTH(FEET) =   345.50   MANNING'S N =  0.013
   DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.4 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   7.89
   ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      24.17
   PIPE TRAVEL TIME(MIN.) =   0.73    Tc(MIN.) =    4.03
   LONGEST FLOWPATH FROM NODE    206.00 TO NODE    210.00 =     522.60 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    0.78   SUBAREA RUNOFF(CFS) =    4.81
   TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      28.98
   TC(MIN.) =    4.03


****************************************************************************
   FLOW PROCESS FROM NODE    212.00 TO NODE    212.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    3.65   SUBAREA RUNOFF(CFS) =   22.50
   TOTAL AREA(ACRES) =        8.4   TOTAL RUNOFF(CFS) =      51.48
   TC(MIN.) =    4.03


****************************************************************************
   FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
   >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
```

```
================================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
   TIME OF CONCENTRATION(MIN.) =    4.03
   RAINFALL INTENSITY(INCH/HR) =   6.85
   TOTAL STREAM AREA(ACRES) =     8.35
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     51.48

   ** CONFLUENCE DATA **
   STREAM     RUNOFF       Tc      INTENSITY      AREA
   NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
       1       52.20     5.97        6.112          9.49
       2       51.48     4.03        6.850          8.35

   RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
   CONFLUENCE FORMULA USED FOR  2 STREAMS.

   ** PEAK FLOW RATE TABLE **
   STREAM     RUNOFF      Tc      INTENSITY
   NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
       1       86.75     4.03       6.850
       2       98.13     5.97       6.112

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =      98.13   Tc(MIN.) =    5.97
   TOTAL AREA(ACRES) =       17.8
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    211.00 =    1215.60 FEET.

================================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)     =       17.8  TC(MIN.) =      5.97
   PEAK FLOW RATE(CFS)   =      98.13

================================================================================

================================================================================
   END OF RATIONAL METHOD ANALYSIS
```

APPENDIX 3

Proposed Conditions Rational Method Computer Output

PROPOSED 100-YEAR RATIONAL ANALYSIS SYSTEM 100

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1509

                              Analysis prepared by:




 ------------------------------------------------------------------------
-
   FILE NAME: S100D100.DAT
   TIME/DATE OF STUDY: 13:38 07/27/2023
 ------------------------------------------------------------------------
-
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
-
   2003 SAN DIEGO MANUAL CRITERIA

   USER SPECIFIED STORM EVENT(YEAR) = 100.00
   6-HOUR DURATION PRECIPITATION (INCHES) =   2.600
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
   SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
   NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:
MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== =====
=======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.10 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*


**************************************************************************
   FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
 ------------------------------------------------------------------------
-
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
============================================================================
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
   UPSTREAM ELEVATION(FEET) =     14.63
   DOWNSTREAM ELEVATION(FEET) =     13.70
   ELEVATION DIFFERENCE(FEET) =      0.93
   URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.070
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      0.43
   TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.43


****************************************************************************
   FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
   >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     13.70  DOWNSTREAM(FEET) =     13.35
   CHANNEL LENGTH THRU SUBAREA(FEET) =    55.00   CHANNEL SLOPE =  0.0064
   CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  50.000
   MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.02
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.63
   AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   0.56
   Tc(MIN.) =    2.63
   SUBAREA AREA(ACRES) =     0.84       SUBAREA RUNOFF(CFS) =    5.18
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
   TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       5.61

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   1.97
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     105.00 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =    11.35  DOWNSTREAM(FEET) =     8.85
   FLOW LENGTH(FEET) =   392.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.9 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   4.99
   ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
```

```
   PIPE-FLOW(CFS) =       5.61
   PIPE TRAVEL TIME(MIN.) =   1.31    Tc(MIN.) =    3.94
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     497.00 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8779
   SUBAREA AREA(ACRES) =    0.72   SUBAREA RUNOFF(CFS) =    4.19
   TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       9.80
   TC(MIN.) =    3.94


****************************************************************************
   FLOW PROCESS FROM NODE    104.00 TO NODE    103.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8804
   SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    1.29
   TOTAL AREA(ACRES) =        1.8   TOTAL RUNOFF(CFS) =      11.10
   TC(MIN.) =    3.94


****************************************************************************
   FLOW PROCESS FROM NODE    103.00 TO NODE    105.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     8.85  DOWNSTREAM(FEET) =     6.24
   FLOW LENGTH(FEET) =   256.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.1 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   7.04
   ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      11.10
   PIPE TRAVEL TIME(MIN.) =   0.61    Tc(MIN.) =    4.55
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     753.00 FEET.
```

```
****************************************************************************
   FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8716
   SUBAREA AREA(ACRES) =    0.75   SUBAREA RUNOFF(CFS) =    4.37
   TOTAL AREA(ACRES) =        2.6   TOTAL RUNOFF(CFS) =      15.46
   TC(MIN.) =    4.55


****************************************************************************
   FLOW PROCESS FROM NODE    107.00 TO NODE    105.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8832
   SUBAREA AREA(ACRES) =    1.78   SUBAREA RUNOFF(CFS) =   10.97
   TOTAL AREA(ACRES) =        4.4   TOTAL RUNOFF(CFS) =      26.44
   TC(MIN.) =    4.55


****************************************************************************
   FLOW PROCESS FROM NODE    106.00 TO NODE    105.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8851
   SUBAREA AREA(ACRES) =    0.56   SUBAREA RUNOFF(CFS) =    3.45
   TOTAL AREA(ACRES) =        4.9   TOTAL RUNOFF(CFS) =      29.89
   TC(MIN.) =    4.55


****************************************************************************
   FLOW PROCESS FROM NODE    108.00 TO NODE    105.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
PAVED SURFACE RUNOFF COEFFICIENT = .9000
SOIL CLASSIFICATION IS "D"
AREA-AVERAGE RUNOFF COEFFICIENT = 0.8857
SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    1.29
TOTAL AREA(ACRES) =        5.1   TOTAL RUNOFF(CFS) =      31.19
TC(MIN.) =    4.55


****************************************************************************
FLOW PROCESS FROM NODE    105.00 TO NODE    109.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
ELEVATION DATA: UPSTREAM(FEET) =     6.24  DOWNSTREAM(FEET) =     4.28
FLOW LENGTH(FEET) =   351.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   7.22
ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      31.19
PIPE TRAVEL TIME(MIN.) =   0.81    Tc(MIN.) =    5.36
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =    1104.00 FEET.


****************************************************************************
FLOW PROCESS FROM NODE    109.00 TO NODE    109.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.550
COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
SOIL CLASSIFICATION IS "D"
AREA-AVERAGE RUNOFF COEFFICIENT = 0.8784
SUBAREA AREA(ACRES) =    1.32   SUBAREA RUNOFF(CFS) =    7.35
TOTAL AREA(ACRES) =        6.5   TOTAL RUNOFF(CFS) =      37.17
TC(MIN.) =    5.36


****************************************************************************
FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
ELEVATION DATA: UPSTREAM(FEET) =     4.28  DOWNSTREAM(FEET) =     3.60
FLOW LENGTH(FEET) =    90.30   MANNING'S N =  0.013
DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.0 INCHES
```

```
   PIPE-FLOW VELOCITY(FEET/SEC.) =   8.42
   ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      37.17
   PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    5.54
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =    1194.30 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
   TIME OF CONCENTRATION(MIN.) =    5.54
   RAINFALL INTENSITY(INCH/HR) =   6.41
   TOTAL STREAM AREA(ACRES) =     6.46
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     37.17


****************************************************************************
   FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  21
 ----------------------------------------------------------------------------
-
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

============================================================================
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
   UPSTREAM ELEVATION(FEET) =     14.23
   DOWNSTREAM ELEVATION(FEET) =     13.50
   ELEVATION DIFFERENCE(FEET) =      0.73
   URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.244
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      0.37
   TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.37


****************************************************************************
   FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  51
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
   >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     13.50  DOWNSTREAM(FEET) =     12.60
   CHANNEL LENGTH THRU SUBAREA(FEET) =    53.10   CHANNEL SLOPE =  0.0169
   CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  50.000
   MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
```

```
   SOIL CLASSIFICATION IS "D"
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.70
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.58
   AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   0.34
   Tc(MIN.) =    2.59
   SUBAREA AREA(ACRES) =     1.08       SUBAREA RUNOFF(CFS) =    6.66
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
   TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       7.03

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.19   FLOW VELOCITY(FEET/SEC.) =   2.86
   LONGEST FLOWPATH FROM NODE    111.00 TO NODE    113.00 =     103.10 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    113.00 TO NODE    114.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =    11.10  DOWNSTREAM(FEET) =     8.44
   FLOW LENGTH(FEET) =   468.50   MANNING'S N =  0.013
   DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.5 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   4.94
   ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =       7.03
   PIPE TRAVEL TIME(MIN.) =   1.58    Tc(MIN.) =    4.17
   LONGEST FLOWPATH FROM NODE    111.00 TO NODE    114.00 =     571.60 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8782
   SUBAREA AREA(ACRES) =    0.88   SUBAREA RUNOFF(CFS) =    5.12
   TOTAL AREA(ACRES) =        2.0   TOTAL RUNOFF(CFS) =      12.15
   TC(MIN.) =    4.17


****************************************************************************
   FLOW PROCESS FROM NODE    114.00 TO NODE    110.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
```

```
   ELEVATION DATA: UPSTREAM(FEET) =     7.31  DOWNSTREAM(FEET) =     3.60
   FLOW LENGTH(FEET) =   540.90   MANNING'S N =  0.013
   DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.3 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   6.05
   ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      12.15
   PIPE TRAVEL TIME(MIN.) =   1.49    Tc(MIN.) =    5.66
   LONGEST FLOWPATH FROM NODE    111.00 TO NODE    110.00 =    1112.50 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    115.00 TO NODE    110.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.327
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8744
   SUBAREA AREA(ACRES) =    0.32   SUBAREA RUNOFF(CFS) =    1.72
   TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =      12.94
   TC(MIN.) =    5.66


****************************************************************************
   FLOW PROCESS FROM NODE    116.00 TO NODE    110.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.327
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8719
   SUBAREA AREA(ACRES) =    0.26   SUBAREA RUNOFF(CFS) =    1.40
   TOTAL AREA(ACRES) =        2.6   TOTAL RUNOFF(CFS) =      14.34
   TC(MIN.) =    5.66


****************************************************************************
   FLOW PROCESS FROM NODE    117.00 TO NODE    110.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.327
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8658
   SUBAREA AREA(ACRES) =    1.00   SUBAREA RUNOFF(CFS) =    5.38
   TOTAL AREA(ACRES) =        3.6   TOTAL RUNOFF(CFS) =      19.72
   TC(MIN.) =    5.66
```

```
****************************************************************************
   FLOW PROCESS FROM NODE    118.00 TO NODE    110.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.327
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8683
   SUBAREA AREA(ACRES) =    0.28   SUBAREA RUNOFF(CFS) =    1.59
   TOTAL AREA(ACRES) =        3.9   TOTAL RUNOFF(CFS) =      21.31
   TC(MIN.) =    5.66


****************************************************************************
   FLOW PROCESS FROM NODE    119.00 TO NODE    110.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.327
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8706
   SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    1.71
   TOTAL AREA(ACRES) =        4.2   TOTAL RUNOFF(CFS) =      23.02
   TC(MIN.) =    5.66


****************************************************************************
   FLOW PROCESS FROM NODE    117.00 TO NODE    110.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
   >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
   TIME OF CONCENTRATION(MIN.) =    5.66
   RAINFALL INTENSITY(INCH/HR) =   6.33
   TOTAL STREAM AREA(ACRES) =     4.18
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     23.02

   ** CONFLUENCE DATA **
   STREAM     RUNOFF       Tc      INTENSITY      AREA
   NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
       1       37.17     5.54        6.413          6.46
       2       23.02     5.66        6.327          4.18

   RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
   CONFLUENCE FORMULA USED FOR  2 STREAMS.
```

```
   ** PEAK FLOW RATE TABLE **
   STREAM     RUNOFF      Tc      INTENSITY
   NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
       1       59.71     5.54       6.413
       2       59.69     5.66       6.327

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =      59.71   Tc(MIN.) =    5.54
   TOTAL AREA(ACRES) =       10.6
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =    1194.30 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     3.60  DOWNSTREAM(FEET) =     1.46
   FLOW LENGTH(FEET) =   433.30   MANNING'S N =  0.013
   DEPTH OF FLOW IN  42.0 INCH PIPE IS  30.2 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   8.06
   ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      59.71
   PIPE TRAVEL TIME(MIN.) =   0.90    Tc(MIN.) =    6.43
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    120.00 =    1627.60 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.822
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8739
   SUBAREA AREA(ACRES) =    0.63   SUBAREA RUNOFF(CFS) =    3.12
   TOTAL AREA(ACRES) =       11.3   TOTAL RUNOFF(CFS) =      59.71
   TC(MIN.) =    6.43
   NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE


****************************************************************************
   FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.822
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
```

```
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8731
   SUBAREA AREA(ACRES) =    0.40   SUBAREA RUNOFF(CFS) =    1.98
   TOTAL AREA(ACRES) =       11.7   TOTAL RUNOFF(CFS) =      59.71
   TC(MIN.) =    6.43
   NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE


****************************************************************************
   FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
   TIME OF CONCENTRATION(MIN.) =    6.43
   RAINFALL INTENSITY(INCH/HR) =   5.82
   TOTAL STREAM AREA(ACRES) =    11.67
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     59.71


****************************************************************************
   FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  21
 ----------------------------------------------------------------------------
-
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

============================================================================
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
   UPSTREAM ELEVATION(FEET) =     11.00
   DOWNSTREAM ELEVATION(FEET) =     10.75
   ELEVATION DIFFERENCE(FEET) =      0.25
   URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.207
   WARNING: THE MINIMUM OVERLAND FLOW SLOPE, 0.5%, IS USED IN Tc
CALCULATION!
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      0.92
   TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.92


****************************************************************************
   FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  51
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
   >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     10.75  DOWNSTREAM(FEET) =     10.17
   CHANNEL LENGTH THRU SUBAREA(FEET) =    99.00   CHANNEL SLOPE =  0.0059
   CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  50.000
   MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
```

```
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.82
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.39
   AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   1.19
   Tc(MIN.) =    4.39
   SUBAREA AREA(ACRES) =     0.29       SUBAREA RUNOFF(CFS) =    1.79
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
   TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       2.71

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   1.49
   LONGEST FLOWPATH FROM NODE    121.00 TO NODE    123.00 =     149.00 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   VEGETATED SLOPES (FLAT) RUNOFF COEFFICIENT = .4500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.7643
   SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.59
   TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       3.30
   TC(MIN.) =    4.39


****************************************************************************
   FLOW PROCESS FROM NODE    124.00 TO NODE    125.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     7.34  DOWNSTREAM(FEET) =     6.59
   FLOW LENGTH(FEET) =   124.10   MANNING'S N =  0.013
   ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
   DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.1 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   4.29
   ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =       3.30
   PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =    4.88
   LONGEST FLOWPATH FROM NODE    121.00 TO NODE    125.00 =     273.10 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
VEGETATED SLOPES (FLAT) RUNOFF COEFFICIENT = .4500
SOIL CLASSIFICATION IS "D"
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6520
SUBAREA AREA(ACRES) =    0.35   SUBAREA RUNOFF(CFS) =    1.08
TOTAL AREA(ACRES) =       1.0   TOTAL RUNOFF(CFS) =       4.38
TC(MIN.) =    4.88


****************************************************************************
FLOW PROCESS FROM NODE    126.00 TO NODE    125.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
PAVED SURFACE RUNOFF COEFFICIENT = .9000
SOIL CLASSIFICATION IS "D"
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7509
SUBAREA AREA(ACRES) =    0.65   SUBAREA RUNOFF(CFS) =    4.01
TOTAL AREA(ACRES) =       1.6   TOTAL RUNOFF(CFS) =       8.38
TC(MIN.) =    4.88


****************************************************************************
FLOW PROCESS FROM NODE    127.00 TO NODE    125.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
PAVED SURFACE RUNOFF COEFFICIENT = .9000
SOIL CLASSIFICATION IS "D"
AREA-AVERAGE RUNOFF COEFFICIENT = 0.8138
SUBAREA AREA(ACRES) =    1.19   SUBAREA RUNOFF(CFS) =    7.34
TOTAL AREA(ACRES) =       2.8   TOTAL RUNOFF(CFS) =      15.72
TC(MIN.) =    4.88


****************************************************************************
FLOW PROCESS FROM NODE    125.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
ELEVATION DATA: UPSTREAM(FEET) =     6.59  DOWNSTREAM(FEET) =     1.46
FLOW LENGTH(FEET) =   219.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.5 INCHES
```

```
   PIPE-FLOW VELOCITY(FEET/SEC.) =  10.52
   ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      15.72
   PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =    5.22
   LONGEST FLOWPATH FROM NODE    121.00 TO NODE    120.00 =     492.10 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    125.00 TO NODE    120.00 IS CODE =   1
 --------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
   >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
   TIME OF CONCENTRATION(MIN.) =    5.22
   RAINFALL INTENSITY(INCH/HR) =   6.66
   TOTAL STREAM AREA(ACRES) =     2.82
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.72

   ** CONFLUENCE DATA **
   STREAM     RUNOFF       Tc      INTENSITY      AREA
   NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
       1       59.71     6.43        5.822         11.67
       2       15.72     5.22        6.661          2.82

   RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
   CONFLUENCE FORMULA USED FOR  2 STREAMS.

   ** PEAK FLOW RATE TABLE **
   STREAM     RUNOFF      Tc      INTENSITY
   NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
       1       67.92     5.22       6.661
       2       73.45     6.43       5.822

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =      73.45   Tc(MIN.) =    6.43
   TOTAL AREA(ACRES) =       14.5
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    120.00 =    1627.60 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    120.00 TO NODE    128.00 IS CODE =  31
 --------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     1.46  DOWNSTREAM(FEET) =     0.45
   FLOW LENGTH(FEET) =   264.70   MANNING'S N =  0.013
   DEPTH OF FLOW IN  48.0 INCH PIPE IS  34.0 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   7.72
   ESTIMATED PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      73.45
```

```
   PIPE TRAVEL TIME(MIN.) =   0.57    Tc(MIN.) =    7.00
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    128.00 =    1892.30 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    129.00 TO NODE    128.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.511
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8594
   SUBAREA AREA(ACRES) =    3.25   SUBAREA RUNOFF(CFS) =   15.23
   TOTAL AREA(ACRES) =       17.7   TOTAL RUNOFF(CFS) =      84.03
   TC(MIN.) =    7.00

****************************************************************************
   FLOW PROCESS FROM NODE    128.00 TO NODE    130.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     1.00  DOWNSTREAM(FEET) =     0.16
   FLOW LENGTH(FEET) =   109.60   MANNING'S N =  0.013
   DEPTH OF FLOW IN  42.0 INCH PIPE IS  33.6 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =  10.17
   ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      84.03
   PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    7.18
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    130.00 =    2001.90 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    128.00 TO NODE    130.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
   TIME OF CONCENTRATION(MIN.) =    7.18
   RAINFALL INTENSITY(INCH/HR) =   5.42
   TOTAL STREAM AREA(ACRES) =    17.74
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     84.03

****************************************************************************
   FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
 ----------------------------------------------------------------------------
-
```

```
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

============================================================================
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
   UPSTREAM ELEVATION(FEET) =     13.73
   DOWNSTREAM ELEVATION(FEET) =     13.00
   ELEVATION DIFFERENCE(FEET) =      0.73
   URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.244
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      0.37
   TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.37


****************************************************************************
   FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  51
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
   >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     13.00  DOWNSTREAM(FEET) =     11.40
   CHANNEL LENGTH THRU SUBAREA(FEET) =   407.00   CHANNEL SLOPE =  0.0039
   CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  50.000
   MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.493
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.29
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.41
   AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   4.80
   Tc(MIN.) =    7.04
   SUBAREA AREA(ACRES) =     1.16       SUBAREA RUNOFF(CFS) =    5.73
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
   TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       6.03

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   1.66
   LONGEST FLOWPATH FROM NODE    130.00 TO NODE    133.00 =     457.00 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    133.00 TO NODE    134.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     8.60  DOWNSTREAM(FEET) =     4.60
   FLOW LENGTH(FEET) =   132.20   MANNING'S N =  0.013
   ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
   DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.2 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   9.10
```

```
   ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =       6.03
   PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =    7.28
   LONGEST FLOWPATH FROM NODE    130.00 TO NODE    134.00 =     589.20 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    135.00 TO NODE    134.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.374
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8611
   SUBAREA AREA(ACRES) =    4.27   SUBAREA RUNOFF(CFS) =   19.51
   TOTAL AREA(ACRES) =        5.5   TOTAL RUNOFF(CFS) =      25.41
   TC(MIN.) =    7.28


****************************************************************************
   FLOW PROCESS FROM NODE    135.00 TO NODE    134.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
   >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
   TIME OF CONCENTRATION(MIN.) =    7.28
   RAINFALL INTENSITY(INCH/HR) =   5.37
   TOTAL STREAM AREA(ACRES) =     5.49
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     25.41

   ** CONFLUENCE DATA **
   STREAM     RUNOFF       Tc      INTENSITY      AREA
   NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
       1       84.03     7.18        5.422         17.74
       2       25.41     7.28        5.374          5.49

   RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
   CONFLUENCE FORMULA USED FOR  2 STREAMS.

   ** PEAK FLOW RATE TABLE **
   STREAM     RUNOFF      Tc      INTENSITY
   NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
       1      109.09     7.18       5.422
       2      108.69     7.28       5.374

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =     109.09   Tc(MIN.) =    7.18
   TOTAL AREA(ACRES) =       23.2
   LONGEST FLOWPATH FROM NODE    100.00 TO NODE    134.00 =    2001.90 FEET.
```

```
============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)     =       23.2  TC(MIN.) =      7.18
   PEAK FLOW RATE(CFS)   =     109.09

============================================================================

============================================================================
   END OF RATIONAL METHOD ANALYSIS
```

PROPOSED 100-YEAR RATIONAL ANALYSIS SYSTEM 200

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1509

                              Analysis prepared by:




 ------------------------------------------------------------------------
-
   FILE NAME: S200D200.DAT
   TIME/DATE OF STUDY: 13:41 07/27/2023
 ------------------------------------------------------------------------
-
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
-
   2003 SAN DIEGO MANUAL CRITERIA

   USER SPECIFIED STORM EVENT(YEAR) = 100.00
   6-HOUR DURATION PRECIPITATION (INCHES) =   2.600
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
   SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
   NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:
MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== =====
=======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.10 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*


**************************************************************************
   FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
 ------------------------------------------------------------------------
-
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
================================================================================
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
   UPSTREAM ELEVATION(FEET) =     14.63
   DOWNSTREAM ELEVATION(FEET) =     14.00
   ELEVATION DIFFERENCE(FEET) =      0.63
   URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.357
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      0.62
   TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.62


****************************************************************************
   FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
   >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

================================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     14.00  DOWNSTREAM(FEET) =     13.20
   CHANNEL LENGTH THRU SUBAREA(FEET) =    64.20   CHANNEL SLOPE =  0.0125
   CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  50.000
   MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.29
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.56
   AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   0.42
   Tc(MIN.) =    2.77
   SUBAREA AREA(ACRES) =     1.84       SUBAREA RUNOFF(CFS) =   11.34
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
   TOTAL AREA(ACRES) =        1.9         PEAK FLOW RATE(CFS) =      11.96

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.25   FLOW VELOCITY(FEET/SEC.) =   2.99
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     114.20 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

================================================================================
   ELEVATION DATA: UPSTREAM(FEET) =    11.70  DOWNSTREAM(FEET) =     7.30
   FLOW LENGTH(FEET) =   503.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.6 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   6.71
   ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
```

```
   PIPE-FLOW(CFS) =      11.96
   PIPE TRAVEL TIME(MIN.) =   1.25    Tc(MIN.) =    4.02
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     617.20 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    204.00 TO NODE    203.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    0.32   SUBAREA RUNOFF(CFS) =    1.97
   TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =      13.93
   TC(MIN.) =    4.02


****************************************************************************
   FLOW PROCESS FROM NODE    205.00 TO NODE    203.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    0.17   SUBAREA RUNOFF(CFS) =    1.05
   TOTAL AREA(ACRES) =        2.4   TOTAL RUNOFF(CFS) =      14.98
   TC(MIN.) =    4.02


****************************************************************************
   FLOW PROCESS FROM NODE    203.00 TO NODE    206.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     7.32  DOWNSTREAM(FEET) =     5.51
   FLOW LENGTH(FEET) =   151.10   MANNING'S N =  0.013
   DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.4 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   7.94
   ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      14.98
   PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    4.34
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =     768.30 FEET.
```

```
****************************************************************************
   FLOW PROCESS FROM NODE    203.00 TO NODE    206.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
   TIME OF CONCENTRATION(MIN.) =    4.34
   RAINFALL INTENSITY(INCH/HR) =   6.85
   TOTAL STREAM AREA(ACRES) =     2.43
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     14.98


****************************************************************************
   FLOW PROCESS FROM NODE    207.00 TO NODE    208.00 IS CODE =  21
 ----------------------------------------------------------------------------
-
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

============================================================================
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
   UPSTREAM ELEVATION(FEET) =     14.50
   DOWNSTREAM ELEVATION(FEET) =     14.20
   ELEVATION DIFFERENCE(FEET) =      0.30
   URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.018
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      2.16
   TOTAL AREA(ACRES) =      0.35   TOTAL RUNOFF(CFS) =      2.16


****************************************************************************
   FLOW PROCESS FROM NODE    208.00 TO NODE    209.00 IS CODE =  51
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
   >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     14.20  DOWNSTREAM(FEET) =     11.30
   CHANNEL LENGTH THRU SUBAREA(FEET) =   205.00   CHANNEL SLOPE =  0.0141
   CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  50.000
   MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.95
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.60
   AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   1.31
   Tc(MIN.) =    4.33
   SUBAREA AREA(ACRES) =     1.23       SUBAREA RUNOFF(CFS) =    7.58
```

```
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
   TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       9.74

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   3.01
   LONGEST FLOWPATH FROM NODE    207.00 TO NODE    209.00 =     255.00 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    210.00 TO NODE    209.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.80
   TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =      10.54
   TC(MIN.) =    4.33


****************************************************************************
   FLOW PROCESS FROM NODE    211.00 TO NODE    209.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8894
   SUBAREA AREA(ACRES) =    0.46   SUBAREA RUNOFF(CFS) =    2.68
   TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =      13.22
   TC(MIN.) =    4.33


****************************************************************************
   FLOW PROCESS FROM NODE    209.00 TO NODE    206.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     6.10  DOWNSTREAM(FEET) =     5.50
   FLOW LENGTH(FEET) =    79.80   MANNING'S N =  0.013
   DEPTH OF FLOW IN  21.0 INCH PIPE IS  17.0 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   6.35
   ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      13.22
   PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    4.54
```

```
   LONGEST FLOWPATH FROM NODE    207.00 TO NODE    206.00 =     334.80 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    209.00 TO NODE    206.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
   >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
   TIME OF CONCENTRATION(MIN.) =    4.54
   RAINFALL INTENSITY(INCH/HR) =   6.85
   TOTAL STREAM AREA(ACRES) =     2.17
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.22

   ** CONFLUENCE DATA **
   STREAM     RUNOFF       Tc      INTENSITY      AREA
   NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
       1       14.98     4.34        6.850          2.43
       2       13.22     4.54        6.850          2.17

   RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
   CONFLUENCE FORMULA USED FOR  2 STREAMS.

   ** PEAK FLOW RATE TABLE **
   STREAM     RUNOFF      Tc      INTENSITY
   NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
       1       27.62     4.34       6.850
       2       28.20     4.54       6.850

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =      28.20   Tc(MIN.) =    4.54
   TOTAL AREA(ACRES) =        4.6
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =     768.30 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    206.00 TO NODE    212.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     5.50  DOWNSTREAM(FEET) =     4.10
   FLOW LENGTH(FEET) =   286.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.0 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   6.72
   ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      28.20
   PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =    5.25
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    212.00 =    1054.30 FEET.
```

```
****************************************************************************
   FLOW PROCESS FROM NODE    212.00 TO NODE    212.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.638
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8959
   SUBAREA AREA(ACRES) =    0.97   SUBAREA RUNOFF(CFS) =    5.79
   TOTAL AREA(ACRES) =        5.6   TOTAL RUNOFF(CFS) =      33.12
   TC(MIN.) =    5.25


****************************************************************************
   FLOW PROCESS FROM NODE    212.00 TO NODE    213.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     4.10  DOWNSTREAM(FEET) =     3.80
   FLOW LENGTH(FEET) =    62.30   MANNING'S N =  0.013
   DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.1 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   6.84
   ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      33.12
   PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    5.40
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    213.00 =    1116.60 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    212.00 TO NODE    213.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
   TIME OF CONCENTRATION(MIN.) =    5.40
   RAINFALL INTENSITY(INCH/HR) =   6.52
   TOTAL STREAM AREA(ACRES) =     5.57
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     33.12


****************************************************************************
   FLOW PROCESS FROM NODE    214.00 TO NODE    215.00 IS CODE =  21
 ----------------------------------------------------------------------------
-
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

============================================================================
```

```
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
   UPSTREAM ELEVATION(FEET) =     14.22
   DOWNSTREAM ELEVATION(FEET) =     13.93
   ELEVATION DIFFERENCE(FEET) =      0.29
   URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.815
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      0.70
   TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.70


****************************************************************************
   FLOW PROCESS FROM NODE    215.00 TO NODE    216.00 IS CODE =  51
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
   >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     13.90  DOWNSTREAM(FEET) =     13.60
   CHANNEL LENGTH THRU SUBAREA(FEET) =    40.90   CHANNEL SLOPE =  0.0073
   CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  50.000
   MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.21
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.58
   AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   0.43
   Tc(MIN.) =    4.25
   SUBAREA AREA(ACRES) =     0.52       SUBAREA RUNOFF(CFS) =    3.03
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
   TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       3.73

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   1.86
   LONGEST FLOWPATH FROM NODE    214.00 TO NODE    216.00 =      90.90 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    216.00 TO NODE    217.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     8.20  DOWNSTREAM(FEET) =     7.10
   FLOW LENGTH(FEET) =   186.00   MANNING'S N =  0.013
   ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
   DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.7 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   4.40
   ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =       3.73
```

```
   PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =    4.95
   LONGEST FLOWPATH FROM NODE    214.00 TO NODE    217.00 =     276.90 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    217.00 TO NODE    217.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
   SUBAREA AREA(ACRES) =    1.22   SUBAREA RUNOFF(CFS) =    7.10
   TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =      10.83
   TC(MIN.) =    4.95

****************************************************************************
   FLOW PROCESS FROM NODE    217.00 TO NODE    218.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     7.10  DOWNSTREAM(FEET) =     6.10
   FLOW LENGTH(FEET) =   186.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.4 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   5.36
   ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      10.83
   PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =    5.53
   LONGEST FLOWPATH FROM NODE    214.00 TO NODE    218.00 =     462.90 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    218.00 TO NODE    218.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.418
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
   SUBAREA AREA(ACRES) =    0.47   SUBAREA RUNOFF(CFS) =    2.56
   TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =      12.71
   TC(MIN.) =    5.53

****************************************************************************
   FLOW PROCESS FROM NODE    218.00 TO NODE    213.00 IS CODE =  31
```

```
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     6.10  DOWNSTREAM(FEET) =     3.80
   FLOW LENGTH(FEET) =   144.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.5 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   8.35
   ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      12.71
   PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =    5.82
   LONGEST FLOWPATH FROM NODE    214.00 TO NODE    213.00 =     606.90 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    218.00 TO NODE    213.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
   >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
   TIME OF CONCENTRATION(MIN.) =    5.82
   RAINFALL INTENSITY(INCH/HR) =   6.21
   TOTAL STREAM AREA(ACRES) =     2.33
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.71

   ** CONFLUENCE DATA **
   STREAM     RUNOFF       Tc      INTENSITY      AREA
   NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
       1       33.12     5.40        6.517          5.57
       2       12.71     5.82        6.212          2.33

   RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
   CONFLUENCE FORMULA USED FOR  2 STREAMS.

   ** PEAK FLOW RATE TABLE **
   STREAM     RUNOFF      Tc      INTENSITY
   NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
       1       44.92     5.40       6.517
       2       44.28     5.82       6.212

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =      44.92   Tc(MIN.) =    5.40
   TOTAL AREA(ACRES) =        7.9
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    213.00 =    1116.60 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    213.00 TO NODE    219.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

================================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     3.80  DOWNSTREAM(FEET) =     2.50
   FLOW LENGTH(FEET) =   257.80   MANNING'S N =  0.013
   DEPTH OF FLOW IN  36.0 INCH PIPE IS  28.7 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   7.44
   ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      44.92
   PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =    5.98
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    219.00 =    1374.40 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    219.00 TO NODE    219.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

================================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.104
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8776
   SUBAREA AREA(ACRES) =    1.35   SUBAREA RUNOFF(CFS) =    7.00
   TOTAL AREA(ACRES) =        9.3   TOTAL RUNOFF(CFS) =      49.55
   TC(MIN.) =    5.98


****************************************************************************
   FLOW PROCESS FROM NODE    219.00 TO NODE    220.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

================================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     2.50  DOWNSTREAM(FEET) =     1.80
   FLOW LENGTH(FEET) =   114.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  36.0 INCH PIPE IS  28.7 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   8.21
   ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      49.55
   PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =    6.21
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    220.00 =    1488.40 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    219.00 TO NODE    220.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

================================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
   TIME OF CONCENTRATION(MIN.) =    6.21
```

```
   RAINFALL INTENSITY(INCH/HR) =   5.96
   TOTAL STREAM AREA(ACRES) =     9.25
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     49.55


****************************************************************************
   FLOW PROCESS FROM NODE    221.00 TO NODE    222.00 IS CODE =  21
 ----------------------------------------------------------------------------
-
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

============================================================================
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
   UPSTREAM ELEVATION(FEET) =     14.90
   DOWNSTREAM ELEVATION(FEET) =     11.50
   ELEVATION DIFFERENCE(FEET) =      3.40
   URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.344
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      0.37
   TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.37


****************************************************************************
   FLOW PROCESS FROM NODE    222.00 TO NODE    223.00 IS CODE =  51
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
   >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     11.60  DOWNSTREAM(FEET) =     10.20
   CHANNEL LENGTH THRU SUBAREA(FEET) =   106.60   CHANNEL SLOPE =  0.0131
   CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  50.000
   MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.91
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.84
   AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   0.97
   Tc(MIN.) =    2.31
   SUBAREA AREA(ACRES) =     0.50       SUBAREA RUNOFF(CFS) =    3.08
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
   TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       3.45

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   2.25
   LONGEST FLOWPATH FROM NODE    221.00 TO NODE    223.00 =     156.60 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    224.00 TO NODE    225.00 IS CODE =  81
```

```
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
   SUBAREA AREA(ACRES) =    0.53   SUBAREA RUNOFF(CFS) =    3.27
   TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       6.72
   TC(MIN.) =    2.31


****************************************************************************
   FLOW PROCESS FROM NODE    223.00 TO NODE    225.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   VEGETATED SLOPES (FLAT) RUNOFF COEFFICIENT = .4500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8216
   SUBAREA AREA(ACRES) =    0.23   SUBAREA RUNOFF(CFS) =    0.71
   TOTAL AREA(ACRES) =        1.3   TOTAL RUNOFF(CFS) =       7.43
   TC(MIN.) =    2.31


****************************************************************************
   FLOW PROCESS FROM NODE    225.00 TO NODE    226.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     7.20  DOWNSTREAM(FEET) =     6.20
   FLOW LENGTH(FEET) =   158.70   MANNING'S N =  0.013
   DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.5 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   5.21
   ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =       7.43
   PIPE TRAVEL TIME(MIN.) =   0.51    Tc(MIN.) =    2.82
   LONGEST FLOWPATH FROM NODE    221.00 TO NODE    226.00 =     315.30 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    227.00 TO NODE    226.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
PAVED SURFACE RUNOFF COEFFICIENT = .9000
SOIL CLASSIFICATION IS "D"
AREA-AVERAGE RUNOFF COEFFICIENT = 0.8447
SUBAREA AREA(ACRES) =    0.55   SUBAREA RUNOFF(CFS) =    3.39
TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =      10.82
TC(MIN.) =    2.82

****************************************************************************
FLOW PROCESS FROM NODE    226.00 TO NODE    226.00 IS CODE =  81
----------------------------------------------------------------------------
-
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
VEGETATED SLOPES (FLAT) RUNOFF COEFFICIENT = .4500
SOIL CLASSIFICATION IS "D"
AREA-AVERAGE RUNOFF COEFFICIENT = 0.8065
SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.62
TOTAL AREA(ACRES) =        2.1   TOTAL RUNOFF(CFS) =      11.44
TC(MIN.) =    2.82

****************************************************************************
FLOW PROCESS FROM NODE    226.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
-
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
ELEVATION DATA: UPSTREAM(FEET) =     6.20  DOWNSTREAM(FEET) =     1.80
FLOW LENGTH(FEET) =   181.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   9.82
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      11.44
PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =    3.12
LONGEST FLOWPATH FROM NODE    221.00 TO NODE    220.00 =     496.30 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    228.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
-
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
PAVED SURFACE RUNOFF COEFFICIENT = .9000
SOIL CLASSIFICATION IS "D"
AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
```

```
   SUBAREA AREA(ACRES) =    0.35   SUBAREA RUNOFF(CFS) =    2.16
   TOTAL AREA(ACRES) =        2.4   TOTAL RUNOFF(CFS) =      13.59
   TC(MIN.) =    3.12


****************************************************************************
   FLOW PROCESS FROM NODE    229.00 TO NODE    220.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   VEGETATED SLOPES (FLAT) RUNOFF COEFFICIENT = .4500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8026
   SUBAREA AREA(ACRES) =    0.12   SUBAREA RUNOFF(CFS) =    0.37
   TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =      13.96
   TC(MIN.) =    3.12


****************************************************************************
   FLOW PROCESS FROM NODE    226.00 TO NODE    220.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
   >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
   TIME OF CONCENTRATION(MIN.) =    3.12
   RAINFALL INTENSITY(INCH/HR) =   6.85
   TOTAL STREAM AREA(ACRES) =     2.54
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.96

   ** CONFLUENCE DATA **
   STREAM     RUNOFF       Tc      INTENSITY      AREA
   NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
       1       49.55     6.21        5.956          9.25
       2       13.96     3.12        6.850          2.54

   RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
   CONFLUENCE FORMULA USED FOR  2 STREAMS.

   ** PEAK FLOW RATE TABLE **
   STREAM     RUNOFF      Tc      INTENSITY
   NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
       1       57.04     3.12       6.850
       2       61.69     6.21       5.956

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =      61.69   Tc(MIN.) =    6.21
   TOTAL AREA(ACRES) =       11.8
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    220.00 =    1488.40 FEET.
```

```
****************************************************************************
   FLOW PROCESS FROM NODE    220.00 TO NODE    230.00 IS CODE =  31
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     1.80  DOWNSTREAM(FEET) =     1.00
   FLOW LENGTH(FEET) =    59.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  36.0 INCH PIPE IS  24.7 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =  11.94
   ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =      61.69
   PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    6.29
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    230.00 =    1547.40 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    220.00 TO NODE    230.00 IS CODE =   1
 ----------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
   TIME OF CONCENTRATION(MIN.) =    6.29
   RAINFALL INTENSITY(INCH/HR) =   5.91
   TOTAL STREAM AREA(ACRES) =    11.79
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     61.69


****************************************************************************
   FLOW PROCESS FROM NODE    231.00 TO NODE    232.00 IS CODE =  21
 ----------------------------------------------------------------------------
-
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

============================================================================
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
   UPSTREAM ELEVATION(FEET) =     15.40
   DOWNSTREAM ELEVATION(FEET) =     15.00
   ELEVATION DIFFERENCE(FEET) =      0.40
   URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.742
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      0.55
   TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.55


****************************************************************************
   FLOW PROCESS FROM NODE    232.00 TO NODE    233.00 IS CODE =  51
```

```
 ----------------------------------------------------------------------------
-
   >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
   >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     15.00  DOWNSTREAM(FEET) =     11.10
   CHANNEL LENGTH THRU SUBAREA(FEET) =   299.50   CHANNEL SLOPE =  0.0130
   CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  50.000
   MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.727
   PAVED SURFACE RUNOFF COEFFICIENT = .9000
   SOIL CLASSIFICATION IS "D"
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.46
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.08
   AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   2.40
   Tc(MIN.) =    5.14
   SUBAREA AREA(ACRES) =     0.64       SUBAREA RUNOFF(CFS) =    3.87
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
   TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       4.42

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   2.38
   LONGEST FLOWPATH FROM NODE    231.00 TO NODE    233.00 =     349.50 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE    233.00 TO NODE    234.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.727
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8940
   SUBAREA AREA(ACRES) =    0.10   SUBAREA RUNOFF(CFS) =    0.57
   TOTAL AREA(ACRES) =        0.8   TOTAL RUNOFF(CFS) =       4.99
   TC(MIN.) =    5.14


****************************************************************************
   FLOW PROCESS FROM NODE    234.00 TO NODE    235.00 IS CODE =  81
 ----------------------------------------------------------------------------
-
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.727
   COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
   SOIL CLASSIFICATION IS "D"
   AREA-AVERAGE RUNOFF COEFFICIENT = 0.8757
   SUBAREA AREA(ACRES) =    0.59   SUBAREA RUNOFF(CFS) =    3.37
   TOTAL AREA(ACRES) =        1.4   TOTAL RUNOFF(CFS) =       8.36
   TC(MIN.) =    5.14
```

```
****************************************************************************
   FLOW PROCESS FROM NODE    235.00 TO NODE    230.00 IS CODE =   1
 --------------------------------------------------------------------------
-
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
   >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
   TIME OF CONCENTRATION(MIN.) =    5.14
   RAINFALL INTENSITY(INCH/HR) =   6.73
   TOTAL STREAM AREA(ACRES) =     1.42
   PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.36

   ** CONFLUENCE DATA **
   STREAM     RUNOFF       Tc      INTENSITY      AREA
   NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
       1       61.69     6.29        5.905         11.79
       2        8.36     5.14        6.727          1.42

   RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
   CONFLUENCE FORMULA USED FOR  2 STREAMS.

   ** PEAK FLOW RATE TABLE **
   STREAM     RUNOFF      Tc      INTENSITY
   NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
       1       62.52     5.14       6.727
       2       69.03     6.29       5.905

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =      69.03   Tc(MIN.) =    6.29
   TOTAL AREA(ACRES) =       13.2
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    230.00 =    1547.40 FEET.

============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)     =       13.2  TC(MIN.) =      6.29
   PEAK FLOW RATE(CFS)   =      69.03

============================================================================

============================================================================
   END OF RATIONAL METHOD ANALYSIS
```

APPENDIX 4

Hydraulic Calculations

To be completed during Final Engineering

APPENDIX 5

Drainage Exhibits

EXISTING 54" STORM DRAIN DISCHARGES TO SLOUGH WHICH CONNECTS TO SAN DIEGO BAY

TOTAL SYSTEM 200
TOTAL Q100 = 98.3 CFS
TOTAL AREA = 17.8 AC

G STREET

EXISTING 36" STORM DRAIN STUB PER 2001 BP SD MAP

EXISTING SDG&E FACILITY (NAP)

0.78 AC
3.65 AC
2.43 AC
2.75 AC
1.16 AC
2.64 AC
2.70 AC
0.12 AC
1.36 AC
0.20 AC
1.41 AC
0.09 AC
1.54 AC
0.09 AC
1.66 AC
4.49 AC
1.45 AC
1.02 AC
1.80 AC
0.88 AC
EXISTING 60" STORM DRAIN STUB PER DWG 11014-8
0.79 AC
1.99 AC
1.43 AC

SYSTEM 100
TOTAL Q100 = 102.70 CFS
TOTAL AREA = 18.6 AC

H STREET

EXISTING 72" STORM DRAIN STUB PER DWG 11014-7

LEGEND:

- PROPERTY BOUNDARY
- DRAINAGE BOUNDARY
- DRAINAGE SYSTEM
- OVERLAND FLOW DIRECTION
- SD — EXISTING STORM DRAIN OVER 12" DIAMETER
- SD — EXISTING STORM DRAIN UNDER 12" DIAMETER
- 0.17 AC — DRAINAGE AREA
- 100 — DRAINAGE NODE

N

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

SCALE:	1"=50'
JOB #:	4508
CREATED:	7/12/23

PREPARED BY:

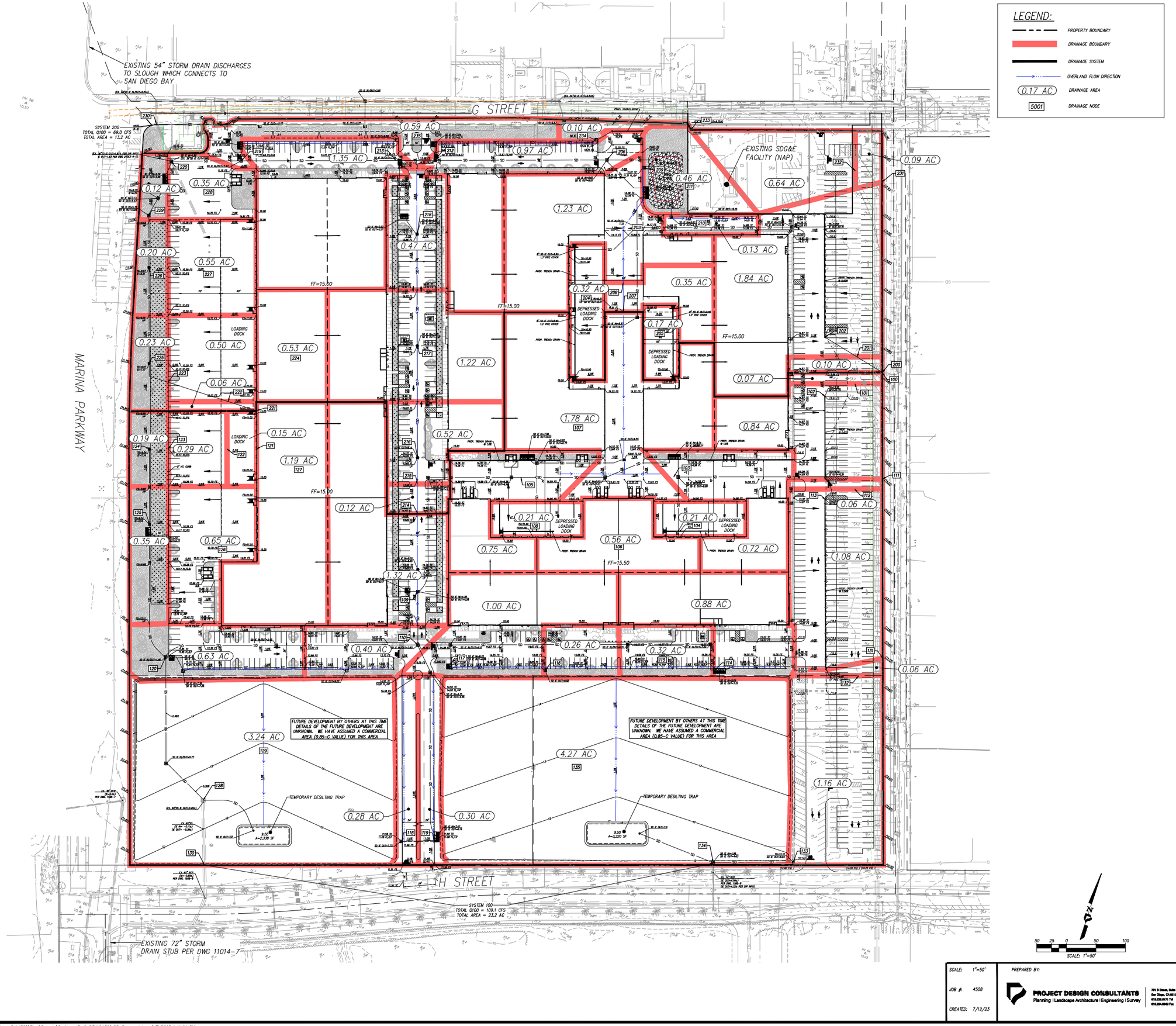
PROJECT DESIGN CONSULTANTS
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CITY OF CHULA VISTA

YARDS AT THE BAY - PARCEL B

EXISTING DRAINAGE EXHIBIT
EXHIBIT A

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SCALE: 1"=50'	PREPARED BY:	CITY OF CHULA VISTA	
JOB #: 4508	PROJECT DESIGN CONSULTANTS Planning | Landscape Architecture | Engineering | Survey	YARDS AT THE BAY - PARCEL B	
CREATED: 7/12/23	701 B Street, Suite 800 San Diego, CA 92101 619.235.6471 Tel 619.234.0349 Fax	PROPOSED DRAINAGE EXHIBIT EXHIBIT B	

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