



Civil Engineering/Surveying/Planning

STUART ENGINEERING

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PRELIMINARY DRAINAGE STUDY

LAKE JENNINGS MARKETPLACE
A PROPOSED COMMERCIAL CENTER
LAKESIDE COMMUNITY PLANNING GROUP
Project Number PDS2014-TM-5590



PREPARED BY:

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1.0 Declaration of Responsible Charge

I hereby declare that I am the Engineer of Work for this Drainage Study, that I have exercised responsible charge over the preparation of said study as defined in Section 6703 of the Business and Professions Code, and that the recommendations are consistent with current standards.

I understand that the check of this drainage study by the County of San Diego is confined to a review only does not relieve me, as Engineer of Work, of my responsibilities.



A handwritten signature in black ink that reads "Stuart Peace".

2-13-15

Stuart Peace, RCE 27232

Date

2.0 Introduction

Project Location:

The project is located in east San Diego County near the community of Lakeside in East San Diego County, south of Old Highway 80, and east of Lake Jennings Park Road (See Vicinity Map Appendix 1). The project site is mapped within the State Responsibility Area.

Project Description:

The proposed project is a commercial shopping center located on an existing vacated site. Work to be done including supporting infrastructure such as sewer, road improvements and utilities, the vacation of an existing paved road, and dedication of a biological open space easement on an approximately 13.10 acre site.

Commercial Shopping Center

The project proposes to construct a commercial shopping center with 76,100 square feet (sf) of building area. The project would include six structures, all of which will be located on individual lots. The development will include the following:

1. Market Building (Building A – 43,000 sf) located along the east side of the project site.
2. Financial Building with drive through (Building B – 4,500 sf) located on the northeast intersection of Olde Highway 80 and the proposed signalized project entrance on Olde Highway 80.

3. Restaurant with drive through (Building C – 3,500 sf) located on the northwest intersection of Olde Highway 80 and the proposed signalized project entrance on Olde Highway 80.
4. Restaurant-Retail Building (Building D – 9,600 sf) located along the southern boundary of the project's developed area.
5. Gas Station with convenience store and car wash (43,800 sf pad) at the intersection of Olde Highway 80 and Lake Jennings Park Road, and Commercial Building (Building E – 3,000 sf) located directly south of the gas station.
6. Restaurant-Retail Building (Building F – 12,500 sf) located along the southern boundary of the project's developed area. Building F shares a common wall with Building D.

Trail Component

The project will construct a multi-use trail suitable for pedestrians and equestrian users. The trail will be 10 feet wide and constructed of decomposed granite material. The trail segments adjacent to the two public streets are proposed as standard trail pathways per the Park Lands Dedication Ordinance (PLDO). The trail segment within the open space lot will run along the southern edge of the development area (immediately north of the proposed open space area) within a 20 foot wide trail easement and will include a 10 foot wide treadway.

Access

The project requires four access points; one from Ridge Hill Road located on the west side of the project, and three others located along Olde Highway 80; a right-in (only) approximately 200 feet east of the intersection of Olde Highway 80 and Lake Jennings Park Road, a full signalized project entry half way along the project frontage, and a second non-signalized project entry (right in – right out only) near the northeast corner of the property.

Walls and Signage

There will be a comprehensive coordinated sign program designed for the project. It includes a Freeway Pylon Display, Monument Center ID Displays, Monument Signage at the signalized entrance on Olde Highway 80, and a state required Gas Pricing Sign for the gas station, convenience store and car wash Pad.

Parking

The project proposes 389 parking spaces. The project parking is almost entirely located within the central portion of the site and will largely be out of the casual view of traffic on Lake Jennings Park Road and Olde Highway 80. The County of San Diego Zoning Ordinance requires a total of 389 parking spaces to be provided by the proposed project based on the size and uses proposed in the buildings. Therefore, the project meets the parking requirements of the County of San Diego Zoning Ordinance.

Landscaping Plans

Landscape plans have been prepared for the project. The landscape plan incorporates a variety of species that are intended to provide a visual buffer from Interstate 8 and be compatible with the riparian zone associated with Los Coches Creek. The plant palette reflects a selection of native plant material which can naturally be found in riparian zones of Southern California.

3.0 Calculation Methodology

Runoff calculations were performed in conformance with the requirements of the *County of San Diego Drainage Design Manual* dated July 2005 and the San Diego County Hydrology Manual dated June 2003 by use of Advanced Engineering Software (AES). The Rational Method Procedure was used for drainage calculations with the following parameters:

Storm Event	100-year, 6-hour event and 24-hour event from Isopluvial Maps (Appendix 2) P6= 2.8 inches, P24= 6.2 inches 2-year, 6-hour event and 24-hour event from Isopluvial Maps (Appendix 2) P6= 1.3 inches
Runoff Coefficient	Estimated actual imperviousness of each sub-basin. See Table 3.1
Soil Type	Type "B" and "C"

The peak flow rate of runoff formula is $Q = CIA$ where:

Q = peak discharge, in cubic feet per second (cfs)

C = runoff coefficient, proportion of the rainfall that runs off the surface (no units)

I = average rainfall intensity for a duration equal to the time of concentration for the area, in inches per hour (in./hr.)

4.0 Existing Drainage Description and Calculations

Existing Onsite Drainage Conditions:

The site currently has sparse vegetation with buildings on the west side of the property. Pecan Park Lane traverses the northeasterly corner of the site. Surface runoff from the area generally sheet flows in a southwesterly direction and discharges to Los Coches Creek without a defined drainage course. The southerly portion of the project is partially located in the Los Coches Creek floodway as shown on the Federal Emergency Management Agency (FEMA) map. The County of San Diego has determined the limits of the floodway through this creek reach.

Existing Offsite Drainage Conditions Flowing to Onsite Areas:

A portion of the property located northeasterly of the site and a portion of Old Highway 80, totaling 3.33 acres drain to a headwall and flow to an existing 24" RCP under Olde Highway 80 and outlets to the site.

Existing Offsite Drainage Conditions Flowing to Existing County Maintained Ridge Hill Road Channel:

There is approximately 115 acres of offsite area located northerly of Interstate 8 that drains into the existing County of San Diego maintained channel in Ridge Hill Road via a series of pipes and channels. The overall 100-year rate of runoff estimated for this 115-acre area is 201 CFS. The runoff discharges into the existing Ridge Hill Road from an existing channel to the north via pipe flow. The rate of discharge into the Ridge Hill Road channel is limited by the 48" pipe to an estimated flow of Q100 of 151 cfs. See Appendix 10 for AES 100-year flow calculations.

Runoff from the existing Ridge Hill Road and a portion of the project site drains to the existing channel at a rate of $Q_{100}=3.36$ cfs. The combined Q_{100} that drains to the existing Ridge Hill Road channel is 154.36 cfs (151 cfs +3.36 cfs). Runoff from existing Ridge Hill Road channel then outlets to a different channel south of Ridge Hill Road via an existing 48" CMP which flows under pressure during the 100-year storm event. This creates a ponded depth of approximately 2 feet in the existing Ridge Hill Road channel. See Detention Calculations-Offsite in Appendix 7.

The runoff for the existing site was analyzed for a 100-year storm event. See pocket for the Existing Drainage Map which illustrates each drainage management areas and discharge locations. The following table 4-1 summarizes the flow calculations. See Appendix 3 for specific AES calculations.

TABLE 4-1 Summary of Existing Conditions Calculations		
	DESCRIPTION	FLOW
DISCHARGE #1 (Southeasterly to Creek)	DMA 207 (Southeasterly portion of project site) [Node 210]	1.01 cfs
	SUBTOTAL #1	1.01 cfs
DISCHARGE #2 (Southwesterly to Creek)	DMAs 200-203 & 205 (Northeasterly property, Olde Hwy 80 and a portion of project site) [Node 150 - Appendix 3]	13.39 cfs
	DMA 206 (Portion of project site) [Node 310-Appendix 3]	4.59 cfs
	SUBTOTAL #2	17.98 cfs
DISCHARGE #3 (Northeasterly to Rios Canyon Road)	DMA 208 (Easterly Basin) [Node 510 – Appendix 3]	0.64 cfs
	SUBTOTAL #3	0.64 cfs
DISCHARGE #4 (Northwesterly to existing County maintained channel)	DMA 204 (Westerly basin and a portion of project site draining to the existing county maintained channel) [Node 410-Appendix 3]	3.36 cfs
	SUBTOTAL #4	3.36 cfs

TABLE 4-2 Summary of Pre-Development 2-year Storm Flow	
DESCRIPTION	FLOW-Q2
DMA 203 [Node 130 – Appendix 5]	2.45 cfs
DMA 204 [Node 410 – Appendix 5]	0.94 cfs
DMA 205 [Node 150 – Appendix 5]	1.55 cfs
DMA 206 [Node 150 – Appendix 5]	2.95 cfs
DMA 207 [Node 210 – Appendix 5]	0.52 cfs
Total Pre-Project Q2	8.41 cfs

5.0 Proposed Drainage Description and Calculations

Offsite (Northeasterly Parcel and Old Highway 80)

Runoff from the off-site property and existing Old Highway 80 northeasterly of this project continue to drain in the same drainage pattern as the existing condition (flow pick up at the existing headwall on the north side of Old Highway 80) however; this project proposes to remove the existing outlet on this project and will construct a public clean-out and public storm drain system in Old Highway 80 to convey the offsite storm water around this project to the west. The public storm drain system in Old Highway 80 will flow from east to west and will accept storm water from new curb inlets constructed on the south side of Old Highway 80. Near the intersection of Old Highway 80 and Lake Jennings Park Road this storm drain system will confluence with the onsite project flow. The 100-year flow rate from only the offsite property and Old Highway 80 is 11.16 cfs.

Onsite

Runoff from the roofs of the proposed buildings is designed to flow to downspouts and discharge to the surface. Most of the parking lots will drain by means of surface flow to bio-retention basins in the parking medians. The loading dock and southerly buildings will drain to a proprietary higher-rate biofilters (Modular Wetlands System) for treatment. Storm water from these onsite areas will enter the mentioned treatment BMPs before it discharges to the underground storm drain system.

Storm water will primarily flow from all the borders of the project into the central portion of the project. The flow will be directed to the central portion of the project because an underground storage system is proposed in this area.

Storm water from the easterly Grocery building and surface parking lot will flow from east to west by means of surface and underground pipe flow.

Storm water from the southerly retail spaces will flow from south to north by means of surface and underground pipe flow.

Storm water from the northwesterly gas station will flow easterly to the central area by means of surface and underground pipe flow.

Stormwater from the northerly financial and food pads will flow southerly to the central area by means of surface and underground pipe flow.

Storage

This project proposes an underground storage facility to be constructed under the proposed surface parking lot in the middle portion of the site. This storage facility consisting of an array of oversized storm drain pipes will serve two purposes which are to address Hydromodification flow control and 100-year peak flow. Contained within the Major SWMP are the Hydromodification flow control sizing calculations. Contained within this report are the 100-year peak flow sizing calculations.

Per the Hydromodification Management Plan (HMP Study) located in the Major Storm Water Management Plan (Major SWMP), the underground storage system is proposed to have a capacity of 53,000 cubic feet and will have a metered (orifice controlled) peak discharge of 50-percent of the pre-project 2-year storm. The 2-year peak flow (See Appendix 5 and Summary in Table 4.2 of Section 4 of this report) is 8.41 cfs and 50-percent of that value is 4.2 cfs.

The 100-year storm was estimated to have an overall volume of 21,917 cubic feet (see volume/detention calculations in Appendix 7) and a peak flow rate of 47.32 cfs (see Appendix 4). With the underground storage detention system in place the entire 100-year storm will be stored and the 100-year discharge will be controlled by an orifice and match the pre-development flow rate (50-percent of the 2-year storm).

It is important to note that this will represent a significant drop in peak flow discharge as compared to existing conditions.

Final Discharge

The final destination of the onsite underground storm drain system carrying the flow from the site is the existing County maintained channel located at the southwest corner of the intersection of Old Highway 80 and Lake Jennings Park Road. Prior to discharging into this channel the onsite flow will converge with the flow from the proposed public storm drain system in Old Highway 80 conveying offsite northeasterly property flow and street flow. The combined 100-year rate of runoff is 22.41 cfs (4.20 cfs-onsite orifice controlled flow, 2.50 cfs-southwesterly onsite area, 11.16 cfs-Old Hwy 80 and northeasterly parcel and 4.55 cfs- Ridge Hill Road). It will discharge by means of headwall and rip rap and will then flow through the existing Ridge Hill Road channel.

Runoff from the project site and offsite flows from the northeasterly property and Old Highway 80 will combine with the runoff from the existing offsite 115-acre area north of Interstate 8 at the existing Ridge Hill Road channel. Runoff from the existing Ridge Hill Road channel flows to an existing 48" corrugated metal pipe under Ridge Hill Road. The existing 48" pipe flows under pressure during the 100-year storm event. This creates a ponded depth of approximately 2.95 feet in the existing Ridge Hill Road channel. The water surface elevation is at elevation 650.91 which is at least 9 feet below the proposed Ridge Hill Road improvements. Therefore, the addition of runoff

from the project site will not have an impact on the adjacent properties and road improvements. See Detention Calculations-Offsite and Onsite in Appendix 8.

Storm water discharges from the existing Ridge Hill Road channel at the south end into the existing 48" corrugated metal pipe under Ridge Hill Road and flows to an existing earthen conveyance south of Ridge Hill Road where it eventually converges with Los Coches Creek.

Runoff in Los Coches Creek travels westerly and northerly for approximately 2 miles and becomes a concrete conveyance. Storm water travels northerly in the concrete conveyance for approximately 2 miles and joins San Diego River at the north side of the intersection of Winter Gardens Boulevard and Highway 67.

The runoff for the proposed commercial site was analyzed for a 100-year storm event. As described above, the proposed project will construct an underground storm drain storage system that will decrease the 100-year flow discharge rate. Runoff from the onsite basins that drains to the underground storm drain storage system will outlet at a rate of 0.5Q₂. See pocket for the Proposed Drainage Map which illustrates each drainage management area and the site storm drain alignment. The following table 5-1 summarizes the flow calculations. See Appendix 4 for Q₁₀₀ and Appendix 5 for Q₂ AES calculations.

TABLE 5-1 Summary of Proposed Conditions Calculations		
	DESCRIPTION	FLOW (Q100)
DISCHARGE #1 (Southeasterly to Creek)	No Flow in Proposed Conditions	N/A
DISCHARGE #2 (Southwesterly to Creek)	No Flow in Proposed Conditions	N/A
DISCHARGE #3 (Northeasterly to Rios Canyon Road)	DMA 122 (Easterly Basin) [Node 170-Appendix 4]	2.24 cfs
	SUBTOTAL #3	2.24 cfs
DISCHARGE #4 (OFFSITE) (Northerly to existing county maintained channel)	DMA 120, 121, 116 thru 118 (Northeasterly property and Olde Hwy 80) [Node 135-Appendix 4]	11.16 cfs
	DMA 119 (Ridge Hill Road) [Node 275-Appendix 4]	4.55 cfs
	SUBTOTAL #4 (Offsite)	15.71 cfs
DISCHARGE #4 (ONSITE) (Project site to existing county maintained channel)	DMA 101 thru 111, 113 thru 115 (Project site- routed through underground storage system)	1.70 cfs orifice controlled flow rate
	DMA 112 (southwest corner of project site not routed to underground storage system) [Node 275- Appendix 4]	2.50 cfs
	SUBTOTAL #4 (Onsite)	4.2 cfs = Pre-development flow rate of 0.5Q2

6.0 Existing vs. Proposed Comparative 100-year Peak Flow Analysis

DISCHARGE #1 Southeasterly to Creek

As Table 6-1 below identifies, in the post-project condition storm water flow will not be discharged southeasterly to the Creek. Storm water flow will instead be collected in the onsite storm drain system and eventually be discharged to the westerly County Maintained Channel on the west side of Ridge Hill Road.

DISCHARGE #2 Southwesterly to Creek

As Table 6-1 below identifies, in the post-project condition storm water flow will not be discharged southwesterly to the Creek. Storm water flow will instead be conveyed to the onsite storm drain system and eventually be discharged to the westerly County Maintained Channel on the west side of Ridge Hill Road.

DISCHARGE #3 Northeasterly to Rios Canyon Road

As Table 6-1 below identifies, in the post-project condition a small increase of storm water to Rios Canyon Road Curb and gutter will occur however; no adverse impacts are anticipated as very little storm water flow currently exists in this location.

DISCHARGE #4 OFFSITE AREA Northeasterly (Old Highway 80 and Ridge Hill Road) to westerly County maintained channel.

As Table 6-1 below identifies, in the post-project condition will increase the amount of storm water being discharged to the westerly County Maintained Channel on the west side of Ridge Hill Road. As section 7.0 of this report demonstrates, the increase in flow will result in a slightly higher ponded depth but well within the capacity of the channel to not cause adverse conditions.

DISCHARGE #4 ONSITE Project to westerly County maintained channel.

As Table 6-1 below identifies, in the post-project condition will increase the amount of storm water being discharged to the westerly County Maintained Channel on the west side of Ridge Hill Road as the project currently surface flows south. As section 7.0 of this report demonstrates, the increase in flow will result in a slightly higher ponded depth but well within the capacity of the channel to not cause adverse conditions.

TABLE 6-1 Summary of Existing vs. Proposed Calculations		
	EXISTING CONDITIONS	PROPOSED CONDITIONS
	FLOW (Q100)	FLOW (Q100)
DISCHARGE #1 (Southeasterly to Creek)	1.01 cfs	0
DISCHARGE #2 (Southwesterly to Creek)	17.98 cfs	0
DISCHARGE #3 (Northeasterly to Rios Canyon Road)	0.64 cfs	2.24 cfs
DISCHARGE #4 (OFFSITE) (Northerly to existing county maintained channel)	3.36 cfs	15.71 cfs
DISCHARGE #4 (ONSITE) (Project site to existing county maintained channel)	0	4.20 CFS
TOTAL Q100	22.99 cfs	22.15 cfs

7.0 Summary of Flows to Existing County Maintained Channel in Ridge Hill Road

Final Discharge

The final destination of the onsite underground storm drain system carrying the flow from the site is the existing County maintained channel located at the southwest corner of the intersection of Old Highway 80 and Lake Jennings Park Road. Most of the onsite flow will go through the onsite detention system which will greatly reduce the peak discharges.

Table 7-1 identifies that at the westerly offsite channel in the proposed project storm water flow will increase however; the slightly higher ponded depth is well within the capacity of the channel to not cause any adverse conditions.

See appendices 7 and 8 for full calculations.

TABLE 7-1 Summary of Flow at Ridge Hill Road Calculations		
	EXISTING CONDITIONS	PROPOSED CONDITIONS
	FLOW (Q100)	FLOW (Q100)
OFFSITE 115 Acres North I-8	151.0 cfs	151.0 cfs
DISCHARGE #4 (OFFSITE) (Northerly to existing county maintained channel)	3.36 cfs	15.71 cfs
DISCHARGE #4 (ONSITE) (Project site to existing county maintained channel)	0	4.20 CFS
TOTAL	154.36 cfs	170.91 cfs
Ponded Depth	1.72' above top of existing 48" pipe in Ridge Hill Road	2.95' above top of existing 48" pipe in Ridge Hill Road.

The discharge through the southerly existing pipe will remain unchanged in the proposed condition as water level in the channel will slightly increase. No adverse impacts are anticipated.

8.0 Conclusion

Local jurisdictional requirements have been identified and addressed in the site planning. With these features/requirements incorporated no adverse impacts are anticipated from the proposed project due to the volume and nature of the runoff.

9.0 Environmental Impacts

This section summarizes the following questions for CEQA purposes:

Would the project:

- 1. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in a substantial erosion or siltation onsite or offsite?**

Response: The proposed commercial project is not substantially altering the drainage pattern of the site that will result in siltation or erosion onsite or offsite.

- 2. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding onsite or offsite?**

Response: An onsite detention basin will be constructed that will control flooding.

- 3. Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems?**

Response: Proposed onsite and offsite storm drain will be sized to handle the 100-year storm event. The increase in peak flow rate and volume will be stored in onsite storage system. Therefore, there will be no impact on the existing downstream drainage systems.

- 4. Place housing within a 100-year flood hazard as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, including County Floodplain Maps?**

Response: The proposed project will not place any structure within the 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or County Floodplain Maps.

- 5. Place within a 100-year flood hazard area structures which would impede or redirect flood flows?**

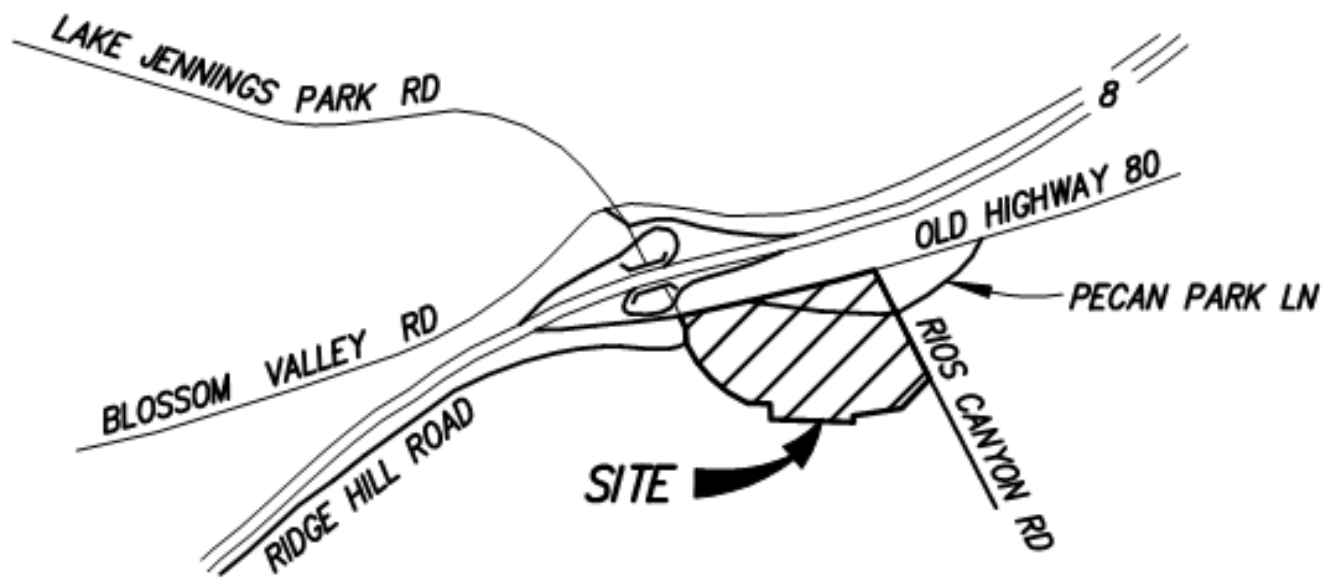
Response: The proposed project will not place any structures including retaining wall within a 100-year flood hazard area which would impede or redirect flood flows.

- 6. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the result of a levee or dam onsite or offsite?**

Response: There are no dams or levees onsite or near proximity to the project site.

APPENDIX 1

VICINITY MAP



VICINITY MAP

NO SCALE

APPENDIX 2

COUNTY OF SAN DIEGO MAPS AND TABLES

**Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS**

Land Use		Runoff Coefficient "C"				
NRCS Elements	County Elements	% IMPER.	Soil Type			
			A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, C_p , for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).

DU/A = dwelling units per acre

NRCS = National Resources Conservation Service

County of San Diego
Hydrology Manual



Soil Hydrologic Groups

Legend

Soil Groups

Group A

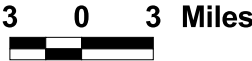
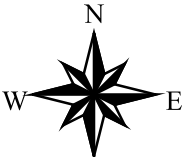
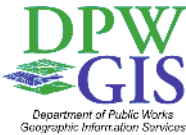
Group B

Group C

Group D

Undetermined

Data Unavailable



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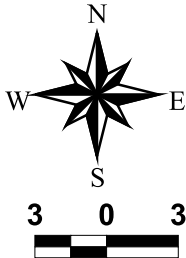
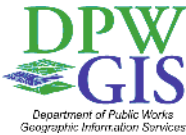


Rainfall Isophuvials

100 Year Rainfall Event - 24 Hours

----- Isopluvial (inches)

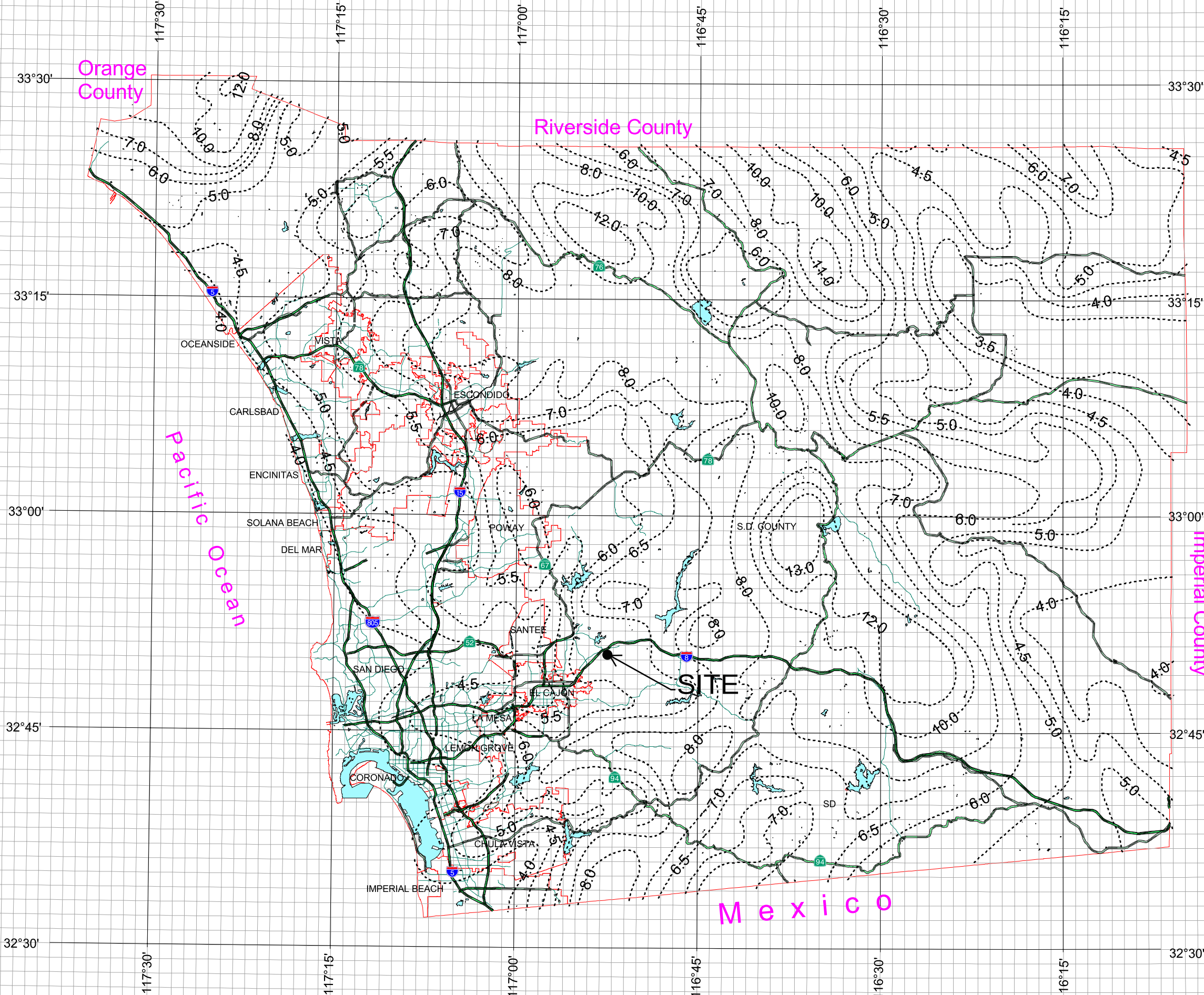
P₂₄= 6.2 inches



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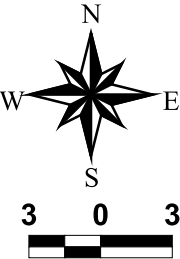


Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

— Isopluvial (inches)

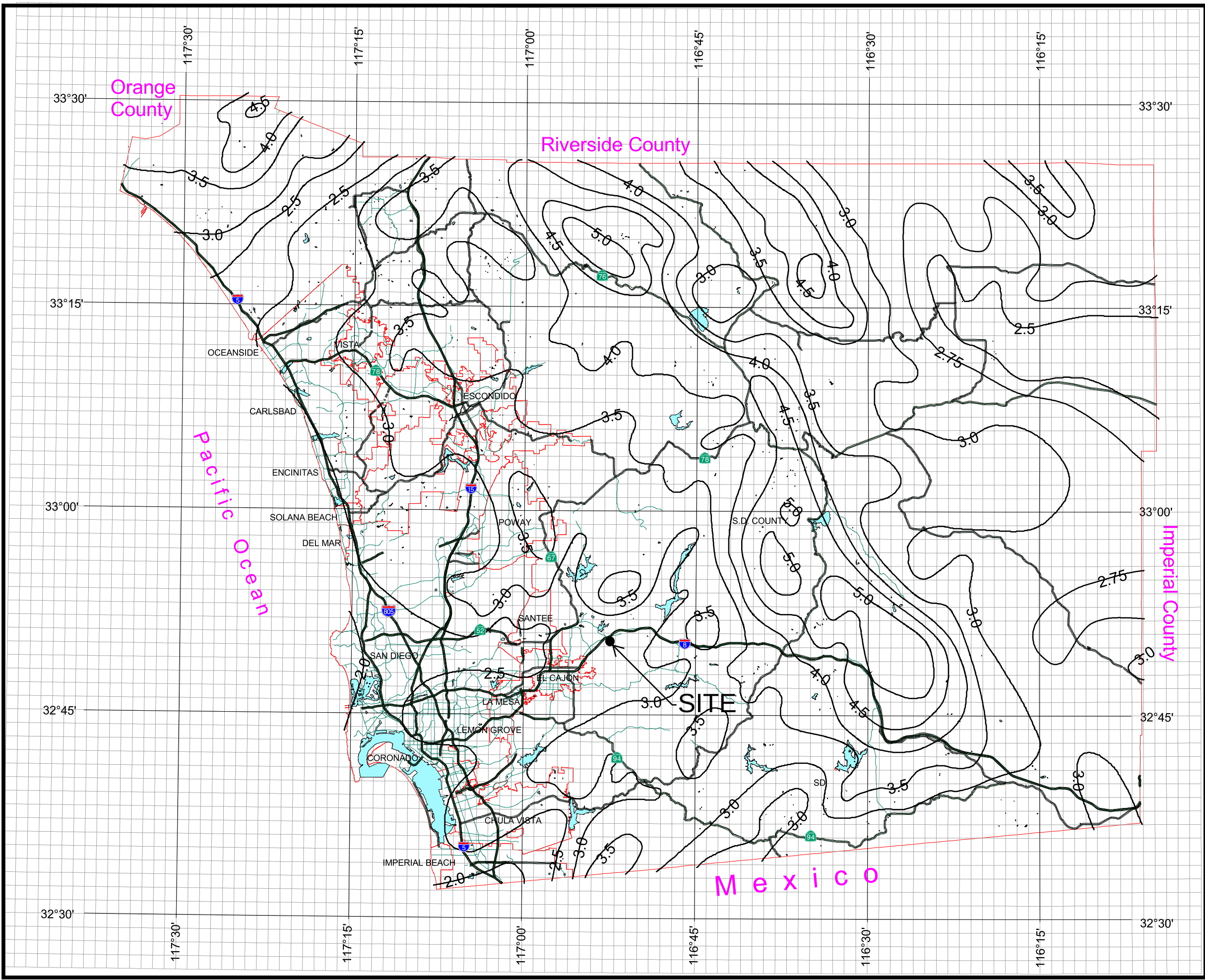
P₆= 2.8 inches



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County of San Diego Hydrology Manual

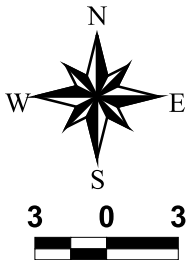
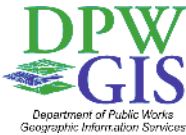


Rainfall Isopluvials

2 Year Rainfall Event - 6 Hours

Isopluvial (inches)

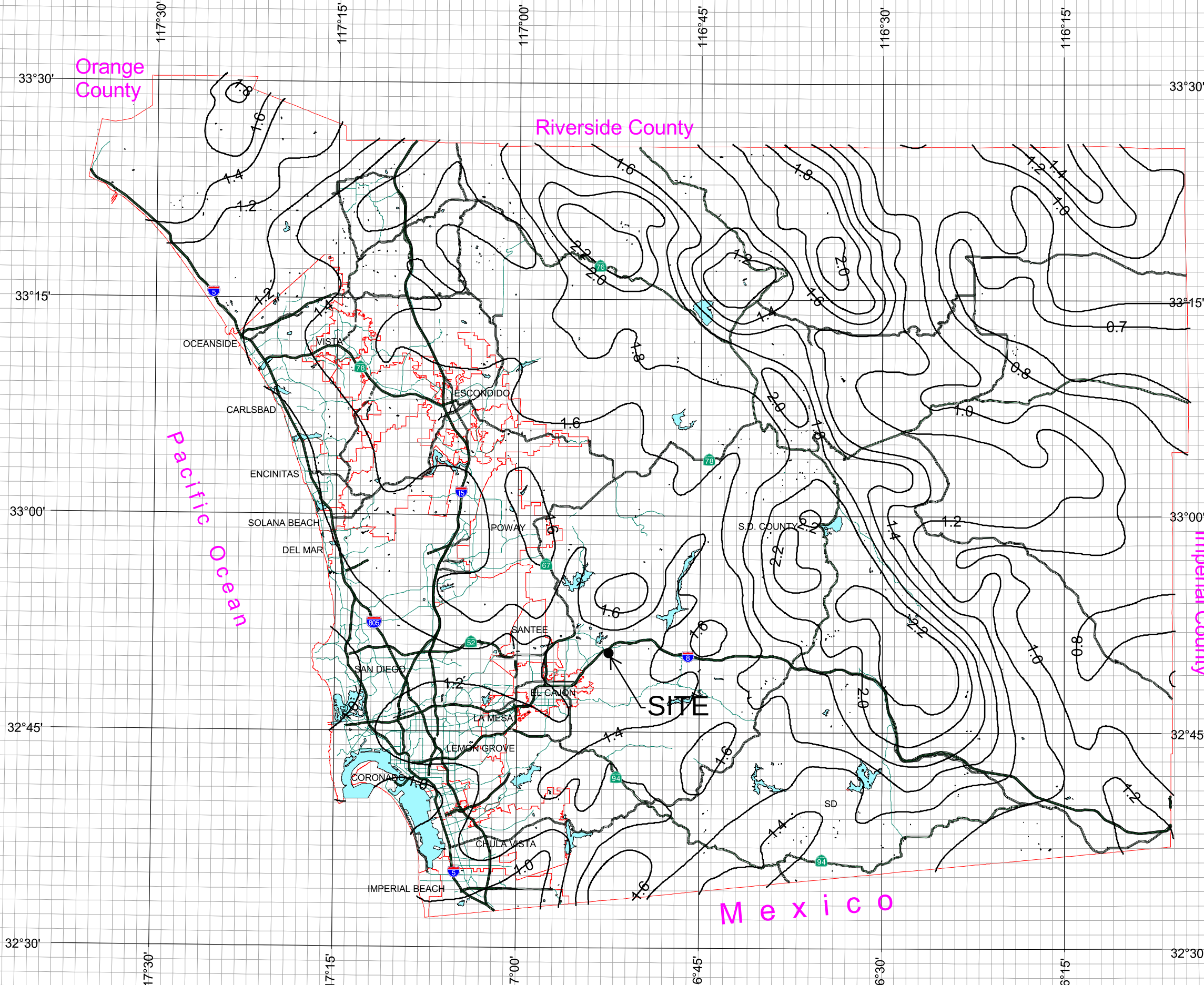
P₆= 1.3 inches

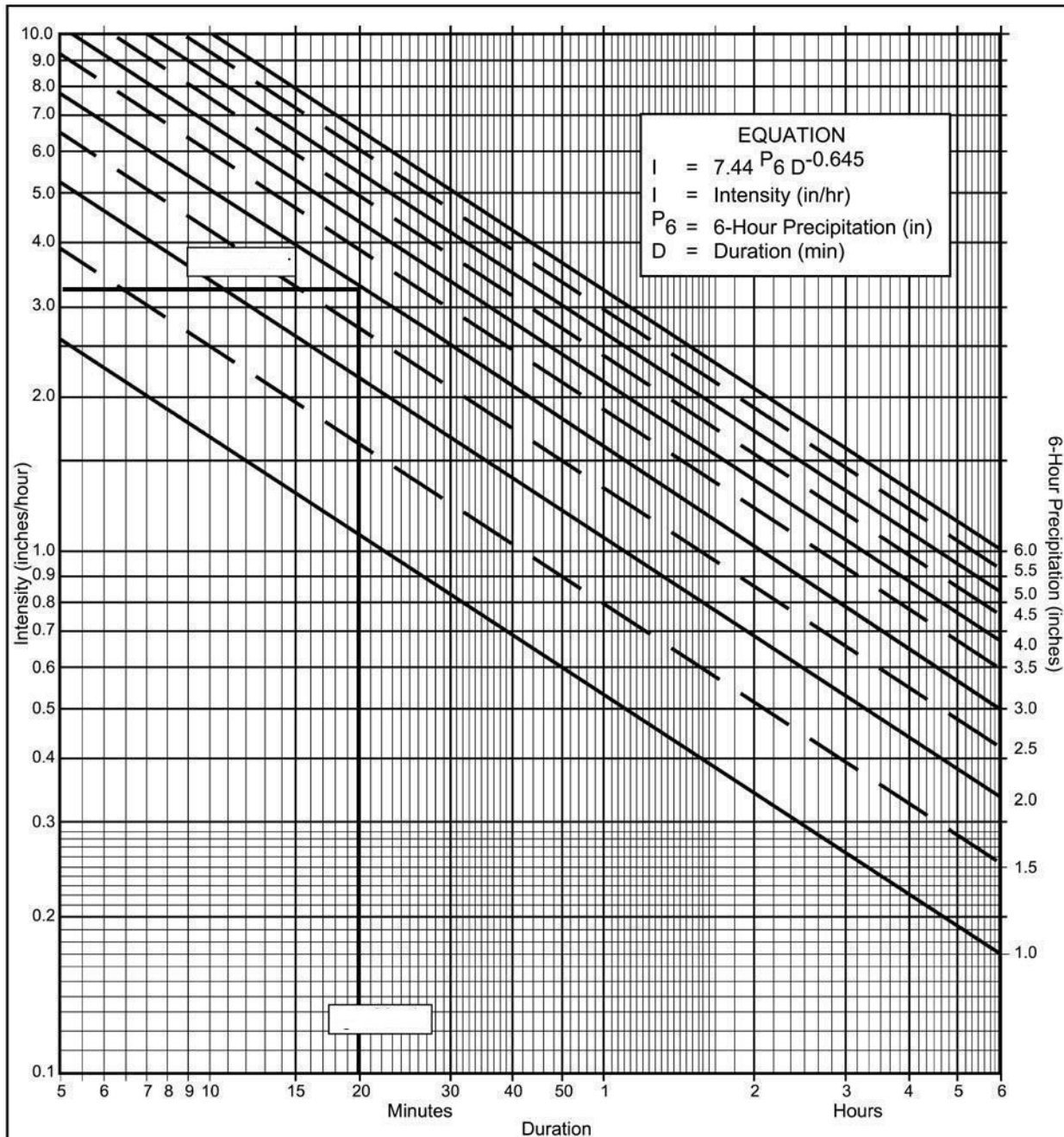


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Directions for Application:

- (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 applicable 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) $P_6 = \underline{2.8}$ in., $P_{24} = \underline{6.2}$, $\frac{P_6}{P_{24}} = \underline{45.2} \%^{(2)}$
- (c) Adjusted $P_6^{(2)} = \underline{2.8}$ in.
- (d) $t_x = \underline{\hspace{2cm}}$ min.
- (e) $I = \underline{\hspace{2cm}}$ 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

FIGURE

3-2

APPENDIX 3

AES 100-YEAR STORM EVENT CALCULATIONS- EXISTING CONDITIONS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
 Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
 2003,1985,1981 HYDROLOGY MANUAL

(c) Copyright 1982-2007 Advanced Engineering Software (aes)
 Ver. 13.9 Release Date: 04/04/2008 License ID 1402

Analysis prepared by:

Stuart Engineering
 7525 Metropolitan Drive, Suite 308
 San Diego, California 92108
 (619) 296-1010 se@stuartengineering.com

***** DESCRIPTION OF STUDY *****
 * LAKE JENNINGS MARKET PLACE - EXISTING CONDITIONS *
 * SOUTHEAST CORNER OLDE HIGHWAY 80 AND LAKE JENNINGS PARK ROAD *
 * COUNTY OF SAN DIEGO - STUART ENGINEERING JOB # 921-05-04 *

FILE NAME: 921HYD2.DAT
 TIME/DATE OF STUDY: 11:19 02/12/2015

 USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
 6-HOUR DURATION PRECIPITATION (INCHES) = 2.800
 SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00
 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

NO.	HALF- WIDTH	CROWN TO CROSSFALL	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT	GUTTER-GEOMETRIES: WIDTH LIP HIKE	MANNING FACTOR
	(FT)	(FT)		(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
2	25.0	15.0	0.020/0.020/0.020	0.50	1.50 0.0313 0.125	0.1000

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
 as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
 OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

 FLOW PROCESS FROM NODE 100.00 TO NODE 105.00 IS CODE = 21

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

=====

*USER SPECIFIED(SUBAREA):

BARREN COVER RUNOFF COEFFICIENT = .3000
 S.C.S. CURVE NUMBER (AMC II) = 0
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
 UPSTREAM ELEVATION(FEET) = 760.00

DOWNSTREAM ELEVATION (FEET) = 741.00
ELEVATION DIFFERENCE (FEET) = 19.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 6.684
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 6.117
SUBAREA RUNOFF (CFS) = 0.18
TOTAL AREA (ACRES) = 0.10 TOTAL RUNOFF (CFS) = 0.18

FLOW PROCESS FROM NODE 105.00 TO NODE 110.00 IS CODE = 51

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

=====

ELEVATION DATA: UPSTREAM (FEET) =	741.00	DOWNSTREAM (FEET) =	681.80
CHANNEL LENGTH THRU SUBAREA (FEET) =	600.00	CHANNEL SLOPE =	0.0987
CHANNEL BASE (FEET) =	0.00	"Z" FACTOR =	7.000
MANNING'S FACTOR =	0.030	MAXIMUM DEPTH (FEET) =	1.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	4.906		

*USER SPECIFIED (SUBAREA):

BARREN COVER RUNOFF COEFFICIENT =	.3000		
S.C.S. CURVE NUMBER (AMC II) =	0		
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) =	1.47		
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) =	3.67		
AVERAGE FLOW DEPTH (FEET) =	0.24	TRAVEL TIME (MIN.) =	2.73
Tc (MIN.) =	9.41		
SUBAREA AREA (ACRES) =	1.73	SUBAREA RUNOFF (CFS) =	2.55
AREA-AVERAGE RUNOFF COEFFICIENT =	0.300		
TOTAL AREA (ACRES) =	1.8	PEAK FLOW RATE (CFS) =	2.69

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH (FEET) =	0.30	FLOW VELOCITY (FEET/SEC.) =	4.26
LONGEST FLOWPATH FROM NODE	100.00	TO NODE	110.00 =
			700.00 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) =	4.906		
*USER SPECIFIED (SUBAREA):			
BARREN COVER RUNOFF COEFFICIENT =	.3600		
S.C.S. CURVE NUMBER (AMC II) =	0		
AREA-AVERAGE RUNOFF COEFFICIENT =	0.3270		
SUBAREA AREA (ACRES) =	1.50	SUBAREA RUNOFF (CFS) =	2.65
TOTAL AREA (ACRES) =	3.3	TOTAL RUNOFF (CFS) =	5.34
TC (MIN.) =	9.41		

FLOW PROCESS FROM NODE 110.00 TO NODE 120.00 IS CODE = 41

>>>> COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA <<<<
>>>> USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT) <<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	681.80	DOWNSTREAM (FEET) =	681.10
FLOW LENGTH (FEET) =	50.00	MANNING'S N =	0.013
DEPTH OF FLOW IN	24.0 INCH PIPE IS	7.4 INCHES	
PIPE-FLOW VELOCITY (FEET/SEC.) =	6.52		
GIVEN PIPE DIAMETER (INCH) =	24.00	NUMBER OF PIPES =	1
PIPE-FLOW (CFS) =	5.34		

PIPE TRAVEL TIME(MIN.) = 0.13 Tc(MIN.) = 9.54
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 750.00 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)	=	4.864
*USER SPECIFIED(SUBAREA):		
STREETS & ROADS (DITCHES) RUNOFF COEFFICIENT	=	.6600
S.C.S. CURVE NUMBER (AMC II)	=	0
AREA-AVERAGE RUNOFF COEFFICIENT	=	0.3855
SUBAREA AREA(ACRES)	=	0.71
SUBAREA RUNOFF(CFS)	=	2.28
TOTAL AREA(ACRES)	=	4.0
TOTAL RUNOFF(CFS)	=	7.58
TC(MIN.)	=	9.54

FLOW PROCESS FROM NODE 120.00 TO NODE 130.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET)	=	681.10	DOWNSTREAM(FEET)	=	669.00
CHANNEL LENGTH THRU SUBAREA(FEET)	=	490.00	CHANNEL SLOPE	=	0.0247
CHANNEL BASE(FEET)	=	10.00	"Z" FACTOR	=	10.000
MANNING'S FACTOR	=	0.015	MAXIMUM DEPTH(FEET)	=	0.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	4.359			
*USER SPECIFIED(SUBAREA):					
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT	=	.4200			
S.C.S. CURVE NUMBER (AMC II)	=	0			
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS)	=	9.85			
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.)	=	4.63			
AVERAGE FLOW DEPTH(FEET)	=	0.18	TRAVEL TIME(MIN.)	=	1.76
Tc(MIN.)	=	11.30			
SUBAREA AREA(ACRES)	=	2.49	SUBAREA RUNOFF(CFS)	=	4.56
AREA-AVERAGE RUNOFF COEFFICIENT	=	0.399			
TOTAL AREA(ACRES)	=	6.5	PEAK FLOW RATE(CFS)	=	11.35

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET)	=	0.20	FLOW VELOCITY(FEET/SEC.)	=	4.86
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 130.00	=	1240.00	FEET.		

FLOW PROCESS FROM NODE 130.00 TO NODE 140.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET)	=	669.00	DOWNSTREAM(FEET)	=	667.00
FLOW LENGTH(FEET)	=	40.00	MANNING'S N	=	0.013
ASSUME FULL-FLOWING PIPELINE					
PIPE-FLOW VELOCITY(FEET/SEC.)	=	14.45			
PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)					
GIVEN PIPE DIAMETER(INCH)	=	12.00	NUMBER OF PIPES	=	1
PIPE-FLOW(CFS)	=	11.35			
PIPE TRAVEL TIME(MIN.)	=	0.05	Tc(MIN.)	=	11.35
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 140.00	=	1280.00	FEET.		

FLOW PROCESS FROM NODE 140.00 TO NODE 150.00 IS CODE = 51

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 667.00 DOWNSTREAM(FEET) = 655.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 420.00 CHANNEL SLOPE = 0.0286
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 20.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 3.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.981
*USER SPECIFIED(SUBAREA):
MEADOW POOR COVER RUNOFF COEFFICIENT = .3600
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 12.86
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.21
AVERAGE FLOW DEPTH(FEET) = 0.13 TRAVEL TIME(MIN.) = 1.66
Tc(MIN.) = 13.01
SUBAREA AREA(ACRES) = 2.11 SUBAREA RUNOFF(CFS) = 3.02
AREA-AVERAGE RUNOFF COEFFICIENT = 0.389
TOTAL AREA(ACRES) = 8.6 PEAK FLOW RATE(CFS) = 13.39

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.14 FLOW VELOCITY(FEET/SEC.) = 4.19
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 150.00 = 1700.00 FEET.

FLOW PROCESS FROM NODE 200.00 TO NODE 205.00 IS CODE = 21

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

=====

*USER SPECIFIED(SUBAREA):
MEADOW POOR COVER RUNOFF COEFFICIENT = .3000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 691.00
DOWNSTREAM ELEVATION(FEET) = 687.00
ELEVATION DIFFERENCE(FEET) = 4.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 9.072
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.024
SUBAREA RUNOFF(CFS) = 0.14
TOTAL AREA(ACRES) = 0.09 TOTAL RUNOFF(CFS) = 0.14

FLOW PROCESS FROM NODE 205.00 TO NODE 210.00 IS CODE = 51

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 687.00 DOWNSTREAM(FEET) = 677.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 160.00 CHANNEL SLOPE = 0.0625
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 20.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 0.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.572
*USER SPECIFIED(SUBAREA):
BARREN COVER RUNOFF COEFFICIENT = .3000
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.58
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.87
AVERAGE FLOW DEPTH(FEET) = 0.12 TRAVEL TIME(MIN.) = 1.43
Tc(MIN.) = 10.50

SUBAREA AREA(ACRES) = 0.65 SUBAREA RUNOFF(CFS) = 0.89
AREA-AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA(ACRES) = 0.7 PEAK FLOW RATE(CFS) = 1.01

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.15 FLOW VELOCITY(FEET/SEC.) = 2.26
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 210.00 = 260.00 FEET.

FLOW PROCESS FROM NODE 300.00 TO NODE 305.00 IS CODE = 21

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

=====

*USER SPECIFIED(SUBAREA):

MEADOW POOR COVER RUNOFF COEFFICIENT = .3000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 691.00
DOWNSTREAM ELEVATION(FEET) = 688.00
ELEVATION DIFFERENCE(FEET) = 3.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 9.985
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.722
SUBAREA RUNOFF(CFS) = 0.13
TOTAL AREA(ACRES) = 0.09 TOTAL RUNOFF(CFS) = 0.13

FLOW PROCESS FROM NODE 305.00 TO NODE 310.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 688.00 DOWNSTREAM(FEET) = 656.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 830.00 CHANNEL SLOPE = 0.0386
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 30.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 0.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.410

*USER SPECIFIED(SUBAREA):

BARREN COVER RUNOFF COEFFICIENT = .3000
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.42
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.11
AVERAGE FLOW DEPTH(FEET) = 0.20 TRAVEL TIME(MIN.) = 6.56
Tc(MIN.) = 16.54
SUBAREA AREA(ACRES) = 4.40 SUBAREA RUNOFF(CFS) = 4.50
AREA-AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA(ACRES) = 4.5 PEAK FLOW RATE(CFS) = 4.59

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.25 FLOW VELOCITY(FEET/SEC.) = 2.47
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 310.00 = 930.00 FEET.

FLOW PROCESS FROM NODE 400.00 TO NODE 405.00 IS CODE = 21

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

=====

*USER SPECIFIED(SUBAREA):

NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 80.00

UPSTREAM ELEVATION (FEET) = 670.70
DOWNSTREAM ELEVATION (FEET) = 668.50
ELEVATION DIFFERENCE (FEET) = 2.20
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 5.746
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 6.744
SUBAREA RUNOFF (CFS) = 0.20
TOTAL AREA (ACRES) = 0.05 TOTAL RUNOFF (CFS) = 0.20

FLOW PROCESS FROM NODE 405.00 TO NODE 410.00 IS CODE = 61

>>>> COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA <<<<
>>>> (STANDARD CURB SECTION USED) <<<<

=====

UPSTREAM ELEVATION (FEET) =	668.00	DOWNSTREAM ELEVATION (FEET) =	660.00
STREET LENGTH (FEET) =	340.00	CURB HEIGHT (INCHES) =	6.0
STREET HALFWIDTH (FEET) =	40.00		

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 10.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

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

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 0.95
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.23
HALFSTREET FLOOD WIDTH (FEET) = 4.98
AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.58
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 0.58
STREET FLOW TRAVEL TIME (MIN.) = 2.19 Tc (MIN.) = 7.94
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 5.474
*USER SPECIFIED (SUBAREA):
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.600
SUBAREA AREA (ACRES) = 0.45 SUBAREA RUNOFF (CFS) = 1.48
TOTAL AREA (ACRES) = 0.5 PEAK FLOW RATE (CFS) = 1.64

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.26 HALFSTREET FLOOD WIDTH (FEET) = 6.76
FLOW VELOCITY (FEET/SEC.) = 2.86 DEPTH*VELOCITY (FT*FT/SEC.) = 0.75
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 410.00 = 420.00 FEET.

FLOW PROCESS FROM NODE 410.00 TO NODE 410.00 IS CODE = 81

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

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	5.474
---	-------

*USER SPECIFIED (SUBAREA):
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
SUBAREA AREA (ACRES) = 0.50 SUBAREA RUNOFF (CFS) = 1.64
TOTAL AREA (ACRES) = 1.0 TOTAL RUNOFF (CFS) = 3.28
TC (MIN.) = 7.94

```

*****
FLOW PROCESS FROM NODE      500.00 TO NODE      505.00 IS CODE =   21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4500
S.C.S. CURVE NUMBER (AMC II) =      0
INITIAL SUBAREA FLOW-LENGTH(FEET) =    100.00
UPSTREAM ELEVATION(FEET) =      702.00
DOWNSTREAM ELEVATION(FEET) =      695.00
ELEVATION DIFFERENCE(FEET) =        7.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =     6.117
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =   6.478
SUBAREA RUNOFF(CFS) =      0.44
TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.44

*****
FLOW PROCESS FROM NODE      505.00 TO NODE      510.00 IS CODE =   51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =      695.00   DOWNSTREAM(FEET) =      689.50
CHANNEL LENGTH THRU SUBAREA(FEET) =      65.00   CHANNEL SLOPE =   0.0846
CHANNEL BASE(FEET) =      0.00   "Z" FACTOR =   20.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =      0.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =   6.162
*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4500
S.C.S. CURVE NUMBER (AMC II) =      0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.55
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =      2.20
AVERAGE FLOW DEPTH(FEET) =      0.11   TRAVEL TIME(MIN.) =      0.49
Tc(MIN.) =      6.61
SUBAREA AREA(ACRES) =      0.08   SUBAREA RUNOFF(CFS) =      0.22
AREA-AVERAGE RUNOFF COEFFICIENT =   0.450
TOTAL AREA(ACRES) =      0.2   PEAK FLOW RATE(CFS) =      0.64

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.12   FLOW VELOCITY(FEET/SEC.) =      2.24
LONGEST FLOWPATH FROM NODE      500.00 TO NODE      510.00 =      165.00 FEET.
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) =      0.2   TC(MIN.) =      6.61
PEAK FLOW RATE(CFS) =      0.64
=====
END OF RATIONAL METHOD ANALYSIS

```


APPENDIX 4

AES 100-YEAR STORM EVENT CALCULATIONS- PROPOSED CONDITIONS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL

(c) Copyright 1982-2007 Advanced Engineering Software (aes)
Ver. 13.9 Release Date: 04/04/2008 License ID 1402

Analysis prepared by:

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***** DESCRIPTION OF STUDY *****

* LAKE JENNINGS MARKETPLACE *

* PRELIMINARY PROPOSED DRAINAGE ANALYSIS *

* 921-13-05 -- ACE 2014-03-26- REVISED 2014-10-13 *

FILE NAME: 921HYDP.DAT
TIME/DATE OF STUDY: 08:52 02/11/2015

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.800
SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
FOR ALL DOWNSTREAM ANALYSES

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MAN- HING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0313 0.167	0.0150
2	35.0	25.0	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 = 0.67 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 105.00 IS CODE = 21

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

=====

*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3000

S.C.S. CURVE NUMBER (AMC II) = 93
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
 UPSTREAM ELEVATION(FEET) = 760.00
 DOWNSTREAM ELEVATION(FEET) = 741.00
 ELEVATION DIFFERENCE(FEET) = 19.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.684
 WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.117
 SUBAREA RUNOFF(CFS) = 0.18
 TOTAL AREA(ACRES) = 0.10 TOTAL RUNOFF(CFS) = 0.18

 FLOW PROCESS FROM NODE 105.00 TO NODE 110.00 IS CODE = 51

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

=====
 CHANNEL LENGTH THRU SUBAREA(FEET) = 600.00
 REPRESENTATIVE CHANNEL SLOPE = 0.1000
 CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 7.000
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 1.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.906
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .3000
 S.C.S. CURVE NUMBER (AMC II) = 93
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.47
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.67
 AVERAGE FLOW DEPTH(FEET) = 0.24 TRAVEL TIME(MIN.) = 2.73
 Tc(MIN.) = 9.41
 SUBAREA AREA(ACRES) = 1.73 SUBAREA RUNOFF(CFS) = 2.55
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.300
 TOTAL AREA(ACRES) = 1.8 PEAK FLOW RATE(CFS) = 2.69

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.29 FLOW VELOCITY(FEET/SEC.) = 4.43
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 700.00 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) = 4.906
 USER-SPECIFIED RUNOFF COEFFICIENT = .3600
 S.C.S. CURVE NUMBER (AMC II) = 76
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.3270
 SUBAREA AREA(ACRES) = 1.50 SUBAREA RUNOFF(CFS) = 2.65
 TOTAL AREA(ACRES) = 3.3 TOTAL RUNOFF(CFS) = 5.34
 TC(MIN.) = 9.41

 FLOW PROCESS FROM NODE 110.00 TO NODE 120.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====
 REPRESENTATIVE SLOPE = 0.0314
 FLOW LENGTH(FEET) = 56.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 6.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.71

GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 5.34
PIPE TRAVEL TIME(MIN.) = 0.11 Tc(MIN.) = 9.52
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 756.00 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) = 4.870
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8400
S.C.S. CURVE NUMBER (AMC II) = 76
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4323
SUBAREA AREA(ACRES) = 0.86 SUBAREA RUNOFF(CFS) = 3.52
TOTAL AREA(ACRES) = 4.2 TOTAL RUNOFF(CFS) = 8.82
TC(MIN.) = 9.52

FLOW PROCESS FROM NODE 120.00 TO NODE 125.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

REPRESENTATIVE SLOPE = 0.0250
FLOW LENGTH(Feet) = 445.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 9.5 INCHES
PIPE-FLOW VELOCITY(Feet/Sec.) = 9.36
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 8.82
PIPE TRAVEL TIME(MIN.) = 0.79 Tc(MIN.) = 10.31
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 125.00 = 1201.00 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) = 4.626
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8700
S.C.S. CURVE NUMBER (AMC II) = 76
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4790
SUBAREA AREA(ACRES) = 0.50 SUBAREA RUNOFF(CFS) = 2.01
TOTAL AREA(ACRES) = 4.7 TOTAL RUNOFF(CFS) = 10.39
TC(MIN.) = 10.31

FLOW PROCESS FROM NODE 125.00 TO NODE 130.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

REPRESENTATIVE SLOPE = 0.0288
FLOW LENGTH(Feet) = 177.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.0 INCHES
PIPE-FLOW VELOCITY(Feet/Sec.) = 10.27
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 10.39

PIPE TRAVEL TIME(MIN.) = 0.29 Tc(MIN.) = 10.60
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 130.00 = 1378.00 FEET.

FLOW PROCESS FROM NODE 130.00 TO NODE 130.00 IS CODE = 81

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.544

*USER SPECIFIED(SUBAREA):

USER-SPECIFIED RUNOFF COEFFICIENT = .8700

S.C.S. CURVE NUMBER (AMC II) = 76

AREA-AVERAGE RUNOFF COEFFICIENT = 0.4980

SUBAREA AREA(ACRES) = 0.24 SUBAREA RUNOFF(CFS) = 0.95

TOTAL AREA(ACRES) = 4.9 TOTAL RUNOFF(CFS) = 11.16

TC(MIN.) = 10.60

FLOW PROCESS FROM NODE 130.00 TO NODE 135.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

REPRESENTATIVE SLOPE = 0.0863

FLOW LENGTH(FEET) = 102.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.6 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 15.76

GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 11.16

PIPE TRAVEL TIME(MIN.) = 0.11 Tc(MIN.) = 10.71

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 135.00 = 1480.00 FEET.

FLOW PROCESS FROM NODE 135.00 TO NODE 135.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

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

=====

*USER SPECIFIED(SUBAREA):

USER-SPECIFIED RUNOFF COEFFICIENT = .8400

S.C.S. CURVE NUMBER (AMC II) = 76

INITIAL SUBAREA FLOW-LENGTH(FEET) = 59.00

UPSTREAM ELEVATION(FEET) = 681.10

DOWNSTREAM ELEVATION(FEET) = 680.50

ELEVATION DIFFERENCE(FEET) = 0.60

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 3.575

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.377

NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.

SUBAREA RUNOFF(CFS) = 4.80

TOTAL AREA(ACRES) = 0.77 TOTAL RUNOFF(CFS) = 4.80

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

```

>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
REPRESENTATIVE SLOPE = 0.0100
FLOW LENGTH(FEET) = 180.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 15.0 INCH PIPE IS 9.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.65
ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 4.80
PIPE TRAVEL TIME(MIN.) = 0.53 Tc(MIN.) = 4.11
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 239.00 FEET.

*****
FLOW PROCESS FROM NODE 203.00 TO NODE 205.00 IS CODE = 51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
CHANNEL LENGTH THRU SUBAREA(FEET) = 54.00
REPRESENTATIVE CHANNEL SLOPE = 0.0850
CHANNEL BASE(FEET) = 30.00 "Z" FACTOR = 3.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 5.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.377
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8100
S.C.S. CURVE NUMBER (AMC II) = 76
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 7.12
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.71
AVERAGE FLOW DEPTH(FEET) = 0.09 TRAVEL TIME(MIN.) = 0.33
Tc(MIN.) = 4.44
SUBAREA AREA(ACRES) = 0.77 SUBAREA RUNOFF(CFS) = 4.63
AREA-AVERAGE RUNOFF COEFFICIENT = 0.825
TOTAL AREA(ACRES) = 1.5 PEAK FLOW RATE(CFS) = 9.43

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.10 FLOW VELOCITY(FEET/SEC.) = 3.05
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 205.00 = 293.00 FEET.

*****
FLOW PROCESS FROM NODE 205.00 TO NODE 210.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
REPRESENTATIVE SLOPE = 0.0100
FLOW LENGTH(FEET) = 233.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 13.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.58
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 9.43
PIPE TRAVEL TIME(MIN.) = 0.59 Tc(MIN.) = 5.03
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 210.00 = 526.00 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) = 7.350
USER-SPECIFIED RUNOFF COEFFICIENT = .8400

```

S.C.S. CURVE NUMBER (AMC II) = 96
AREA-AVERAGE RUNOFF COEFFICIENT = 0.8284
SUBAREA AREA(ACRES) = 0.46 SUBAREA RUNOFF(CFS) = 2.84
TOTAL AREA(ACRES) = 2.0 TOTAL RUNOFF(CFS) = 12.24
TC(MIN.) = 5.03

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)	=	7.350
USER-SPECIFIED RUNOFF COEFFICIENT	=	.8400
S.C.S. CURVE NUMBER (AMC II)	=	96
AREA-AVERAGE RUNOFF COEFFICIENT	=	0.8302
SUBAREA AREA(ACRES)	=	0.37
SUBAREA RUNOFF(CFS)	=	2.28
TOTAL AREA(ACRES)	=	2.4
TOTAL RUNOFF(CFS)	=	14.52
TC(MIN.)	=	5.03

FLOW PROCESS FROM NODE 210.00 TO NODE 215.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

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

=====

REPRESENTATIVE SLOPE	=	0.0087
FLOW LENGTH(Feet)	=	55.00
MANNING'S N	=	0.013
DEPTH OF FLOW IN 24.0 INCH PIPE IS		14.9 INCHES
PIPE-FLOW VELOCITY(Feet/Sec.)	=	7.10
ESTIMATED PIPE DIAMETER(INCH)	=	24.00
NUMBER OF PIPES	=	1
PIPE-FLOW(CFS)	=	14.52
PIPE TRAVEL TIME(MIN.)	=	0.13
Tc(MIN.)	=	5.16
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 215.00	=	581.00 FEET.

FLOW PROCESS FROM NODE 215.00 TO NODE 215.00 IS CODE = 81

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	7.231
USER-SPECIFIED RUNOFF COEFFICIENT	=	.8400
S.C.S. CURVE NUMBER (AMC II)	=	96
AREA-AVERAGE RUNOFF COEFFICIENT	=	0.8310
SUBAREA AREA(ACRES)	=	0.21
SUBAREA RUNOFF(CFS)	=	1.28
TOTAL AREA(ACRES)	=	2.6
TOTAL RUNOFF(CFS)	=	15.56
TC(MIN.)	=	5.16

FLOW PROCESS FROM NODE 215.00 TO NODE 215.00 IS CODE = 81

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	7.231
USER-SPECIFIED RUNOFF COEFFICIENT	=	.8400
S.C.S. CURVE NUMBER (AMC II)	=	96
AREA-AVERAGE RUNOFF COEFFICIENT	=	0.8318
SUBAREA AREA(ACRES)	=	0.23
SUBAREA RUNOFF(CFS)	=	1.40
TOTAL AREA(ACRES)	=	2.8
TOTAL RUNOFF(CFS)	=	16.96
TC(MIN.)	=	5.16


```

*****
FLOW PROCESS FROM NODE      215.00 TO NODE      215.00 IS CODE =   10
-----
>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<
=====

*****
FLOW PROCESS FROM NODE      250.00 TO NODE      255.00 IS CODE =   21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 96
INITIAL SUBAREA FLOW-LENGTH(FEET) = 96.00
UPSTREAM ELEVATION(FEET) = 690.00
DOWNSTREAM ELEVATION(FEET) = 681.80
ELEVATION DIFFERENCE(FEET) = 8.20
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 4.314
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.377
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 1.46
TOTAL AREA(ACRES) = 0.33 TOTAL RUNOFF(CFS) = 1.46

*****
FLOW PROCESS FROM NODE      255.00 TO NODE      256.00 IS CODE =   31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
REPRESENTATIVE SLOPE = 0.0190
FLOW LENGTH(FEET) = 135.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 9.0 INCH PIPE IS 5.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.36
ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1.46
PIPE TRAVEL TIME(MIN.) = 0.42 Tc(MIN.) = 4.73
LONGEST FLOWPATH FROM NODE 250.00 TO NODE 256.00 = 231.00 FEET.

*****
FLOW PROCESS FROM NODE      256.00 TO NODE      256.00 IS CODE =   81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.377
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
USER-SPECIFIED RUNOFF COEFFICIENT = .8400
S.C.S. CURVE NUMBER (AMC II) = 96
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6715
SUBAREA AREA(ACRES) = 0.14 SUBAREA RUNOFF(CFS) = 0.87
TOTAL AREA(ACRES) = 0.5 TOTAL RUNOFF(CFS) = 2.33
TC(MIN.) = 4.73

*****
FLOW PROCESS FROM NODE      256.00 TO NODE      260.00 IS CODE =   31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
REPRESENTATIVE SLOPE = 0.0150

```

FLOW LENGTH(FEET) = 398.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 6.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.53
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.33
PIPE TRAVEL TIME(MIN.) = 1.20 Tc(MIN.) = 5.93
LONGEST FLOWPATH FROM NODE 250.00 TO NODE 260.00 = 629.00 FEET.

FLOW PROCESS FROM NODE 260.00 TO NODE 260.00 IS CODE = 81

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	6.606
USER-SPECIFIED RUNOFF COEFFICIENT	=	.8400
S.C.S. CURVE NUMBER (AMC II)	=	96
AREA-AVERAGE RUNOFF COEFFICIENT	=	0.7557
SUBAREA AREA(ACRES)	=	0.47
SUBAREA RUNOFF(CFS)	=	2.61
TOTAL AREA(ACRES)	=	0.9
TOTAL RUNOFF(CFS)	=	4.69
TC(MIN.)	=	5.93

FLOW PROCESS FROM NODE 260.00 TO NODE 260.00 IS CODE = 81

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	6.606
USER-SPECIFIED RUNOFF COEFFICIENT	=	.8400
S.C.S. CURVE NUMBER (AMC II)	=	96
AREA-AVERAGE RUNOFF COEFFICIENT	=	0.7872
SUBAREA AREA(ACRES)	=	0.56
SUBAREA RUNOFF(CFS)	=	3.11
TOTAL AREA(ACRES)	=	1.5
TOTAL RUNOFF(CFS)	=	7.80
TC(MIN.)	=	5.93

FLOW PROCESS FROM NODE 260.00 TO NODE 260.00 IS CODE = 81

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	6.606
USER-SPECIFIED RUNOFF COEFFICIENT	=	.8400
S.C.S. CURVE NUMBER (AMC II)	=	96
AREA-AVERAGE RUNOFF COEFFICIENT	=	0.7972
SUBAREA AREA(ACRES)	=	0.35
SUBAREA RUNOFF(CFS)	=	1.94
TOTAL AREA(ACRES)	=	1.9
TOTAL RUNOFF(CFS)	=	9.74
TC(MIN.)	=	5.93

FLOW PROCESS FROM NODE 260.00 TO NODE 215.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

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

=====

REPRESENTATIVE SLOPE	=	0.0150
FLOW LENGTH(FEET)	=	111.00
MANNING'S N	=	0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS	=	11.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.)	=	7.84
ESTIMATED PIPE DIAMETER(INCH)	=	18.00
NUMBER OF PIPES	=	1
PIPE-FLOW(CFS)	=	9.74
PIPE TRAVEL TIME(MIN.)	=	0.24
Tc(MIN.)	=	6.17

LONGEST FLOWPATH FROM NODE 250.00 TO NODE 215.00 = 740.00 FEET.

FLOW PROCESS FROM NODE 215.00 TO NODE 215.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<

==
** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	9.74	6.17	6.442	1.85

LONGEST FLOWPATH FROM NODE 250.00 TO NODE 215.00 = 740.00 FEET.

** MEMORY BANK # 2 CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	16.96	5.16	7.231	2.82

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 215.00 = 581.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	25.11	5.16	7.231
2	24.85	6.17	6.442

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 25.11 Tc(MIN.) = 5.16

TOTAL AREA(ACRES) = 4.7

FLOW PROCESS FROM NODE 215.00 TO NODE 265.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

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

==
REPRESENTATIVE SLOPE = 0.0210

FLOW LENGTH(Feet) = 213.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 24.0 INCH PIPE IS 16.0 INCHES

PIPE-FLOW VELOCITY(Feet/Sec.) = 11.26

ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 25.11

PIPE TRAVEL TIME(MIN.) = 0.32 Tc(MIN.) = 5.47

LONGEST FLOWPATH FROM NODE 250.00 TO NODE 265.00 = 953.00 FEET.

FLOW PROCESS FROM NODE 265.00 TO NODE 265.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<

FLOW PROCESS FROM NODE 265.00 TO NODE 265.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 2 <<<<

FLOW PROCESS FROM NODE 300.00 TO NODE 305.00 IS CODE = 21

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

=====

USER-SPECIFIED RUNOFF COEFFICIENT = .8400
S.C.S. CURVE NUMBER (AMC II) = 96
INITIAL SUBAREA FLOW-LENGTH(FEET) = 74.00
UPSTREAM ELEVATION(FEET) = 674.30
DOWNSTREAM ELEVATION(FEET) = 672.40
ELEVATION DIFFERENCE(FEET) = 1.90
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 2.940
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.377
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 2.79
TOTAL AREA(ACRES) = 0.45 TOTAL RUNOFF(CFS) = 2.79

FLOW PROCESS FROM NODE 305.00 TO NODE 310.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

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

=====

REPRESENTATIVE SLOPE = 0.0105
FLOW LENGTH(FEET) = 206.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 8.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.01
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.79
PIPE TRAVEL TIME(MIN.) = 0.68 Tc(MIN.) = 3.62
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 310.00 = 280.00 FEET.

FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 IS CODE = 81

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.377
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8400
S.C.S. CURVE NUMBER (AMC II) = 96
AREA-AVERAGE RUNOFF COEFFICIENT = 0.8400
SUBAREA AREA(ACRES) = 0.42 SUBAREA RUNOFF(CFS) = 2.60
TOTAL AREA(ACRES) = 0.9 TOTAL RUNOFF(CFS) = 5.39
TC(MIN.) = 3.62

FLOW PROCESS FROM NODE 310.00 TO NODE 315.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

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

=====

REPRESENTATIVE SLOPE = 0.0500
FLOW LENGTH(FEET) = 285.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 7.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 10.68
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 5.39
PIPE TRAVEL TIME(MIN.) = 0.44 Tc(MIN.) = 4.07
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 315.00 = 565.00 FEET.

FLOW PROCESS FROM NODE 315.00 TO NODE 315.00 IS CODE = 81

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.377
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
USER-SPECIFIED RUNOFF COEFFICIENT = .8400
S.C.S. CURVE NUMBER (AMC II) = 96
AREA-AVERAGE RUNOFF COEFFICIENT = 0.8400
SUBAREA AREA(ACRES) = 1.83 SUBAREA RUNOFF(CFS) = 11.34
TOTAL AREA(ACRES) = 2.7 TOTAL RUNOFF(CFS) = 16.73
TC(MIN.) = 4.07

FLOW PROCESS FROM NODE 315.00 TO NODE 315.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<

FLOW PROCESS FROM NODE 325.00 TO NODE 326.00 IS CODE = 21

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

USER-SPECIFIED RUNOFF COEFFICIENT = .8400
S.C.S. CURVE NUMBER (AMC II) = 96
INITIAL SUBAREA FLOW-LENGTH(FEET) = 73.00
UPSTREAM ELEVATION(FEET) = 672.40
DOWNSTREAM ELEVATION(FEET) = 670.60
ELEVATION DIFFERENCE(FEET) = 1.80
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 2.960
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.377
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 326.00 TO NODE 330.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

CHANNEL LENGTH THRU SUBAREA(FEET) = 200.00
REPRESENTATIVE CHANNEL SLOPE = 0.0130
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 20.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 0.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.205
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8400
S.C.S. CURVE NUMBER (AMC II) = 96
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.09
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.50
AVERAGE FLOW DEPTH(FEET) = 0.26 TRAVEL TIME(MIN.) = 2.23
Tc(MIN.) = 5.19
SUBAREA AREA(ACRES) = 0.55 SUBAREA RUNOFF(CFS) = 3.33
AREA-AVERAGE RUNOFF COEFFICIENT = 0.840
TOTAL AREA(ACRES) = 0.6 PEAK FLOW RATE(CFS) = 3.75

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.33 FLOW VELOCITY(FEET/SEC.) = 1.71

LONGEST FLOWPATH FROM NODE 325.00 TO NODE 331.00 = 273.00 FEET.

FLOW PROCESS FROM NODE 330.00 TO NODE 335.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

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

=====

REPRESENTATIVE SLOPE = 0.0125

FLOW LENGTH(FEET) = 35.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 12.0 INCH PIPE IS 9.5 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 5.63

ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 3.75

PIPE TRAVEL TIME(MIN.) = 0.10 Tc(MIN.) = 5.29

LONGEST FLOWPATH FROM NODE 325.00 TO NODE 335.00 = 308.00 FEET.

FLOW PROCESS FROM NODE 335.00 TO NODE 335.00 IS CODE = 81

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.113

USER-SPECIFIED RUNOFF COEFFICIENT = .8400

S.C.S. CURVE NUMBER (AMC II) = 96

AREA-AVERAGE RUNOFF COEFFICIENT = 0.8400

SUBAREA AREA(ACRES) = 0.54 SUBAREA RUNOFF(CFS) = 3.23

TOTAL AREA(ACRES) = 1.2 TOTAL RUNOFF(CFS) = 6.93

TC(MIN.) = 5.29

FLOW PROCESS FROM NODE 335.00 TO NODE 340.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

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

=====

REPRESENTATIVE SLOPE = 0.0230

FLOW LENGTH(FEET) = 147.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 15.0 INCH PIPE IS 9.5 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 8.48

ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 6.93

PIPE TRAVEL TIME(MIN.) = 0.29 Tc(MIN.) = 5.58

LONGEST FLOWPATH FROM NODE 325.00 TO NODE 340.00 = 455.00 FEET.

FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<

=====

** MAIN STREAM CONFLUENCE DATA **

STREAM	RUNOFF	Tc	INTENSITY	AREA
NUMBER	(CFS)	(MIN.)	(INCH/HOUR)	(ACRE)

1	6.93	5.58	6.874	1.16
---	------	------	-------	------

LONGEST FLOWPATH FROM NODE 325.00 TO NODE 340.00 = 455.00 FEET.

** MEMORY BANK # 2 CONFLUENCE DATA **

STREAM	RUNOFF	Tc	INTENSITY	AREA
NUMBER	(CFS)	(MIN.)	(INCH/HOUR)	(ACRE)

--	--	--	--	--

1 16.73 4.07 7.377 2.70
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 340.00 = 565.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	21.79	4.07	7.377
2	22.52	5.58	6.874

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 22.52 Tc(MIN.) = 5.58

TOTAL AREA(ACRES) = 3.9

FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<

=====

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	21.79	4.07	7.377	3.86
2	22.52	5.58	6.874	3.86

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 340.00 = 565.00 FEET.

** MEMORY BANK # 3 CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	25.11	5.47	6.960	4.67
2	24.85	6.48	6.238	4.67

LONGEST FLOWPATH FROM NODE 250.00 TO NODE 340.00 = 953.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	40.46	4.07	7.377
2	47.20	5.47	6.960
3	47.32	5.58	6.874
4	45.29	6.48	6.238

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 47.32 Tc(MIN.) = 5.58

TOTAL AREA(ACRES) = 8.5

FLOW PROCESS FROM NODE 270.00 TO NODE 275.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

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

=====

REPRESENTATIVE SLOPE = 0.0169

FLOW LENGTH(FEET) = 320.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 30.0 INCH PIPE IS 22.5 INCHES

PIPE-FLOW VELOCITY(Feet/Sec.) = 12.00

ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 47.32

PIPE TRAVEL TIME(MIN.) = 0.44 Tc(MIN.) = 6.02

LONGEST FLOWPATH FROM NODE 250.00 TO NODE 275.00 = 1273.00 FEET.

FLOW PROCESS FROM NODE 275.00 TO NODE 275.00 IS CODE = 81

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.542

USER-SPECIFIED RUNOFF COEFFICIENT = .7800

S.C.S. CURVE NUMBER (AMC II) = 93

AREA-AVERAGE RUNOFF COEFFICIENT = 0.8254

SUBAREA AREA(ACRES) = 0.49 SUBAREA RUNOFF(CFS) = 2.50

TOTAL AREA(ACRES) = 9.0 TOTAL RUNOFF(CFS) = 48.70

TC(MIN.) = 6.02

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)
1	54.92	4.53
2	49.27	5.92
3	48.70	6.02
4	45.29	6.93

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 54.92 Tc(MIN.) = 4.53

FLOW PROCESS FROM NODE 275.00 TO NODE 275.00 IS CODE = 81

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.377

NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.

*USER SPECIFIED(SUBAREA):

USER-SPECIFIED RUNOFF COEFFICIENT = .7800

S.C.S. CURVE NUMBER (AMC II) = 93

AREA-AVERAGE RUNOFF COEFFICIENT = 0.8217

SUBAREA AREA(ACRES) = 0.79 SUBAREA RUNOFF(CFS) = 4.55

TOTAL AREA(ACRES) = 9.8 TOTAL RUNOFF(CFS) = 59.47

TC(MIN.) = 4.53

FLOW PROCESS FROM NODE 275.00 TO NODE 135.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

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

REPRESENTATIVE SLOPE = 0.0100

FLOW LENGTH(FEET) = 145.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.1 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 10.43

ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 59.47

PIPE TRAVEL TIME(MIN.) = 0.23 Tc(MIN.) = 4.76

LONGEST FLOWPATH FROM NODE 250.00 TO NODE 135.00 = 1418.00 FEET.

FLOW PROCESS FROM NODE 135.00 TO NODE 135.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<

** MAIN STREAM CONFLUENCE DATA **

STREAM	RUNOFF	Tc	INTENSITY	AREA
--------	--------	----	-----------	------

NUMBER	(CFS)	(MIN.)	(INCH/HOUR)	(ACRE)
1	59.47	4.76	7.377	9.81
2	53.35	6.15	6.453	9.81
3	52.74	6.26	6.382	9.81
4	48.17	7.18	5.843	9.81

LONGEST FLOWPATH FROM NODE 250.00 TO NODE 135.00 = 1418.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	11.16	10.71	4.515	4.93

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 135.00 = 1480.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	64.43	4.76	7.377
2	59.76	6.15	6.453
3	59.26	6.26	6.382
4	55.65	7.18	5.843
5	48.48	10.71	4.515

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 64.43 Tc(MIN.) = 4.76

TOTAL AREA(ACRES) = 14.7

FLOW PROCESS FROM NODE 135.00 TO NODE 140.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

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

=====

REPRESENTATIVE SLOPE = 0.0100
FLOW LENGTH(FEET) = 58.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 29.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 10.48
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 64.43
PIPE TRAVEL TIME(MIN.) = 0.09 Tc(MIN.) = 4.85
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 140.00 = 1538.00 FEET.

FLOW PROCESS FROM NODE 160.00 TO NODE 165.00 IS CODE = 21

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

=====

*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6900
S.C.S. CURVE NUMBER (AMC II) = 93
INITIAL SUBAREA FLOW-LENGTH(FEET) = 86.00
UPSTREAM ELEVATION(FEET) = 697.00
DOWNSTREAM ELEVATION(FEET) = 693.50
ELEVATION DIFFERENCE(FEET) = 3.50
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 4.287
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.377
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 1.12
TOTAL AREA(ACRES) = 0.22 TOTAL RUNOFF(CFS) = 1.12

FLOW PROCESS FROM NODE 165.00 TO NODE 170.00 IS CODE = 61

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STANDARD CURB SECTION USED)<<<<

=====

REPRESENTATIVE SLOPE =	0.0400	
STREET LENGTH(Feet) =	110.00	CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(Feet) =	50.00	

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(Feet) =	40.00
INSIDE STREET CROSSFALL(DECIMAL) =	0.020
OUTSIDE STREET CROSSFALL(DECIMAL) =	0.020

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

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =	1.68	
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:		
STREET FLOW DEPTH(Feet) =	0.25	
HALFSTREET FLOOD WIDTH(Feet) =	5.98	
AVERAGE FLOW VELOCITY(Feet/Sec.) =	3.53	
PRODUCT OF DEPTH&VELOCITY(Ft*Ft/Sec.) =	0.87	
STREET FLOW TRAVEL TIME(Min.) =	0.52	Tc(Min.) = 4.81
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	7.377	
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.		
*USER SPECIFIED(SUBAREA):		
USER-SPECIFIED RUNOFF COEFFICIENT =	.6900	
S.C.S. CURVE NUMBER (AMC II) =	93	
AREA-AVERAGE RUNOFF COEFFICIENT =	0.690	
SUBAREA AREA(ACRES) =	0.22	SUBAREA RUNOFF(CFS) = 1.12
TOTAL AREA(ACRES) =	0.4	PEAK FLOW RATE(CFS) = 2.24

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(Feet) =	0.26	HALFSTREET FLOOD WIDTH(Feet) =	6.91
FLOW VELOCITY(Feet/Sec.) =	3.76	DEPTH*VELOCITY(Ft*Ft/Sec.) =	0.99
LONGEST FLOWPATH FROM NODE	160.00	TO NODE	170.00 = 196.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES)	=	0.4	TC(Min.) =	4.81
PEAK FLOW RATE(CFS)	=	2.24		

=====

=====

END OF RATIONAL METHOD ANALYSIS

APPENDIX 5

AES 2-YEAR STORM EVENT CALCULATIONS- EXISTING CONDITIONS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL

(c) Copyright 1982-2007 Advanced Engineering Software (aes)
Ver. 13.9 Release Date: 04/04/2008 License ID 1402

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***** DESCRIPTION OF STUDY *****
* LAKE JENNINGS MARKET PLACE - EXISTING CONDITIONS *
* SOUTHEAST CORNER OLDE HIGHWAY 80 AND LAKE JENNINGS PARK ROAD *
* COUNTY OF SAN DIEGO - STUART ENGINEERING JOB # 921-05-04 *

FILE NAME: 921HYD2.DAT
TIME/DATE OF STUDY: 11:59 02/12/2015

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 2.00
6-HOUR DURATION PRECIPITATION (INCHES) = 1.300
SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00
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

NO.	HALF- WIDTH	CROWN TO CROSSFALL	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT	GUTTER-GEOMETRIES: WIDTH LIP HIKE	MANNING FACTOR
	(FT)	(FT)		(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
2	25.0	15.0	0.020/0.020/0.020	0.50	1.50 0.0313 0.125	0.1000

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
 - (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 105.00 IS CODE = 21

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

=====

*USER SPECIFIED(SUBAREA):
BARREN COVER RUNOFF COEFFICIENT = .3000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 760.00

DOWNSTREAM ELEVATION(FEET) = 741.00
ELEVATION DIFFERENCE(FEET) = 19.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.684
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.840
SUBAREA RUNOFF(CFS) = 0.09
TOTAL AREA(ACRES) = 0.10 TOTAL RUNOFF(CFS) = 0.09

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

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

=====

2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.840
*USER SPECIFIED(SUBAREA):
MEADOW POOR COVER RUNOFF COEFFICIENT = .3000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3000
SUBAREA AREA(ACRES) = 1.73 SUBAREA RUNOFF(CFS) = 1.47
TOTAL AREA(ACRES) = 1.8 TOTAL RUNOFF(CFS) = 1.56
TC(MIN.) = 6.68

FLOW PROCESS FROM NODE 105.00 TO NODE 110.00 IS CODE = 51

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 741.00 DOWNSTREAM(FEET) = 681.80
CHANNEL LENGTH THRU SUBAREA(FEET) = 0.01 CHANNEL SLOPE = *****
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 7.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 1.00
CHANNEL FLOW THRU SUBAREA(CFS) = 1.56
FLOW VELOCITY(FEET/SEC.) = 199.94 FLOW DEPTH(FEET) = 0.03
TRAVEL TIME(MIN.) = 0.00 Tc(MIN.) = 6.68
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 100.01 FEET.

FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 IS CODE = 81

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

=====

2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.840
*USER SPECIFIED(SUBAREA):
BARREN COVER RUNOFF COEFFICIENT = .3600
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3270
SUBAREA AREA(ACRES) = 1.50 SUBAREA RUNOFF(CFS) = 1.53
TOTAL AREA(ACRES) = 3.3 TOTAL RUNOFF(CFS) = 3.09
TC(MIN.) = 6.68

FLOW PROCESS FROM NODE 110.00 TO NODE 120.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 681.80 DOWNSTREAM(FEET) = 681.10
FLOW LENGTH(FEET) = 50.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 24.0 INCH PIPE IS 5.6 INCHES

PIPE-FLOW VELOCITY (FEET/SEC.) = 5.58
GIVEN PIPE DIAMETER (INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 3.09
PIPE TRAVEL TIME (MIN.) = 0.15 Tc (MIN.) = 6.83
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 150.01 FEET.

FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 81

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

=====

2 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.800
*USER SPECIFIED (SUBAREA):
STREETS & ROADS (DITCHES) RUNOFF COEFFICIENT = .6600
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3855
SUBAREA AREA (ACRES) = 0.71 SUBAREA RUNOFF (CFS) = 1.31
TOTAL AREA (ACRES) = 4.0 TOTAL RUNOFF (CFS) = 4.36
Tc (MIN.) = 6.83

FLOW PROCESS FROM NODE 120.00 TO NODE 130.00 IS CODE = 51

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

=====

ELEVATION DATA: UPSTREAM (FEET) = 681.10 DOWNSTREAM (FEET) = 669.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 490.00 CHANNEL SLOPE = 0.0247
CHANNEL BASE (FEET) = 10.00 "Z" FACTOR = 10.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH (FEET) = 0.50
2 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.340
*USER SPECIFIED (SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4200
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 5.59
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 3.72
AVERAGE FLOW DEPTH (FEET) = 0.13 TRAVEL TIME (MIN.) = 2.19
Tc (MIN.) = 9.03
SUBAREA AREA (ACRES) = 2.49 SUBAREA RUNOFF (CFS) = 2.45 ✓
AREA-AVERAGE RUNOFF COEFFICIENT = 0.399
TOTAL AREA (ACRES) = 6.5 PEAK FLOW RATE (CFS) = 6.09

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.14 FLOW VELOCITY (FEET/SEC.) = 3.81
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 130.00 = 640.01 FEET.

FLOW PROCESS FROM NODE 130.00 TO NODE 140.00 IS CODE = 41

>>>> COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA <<<<
>>>> USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT) <<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 669.00 DOWNSTREAM (FEET) = 667.00
FLOW LENGTH (FEET) = 40.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 8.0 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 10.95
GIVEN PIPE DIAMETER (INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 6.09
PIPE TRAVEL TIME (MIN.) = 0.06 Tc (MIN.) = 9.09
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 140.00 = 680.01 FEET.

```

*****
FLOW PROCESS FROM NODE      140.00 TO NODE      150.00 IS CODE =  51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    667.00  DOWNSTREAM(FEET) =    655.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    420.00  CHANNEL SLOPE =    0.0286
CHANNEL BASE(FEET) =    20.00  "Z" FACTOR =    20.000
MANNING'S FACTOR = 0.015  MAXIMUM DEPTH(FEET) =    3.00
  2 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.037
*USER SPECIFIED(SUBAREA):
MEADOW POOR COVER RUNOFF COEFFICIENT = .3600
S.C.S. CURVE NUMBER (AMC II) =    0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    6.87
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =    3.32
AVERAGE FLOW DEPTH(FEET) =    0.09  TRAVEL TIME(MIN.) =    2.11
Tc(MIN.) =    11.20
SUBAREA AREA(ACRES) =    2.11  SUBAREA RUNOFF(CFS) =    1.55 ✓
AREA-AVERAGE RUNOFF COEFFICIENT =    0.389
TOTAL AREA(ACRES) =    8.6  PEAK FLOW RATE(CFS) =    6.85

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =    0.09  FLOW VELOCITY(FEET/SEC.) =    3.31
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    150.00 =    1100.01 FEET.

*****
FLOW PROCESS FROM NODE      200.00 TO NODE      205.00 IS CODE =  21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED(SUBAREA):
MEADOW POOR COVER RUNOFF COEFFICIENT = .3000
S.C.S. CURVE NUMBER (AMC II) =    0
INITIAL SUBAREA FLOW-LENGTH(FEET) =    100.00
UPSTREAM ELEVATION(FEET) =    691.00
DOWNSTREAM ELEVATION(FEET) =    687.00
ELEVATION DIFFERENCE(FEET) =    4.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.072
  2 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.332
SUBAREA RUNOFF(CFS) =    0.06
TOTAL AREA(ACRES) =    0.09  TOTAL RUNOFF(CFS) =    0.06

*****
FLOW PROCESS FROM NODE      205.00 TO NODE      205.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
  2 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.332
*USER SPECIFIED(SUBAREA):
MEADOW POOR COVER RUNOFF COEFFICIENT = .3000
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3000
SUBAREA AREA(ACRES) =    0.65  SUBAREA RUNOFF(CFS) =    0.45
TOTAL AREA(ACRES) =    0.7  TOTAL RUNOFF(CFS) =    0.52 ✓
TC(MIN.) =    9.07

*****
FLOW PROCESS FROM NODE      205.00 TO NODE      210.00 IS CODE =  51

```



```

-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 687.00 DOWNSTREAM(FEET) = 677.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 0.01 CHANNEL SLOPE = *****
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 20.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 0.50
CHANNEL FLOW THRU SUBAREA(CFS) = 0.52
FLOW VELOCITY(FEET/SEC.) = 64.55 FLOW DEPTH(FEET) = 0.02
TRAVEL TIME(MIN.) = 0.00 Tc(MIN.) = 9.07
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 210.00 = 100.01 FEET.

*****
FLOW PROCESS FROM NODE 300.00 TO NODE 305.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED(SUBAREA):
MEADOW POOR COVER RUNOFF COEFFICIENT = .3000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 691.00
DOWNSTREAM ELEVATION(FEET) = 688.00
ELEVATION DIFFERENCE(FEET) = 3.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 9.985
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.193
SUBAREA RUNOFF(CFS) = 0.06
TOTAL AREA(ACRES) = 0.09 TOTAL RUNOFF(CFS) = 0.06

*****
FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.193
*USER SPECIFIED(SUBAREA):
MEADOW POOR COVER RUNOFF COEFFICIENT = .3000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3000
SUBAREA AREA(ACRES) = 4.40 SUBAREA RUNOFF(CFS) = 2.89
TOTAL AREA(ACRES) = 4.5 TOTAL RUNOFF(CFS) = 2.95
TC(MIN.) = 9.98

*****
FLOW PROCESS FROM NODE 305.00 TO NODE 310.00 IS CODE = 51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 688.00 DOWNSTREAM(FEET) = 656.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 0.01 CHANNEL SLOPE = *****
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 30.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 0.50
CHANNEL FLOW THRU SUBAREA(CFS) = 2.95✓
FLOW VELOCITY(FEET/SEC.) = 148.48 FLOW DEPTH(FEET) = 0.03
TRAVEL TIME(MIN.) = 0.00 Tc(MIN.) = 9.98
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 310.00 = 100.01 FEET.

*****

```

FLOW PROCESS FROM NODE 400.00 TO NODE 405.00 IS CODE = 21

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

*USER SPECIFIED(SUBAREA):

NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6000

S.C.S. CURVE NUMBER (AMC II) = 0

INITIAL SUBAREA FLOW-LENGTH(FEET) = 80.00

UPSTREAM ELEVATION(FEET) = 670.70

DOWNSTREAM ELEVATION(FEET) = 668.50

ELEVATION DIFFERENCE(FEET) = 2.20

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.746

2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.131

SUBAREA RUNOFF(CFS) = 0.09

TOTAL AREA(ACRES) = 0.05 TOTAL RUNOFF(CFS) = 0.09

FLOW PROCESS FROM NODE 405.00 TO NODE 405.00 IS CODE = 81

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

2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.131

*USER SPECIFIED(SUBAREA):

NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6000

S.C.S. CURVE NUMBER (AMC II) = 0

AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000

SUBAREA AREA(ACRES) = 0.45 SUBAREA RUNOFF(CFS) = 0.85

TOTAL AREA(ACRES) = 0.5 TOTAL RUNOFF(CFS) = 0.94

TC(MIN.) = 5.75

FLOW PROCESS FROM NODE 405.00 TO NODE 405.00 IS CODE = 81

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

2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.131

*USER SPECIFIED(SUBAREA):

NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6000

S.C.S. CURVE NUMBER (AMC II) = 0

AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000

SUBAREA AREA(ACRES) = 0.50 SUBAREA RUNOFF(CFS) = 0.94

TOTAL AREA(ACRES) = 1.0 TOTAL RUNOFF(CFS) = 1.88

TC(MIN.) = 5.75

FLOW PROCESS FROM NODE 405.00 TO NODE 410.00 IS CODE = 61

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>(STANDARD CURB SECTION USED)<<<<

UPSTREAM ELEVATION(FEET) = 668.00 DOWNSTREAM ELEVATION(FEET) = 660.00

STREET LENGTH(FEET) = 0.01 CURB HEIGHT(INCHES) = 6.0

STREET HALFWIDTH(FEET) = 40.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.89
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.16
HALFSTREET FLOOD WIDTH(FEET) = 1.50
AVERAGE FLOW VELOCITY(FEET/SEC.) = 533.45
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 83.35
STREET FLOW TRAVEL TIME(MIN.) = 0.00 Tc(MIN.) = 5.75
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.131
*USER SPECIFIED(SUBAREA):
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.600
SUBAREA AREA(ACRES) = 0.01 SUBAREA RUNOFF(CFS) = 0.02
TOTAL AREA(ACRES) = 1.0 PEAK FLOW RATE(CFS) = 1.90

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.16 HALFSTREET FLOOD WIDTH(FEET) = 1.50
FLOW VELOCITY(FEET/SEC.) = ***** DEPTH*VELOCITY(FT*FT/SEC.) = 83.35
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 410.00 = 80.01 FEET.

FLOW PROCESS FROM NODE 500.00 TO NODE 505.00 IS CODE = 21

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

=====

*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 702.00
DOWNSTREAM ELEVATION(FEET) = 695.00
ELEVATION DIFFERENCE(FEET) = 7.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.117
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.008
SUBAREA RUNOFF(CFS) = 0.20
TOTAL AREA(ACRES) = 0.15 TOTAL RUNOFF(CFS) = 0.20

FLOW PROCESS FROM NODE 505.00 TO NODE 510.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 695.00 DOWNSTREAM(FEET) = 689.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 65.00 CHANNEL SLOPE = 0.0846
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 20.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 0.50
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.820
*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.25
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.68
AVERAGE FLOW DEPTH(FEET) = 0.09 TRAVEL TIME(MIN.) = 0.64
Tc(MIN.) = 6.76
SUBAREA AREA(ACRES) = 0.08 SUBAREA RUNOFF(CFS) = 0.10
AREA-AVERAGE RUNOFF COEFFICIENT = 0.450

TOTAL AREA (ACRES) = 0.2 PEAK FLOW RATE (CFS) = 0.29

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH (FEET) = 0.09 FLOW VELOCITY (FEET/SEC.) = 1.86

LONGEST FLOWPATH FROM NODE 500.00 TO NODE 510.00 = 165.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 0.2 TC (MIN.) = 6.76

PEAK FLOW RATE (CFS) = 0.29

=====

END OF RATIONAL METHOD ANALYSIS

APPENDIX 6

PIPE CALCULATIONS

Exist 48-inch pipe under Ridge Hill Rd.txt

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Analysis prepared by:

Stuart Engineering
7525 Metropolitan Drive, Suite 308
San Diego, California 92108
(619) 296-1010 se@stuartengineering.com

TIME/DATE OF STUDY: 14:08 10/28/2014
=====

Problem Descriptions:

Lake Jennings MarketPlace
Existing 48-in CMP south of County Maintained Channel
under Ridge Hill Road

>>>>PIPEFLOW HYDRAULIC INPUT INFORMATION<<<<

PIPE DIAMETER(FEET) = 4.000
FLOWDEPTH(FEET) = 3.960
PIPE SLOPE(FEET/FEET) = 0.0220
MANNINGS FRICTION FACTOR = 0.022000
>>>>> NORMAL DEPTH FLOW(CFS) = 131.18
=====

NORMAL-DEPTH FLOW INFORMATION:

NORMAL DEPTH(FEET) = 3.96
FLOW AREA(SQUARE FEET) = 12.55
FLOW TOP-WIDTH(FEET) = 0.796
FLOW PRESSURE + MOMENTUM(POUNDS) = 4196.72
FLOW VELOCITY(FEET/SEC.) = 10.457
FLOW VELOCITY HEAD(FEET) = 1.698
HYDRAULIC DEPTH(FEET) = 15.76
FROUDE NUMBER = 0.464
SPECIFIC ENERGY(FEET) = 5.66
=====

Exist 48-inch pipe north of Ridge Hill Rd Channel.txt

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Analysis prepared by:

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TIME/DATE OF STUDY: 11:13 10/28/2014
=====

Problem Descriptions:

Lake Jennings MarketPlace
Existing 48" Pipe North of Existing County Maintained Channel

>>>>PIPEFLOW HYDRAULIC INPUT INFORMATION<<<<

PIPE DIAMETER(FEET) = 4.000
FLOWDEPTH(FEET) = 3.960
PIPE SLOPE(FEET/FEET) = 0.0290
MANNINGS FRICTION FACTOR = 0.022000
>>>> NORMAL DEPTH FLOW(CFS) = 150.61
=====

NORMAL-DEPTH FLOW INFORMATION:

NORMAL DEPTH(FEET) = 3.96
FLOW AREA(SQUARE FEET) = 12.55
FLOW TOP-WIDTH(FEET) = 0.796
FLOW PRESSURE + MOMENTUM(POUNDS) = 5042.52
FLOW VELOCITY(FEET/SEC.) = 12.006
FLOW VELOCITY HEAD(FEET) = 2.238
HYDRAULIC DEPTH(FEET) = 15.76
FROUDE NUMBER = 0.533
SPECIFIC ENERGY(FEET) = 6.20
=====

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1402

Analysis prepared by:

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TIME/DATE OF STUDY: 08:21 02/13/2015
=====

=====

Problem Descriptions:

Lake Jennings Market Place -2015-02-13
0.5 Q2 plus Q100 of DMA 112 and Offsite Q100- Node 135-140
Proposed 36" pipe

>>>>PIPEFLOW HYDRAULIC INPUT INFORMATION<<<<

PIPE DIAMETER(FEET) = 3.000
PIPE SLOPE(FEET/FEET) = 0.0100
PIPEFLOW(CFS) = 19.91
MANNINGS FRICTION FACTOR = 0.013000
=====

=====

CRITICAL-DEPTH FLOW INFORMATION:

CRITICAL DEPTH(FEET) = 1.43
CRITICAL FLOW AREA(SQUARE FEET) = 3.329
CRITICAL FLOW TOP-WIDTH(FEET) = 2.997
CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) = 356.48
CRITICAL FLOW VELOCITY(FEET/SEC.) = 5.981
CRITICAL FLOW VELOCITY HEAD(FEET) = 0.56
CRITICAL FLOW HYDRAULIC DEPTH(FEET) = 1.11

CRITICAL FLOW SPECIFIC ENERGY (FEET) = 1.99

=====

NORMAL-DEPTH FLOW INFORMATION:

NORMAL DEPTH (FEET) =	1.12	
FLOW AREA (SQUARE FEET) =	2.42	
FLOW TOP-WIDTH (FEET) =	2.904	
FLOW PRESSURE + MOMENTUM (POUNDS) =		388.43
FLOW VELOCITY (FEET/SEC.) =	8.237	
FLOW VELOCITY HEAD (FEET) =	1.054	
HYDRAULIC DEPTH (FEET) =	0.83	
FROUDE NUMBER =	1.591	
SPECIFIC ENERGY (FEET) =	2.18	

=====

=====

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1402

Analysis prepared by:

Stuart Engineering
7525 Metropolitan Drive, Suite 308
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(619) 296-1010 se@stuartengineering.com

TIME/DATE OF STUDY: 08:24 02/13/2015
=====

=====

Problem Descriptions:

Lake Jennings Market Place -2015-02-13
Onsite Q= 0.5 Pre-development Q2 plus Ridge Hill Road
Proposed 36" pipe

>>>>PIPEFLOW HYDRAULIC INPUT INFORMATION<<<<

PIPE DIAMETER(FEET) = 3.000
PIPE SLOPE(FEET/FEET) = 0.0100
PIPEFLOW(CFS) = 8.75
MANNINGS FRICTION FACTOR = 0.013000
=====

=====

CRITICAL-DEPTH FLOW INFORMATION:

CRITICAL DEPTH(FEET) = 0.93
CRITICAL FLOW AREA(SQUARE FEET) = 1.876
CRITICAL FLOW TOP-WIDTH(FEET) = 2.778
CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) = 124.62
CRITICAL FLOW VELOCITY(FEET/SEC.) = 4.664
CRITICAL FLOW VELOCITY HEAD(FEET) = 0.34
CRITICAL FLOW HYDRAULIC DEPTH(FEET) = 0.68

CRITICAL FLOW SPECIFIC ENERGY(FEET) = 1.27

=====

NORMAL-DEPTH FLOW INFORMATION:

NORMAL DEPTH(FEET) =	0.73	
FLOW AREA(SQUARE FEET) =	1.34	
FLOW TOP-WIDTH(FEET) =	2.579	
FLOW PRESSURE + MOMENTUM(POUNDS) =		136.29
FLOW VELOCITY(FEET/SEC.) =	6.529	
FLOW VELOCITY HEAD(FEET) =	0.662	
HYDRAULIC DEPTH(FEET) =	0.52	
FROUDE NUMBER =	1.596	
SPECIFIC ENERGY(FEET) =	1.40	

=====

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HYDRAULIC ELEMENTS - I PROGRAM PACKAGE
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1402

Analysis prepared by:

Stuart Engineering
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San Diego, California 92108
(619) 296-1010 se@stuartengineering.com

TIME/DATE OF STUDY: 08:27 02/13/2015
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Problem Descriptions:
Lake Jennings Market Place -2015-02-13
Proposed 18" pipe in Ridge Hill Road- from Olde Highway 80
basins

>>>>PIPEFLOW HYDRAULIC INPUT INFORMATION<<<<

PIPE DIAMETER(FEET) = 1.500
PIPE SLOPE(FEET/FEET) = 0.0200
PIPEFLOW(CFS) = 11.16
MANNINGS FRICTION FACTOR = 0.013000

=====

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CRITICAL-DEPTH FLOW INFORMATION:

CRITICAL DEPTH(FEET) = 1.28
CRITICAL FLOW AREA(SQUARE FEET) = 1.604
CRITICAL FLOW TOP-WIDTH(FEET) = 1.066
CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) = 209.69
CRITICAL FLOW VELOCITY(FEET/SEC.) = 6.959
CRITICAL FLOW VELOCITY HEAD(FEET) = 0.75

CRITICAL FLOW HYDRAULIC DEPTH(FEET) = 1.50
CRITICAL FLOW SPECIFIC ENERGY(FEET) = 2.03

=====

NORMAL-DEPTH FLOW INFORMATION:

NORMAL DEPTH(FEET) = 0.97
FLOW AREA(SQUARE FEET) = 1.21
FLOW TOP-WIDTH(FEET) = 1.434
FLOW PRESSURE + MOMENTUM(POUNDS) = 231.56
FLOW VELOCITY(FEET/SEC.) = 9.229
FLOW VELOCITY HEAD(FEET) = 1.323
HYDRAULIC DEPTH(FEET) = 0.84
FROUDE NUMBER = 1.771
SPECIFIC ENERGY(FEET) = 2.29

=====

=====

APPENDIX 7

DETENTION CALCULATIONS- OFFSITE BASINS DRAINING TO EXISTING COUNTY OF SAN DIEGO MAINTAINED CHANNEL

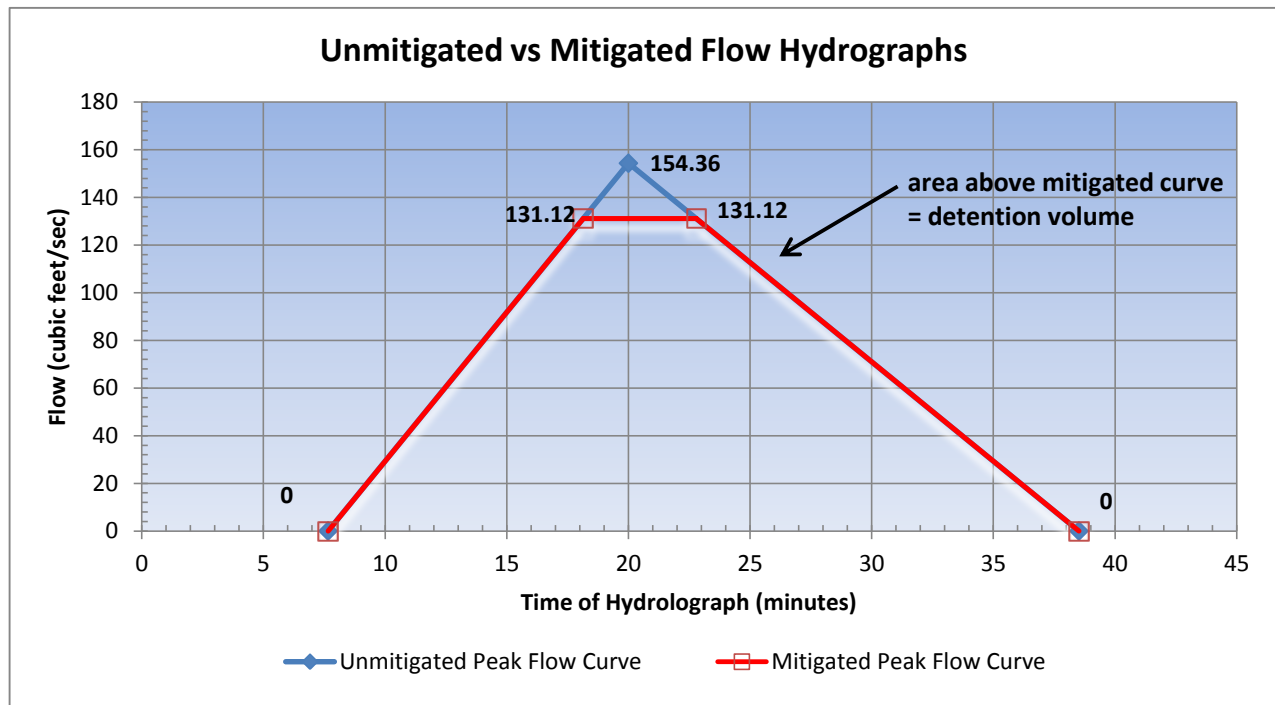
EMDF EXPANSION- DETENTION CALCULATIONS - EXISTING CONDITIONS (EXISTING COUNTY MAINTAINED CHANNEL)

Proposed Drainage

Time of Concentration (minutes)	11.15	from AES
Time of hydrograph beginning (minutes)	7.65	
Time of Hydrograph Peak (minutes)	20.00	
Time of hydrograph end (minutes)	38.52	
Peak flow (cubic feet per second)	154.36	from AES

Existing Drainage through existing 48" pipe under Ridge Hill Road

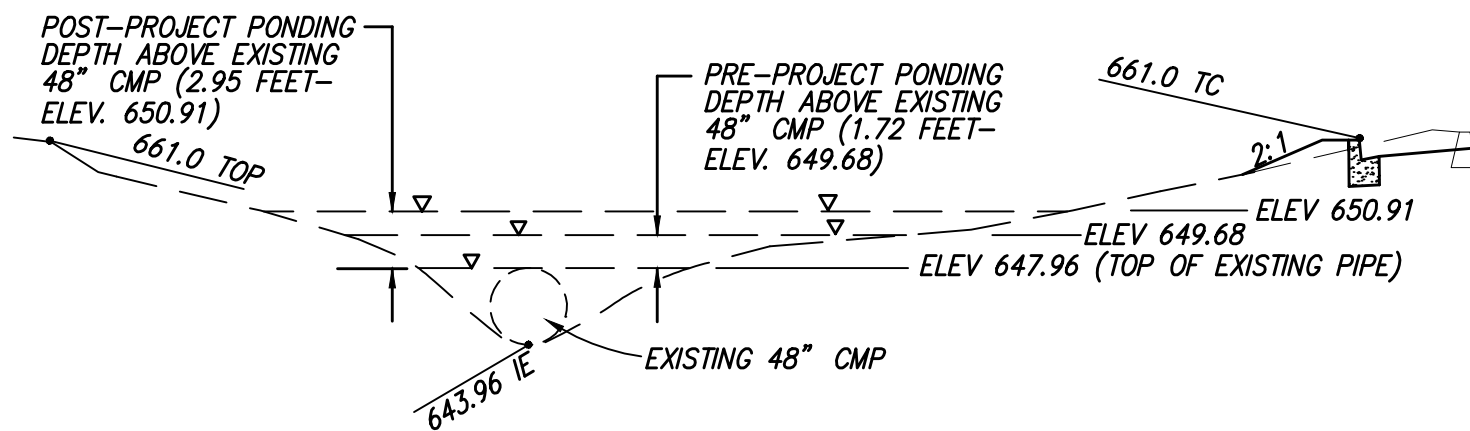
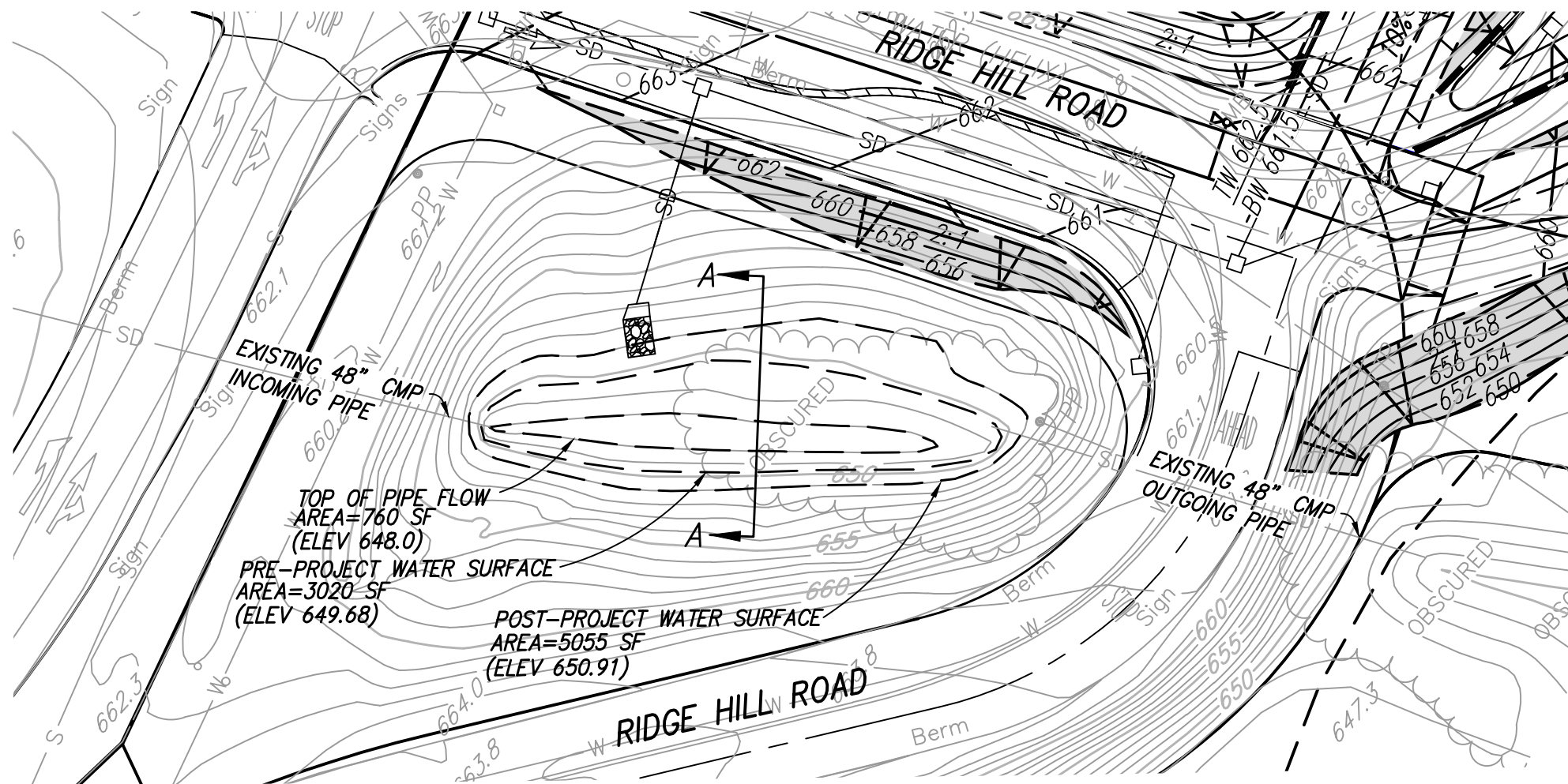
Peak Flow (Cubic feet per second)	131.12	from AES
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Required Detention Volume

Volume (Cubic feet)	3240
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RIDGE HILL ROAD EXIST. COUNTY MAINTAINED CHANNEL FLOW EXHIBIT



SECTION A-A
SCALE: HORIZ AND VERT: 1"=10'

PRE-PROJECT PONDING 100-YEAR VOLUME

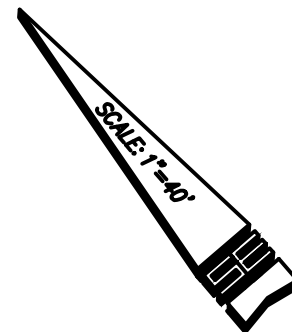
$$VOLUME = \frac{(760 + 3020)1.72}{2} = 3250 \text{ CF (1.72' DEPTH)}$$

VOLUME REQUIRED: 3240 CF

POST-PROJECT PONDING VOLUME WITH MITIGATED PROJECT FLOW

$$VOLUME = \frac{(760 + 5055) 2.95}{2} = 8577 \text{ CF (2.95' DEPTH)}$$

VOLUME REQUIRED: 8577 CF



APPENDIX 8

**DETENTION CALCULATIONS- OFFSITE AND ONSITE BASINS DRAINING
TO EXISTING COUNTY OF SAN DIEGO MAINTAINED CHANNEL**

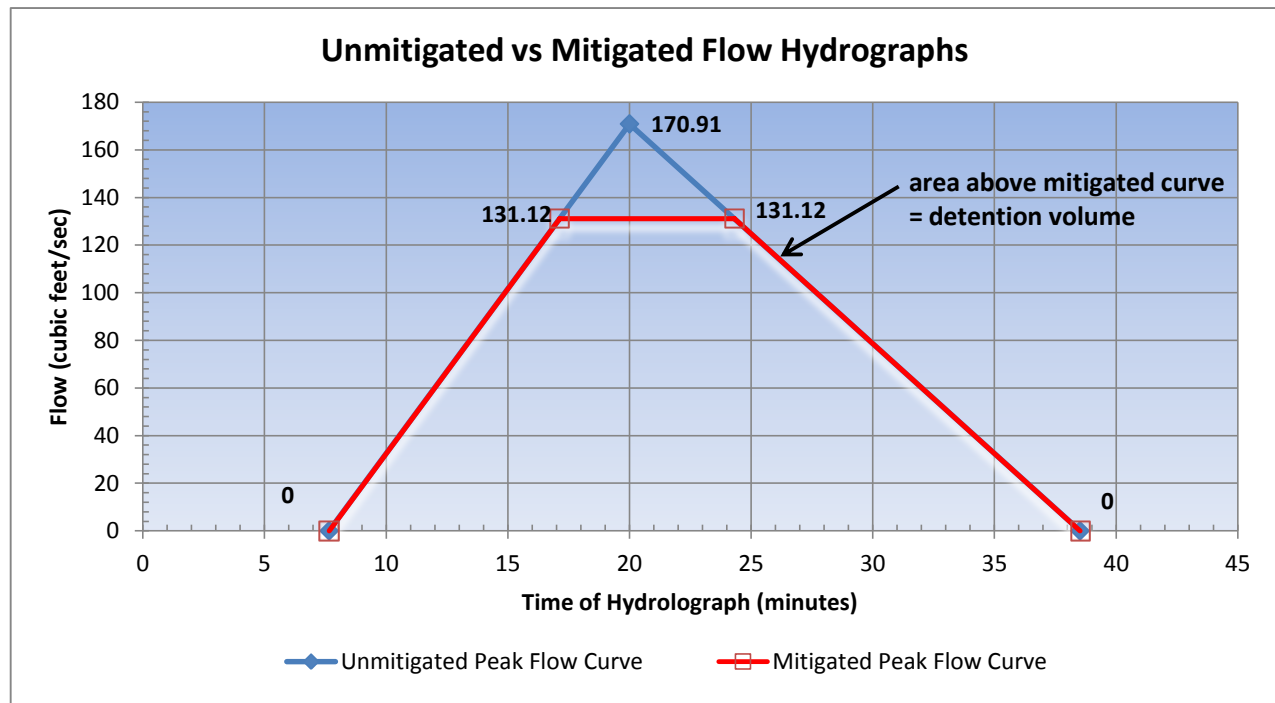
EMDF EXPANSION- DETENTION CALCULATIONS - PROPOSED CONDITIONS (EXISTING COUNTY MAINTAINED CHANNEL)

Proposed Drainage

Time of Concentration (minutes)	11.15	from AES
Time of hydrograph beginning (minutes)	7.65	
Time of Hydrograph Peak (minutes)	20.00	
Time of hydrograph end (minutes)	38.52	
Peak flow (cubic feet per second)	170.91	from AES

Existing Drainage through existing 48" pipe under Ridge Hill Road

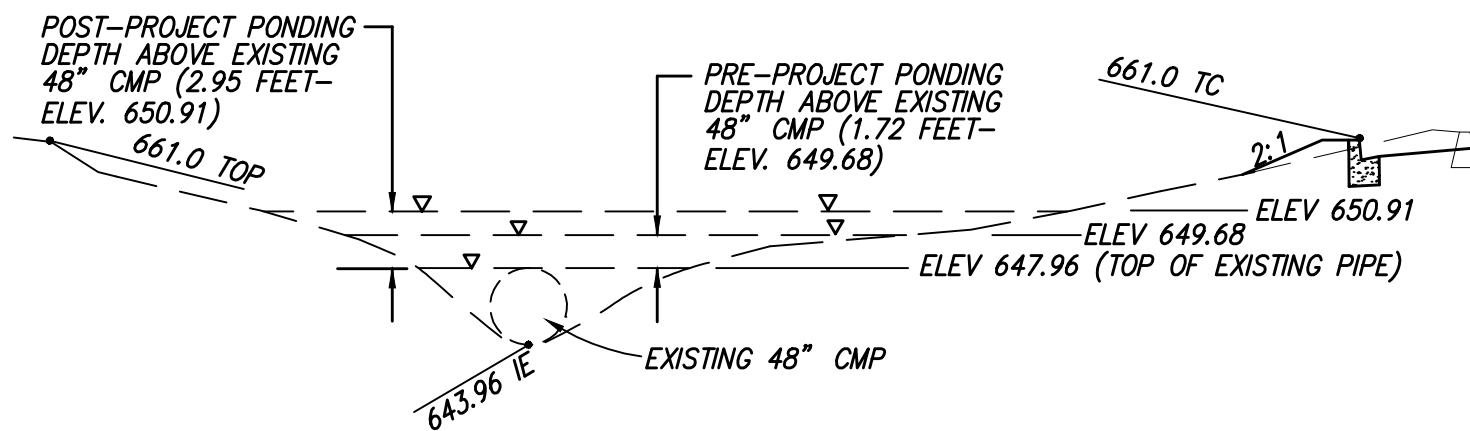
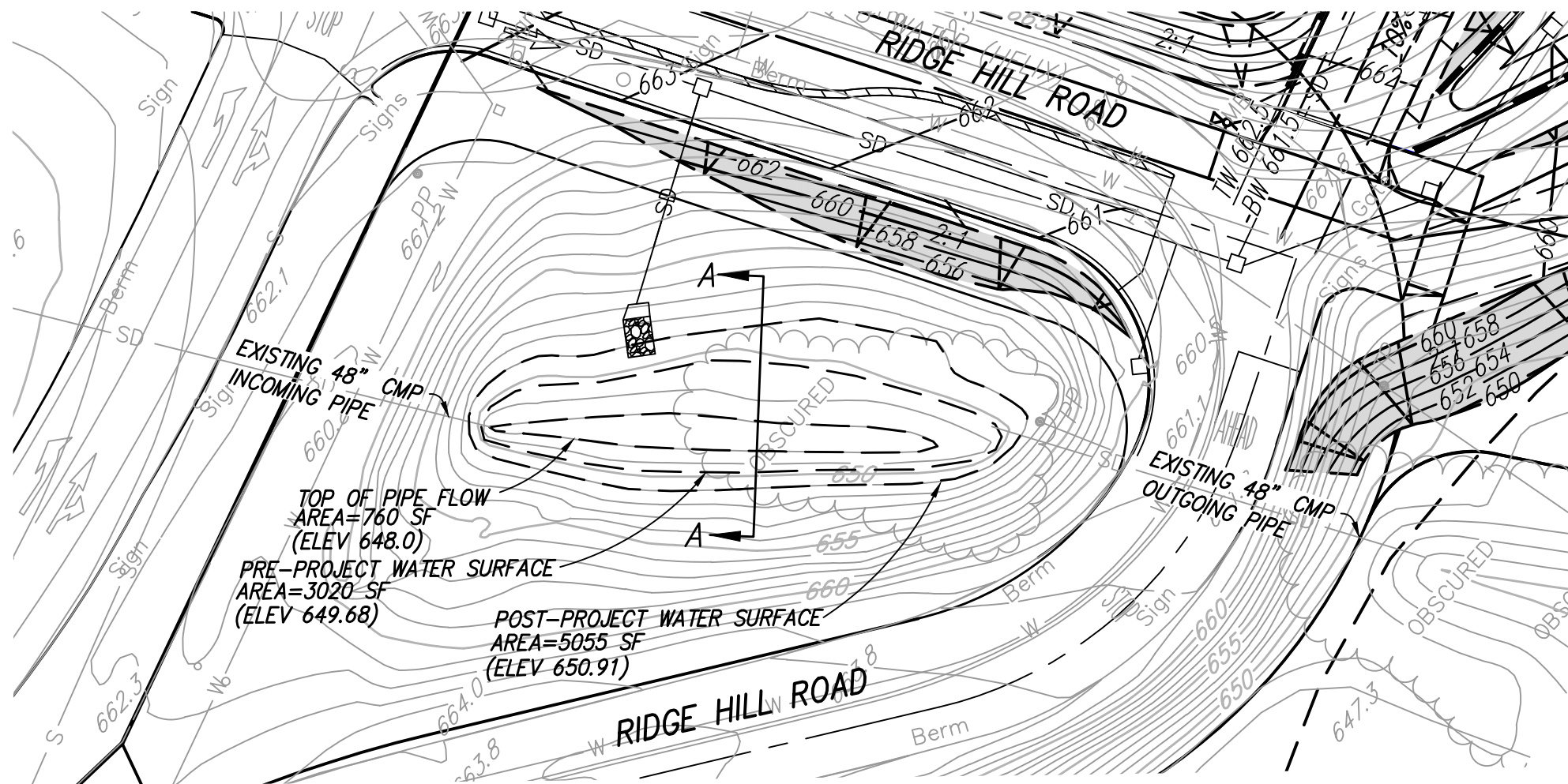
Peak Flow (Cubic feet per second)	131.12	from AES
-----------------------------------	--------	----------



Required Detention Volume

Volume (Cubic feet)	8577
---------------------	------

RIDGE HILL ROAD EXIST. COUNTY MAINTAINED CHANNEL FLOW EXHIBIT



SECTION A-A
SCALE: HORIZ AND VERT: 1"=10'

PRE-PROJECT PONDING 100-YEAR VOLUME

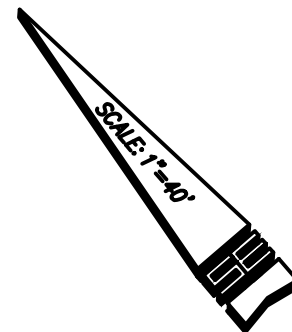
$$VOLUME = \frac{(760 + 3020)1.72}{2} = 3250 \text{ CF (1.72' DEPTH)}$$

VOLUME REQUIRED: 3240 CF

POST-PROJECT PONDING VOLUME WITH MITIGATED PROJECT FLOW

$$VOLUME = \frac{(760 + 5055) 2.95}{2} = 8577 \text{ CF (2.95' DEPTH)}$$

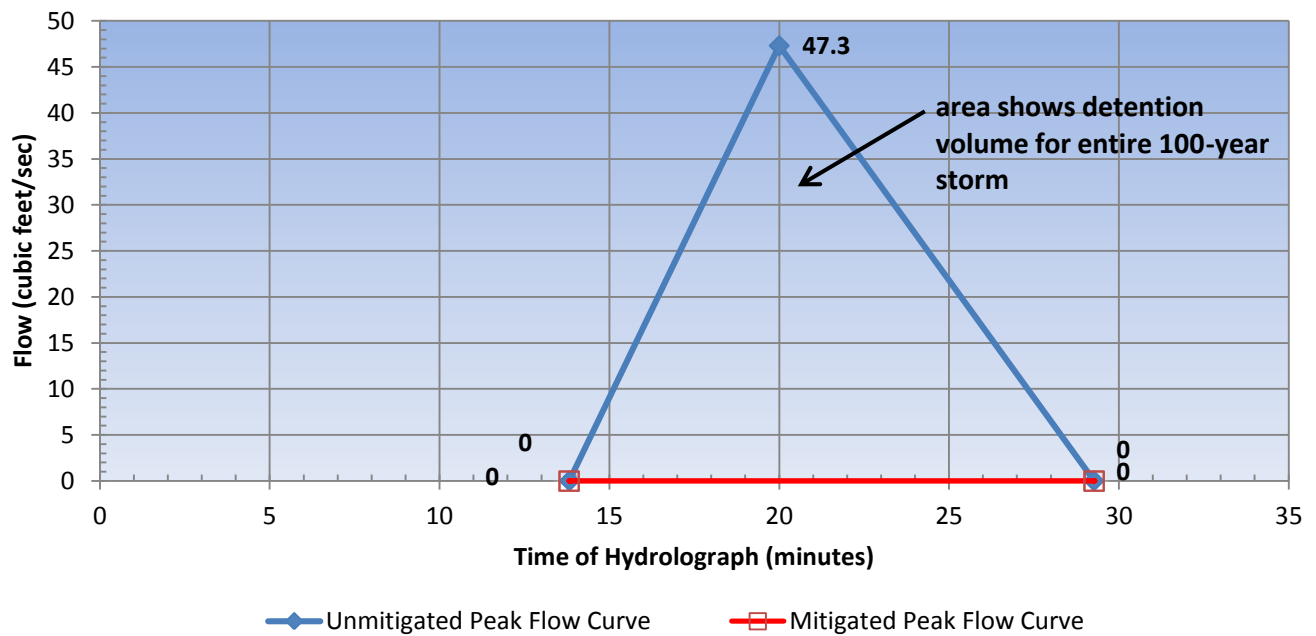
VOLUME REQUIRED: 8577 CF



APPENDIX 9

DETENTION CALCULATIONS- ONSITE (HYDROMODIFICATION)

Unmitigated vs Mitigated Flow Hydrographs



APPENDIX 10

AES 100-YEAR STORM EVENT CALCULATIONS- EXISTING OFFSITE CONDITIONS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL

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Ver. 13.9 Release Date: 04/04/2008 License ID 1402

Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
* LAKE JENNINGS MARKET PLACE OFFSITE DRAINAGE STUDY *
* 100 YEAR 6 HOUR - EXISTING CONDITIONS *
* STUART ENGINEERING JOB NO. 921-13-05 PREPARED BY HUELSMAN *

FILE NAME: 921HYDE.DAT
TIME/DATE OF STUDY: 16:12 10/28/2014

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 10.00
6-HOUR DURATION PRECIPITATION (INCHES) = 1.870
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS

FOR ALL DOWNSTREAM ANALYSES

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH	CROWN TO CROSSFALL	STREET-CROSSFALL:			CURB HEIGHT	GUTTER-GEOMETRIES:			MANNING
	(FT)	(FT)	IN- SIDE	OUT- SIDE	/PARK- WAY	(FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018	0.018	0.020	0.67	2.00	0.0313	0.167	0.0150
2	25.0	10.0	0.020	0.020	0.020	0.50	1.50	0.0313	0.125	0.0130

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.50 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
 - (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 5.00 TO NODE 10.00 IS CODE = 21

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

=====

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600
SOIL CLASSIFICATION IS "C"

S.C.S. CURVE NUMBER (AMC II) = 76
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 432.00
 UPSTREAM ELEVATION(FEET) = 960.00
 DOWNSTREAM ELEVATION(FEET) = 860.00
 ELEVATION DIFFERENCE(FEET) = 100.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.183
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
 THE MAXIMUM OVERLAND FLOW LENGTH = 100.00
 (Reference: Table 3-1B of Hydrology Manual)
 THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
 10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.296
 SUBAREA RUNOFF(CFS) = 1.55
 TOTAL AREA(ACRES) = 1.00 TOTAL RUNOFF(CFS) = 1.55

 FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 62

>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====
 UPSTREAM ELEVATION(FEET) = 860.00 DOWNSTREAM ELEVATION(FEET) = 810.00
 STREET LENGTH(FEET) = 426.00 CURB HEIGHT(INCHES) = 6.0
 STREET HALFWIDTH(FEET) = 25.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0130
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0130

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 5.05
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.27
 HALFSTREET FLOOD WIDTH(FEET) = 7.38
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 7.61
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.09
 STREET FLOW TRAVEL TIME(MIN.) = 0.93 Tc(MIN.) = 7.12
 10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.924
 RESIDENTAIL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
 SOIL CLASSIFICATION IS "C"
 S.C.S. CURVE NUMBER (AMC II) = 90
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.598
 SUBAREA AREA(ACRES) = 2.60 SUBAREA RUNOFF(CFS) = 7.04
 TOTAL AREA(ACRES) = 3.6 PEAK FLOW RATE(CFS) = 8.45

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.31 HALFSTREET FLOOD WIDTH(FEET) = 9.33
 FLOW VELOCITY(FEET/SEC.) = 8.55 DEPTH*VELOCITY(FT*FT/SEC.) = 2.67
 LONGEST FLOWPATH FROM NODE 5.00 TO NODE 15.00 = 858.00 FEET.

 FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 62

>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====
 UPSTREAM ELEVATION(FEET) = 810.00 DOWNSTREAM ELEVATION(FEET) = 780.00

STREET LENGTH(FEET) = 632.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 25.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0130
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0130

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 17.81
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.43
HALFSTREET FLOOD WIDTH(FEET) = 15.35
AVERAGE FLOW VELOCITY(FEET/SEC.) = 7.20
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.12
STREET FLOW TRAVEL TIME(MIN.) = 1.46 Tc(MIN.) = 8.58
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.478
RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 90
AREA-AVERAGE RUNOFF COEFFICIENT = 0.661
SUBAREA AREA(ACRES) = 7.80 SUBAREA RUNOFF(CFS) = 18.72
TOTAL AREA(ACRES) = 11.4 PEAK FLOW RATE(CFS) = 26.21

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.48 HALFSTREET FLOOD WIDTH(FEET) = 17.85
FLOW VELOCITY(FEET/SEC.) = 7.93 DEPTH*VELOCITY(FT*FT/SEC.) = 3.83
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 20.00 = 1490.00 FEET.

FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 62

>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 780.00 DOWNSTREAM ELEVATION(FEET) = 725.00
STREET LENGTH(FEET) = 489.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 25.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 10.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0130
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0130

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 33.40
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.46
HALFSTREET FLOOD WIDTH(FEET) = 16.60
AVERAGE FLOW VELOCITY(FEET/SEC.) = 11.62
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 5.33
STREET FLOW TRAVEL TIME(MIN.) = 0.70 Tc(MIN.) = 9.28
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.306
RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900

SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 90
AREA-AVERAGE RUNOFF COEFFICIENT = 0.671
SUBAREA AREA(ACRES) = 6.30 SUBAREA RUNOFF(CFS) = 14.37
TOTAL AREA(ACRES) = 17.7 PEAK FLOW RATE(CFS) = 39.29

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.48 HALFSTREET FLOOD WIDTH(FEET) = 17.70
FLOW VELOCITY(FEET/SEC.) = 12.09 DEPTH*VELOCITY(FT*FT/SEC.) = 5.81
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 25.00 = 1979.00 FEET.

FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 81

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

=====

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.306
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6838
SUBAREA AREA(ACRES) = 2.30 SUBAREA RUNOFF(CFS) = 5.93
TOTAL AREA(ACRES) = 20.0 TOTAL RUNOFF(CFS) = 45.22
TC(MIN.) = 9.28

FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 81

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

=====

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.306
RESIDENTIAL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 86
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6316
SUBAREA AREA(ACRES) = 33.10 SUBAREA RUNOFF(CFS) = 65.66
TOTAL AREA(ACRES) = 53.1 TOTAL RUNOFF(CFS) = 110.88
TC(MIN.) = 9.28

FLOW PROCESS FROM NODE 25.00 TO NODE 26.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 707.00 DOWNSTREAM(FEET) = 694.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 263.00 CHANNEL SLOPE = 0.0494
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 5.00
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.218
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 76
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 114.18
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 11.09
AVERAGE FLOW DEPTH(FEET) = 2.27 TRAVEL TIME(MIN.) = 0.40
Tc(MIN.) = 9.68
SUBAREA AREA(ACRES) = 5.70 SUBAREA RUNOFF(CFS) = 6.60
AREA-AVERAGE RUNOFF COEFFICIENT = 0.605
TOTAL AREA(ACRES) = 58.8 PEAK FLOW RATE(CFS) = 114.54

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 2.27 FLOW VELOCITY(FEET/SEC.) = 11.13
 LONGEST FLOWPATH FROM NODE 5.00 TO NODE 26.00 = 2242.00 FEET.

 FLOW PROCESS FROM NODE 26.00 TO NODE 30.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	694.00	DOWNSTREAM(FEET) =	692.60
FLOW LENGTH(FEET) =	50.00	MANNING'S N =	0.024
DEPTH OF FLOW IN	48.0 INCH PIPE IS	35.7 INCHES	
PIPE-FLOW VELOCITY(FEET/SEC.) =	11.43		
GIVEN PIPE DIAMETER(INCH) =	48.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	114.54		
PIPE TRAVEL TIME(MIN.) =	0.07	Tc(MIN.) =	9.75
LONGEST FLOWPATH FROM NODE	5.00 TO NODE	30.00 =	2292.00 FEET.

 FLOW PROCESS FROM NODE 30.00 TO NODE 30.00 IS CODE = 81

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

=====

10 YEAR RAINFALL INTENSITY(INCH/HOUR) =	3.203
RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT =	.6000
SOIL CLASSIFICATION IS "C"	
S.C.S. CURVE NUMBER (AMC II) =	86
AREA-AVERAGE RUNOFF COEFFICIENT =	0.6046
SUBAREA AREA(ACRES) =	9.10
SUBAREA RUNOFF(CFS) =	17.49
TOTAL AREA(ACRES) =	67.9
TOTAL RUNOFF(CFS) =	131.48
TC(MIN.) =	9.75

 FLOW PROCESS FROM NODE 30.00 TO NODE 30.00 IS CODE = 81

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

=====

10 YEAR RAINFALL INTENSITY(INCH/HOUR) =	3.203
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT =	.7800
SOIL CLASSIFICATION IS "C"	
S.C.S. CURVE NUMBER (AMC II) =	93
AREA-AVERAGE RUNOFF COEFFICIENT =	0.6063
SUBAREA AREA(ACRES) =	0.70
SUBAREA RUNOFF(CFS) =	1.75
TOTAL AREA(ACRES) =	68.6
TOTAL RUNOFF(CFS) =	133.23
TC(MIN.) =	9.75

 FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	692.60	DOWNSTREAM(FEET) =	689.00
FLOW LENGTH(FEET) =	120.00	MANNING'S N =	0.024
ASSUME FULL-FLOWING PIPELINE			
PIPE-FLOW VELOCITY(FEET/SEC.) =	10.45		
(PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)			
GIVEN PIPE DIAMETER(INCH) =	48.00	NUMBER OF PIPES =	1

PIPE-FLOW(CFS) = 133.23
PIPE TRAVEL TIME(MIN.) = 0.19 Tc(MIN.) = 9.94
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 35.00 = 2412.00 FEET.

FLOW PROCESS FROM NODE 35.00 TO NODE 35.00 IS CODE = 81

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

=====

10 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.163
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT	=	.7800
SOIL CLASSIFICATION IS "C"		
S.C.S. CURVE NUMBER (AMC II)	=	93
AREA-AVERAGE RUNOFF COEFFICIENT	=	0.6091
SUBAREA AREA(ACRES)	=	1.10
SUBAREA RUNOFF(CFS)	=	2.71
TOTAL AREA(ACRES)	=	69.7
TOTAL RUNOFF(CFS)	=	134.28
Tc(MIN.)	=	9.94

FLOW PROCESS FROM NODE 35.00 TO NODE 36.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(Feet)	=	689.00	DOWNSTREAM(Feet)	=	682.50
CHANNEL LENGTH THRU SUBAREA(Feet)	=	213.00	CHANNEL SLOPE	=	0.0305
CHANNEL BASE(Feet)	=	20.00	"Z" FACTOR	=	4.000
MANNING'S FACTOR	=	0.030	MAXIMUM DEPTH(Feet)	=	8.00
10 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.062			
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT	=	.3600			
SOIL CLASSIFICATION IS "C"					
S.C.S. CURVE NUMBER (AMC II)	=	76			
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS)	=	135.33			
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(Feet/Sec.)	=	6.95			
AVERAGE FLOW DEPTH(Feet)	=	0.83	TRAVEL TIME(MIN.)	=	0.51
Tc(MIN.)	=	10.45			
SUBAREA AREA(ACRES)	=	1.90	SUBAREA RUNOFF(CFS)	=	2.09
AREA-AVERAGE RUNOFF COEFFICIENT	=	0.602			
TOTAL AREA(ACRES)	=	71.6	PEAK FLOW RATE(CFS)	=	134.28

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(Feet)	=	0.83	FLOW VELOCITY(Feet/Sec.)	=	6.95
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 36.00	=				2625.00 FEET.

FLOW PROCESS FROM NODE 36.00 TO NODE 40.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(Feet)	=	682.50	DOWNSTREAM(Feet)	=	680.60
FLOW LENGTH(Feet)	=	125.00	MANNING'S N	=	0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS		31.8 INCHES			
PIPE-FLOW VELOCITY(Feet/Sec.)	=	15.18			
GIVEN PIPE DIAMETER(INCH)	=	48.00	NUMBER OF PIPES	=	1
PIPE-FLOW(CFS)	=	134.28			
PIPE TRAVEL TIME(MIN.)	=	0.14	Tc(MIN.)	=	10.59
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 40.00	=				2750.00 FEET.

FLOW PROCESS FROM NODE 40.00 TO NODE 40.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<

START OF NEW INITIAL TOC

FLOW PROCESS FROM NODE 100.00 TO NODE 105.00 IS CODE = 21

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

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600

SOIL CLASSIFICATION IS "C"

S.C.S. CURVE NUMBER (AMC II) = 76

INITIAL SUBAREA FLOW-LENGTH(FEET) = 589.00

UPSTREAM ELEVATION(FEET) = 880.00

DOWNSTREAM ELEVATION(FEET) = 770.00

ELEVATION DIFFERENCE(FEET) = 110.00

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.183

WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN

THE MAXIMUM OVERLAND FLOW LENGTH = 100.00

(Reference: Table 3-1B of Hydrology Manual)

THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.296

SUBAREA RUNOFF(CFS) = 10.67

TOTAL AREA(ACRES) = 6.90 TOTAL RUNOFF(CFS) = 10.67

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

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

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.296

RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7800

SOIL CLASSIFICATION IS "C"

S.C.S. CURVE NUMBER (AMC II) = 93

AREA-AVERAGE RUNOFF COEFFICIENT = 0.3884

SUBAREA AREA(ACRES) = 0.50 SUBAREA RUNOFF(CFS) = 1.68

TOTAL AREA(ACRES) = 7.4 TOTAL RUNOFF(CFS) = 12.35

TC(MIN.) = 6.18

FLOW PROCESS FROM NODE 105.00 TO NODE 110.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 770.00 DOWNSTREAM(FEET) = 720.00

FLOW LENGTH(FEET) = 127.00 MANNING'S N = 0.024

DEPTH OF FLOW IN 24.0 INCH PIPE IS 6.6 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 17.62

GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 12.35

PIPE TRAVEL TIME(MIN.) = 0.12 Tc(MIN.) = 6.30

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 716.00 FEET.

```

*****
FLOW PROCESS FROM NODE      110.00 TO NODE      110.00 IS CODE =  81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.243
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) =  76
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3823
SUBAREA AREA(ACRES) =      2.00 SUBAREA RUNOFF(CFS) =      3.06
TOTAL AREA(ACRES) =      9.4  TOTAL RUNOFF(CFS) =      15.25
TC(MIN.) =      6.30

*****
FLOW PROCESS FROM NODE      110.00 TO NODE      115.00 IS CODE =  41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =  720.00 DOWNSTREAM(FEET) =  701.30
FLOW LENGTH(FEET) =  495.00 MANNING'S N =  0.024
DEPTH OF FLOW IN  24.0 INCH PIPE IS  14.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  7.88
GIVEN PIPE DIAMETER(INCH) =  24.00 NUMBER OF PIPES =  1
PIPE-FLOW(CFS) =      15.25
PIPE TRAVEL TIME(MIN.) =  1.05 Tc(MIN.) =  7.35
LONGEST FLOWPATH FROM NODE      100.00 TO NODE      115.00 =  1211.00 FEET.

*****
FLOW PROCESS FROM NODE      115.00 TO NODE      115.00 IS CODE =  81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.843
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) =  76
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3762
SUBAREA AREA(ACRES) =      3.60 SUBAREA RUNOFF(CFS) =      4.98
TOTAL AREA(ACRES) =      13.0  TOTAL RUNOFF(CFS) =      18.79
TC(MIN.) =      7.35

*****
FLOW PROCESS FROM NODE      115.00 TO NODE      115.00 IS CODE =  81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.843
RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) =  93
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4023
SUBAREA AREA(ACRES) =      0.90 SUBAREA RUNOFF(CFS) =      2.70
TOTAL AREA(ACRES) =      13.9  TOTAL RUNOFF(CFS) =      21.49
TC(MIN.) =      7.35

*****
FLOW PROCESS FROM NODE      115.00 TO NODE      115.00 IS CODE =  81

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-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.843
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 76
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3954
SUBAREA AREA(ACRES) = 2.70 SUBAREA RUNOFF(CFS) = 3.74
TOTAL AREA(ACRES) = 16.6 TOTAL RUNOFF(CFS) = 25.23
TC(MIN.) = 7.35

*****
FLOW PROCESS FROM NODE 115.00 TO NODE 120.00 IS CODE = 51
-----

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 701.30 DOWNSTREAM(FEET) = 697.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 295.00 CHANNEL SLOPE = 0.0146
CHANNEL BASE(FEET) = 12.00 "Z" FACTOR = 6.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.421
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 76
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 26.27
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.39
AVERAGE FLOW DEPTH(FEET) = 0.51 TRAVEL TIME(MIN.) = 1.45
Tc(MIN.) = 8.80
SUBAREA AREA(ACRES) = 1.70 SUBAREA RUNOFF(CFS) = 2.09
AREA-AVERAGE RUNOFF COEFFICIENT = 0.392
TOTAL AREA(ACRES) = 18.3 PEAK FLOW RATE(CFS) = 25.23

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.50 FLOW VELOCITY(FEET/SEC.) = 3.36
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 1506.00 FEET.

*****
FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 81
-----

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.421
RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4024
SUBAREA AREA(ACRES) = 0.50 SUBAREA RUNOFF(CFS) = 1.33
TOTAL AREA(ACRES) = 18.8 TOTAL RUNOFF(CFS) = 25.89
TC(MIN.) = 8.80

*****
FLOW PROCESS FROM NODE 120.00 TO NODE 125.00 IS CODE = 41
-----

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 697.00 DOWNSTREAM(FEET) = 680.00
FLOW LENGTH(FEET) = 115.00 MANNING'S N = 0.024

```

DEPTH OF FLOW IN 30.0 INCH PIPE IS 11.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.97
 GIVEN PIPE DIAMETER (INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 25.89
 PIPE TRAVEL TIME (MIN.) = 0.13 Tc (MIN.) = 8.93
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 125.00 = 1621.00 FEET.

 FLOW PROCESS FROM NODE 40.00 TO NODE 125.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<
 =====

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	25.89	8.93	3.390	18.80

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 125.00 = 1621.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	134.28	10.59	3.037	71.60

LONGEST FLOWPATH FROM NODE 5.00 TO NODE 125.00 = 2750.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	139.12	8.93	3.390
2	157.47	10.59	3.037

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 157.47 Tc (MIN.) = 10.59
 TOTAL AREA (ACRES) = 90.4

 FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 51

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

ELEVATION DATA: UPSTREAM (FEET) = 680.60 DOWNSTREAM (FEET) = 676.60
 CHANNEL LENGTH THRU SUBAREA (FEET) = 225.00 CHANNEL SLOPE = 0.0178
 CHANNEL BASE (FEET) = 5.00 "Z" FACTOR = 6.000
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH (FEET) = 8.00
 10 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.935
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600
 SOIL CLASSIFICATION IS "C"
 S.C.S. CURVE NUMBER (AMC II) = 76
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 158.16
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 6.52
 AVERAGE FLOW DEPTH (FEET) = 1.64 TRAVEL TIME (MIN.) = 0.58
 Tc (MIN.) = 11.16
 SUBAREA AREA (ACRES) = 1.30 SUBAREA RUNOFF (CFS) = 1.37
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.558
 TOTAL AREA (ACRES) = 91.7 PEAK FLOW RATE (CFS) = 157.47

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH (FEET) = 1.64 FLOW VELOCITY (FEET/SEC.) = 6.49
 LONGEST FLOWPATH FROM NODE 5.00 TO NODE 45.00 = 2975.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)
1	166.38	9.52
2	157.47	11.17

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 166.38 Tc(MIN.) = 9.52

FLOW PROCESS FROM NODE 45.00 TO NODE 50.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 676.60 DOWNSTREAM(FEET) = 670.10

FLOW LENGTH(FEET) = 110.00 MANNING'S N = 0.024

ASSUME FULL-FLOWING PIPELINE

PIPE-FLOW VELOCITY(FEET/SEC.) = 14.05

(PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)

GIVEN PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 166.38

PIPE TRAVEL TIME(MIN.) = 0.13 Tc(MIN.) = 9.65

LONGEST FLOWPATH FROM NODE 5.00 TO NODE 50.00 = 3085.00 FEET.

FLOW PROCESS FROM NODE 50.00 TO NODE 50.00 IS CODE = 81

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

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.223

RESIDENTAIL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7800

SOIL CLASSIFICATION IS "C"

S.C.S. CURVE NUMBER (AMC II) = 93

AREA-AVERAGE RUNOFF COEFFICIENT = 0.5664

SUBAREA AREA(ACRES) = 3.60 SUBAREA RUNOFF(CFS) = 9.05

TOTAL AREA(ACRES) = 95.3 TOTAL RUNOFF(CFS) = 173.98

TC(MIN.) = 9.65

FLOW PROCESS FROM NODE 50.00 TO NODE 50.00 IS CODE = 81

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

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.223

RESIDENTAIL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7800

SOIL CLASSIFICATION IS "C"

S.C.S. CURVE NUMBER (AMC II) = 93

AREA-AVERAGE RUNOFF COEFFICIENT = 0.5675

SUBAREA AREA(ACRES) = 0.50 SUBAREA RUNOFF(CFS) = 1.26

TOTAL AREA(ACRES) = 95.8 TOTAL RUNOFF(CFS) = 175.23

TC(MIN.) = 9.65

FLOW PROCESS FROM NODE 50.00 TO NODE 50.00 IS CODE = 81

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

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.223

RESIDENTAIL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7800

SOIL CLASSIFICATION IS "C"

S.C.S. CURVE NUMBER (AMC II) = 93
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5708
SUBAREA AREA(ACRES) = 1.50 SUBAREA RUNOFF(CFS) = 3.77
TOTAL AREA(ACRES) = 97.3 TOTAL RUNOFF(CFS) = 179.01
TC(MIN.) = 9.65

FLOW PROCESS FROM NODE 50.00 TO NODE 50.00 IS CODE = 81

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

=====

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.223
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 76
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5695
SUBAREA AREA(ACRES) = 0.60 SUBAREA RUNOFF(CFS) = 0.70
TOTAL AREA(ACRES) = 97.9 TOTAL RUNOFF(CFS) = 179.70
TC(MIN.) = 9.65

FLOW PROCESS FROM NODE 50.00 TO NODE 55.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 670.10 DOWNSTREAM(FEET) = 655.00
FLOW LENGTH(FEET) = 250.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS 24.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 27.68
GIVEN PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 179.70
PIPE TRAVEL TIME(MIN.) = 0.15 Tc(MIN.) = 9.80
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 55.00 = 3335.00 FEET.

FLOW PROCESS FROM NODE 55.00 TO NODE 55.00 IS CODE = 81

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

=====

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.191
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3600
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 76
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5674
SUBAREA AREA(ACRES) = 1.00 SUBAREA RUNOFF(CFS) = 1.15
TOTAL AREA(ACRES) = 98.9 TOTAL RUNOFF(CFS) = 179.70
TC(MIN.) = 9.80
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

FLOW PROCESS FROM NODE 55.00 TO NODE 55.00 IS CODE = 81

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

=====

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.191
RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5687

SUBAREA AREA(ACRES) = 0.60 SUBAREA RUNOFF(CFS) = 1.49
TOTAL AREA(ACRES) = 99.5 TOTAL RUNOFF(CFS) = 180.56
TC(MIN.) = 9.80

FLOW PROCESS FROM NODE 55.00 TO NODE 55.00 IS CODE = 81

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

=====

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.191
RESIDENTAIL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5724
SUBAREA AREA(ACRES) = 1.80 SUBAREA RUNOFF(CFS) = 4.48
TOTAL AREA(ACRES) = 101.3 TOTAL RUNOFF(CFS) = 185.04
TC(MIN.) = 9.80

FLOW PROCESS FROM NODE 55.00 TO NODE 55.00 IS CODE = 81

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

=====

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.191
RESIDENTAIL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 90
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5802
SUBAREA AREA(ACRES) = 7.20 SUBAREA RUNOFF(CFS) = 15.85
TOTAL AREA(ACRES) = 108.5 TOTAL RUNOFF(CFS) = 200.89
TC(MIN.) = 9.80

FLOW PROCESS FROM NODE 55.00 TO NODE 60.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 655.00 DOWNSTREAM(FEET) = 654.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 150.00 CHANNEL SLOPE = 0.0067
CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 10.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 8.00
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.071
RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 86
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 203.29
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.16
AVERAGE FLOW DEPTH(FEET) = 1.58 TRAVEL TIME(MIN.) = 0.60
Tc(MIN.) = 10.41
SUBAREA AREA(ACRES) = 2.60 SUBAREA RUNOFF(CFS) = 4.79
AREA-AVERAGE RUNOFF COEFFICIENT = 0.581
TOTAL AREA(ACRES) = 111.1 PEAK FLOW RATE(CFS) = 200.89

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 1.57 FLOW VELOCITY(FEET/SEC.) = 4.15
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 60.00 = 3485.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)
------------------	-----------------	--------------

1 200.89 10.41
2 181.75 12.07

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 200.89 Tc(MIN.) = 10.41

FLOW PROCESS FROM NODE 60.00 TO NODE 60.00 IS CODE = 81

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

=====

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.071
RESIDENTAIL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 90
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5820
SUBAREA AREA(ACRES) = 1.30 SUBAREA RUNOFF(CFS) = 2.75
TOTAL AREA(ACRES) = 112.4 TOTAL RUNOFF(CFS) = 200.89
TC(MIN.) = 10.41
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

FLOW PROCESS FROM NODE 60.00 TO NODE 65.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 654.00 DOWNSTREAM(FEET) = 650.00
FLOW LENGTH(FEET) = 190.00 MANNING'S N = 0.024
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.55
(PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 200.89
PIPE TRAVEL TIME(MIN.) = 0.70 Tc(MIN.) = 11.10
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 65.00 = 3675.00 FEET.

FLOW PROCESS FROM NODE 65.00 TO NODE 70.00 IS CODE = 51

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 650.00 DOWNSTREAM(FEET) = 648.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 135.00 CHANNEL SLOPE = 0.0148
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 5.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 13.00
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.888
RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 86
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 202.80
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 6.59
AVERAGE FLOW DEPTH(FEET) = 1.68 TRAVEL TIME(MIN.) = 0.34
Tc(MIN.) = 11.44
SUBAREA AREA(ACRES) = 2.20 SUBAREA RUNOFF(CFS) = 3.81
AREA-AVERAGE RUNOFF COEFFICIENT = 0.582
TOTAL AREA(ACRES) = 114.6 PEAK FLOW RATE(CFS) = 200.89

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 1.67 FLOW VELOCITY(FEET/SEC.) = 6.57

LONGEST FLOWPATH FROM NODE 5.00 TO NODE 70.00 = 3810.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)
1	200.89	11.44
2	182.56	13.12

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 200.89 Tc(MIN.) = 11.44

FLOW PROCESS FROM NODE 70.00 TO NODE 75.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 648.00 DOWNSTREAM(FEET) = 645.00

FLOW LENGTH(FEET) = 120.00 MANNING'S N = 0.024

ASSUME FULL-FLOWING PIPELINE

PIPE-FLOW VELOCITY(FEET/SEC.) = 9.54

(PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)

GIVEN PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 200.89

PIPE TRAVEL TIME(MIN.) = 0.21 Tc(MIN.) = 11.65

LONGEST FLOWPATH FROM NODE 5.00 TO NODE 75.00 = 3930.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 114.6 TC(MIN.) = 11.65

PEAK FLOW RATE(CFS) = 200.89

*** PEAK FLOW RATE TABLE ***

	Q(CFS)	Tc(MIN.)
1	200.89	11.65
2	182.56	13.32

=====

END OF RATIONAL METHOD ANALYSIS

EXHIBIT A - DRAINAGE MAP - EXISTING CONDITIONS
FOR
LAKE JENNINGS MARKETPLACE

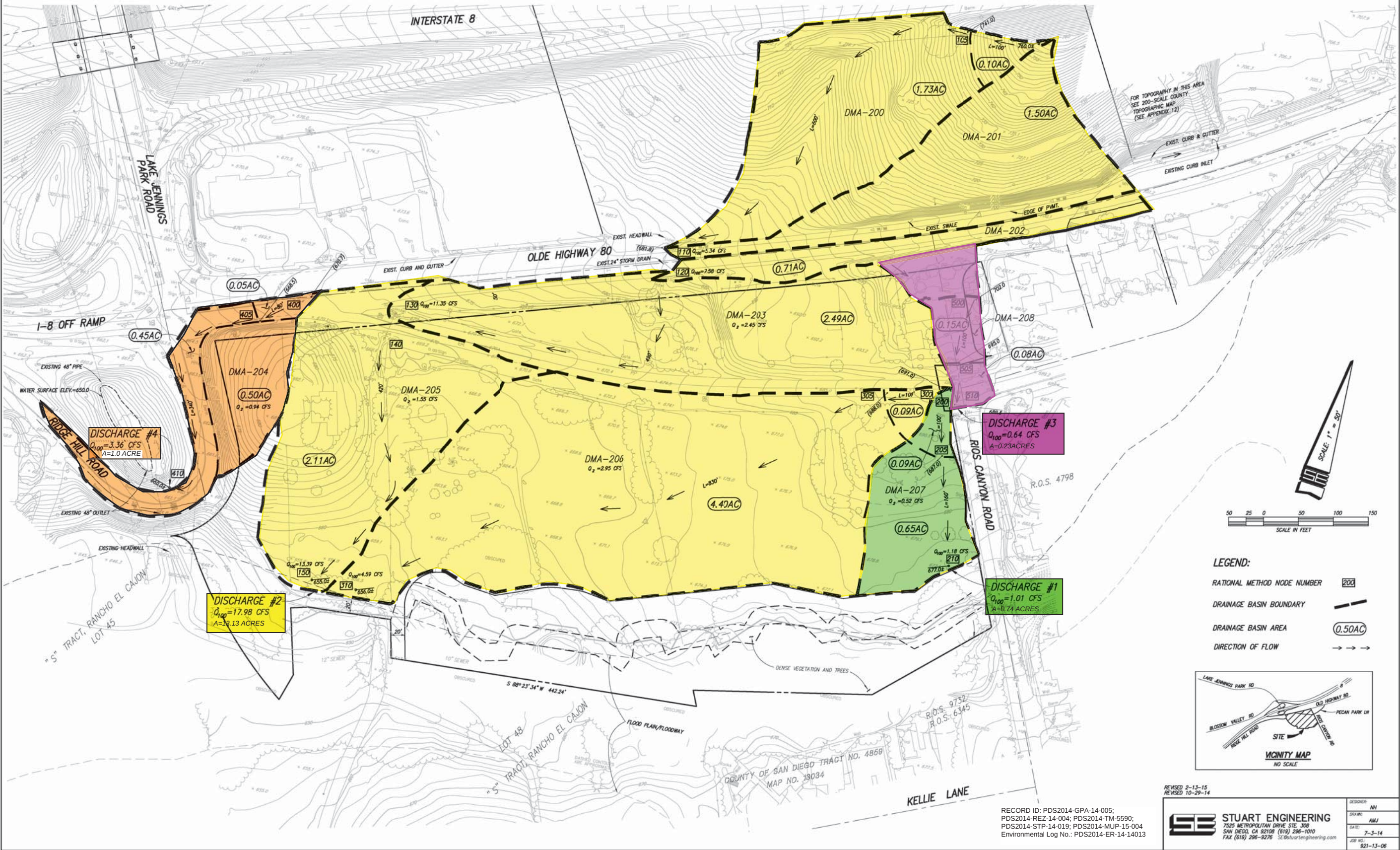
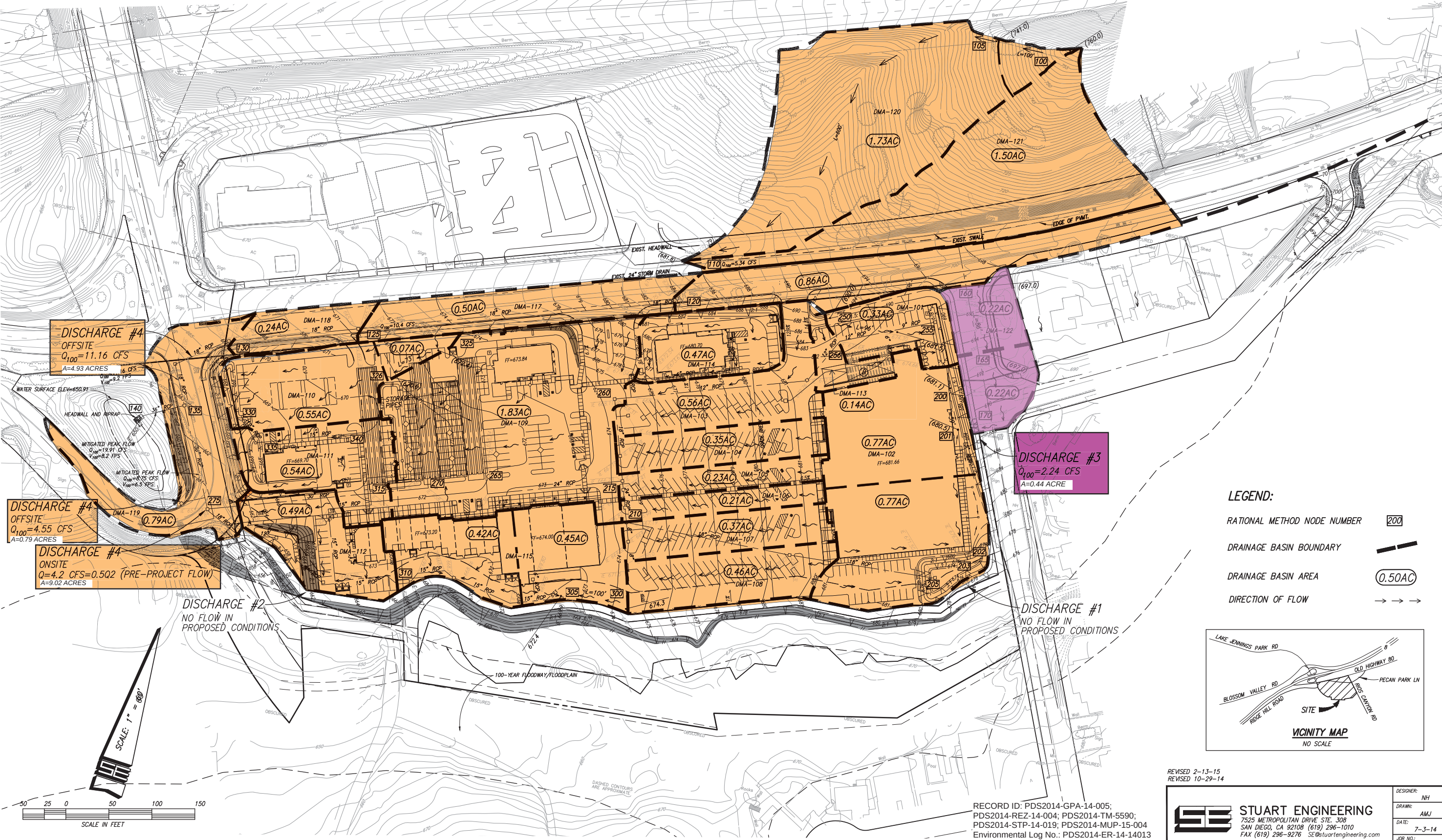
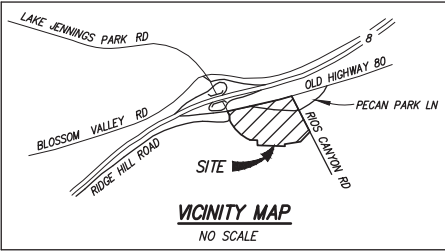


EXHIBIT B - DRAINAGE MAP - PROPOSED CONDITIONS FOR LAKE JENNINGS MARKETPLACE



LEGEND:

- RATIONAL METHOD NODE NUMBER 200
- DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN AREA 0.50AC
- DIRECTION OF FLOW



REVISED 2-13-15
REVISED 10-29-14

RECORD ID: PDS2014-GPA-14-005;
PDS2014-REZ-14-004; PDS2014-TM-5590;
PDS2014-STP-14-019; PDS2014-MUP-15-004
Environmental Log No.: PDS2014-ER-14-14013



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DESIGNER:	NH
DRAWN:	AMJ
DATE:	7-3-14
JOB NO.:	921-13-06

EXHIBIT C - OFFSITE DRAINAGE MAP - EXISTING CONDITIONS

FOR LAKE JENNINGS MARKETPLACE



RECORD ID: PDS2014-GPA-14-005;
PDS2014-REZ-14-004; PDS2014-TM-5590;
PDS2014-STP-14-019; PDS2014-MUP-15-004
Environmental Log No.: PDS2014-ER-14-14013

LAKE JENNINGS MARKETPLACE
DRAINAGE EXHIBIT
EXISTING CONDITIONS- OFFSITE



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EXHIBIT D - FEMA MAP

