TORY R. WALKER ENGINEERING

DRAINAGE REPORT

Las Lomas Grading Project

APN 174-260-15

Vista, California

Land Development No. LD23-004

Grading Permit No. GP23-004

Preparation Date:

August 23, 2023

Prepared for:

Wheeler Family Trust

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CHAPTER 1 - BACKGROUND

1.1 – Introduction

The purpose of this report is to summarize the hydrologic and hydraulic analyses of the proposed rough grading of PM 14659 Parcel E and its associated offsite improvements, including the street widening of Las Lomas and new fire access road (herein referred to as the "Las Lomas Grading Project").

The Las Lomas Grading Project proposes to rough grade APN 174-260-15 in the City of Vista. The site is bound by private roads Las Lomas to the north and Tierra del Cielo to the west.

This report analyzes the pre-project and post-project 100-year Rational Method peak flow rate at two main discharge points associated with the project.

1.2 – Summary of Pre-Project Conditions

The existing site drainage conveyance is urbanized, with undeveloped hillsides contributing runoff to the existing roadway along Las Lomas and Tierra del Cielo. The existing roadway discharges offsite at two main locations: a northern discharge point just northwest of Las Lomas where runoff directly discharges into the King's View Estates private storm drain system, and a southern discharge point just west of the first easterly turn along Tierra del Cielo where runoff drains through a natural drainage system until confluencing with the King's View Estates private storm drain system at Warmlands Avenue.

Runoff from areas beyond the property limits drains onto Las Lomas and Tierra del Cielo. A portion of the proposed graded pad on APN 174-260-15 and three existing developed single-family residences at 1988, 1966, and 1960 Las Lomas contribute runoff onto Las Lomas as sheet flow and shallow concentrated roadside flow before intercepted by a 24-inch diameter corrugated metal pipe (CMP) and draining as shallow concentrated flow to the northerly King's View Estates private storm drain system as described above (also a 24-inch diameter CMP per City of Vista record drawing number D1654). A portion of the proposed graded pad on APN 174-260-15 and an existing developed single-family residence at 1515 Tierra del Cielo contribute runoff onto Tierra del Cielo as sheet flow and shallow concentrated roadside flow before draining to the southerly natural drainage system as described above.

The existing project site drainage conveyance network is described above as sheet flow, shallow concentrated roadside flow, pipe flow, and inlet flow at the designated ultimate discharge points described above.

The pre-project drainage areas consist of approximately 16 acres of offsite and onsite area draining to the northerly discharge point at King's View Estates by way of the above-described flow path and approximately 5 acres of offsite and onsite area draining to the southerly discharge point at the natural drainage system by way of the separate above-described flow path.

The project site is not located within a Federal Emergency Management Agency (FEMA) Special Flood Hazard Area (SFHA). Refer to the National Flood Hazard Layer FIRMette provided in Attachment 9.

1.3 – Summary of Post-Project Conditions

The proposed site drainage conveyance will remain substantially similar to the existing condition as predominantly urbanized and steeply sloping shallow concentrated street flow along Las Lomas and Tierra del Cielo. Each roadway will drain sheet flow onto a proposed Green Streets roadside rock-lined swale via one-foot-wide curb cuts spaced every 15 feet along the existing road profile and proposed fire road. The proposed rock-lined swale will vary between 12 to 15 inches deep, comprised of 9-inch diameter rock underlain by a three-inch gravel filter layer (or filter fabric) and will vary between two to three feet in width. Proposed via vegetated brow ditches atop the cut slopes along the widened portion of Tierra del Cielo and Las Lomas will intercept hillside runoff and discharge concentrated flows onto the proposed Green Streets roadside rock-lined swales at select locations along the road profile. Vegetated brow ditches will be three-feet-wide, twelve-inches-deep, and comprised of Propex Pyramat 25 high performance turf reinforcement mat (HPTRM) (or equivalent). The proposed roadway widening will maintain existing points at the two main locations described previously: a northern discharge point just northwest of Las Lomas where runoff directly discharges into the King's View Estates private storm drain system (D1654), and a southern discharge point just west of the first easterly turn along Tierra del Cielo where runoff drains through a natural drainage system until confluencing with the King's View Estates private storm drain system at Warmlands Avenue.

Runoff from areas beyond the property limits will continue to drain onto Las Lomas and Tierra del Cielo. A portion of the proposed graded pad on APN 174-260-15 and three existing developed single-family residences at 1988, 1966, and 1960 Las Lomas will continue to contribute runoff onto Las Lomas as sheet flow and shallow concentrated roadside flow before intercepted by a newly constructed Type A D-16 inlet and rock-lined swale draining shallow concentrated flow to the existing low point just east of the low point along the existing, undisturbed Tierra del Cielo alignment to the north. Newly created roadway surfaces and existing areas tributary thereto will be hydraulically

isolated and drain to a proposed detention basin to mitigate potential increases in the 100-year peak flow rate due to the proposed widening. Detained outflows will drain just west of the existing Tierra del Cielo sump, where they confluence with the remaining bypassed drainage area before reaching the existing King's View Estates private storm drain system as previously described. A portion of the proposed graded pad on APN 174-260-15 and an existing developed single-family residence at 1515 Tierra del Cielo contribute runoff onto Tierra del Cielo as sheet flow and shallow concentrated roadside flow as in the existing condition. Roadway runoff reaching the Tierra del Cielo sump from the north will continue draining to the existing southerly natural drainage system as previously described.

The proposed project site drainage conveyance network is described above as sheet flow, shallow concentrated roadside and swale flow, pipe flow, and inlet flow at the designated ultimately discharge points described above.

The proposed-project drainage areas will remain similar and consist of approximately 17 acres of onsite and offsite area draining to the northerly discharge point at King's View Estates and approximately 4 acres of onsite and offsite area draining to the southerly discharge point at the natural drainage system. The post-developed hydrology exhibit is provided in Attachment 1.

CHAPTER 2 – HYDROLOGIC ANALYSIS

2.1 – Rational Method

Advanced Engineering Software (AES) was used for computing the pre-project and post-project 100-year Rational Method peak flows. AES computes Rational Method storm runoff based upon the procedure set forth in the San Diego County Hydrology Manual (SDCHM).

The Rational Method analysis is summarized below. All supporting hydrologic parameters are provided in Attachment 2. Rational Method calculations are provided in Attachment 3. Each peak at each time interval is equal to:

$$Q = CIA$$

Where: Q = peak discharge (cfs)
C = runoff coefficient, where:
$C = 0.90 \times (\%\ \text{Impervious}) + C_P \times (1 - \%\ \text{Impervious})$
I = average rainfall intensity, taken at the time of concentration (in/hr)
A = drainage area (ac)

2.1.1 Design Storms

Point precipitation frequencies were selected using National Oceanic and Atmospheric Administration (NOAA) Atlas 14. Point precipitation intensities for varying storm durations were input into AES to construct a rainfall intensity relationship for varying times of concentration. Per the SDCHM, the post-project 100-year peak flow is calculated using the 100-year storm and AMC II.

2.1.2 Soil Type and Land Cover

The pre-project condition at the project site consists of predominantly urbanized and steeply sloping shallow concentrated street flow along Las Lomas and Tierra del Cielo and moderately vegetated hillsides for natural areas. Per the National Resources Conservation Service (NRCS) Web Soil Survey (WSS), the subject site is predominantly underlain by Hydrologic Soil Group (HSG) Type D. The post-project land cover remains substantially similar to the pre-project condition. Due to the uniquely steep conditions of natural adjacent hillsides—factors that are not taken into consideration per the SDCHM runoff coefficients—Caltrans runoff coefficients were selected for said portions of the hydrologic analysis to determine the pervious coefficient runoff value (C_p). SDCHM pervious runoff coefficients were utilized for flat areas. Additionally, the initial time of concentration included two additional

minutes be added (per the Kirpich formula) in accordance with the SDCHM for natural or rural watersheds. Best professional judgment informs this modification to the hydrologic approach, as strict adherence to the SDCHM Rational Method procedure for areas with steep, natural hillsides tends to underestimate the amount of runoff generated. Therefore, this modification lends itself to a more conservative approach than what is prescribed by the SDCHM. Runoff coefficients are summarized in Table 1:

Table 1: Rational Method Runoff Coefficient Summary

Condition	U/S Node	D/S Node	Area (acres)	Percent Impervious	C_p	Runoff Coefficient
Pre-Project	100	102	0.74	0%	0.60	0.60
	102	104	3.55	30%	0.60	0.69
	108.1	108	7.96	3%	0.60	0.61
	110	112	4.02	1%	0.60	0.60
	200	202	0.10	0%	0.60	0.60
	202	204	2.59	8%	0.60	0.62
	204.1	204	1.36	0%	0.60	0.60
	204	206	0.92	25%	0.60	0.68
	206.1	206	0.08	100%	N/A	0.90
Post-Project	100	102	0.74	0%	0.60	0.60
	102	104	3.67	30%	0.60	0.69
	104.1	104	0.59	0%	0.60	0.60
	106	108	0.23	64%	0.60	0.79
	110.1	110	0.29	0%	0.60	0.60
	114.1	114	9.37	3%	0.60	0.61
	112	114	2.11	4%	0.60	0.61
	114.1	114	0.02	80%	0.60	0.84
	200	202	0.18	0%	0.35	0.60
	202	204	1.34	0%	0.60	0.60
	206.1	206	0.30	25%	0.60	0.68
	206	208	0.05	40%	0.60	0.72
	208.1	208	1.29	0%	0.60	0.60
	208	210	0.27	25%	0.60	0.68
	210.1	210	0.20	0%	0.60	0.60
	210	212	0.14	100%	N/A	0.90
	212.1	212	0.51	61%	0.60	0.78
	212.2	212	0.14	90%	0.35	0.85

2.1.3 Peak Flow Summary

The Rational Method results are summarized in Table 2:

Table 2: 100-Year Rational Method Peak Flow Summary

Condition	Discharge Point	AES Node	Peak Flow (cfs)	Area (acres)	Average Runoff Coefficient	Time of Concentration (min)
Pre-Project	1 (North)	112.0	30.84	16.24	0.63	11.24
	2 (South)	206.0	10.69	5.05	0.63	9.32
Post-Project	1 (North)	114.0	32.07	17.01	0.63	11.59
	2 (South)	212.0	9.58	4.41	0.65	9.43

Based upon the Rational Method analysis, the increase in peak flow was determined to be roughly four percent greater (+1.23 cfs) and ten percent lower (-1.11 cfs) at the northern and southerly discharge points, respectively. Due to the minor increase in peak flow to the northern discharge point and the existing storm drain within King's View, detention is proposed for the 100-year peak flow. The decrease in peak flow to the southern discharge point improves upon existing conditions and warrants no detention. Therefore, detention at the northern discharge point is proposed for the 100-year peak flow. The onsite detention analysis is described in the following section.

Future improvements on Parcel E will feature onsite pollutant removal, hydromodification flow control, and 100-year detention facilities are and are omitted from this report.

2.2 – Rational Method Hydrograph

The unattenuated pre-project and post-project Rational Method Hydrographs were calculated following the procedure prescribed by SDCHM Section 6.2, as all drainage areas are less than one square mile in size. Hydrograph time series and parameter calculations are provided in Attachments 4 and 5.

The design objective was to attenuate the post-developed peak flow to a rate equal to or less than the pre-project condition at the northern discharge point. Pre-project and post-project hydrology maps are provided in Attachment 1. The pre-project and post-project drainage area parameters presented in Table 2 were used to construct the corresponding Rational Method hydrograph.

All watershed and hydrograph parameters were selected in a manner consistent with those used in the Rational Method analysis. NOAA Atlas 14 was used to determine point precipitation depths at the project site. Soil Type and Atlas 14 information is provided in Attachment 2.

Hydrograph routing was completed using the Modified Puls Method in EPA SWMM for the 100-year storm event. A storage curve (depth vs. area) and a rating curve (depth vs. discharge) was developed to create the basin surface storage and flow control structure properties in SWMM. Hydraulic routing through the flow control riser begins at the invert of the lowest surface discharge outlet in the overflow riser and extends upward to the lowest basin wall elevation. The storage and rating curves are provided in Attachment 7.

The proposed detention facility is comprised of two main components: surface basin and a precast grated inlet with several orifices at varying elevations for flow control. The proposed flow control facility allows for the requisite level of flow control and conveyance of detained outflows flows to the designated discharge point in the same manner as the pre-project condition. Detailed outlet structure specifications are provided in Attachment 7. The general detention system specifications are provided in Table 3 below:

Table 3: Detention System Specifications

Surface Storage Bottom Area (sf)	Surface Storage Top Area (sf)	Maximum Detention Depth (ft)	Total Static Detention Volume (cf)
3,785	5,570	3.80	17,687

Complete hydrograph and detention routing data are provided in Attachments 4 through 7. The hydrograph routing analyses are summarized in Figure 1 and Table 4 below:

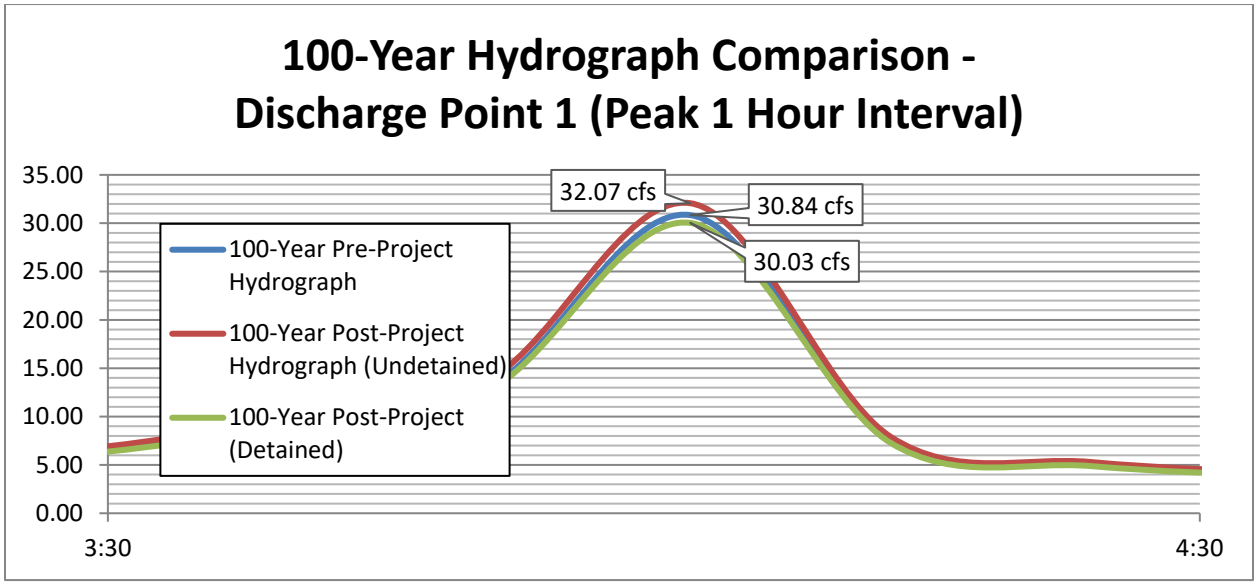


Figure 1: Hydrograph Comparison

Table 4: Rational Method Hydrograph Detention Summary at Northern Discharge Point

Storm Event	Peak Flow (cfs)			
	Pre-Development	Post-Development	Mitigated	% Pre-Development
100-yr 6-hour	30.84	32.07	30.03	97%

When considering the differential between the pre-project and mitigated post-project 100-year 6-hour hydrographs, we find that the provided detention reduces the outflow to a level approximately three percent lower than the pre-project condition peak flow. The proposed detention facility provides a level of flood protection that exceeds the criteria set forth by the City of Vista for increased runoff criteria and the project is therefore not expected to result in adverse upstream or downstream impacts.

CHAPTER 3 – HYDRAULIC ANALYSIS

3.1 – Storm Drain and Swale Hydraulics

The 100-year storm Rational Method peak flows were used for onsite pipe sizing. Pipes were assumed to be either RCP, with a roughness coefficient of n = 0.013. Manning's equation was used to calculate normal depths. Pipes were determined to be adequately sized if they can flow without pressurizing during a 100-year storm event. Roadside swales and wall brow ditches were modeled to assume conveyance of the 100-year flow from the tributary area without overtopping. Manning's roughness coefficients of 0.035 and 0.030 were used for rock-lined and vegetated brow ditches, respectively.

The normal depth calculations demonstrate that the proposed storm drain system is expected to function under open channel flow conditions. Refer to Attachment 3 for pipe and swale flow calculations.

3.2 – Energy Dissipation

All proposed riprap dissipation pads were conservatively specified to feature one-quarter ton riprap, as the velocity at all riprap pads is assumed to fall below 12 feet per second (fps). One exception to this assumption was at the outlet of the detention basin outflow pipe, where one-half ton riprap is proposed (as an added measure of safety, despite the velocities thereto estimated at less than 12 fps). Refer to Attachment 3 for pipe velocities. Reference standards are provided in Attachment 9.

CHAPTER 4 – CONCLUSION

Our analysis demonstrates that the Las Lomas Grading Project is expected to:

1. Provide adequately sized storm drain and energy dissipation to convey onsite flows to the downstream drainage systems
2. Not create a significant alteration at the northern discharge point as a result of the proposed grading and associated improvements
3. Result in a reduction in peak flow rate at the northern discharge point due to the proposed detention basin and flow control structure
4. Result in a reduction in peak flow rate at the southern discharge point without the need for a detention facility

REFERENCES

1. San Diego County, Hydrology Manual, June 2003.

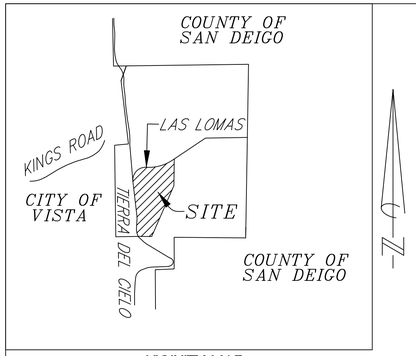
2. California Department of Transportation (Caltrans), Highway Design Manual, July 2020.

3. Federal Emergency Management Agency, National Flood Hazard Layer FIRMette, April 2021.

Attachment 1

Hydrology Exhibits

EXISTING CONDITION DRAINAGE EXHIBIT
LAS LOMAS GRADING PROJECT
CITY OF VISTA, CA



VICINITY MAP
NOT TO SCALE

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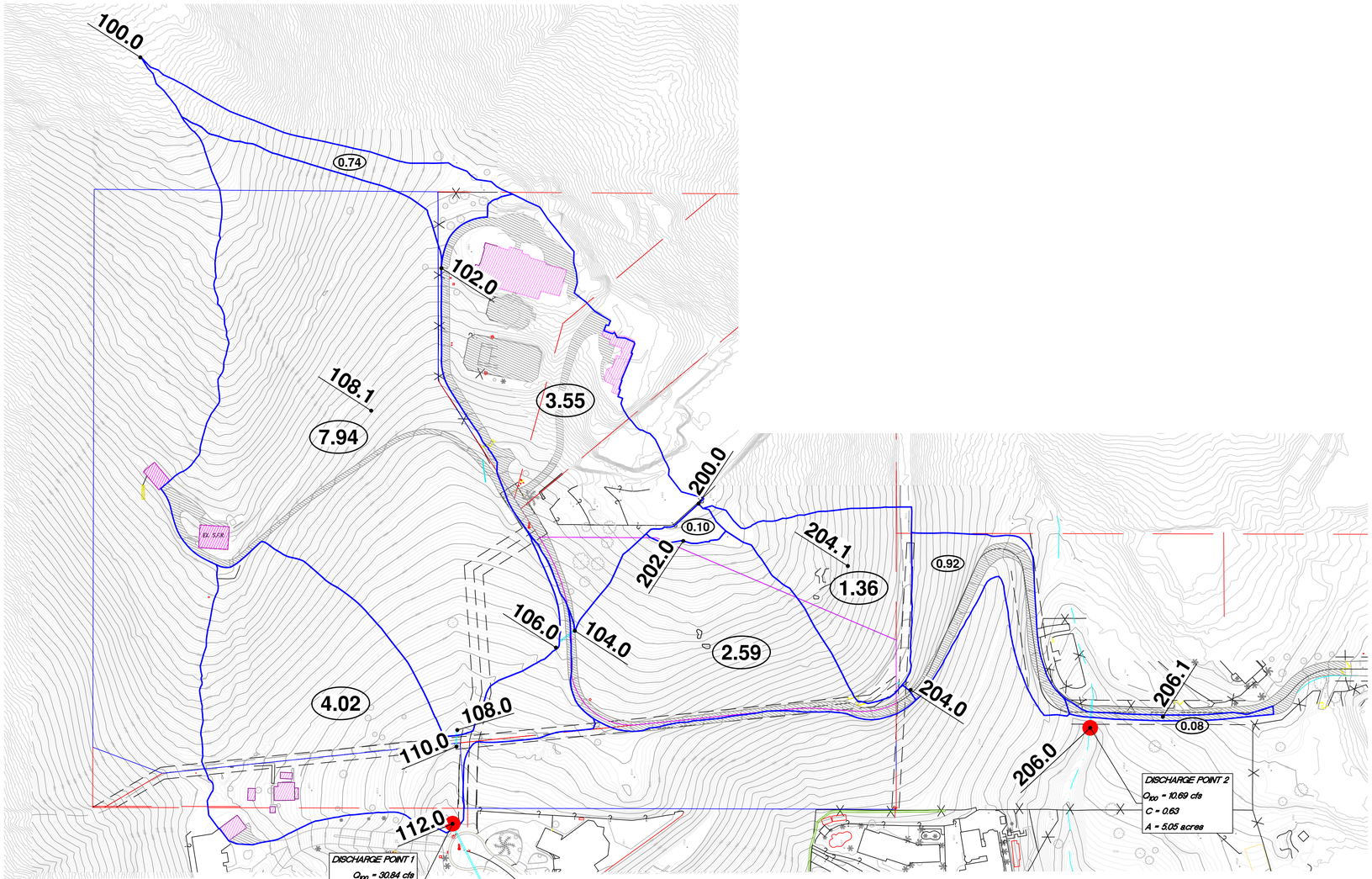
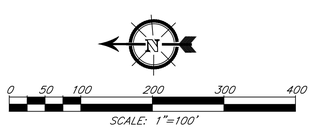
EXHIBIT LEGEND AND SYMBOLOGY

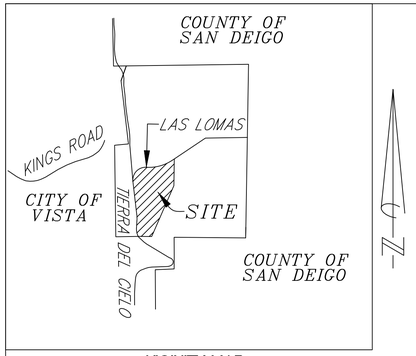
- PARCEL BOUNDARY
- PARCEL MAP 2626 BOUNDARY
- OFFSITE PARCEL BOUNDARY
- DRAINAGE AREA BOUNDARY
- EXISTING PRIVATE STORM DRAIN
- 1280 — EXISTING CONTOUR LINE
- DISCHARGE POINT
- EXISTING AC/CONCRETE/DRIVEWAY/HARDSCAPE
- EXISTING STRUCTURE ROOFTOP
- XXX.X — AES HYDROLOGIC NODE IDENTIFIER
- Y.YY — DRAINAGE AREA ACREAGE





CITY OF VISTA	1 OF 2 SHEETS
EXISTING CONDITION DRAINAGE EXHIBIT LAS LOMAS GRADING PROJECT	

PROPOSED CONDITION DRAINAGE EXHIBIT
LAS LOMAS GRADING PROJECT
CITY OF VISTA, CA



VICINITY MAP
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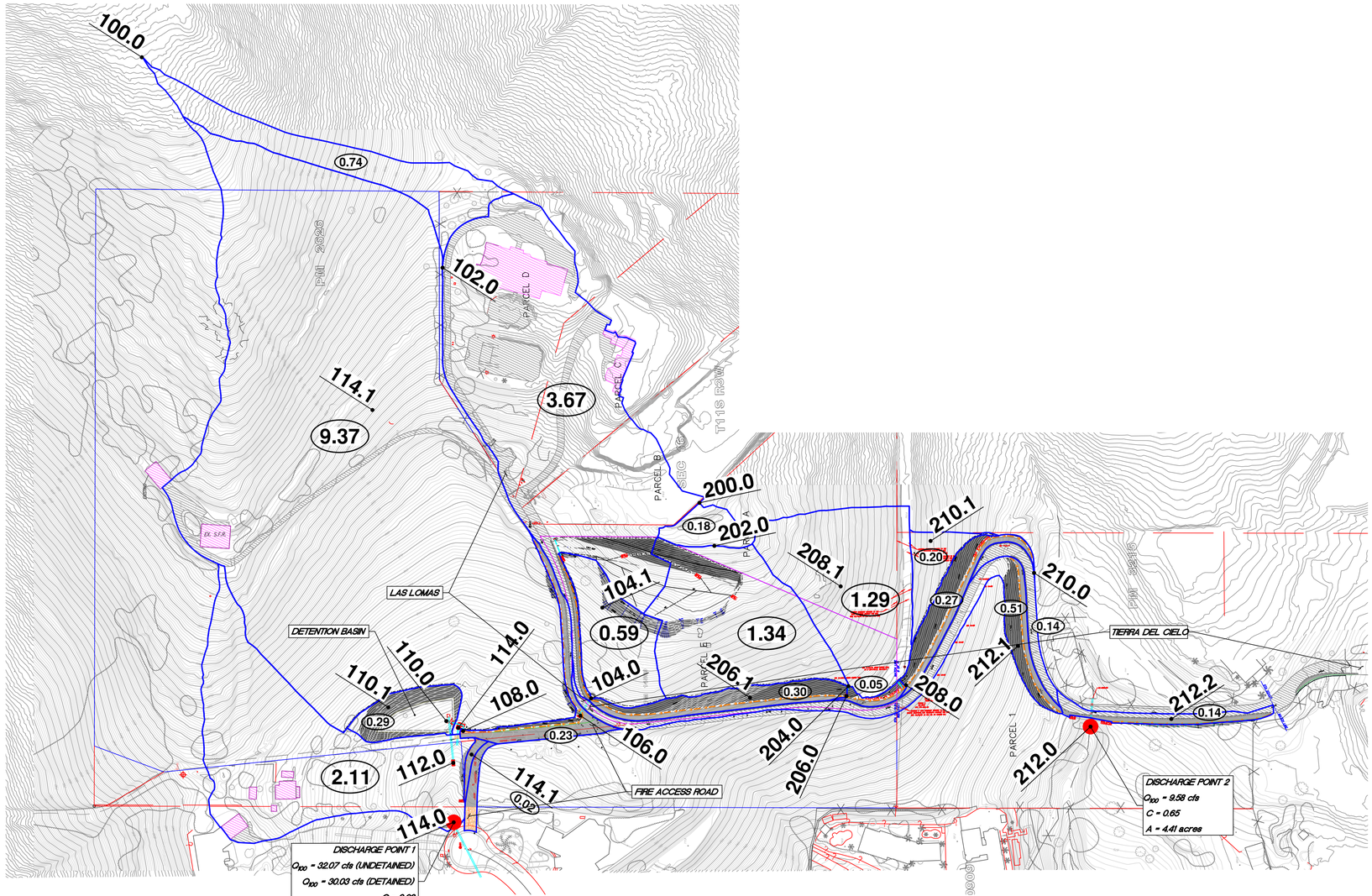
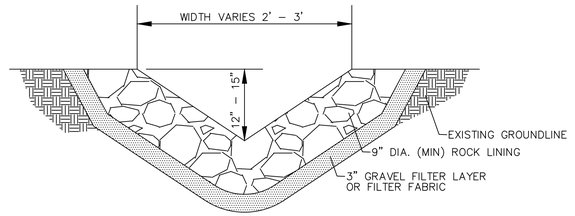
EXHIBIT LEGEND AND SYMBOLOGY

- PARCEL E BOUNDARY
- PARCEL MAP 2626 BOUNDARY
- OFFSITE PARCEL BOUNDARY
- DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY
- SELF-MITIGATING DMA BOUNDARY
- ROCK-LINED SWALE FLOWLINE
- PROPOSED PRIVATE STORM DRAIN
- EXISTING PRIVATE STORM DRAIN
- 1280 EXISTING CONTOUR LINE
- DISCHARGE POINT
- PROPOSED AC SURFACE
- PROPOSED DECOMPOSED GRANITE
- EXISTING AC/CONCRETE AREA
- EXISTING STRUCTURE ROOFTOP
- XXX.X AES HYDROLOGIC NODE IDENTIFIER
- Y.YY DRAINAGE AREA ACREAGE



GENERAL NOTES

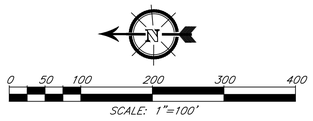
1. PROJECT PROPOSES A STREET WIDENING DESIGNED IN ACCORDANCE WITH USEPA GREEN STREETS FEATURES.
2. PROPOSED GREEN STREETS FEATURES PROVIDE SOURCE CONTROL OF STORMWATER, LIMITS ITS TRANSPORT AND POLLUTANT CONVEYANCE TO THE COLLECTION SYSTEM, RESTORE PREDEVELOPMENT HYDROLOGY TO THE MAXIMUM EXTENT PRACTICABLE (MEP), AND PROVIDE ENVIRONMENTALLY ENHANCED ROADS. POTENTIAL FOR INCREASED RUNOFF FOR GREEN STREETS AREAS NOT DRAINING TO A DETENTION FACILITY ARE REASONABLY ASSUMED TO BE NEGLIGIBLE.



ROCK LINED SWALE
NTS

NOTES:

1. ROCK LINING TO BE INSTALLED TO FORM A STABLE STRUCTURE WITH A MINIMUM OF VOIDS, AND EACH PLACED IN CONTACT WITH ADJACENT ROCKS.
2. ROCK LINING SHALL BE SOUND, DENSE, AND DURABLE ANGULAR ROCK WITH A MINIMUM SPECIFIC GRAVITY OF 2.6.
3. ROCK LINED CHANNELS LARGER THAN THE DIMENSIONS SHOWN, OR ON SLOPES STEEPER THAN 5% SHALL BE DESIGNED BY A CIVIL ENGINEER.
4. IF A GRAVEL FILTER LAYER IS SUBSTITUTED FOR FILTER FABRIC, MATERIAL SHALL BE A MIXTURE OF CLEAN, WASHED SAND AND GRAVEL, COMPRISED OF MATERIAL LESS THAN 1-1/2" DIAMETER IN SIZE.
5. CHECK DAMS MAY BE INSTALLED IN ROCK LINED SWALE DEPENDING UPON APPLICATION AND SITE CONDITIONS.

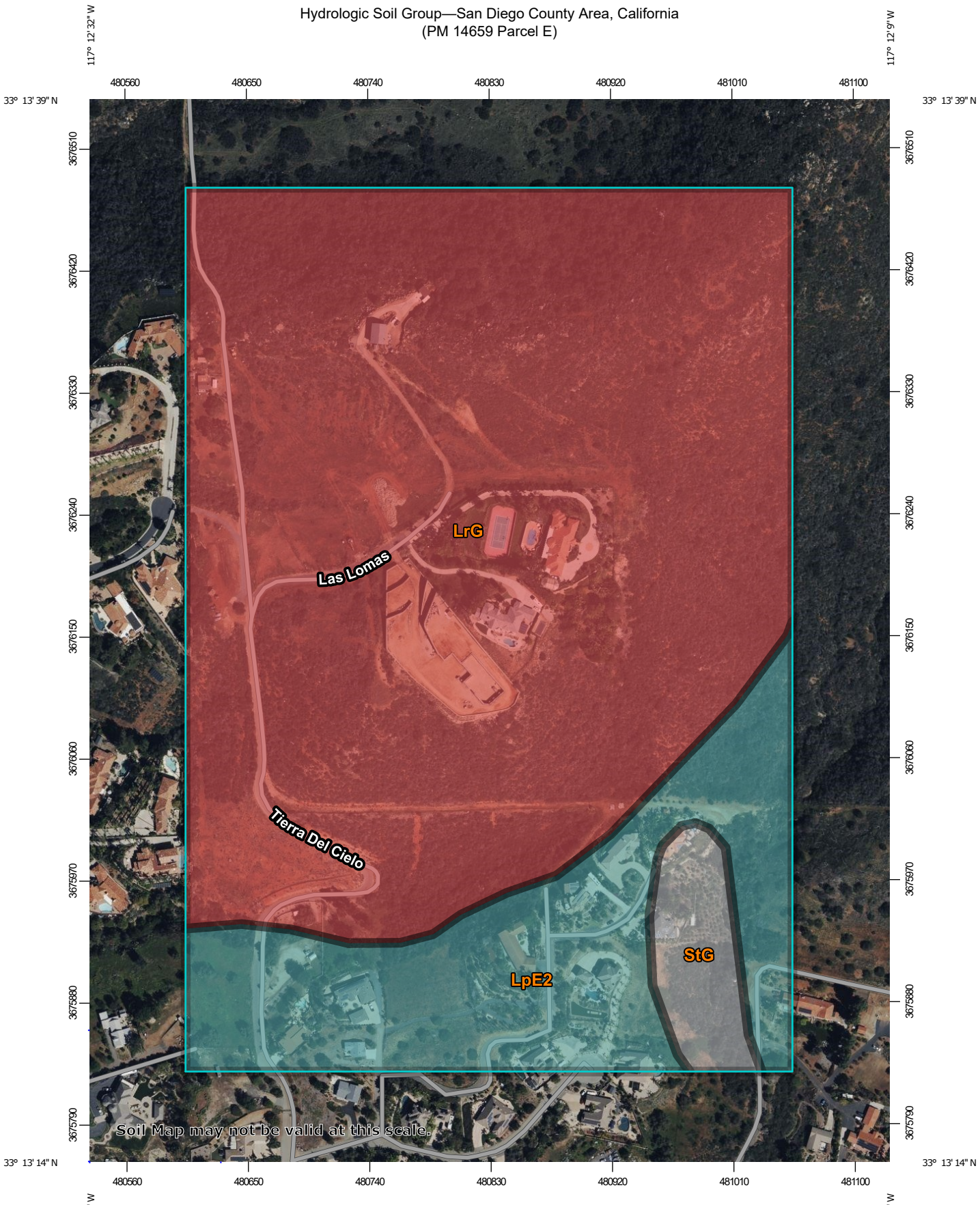


CITY OF VISTA	
PROPOSED CONDITION DRAINAGE EXHIBIT LAS LOMAS GRADING PROJECT	2 OF 2 SHEETS

Attachment 2

Hydrologic Parameters

Hydrologic Soil Group—San Diego County Area, California
(PM 14659 Parcel E)



Map Scale: 1:3,830 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
LpE2	Las Posas fine sandy loam, 15 to 30 percent slopes, eroded	C	14.7	20.2%
LrG	Las Posas loam, 30 to 65 percent slopes, stony	D	55.5	76.2%
StG	Steep gullied land		2.6	3.6%
Totals for Area of Interest			**72.8**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOAA Atlas 14, Volume 6, Version 2
Location name: Vista, California, USA*
Latitude: 33.2256°, Longitude: -117.206°
Elevation: 949.76 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.122** (0.103-0.146)	**0.154** (0.129-0.184)	**0.197** (0.165-0.237)	**0.233** (0.194-0.284)	**0.285** (0.229-0.359)	**0.327** (0.257-0.422)	**0.371** (0.284-0.491)	**0.419** (0.310-0.571)	**0.486** (0.344-0.692)	**0.540** (0.369-0.798)
10-min	**0.175** (0.147-0.210)	**0.220** (0.185-0.264)	**0.282** (0.236-0.340)	**0.334** (0.278-0.406)	**0.409** (0.328-0.515)	**0.469** (0.368-0.604)	**0.532** (0.407-0.704)	**0.600** (0.445-0.818)	**0.696** (0.493-0.992)	**0.774** (0.529-1.14)
15-min	**0.212** (0.178-0.254)	**0.266** (0.224-0.320)	**0.341** (0.286-0.411)	**0.404** (0.336-0.491)	**0.495** (0.397-0.623)	**0.567** (0.445-0.731)	**0.644** (0.492-0.852)	**0.726** (0.538-0.989)	**0.842** (0.597-1.20)	**0.936** (0.639-1.38)
30-min	**0.302** (0.254-0.362)	**0.380** (0.319-0.456)	**0.486** (0.408-0.586)	**0.577** (0.480-0.701)	**0.706** (0.566-0.889)	**0.809** (0.635-1.04)	**0.919** (0.702-1.22)	**1.04** (0.767-1.41)	**1.20** (0.851-1.71)	**1.34** (0.912-1.97)
60-min	**0.432** (0.364-0.518)	**0.543** (0.457-0.652)	**0.696** (0.584-0.838)	**0.825** (0.686-1.00)	**1.01** (0.809-1.27)	**1.16** (0.908-1.49)	**1.31** (1.00-1.74)	**1.48** (1.10-2.02)	**1.72** (1.22-2.45)	**1.91** (1.30-2.82)
2-hr	**0.603** (0.508-0.723)	**0.755** (0.635-0.907)	**0.964** (0.809-1.16)	**1.14** (0.949-1.39)	**1.39** (1.12-1.76)	**1.60** (1.25-2.06)	**1.81** (1.38-2.40)	**2.04** (1.51-2.78)	**2.37** (1.68-3.38)	**2.63** (1.80-3.89)
3-hr	**0.726** (0.611-0.870)	**0.909** (0.765-1.09)	**1.16** (0.973-1.40)	**1.37** (1.14-1.67)	**1.68** (1.34-2.11)	**1.92** (1.50-2.47)	**2.17** (1.66-2.88)	**2.45** (1.82-3.34)	**2.84** (2.01-4.04)	**3.15** (2.15-4.66)
6-hr	**0.985** (0.830-1.18)	**1.24** (1.04-1.48)	**1.58** (1.32-1.90)	**1.87** (1.55-2.27)	**2.27** (1.82-2.87)	**2.60** (2.04-3.35)	**2.94** (2.25-3.89)	**3.31** (2.45-4.51)	**3.82** (2.71-5.45)	**4.24** (2.89-6.26)
12-hr	**1.31** (1.10-1.57)	**1.64** (1.38-1.97)	**2.10** (1.76-2.52)	**2.47** (2.06-3.01)	**3.01** (2.41-3.79)	**3.43** (2.69-4.41)	**3.86** (2.95-5.11)	**4.32** (3.21-5.89)	**4.97** (3.52-7.08)	**5.48** (3.75-8.11)
24-hr	**1.65** (1.45-1.90)	**2.08** (1.84-2.41)	**2.66** (2.34-3.09)	**3.15** (2.75-3.68)	**3.82** (3.23-4.60)	**4.34** (3.60-5.34)	**4.88** (3.96-6.15)	**5.45** (4.30-7.05)	**6.24** (4.73-8.39)	**6.86** (5.03-9.53)
2-day	**2.04** (1.80-2.35)	**2.61** (2.31-3.02)	**3.38** (2.97-3.92)	**4.01** (3.50-4.69)	**4.88** (4.13-5.89)	**5.56** (4.61-6.84)	**6.25** (5.07-7.87)	**6.98** (5.51-9.02)	**7.97** (6.05-10.7)	**8.76** (6.43-12.2)
3-day	**2.27** (2.01-2.63)	**2.94** (2.60-3.41)	**3.83** (3.37-4.45)	**4.57** (3.99-5.34)	**5.58** (4.72-6.73)	**6.36** (5.28-7.83)	**7.17** (5.81-9.03)	**8.01** (6.32-10.4)	**9.16** (6.95-12.3)	**10.1** (7.39-14.0)
4-day	**2.49** (2.20-2.88)	**3.25** (2.86-3.76)	**4.25** (3.74-4.93)	**5.08** (4.43-5.94)	**6.22** (5.26-7.51)	**7.11** (5.90-8.75)	**8.03** (6.50-10.1)	**8.98** (7.09-11.6)	**10.3** (7.80-13.8)	**11.3** (8.31-15.7)
7-day	**2.88** (2.55-3.33)	**3.80** (3.35-4.39)	**5.02** (4.41-5.82)	**6.03** (5.27-7.06)	**7.45** (6.30-8.99)	**8.56** (7.10-10.5)	**9.71** (7.87-12.2)	**10.9** (8.62-14.1)	**12.6** (9.57-17.0)	**14.0** (10.2-19.4)
10-day	**3.18** (2.81-3.68)	**4.21** (3.72-4.88)	**5.61** (4.93-6.51)	**6.78** (5.92-7.93)	**8.42** (7.12-10.2)	**9.73** (8.07-12.0)	**11.1** (8.99-14.0)	**12.5** (9.89-16.2)	**14.6** (11.0-19.6)	**16.2** (11.9-22.5)
20-day	**3.83** (3.39-4.43)	**5.14** (4.53-5.95)	**6.94** (6.11-8.05)	**8.48** (7.40-9.91)	**10.7** (9.03-12.9)	**12.4** (10.3-15.3)	**14.3** (11.6-18.0)	**16.3** (12.9-21.1)	**19.2** (14.6-25.8)	**21.5** (15.8-29.9)
30-day	**4.59** (4.05-5.30)	**6.19** (5.46-7.16)	**8.40** (7.39-9.75)	**10.3** (9.01-12.1)	**13.1** (11.1-15.8)	**15.3** (12.7-18.9)	**17.7** (14.4-22.3)	**20.3** (16.1-26.3)	**24.1** (18.3-32.4)	**27.2** (19.9-37.8)
45-day	**5.44** (4.81-6.29)	**7.34** (6.47-8.49)	**10.0** (8.80-11.6)	**12.3** (10.8-14.4)	**15.7** (13.3-18.9)	**18.5** (15.3-22.7)	**21.5** (17.4-27.1)	**24.8** (19.6-32.0)	**29.5** (22.4-39.7)	**33.5** (24.6-46.6)
60-day	**6.38** (5.63-7.38)	**8.57** (7.56-9.92)	**11.7** (10.3-13.5)	**14.4** (12.6-16.8)	**18.4** (15.5-22.2)	**21.7** (18.0-26.7)	**25.3** (20.5-31.9)	**29.3** (23.1-37.9)	**35.1** (26.6-47.2)	**40.0** (29.4-55.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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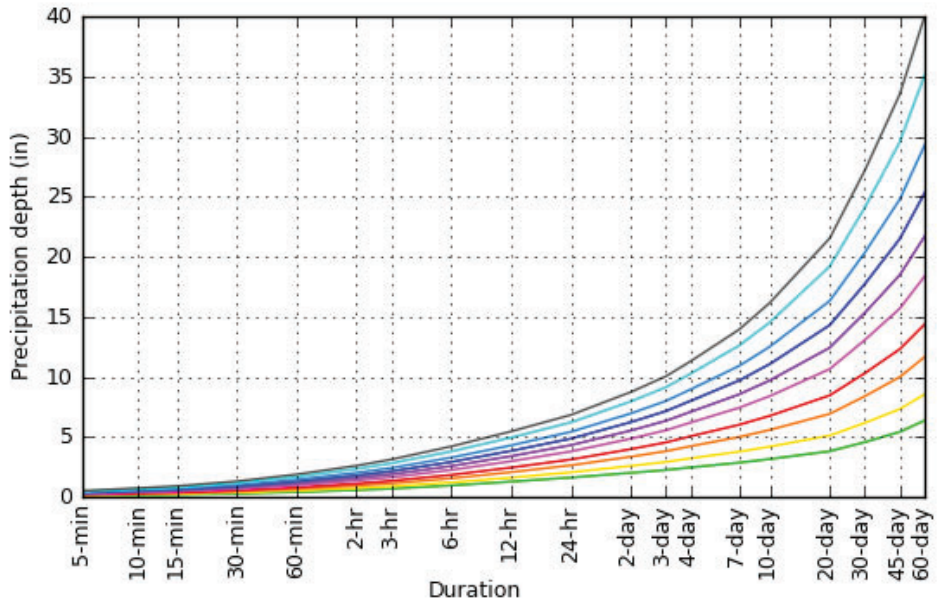
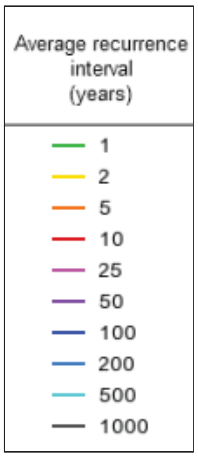
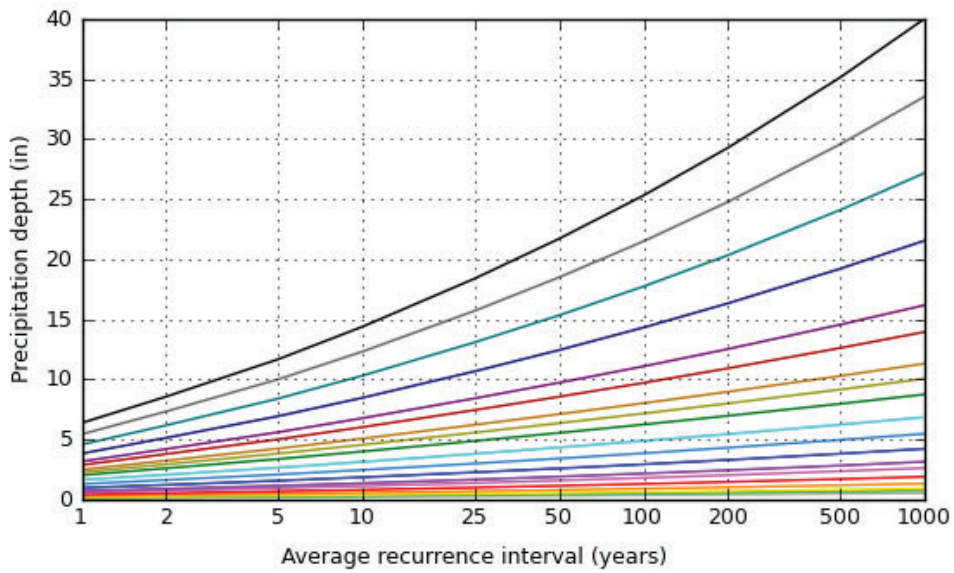
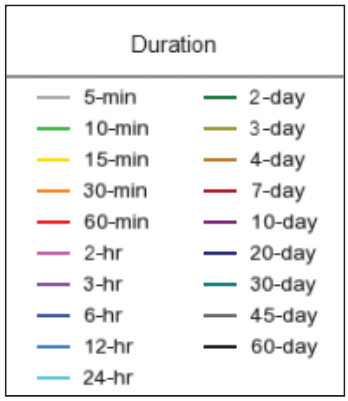
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 33.2256°, Longitude: -117.2060°









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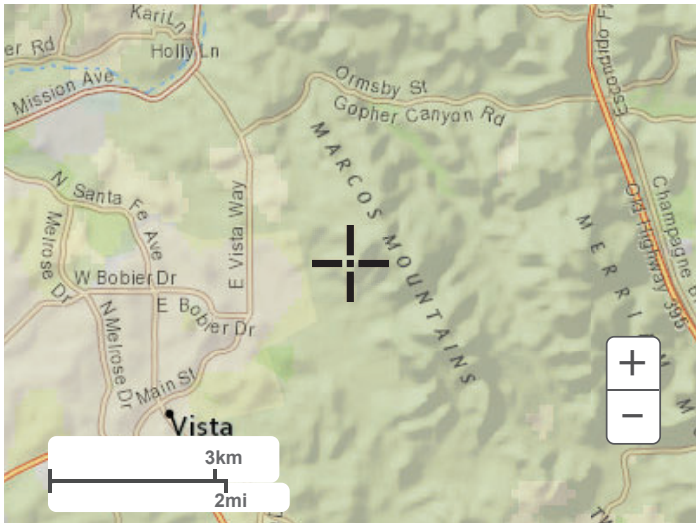
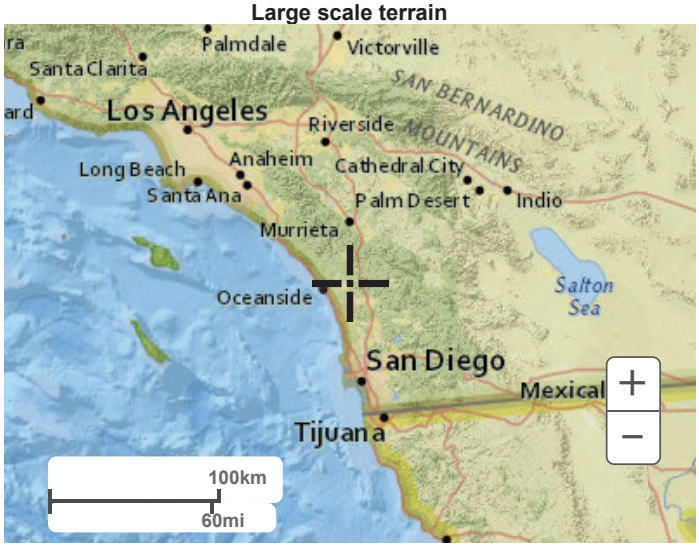
Maps & aerials

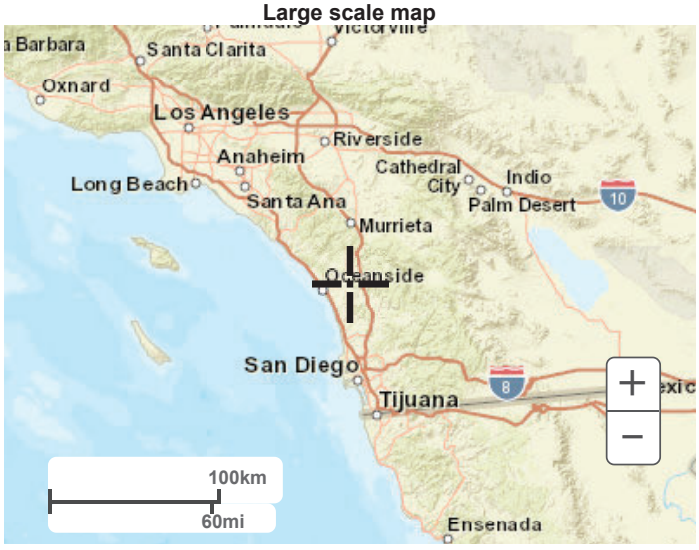
Small scale terrain



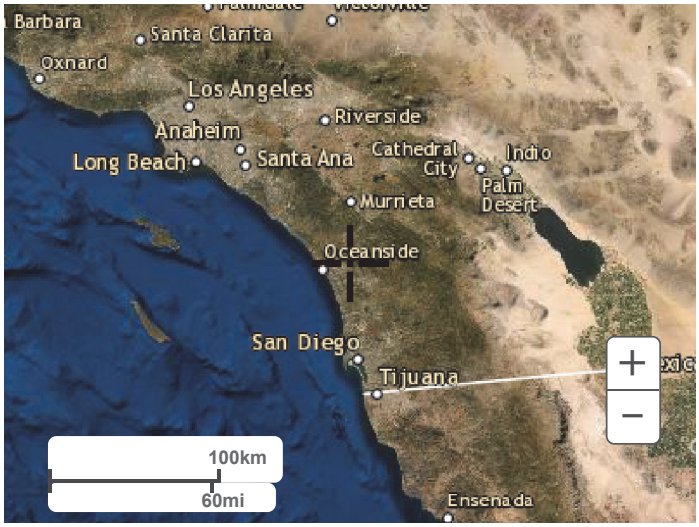
Large scale terrain



Large scale map



Large scale aerial



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Disclaimer

NOAA Atlas 14, Volume 6, Version 2
Location name: Vista, California, USA*
Latitude: 33.2256°, Longitude: -117.206°
Elevation: 949.76 ft**
* source: ESRI Maps
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POINT PRECIPITATION FREQUENCY ESTIMATES

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PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.46** (1.24-1.75)	**1.85** (1.55-2.21)	**2.36** (1.98-2.84)	**2.80** (2.33-3.41)	**3.42** (2.75-4.31)	**3.92** (3.08-5.06)	**4.45** (3.41-5.89)	**5.03** (3.72-6.85)	**5.83** (4.13-8.30)	**6.48** (4.43-9.58)
10-min	**1.05** (0.882-1.26)	**1.32** (1.11-1.58)	**1.69** (1.42-2.04)	**2.00** (1.67-2.44)	**2.45** (1.97-3.09)	**2.81** (2.21-3.62)	**3.19** (2.44-4.22)	**3.60** (2.67-4.91)	**4.18** (2.96-5.95)	**4.64** (3.17-6.86)
15-min	**0.848** (0.712-1.02)	**1.06** (0.896-1.28)	**1.36** (1.14-1.64)	**1.62** (1.34-1.96)	**1.98** (1.59-2.49)	**2.27** (1.78-2.92)	**2.58** (1.97-3.41)	**2.90** (2.15-3.96)	**3.37** (2.39-4.80)	**3.74** (2.56-5.53)
30-min	**0.604** (0.508-0.724)	**0.760** (0.638-0.912)	**0.972** (0.816-1.17)	**1.15** (0.960-1.40)	**1.41** (1.13-1.78)	**1.62** (1.27-2.09)	**1.84** (1.40-2.43)	**2.07** (1.53-2.82)	**2.40** (1.70-3.42)	**2.67** (1.82-3.95)
60-min	**0.432** (0.364-0.518)	**0.543** (0.457-0.652)	**0.696** (0.584-0.838)	**0.825** (0.686-1.00)	**1.01** (0.809-1.27)	**1.16** (0.908-1.49)	**1.31** (1.00-1.74)	**1.48** (1.10-2.02)	**1.72** (1.22-2.45)	**1.91** (1.30-2.82)
2-hr	**0.302** (0.254-0.362)	**0.378** (0.318-0.454)	**0.482** (0.404-0.580)	**0.571** (0.474-0.694)	**0.697** (0.559-0.878)	**0.798** (0.626-1.03)	**0.906** (0.692-1.20)	**1.02** (0.756-1.39)	**1.18** (0.840-1.69)	**1.32** (0.900-1.95)
3-hr	**0.242** (0.203-0.290)	**0.303** (0.255-0.364)	**0.386** (0.324-0.466)	**0.457** (0.380-0.556)	**0.558** (0.448-0.703)	**0.639** (0.501-0.823)	**0.724** (0.553-0.958)	**0.816** (0.604-1.11)	**0.945** (0.670-1.35)	**1.05** (0.717-1.55)
6-hr	**0.164** (0.139-0.197)	**0.206** (0.174-0.248)	**0.264** (0.221-0.317)	**0.312** (0.259-0.379)	**0.380** (0.305-0.478)	**0.434** (0.341-0.559)	**0.491** (0.375-0.650)	**0.552** (0.409-0.753)	**0.638** (0.452-0.909)	**0.707** (0.483-1.05)
12-hr	**0.108** (0.091-0.130)	**0.136** (0.115-0.164)	**0.174** (0.146-0.209)	**0.205** (0.171-0.250)	**0.249** (0.200-0.314)	**0.284** (0.223-0.366)	**0.321** (0.245-0.424)	**0.359** (0.266-0.489)	**0.412** (0.292-0.588)	**0.455** (0.311-0.673)
24-hr	**0.069** (0.061-0.079)	**0.087** (0.076-0.100)	**0.111** (0.098-0.129)	**0.131** (0.114-0.153)	**0.159** (0.135-0.192)	**0.181** (0.150-0.223)	**0.204** (0.165-0.256)	**0.227** (0.179-0.294)	**0.260** (0.197-0.350)	**0.286** (0.210-0.397)
2-day	**0.042** (0.037-0.049)	**0.054** (0.048-0.063)	**0.070** (0.062-0.082)	**0.084** (0.073-0.098)	**0.102** (0.086-0.123)	**0.116** (0.096-0.142)	**0.130** (0.106-0.164)	**0.145** (0.115-0.188)	**0.166** (0.126-0.223)	**0.182** (0.134-0.253)
3-day	**0.032** (0.028-0.036)	**0.041** (0.036-0.047)	**0.053** (0.047-0.062)	**0.063** (0.055-0.074)	**0.077** (0.066-0.093)	**0.088** (0.073-0.109)	**0.100** (0.081-0.125)	**0.111** (0.088-0.144)	**0.127** (0.096-0.171)	**0.140** (0.103-0.194)
4-day	**0.026** (0.023-0.030)	**0.034** (0.030-0.039)	**0.044** (0.039-0.051)	**0.053** (0.046-0.062)	**0.065** (0.055-0.078)	**0.074** (0.061-0.091)	**0.084** (0.068-0.105)	**0.094** (0.074-0.121)	**0.107** (0.081-0.144)	**0.118** (0.087-0.164)
7-day	**0.017** (0.015-0.020)	**0.023** (0.020-0.026)	**0.030** (0.026-0.035)	**0.036** (0.031-0.042)	**0.044** (0.037-0.053)	**0.051** (0.042-0.063)	**0.058** (0.047-0.073)	**0.065** (0.051-0.084)	**0.075** (0.057-0.101)	**0.083** (0.061-0.115)
10-day	**0.013** (0.012-0.015)	**0.018** (0.015-0.020)	**0.023** (0.021-0.027)	**0.028** (0.025-0.033)	**0.035** (0.030-0.042)	**0.041** (0.034-0.050)	**0.046** (0.037-0.058)	**0.052** (0.041-0.068)	**0.061** (0.046-0.082)	**0.067** (0.049-0.094)
20-day	**0.008** (0.007-0.009)	**0.011** (0.009-0.012)	**0.014** (0.013-0.017)	**0.018** (0.015-0.021)	**0.022** (0.019-0.027)	**0.026** (0.021-0.032)	**0.030** (0.024-0.038)	**0.034** (0.027-0.044)	**0.040** (0.030-0.054)	**0.045** (0.033-0.062)
30-day	**0.006** (0.006-0.007)	**0.009** (0.008-0.010)	**0.012** (0.010-0.014)	**0.014** (0.013-0.017)	**0.018** (0.015-0.022)	**0.021** (0.018-0.026)	**0.025** (0.020-0.031)	**0.028** (0.022-0.037)	**0.033** (0.025-0.045)	**0.038** (0.028-0.052)
45-day	**0.005** (0.004-0.006)	**0.007** (0.006-0.008)	**0.009** (0.008-0.011)	**0.011** (0.010-0.013)	**0.015** (0.012-0.018)	**0.017** (0.014-0.021)	**0.020** (0.016-0.025)	**0.023** (0.018-0.030)	**0.027** (0.021-0.037)	**0.031** (0.023-0.043)
60-day	**0.004** (0.004-0.005)	**0.006** (0.005-0.007)	**0.008** (0.007-0.009)	**0.010** (0.009-0.012)	**0.013** (0.011-0.015)	**0.015** (0.012-0.019)	**0.018** (0.014-0.022)	**0.020** (0.016-0.026)	**0.024** (0.018-0.033)	**0.028** (0.020-0.039)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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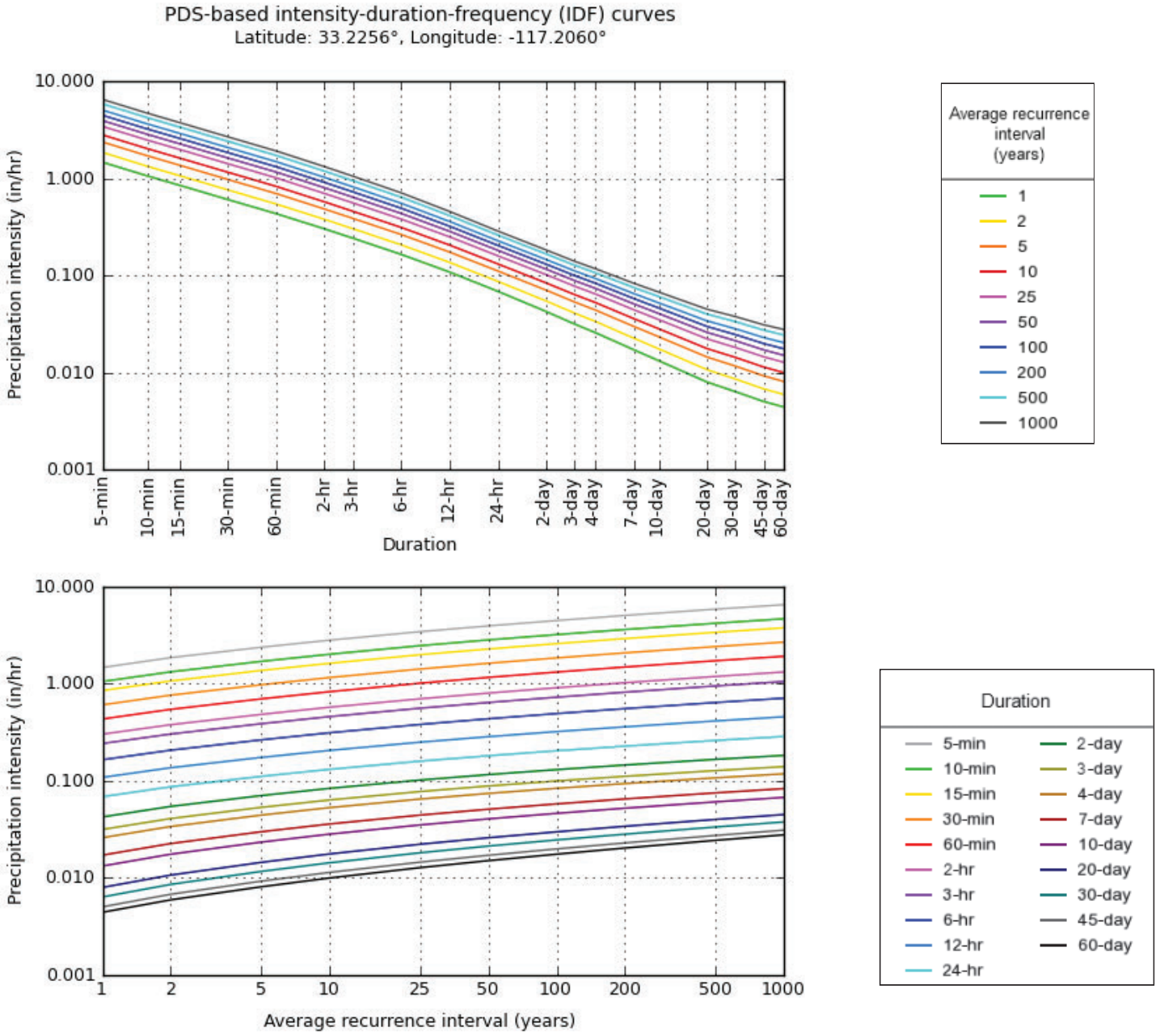
PF graphical



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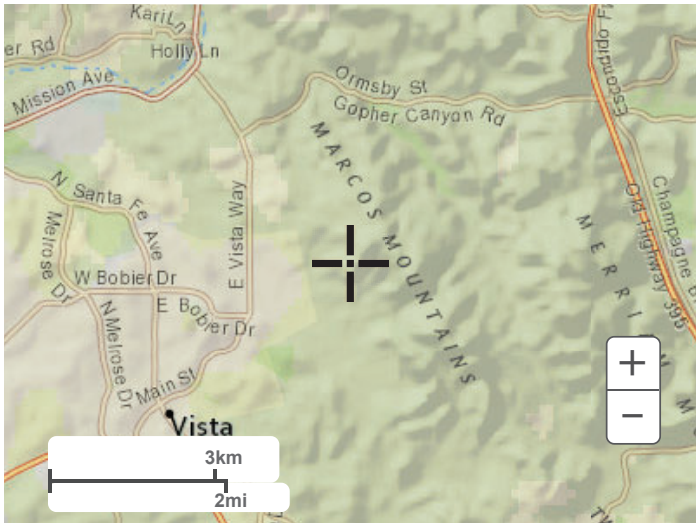
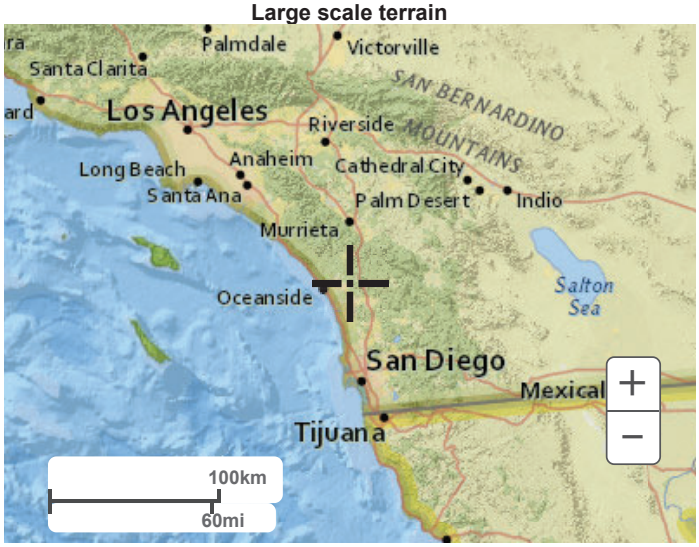
Maps & aerials

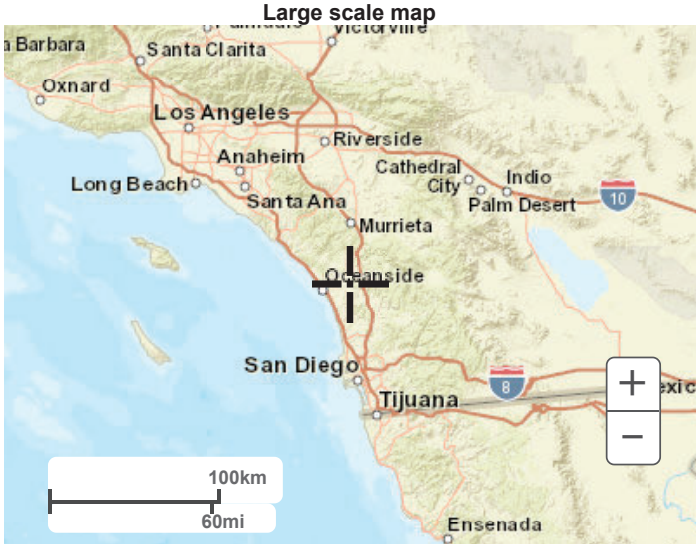
Small scale terrain



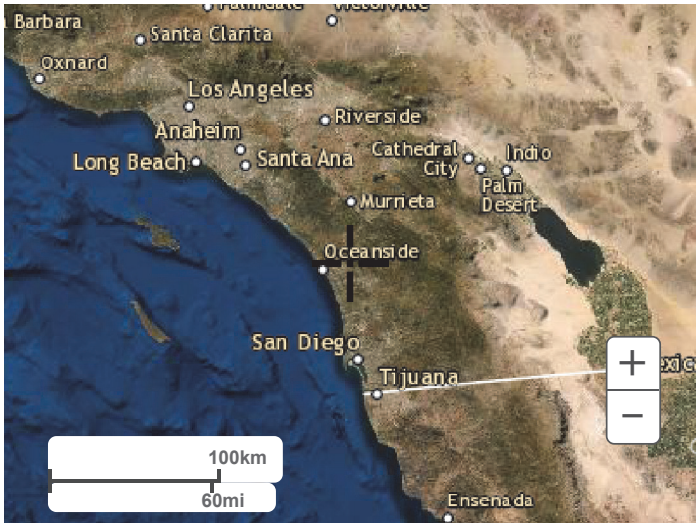
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Figure 819.2A

CALTRANS Cp DETERMINATION USED ONLY FOR NATURAL HILLSIDE AND CUT SLOPE PERVIOUS AREAS MEETING BELOW DESCRIPTIONS

Runoff Coefficients for Undeveloped Areas Watershed Types

	Extreme	High	Normal	Low
Relief	.28 -.35 Steep, rugged terrain with average slopes above 30%	.20 -.28 Hilly, with average slopes of 10 to 30% 0.24	.14 -.20 Rolling, with average slopes of 5 to 10%	.08 -.14 Relatively flat land, with average slopes of 0 to 5%
Soil Infiltration	.12 -.16 No effective soil cover, either rock or thin soil mantle of negligible infiltration capacity 0.14	.08 -.12 Slow to take up water, clay or shallow loam soils of low infiltration capacity, imperfectly or poorly drained	.06 -.08 Normal; well drained light or medium textured soils, sandy loams, silt and silt loams	.04 -.06 High; deep sand or other soil that takes up water readily, very light well drained soils
Vegetal Cover	.12 -.16 No effective plant cover, bare or very sparse cover	.08 -.12 Poor to fair; clean cultivation crops, or poor natural cover, less than 20% of drainage area over good cover 0.10	.06 -.08 Fair to good; about 50% of area in good grassland or woodland, not more than 50% of area in cultivated crops	.04 -.06 Good to excellent; about 90% of drainage area in good grassland, woodland or equivalent cover
Surface Storage	.10 -.12 Negligible surface depression few and shallow; drainageways steep and small, no marshes 0.12	.08 -.10 Low; well defined system of small drainageways; no ponds or marshes	.06 -.08 Normal; considerable surface depression storage; lakes and pond marshes	.04 -.06 High; surface storage, high; drainage system not sharply defined; large floodplain storage or large number of ponds or marshes
Given	An undeveloped watershed consisting of; 1) rolling terrain with average slopes of 5%, 2) clay type soils, 3) good grassland area, and 4) normal surface depressions.		Solution: Relief Soil Infiltration Vegetal Cover Surface Storage	0.24 0.14 0.10 0.12 C = 0.60
Find	The runoff coefficient, C, for the above watershed.			

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

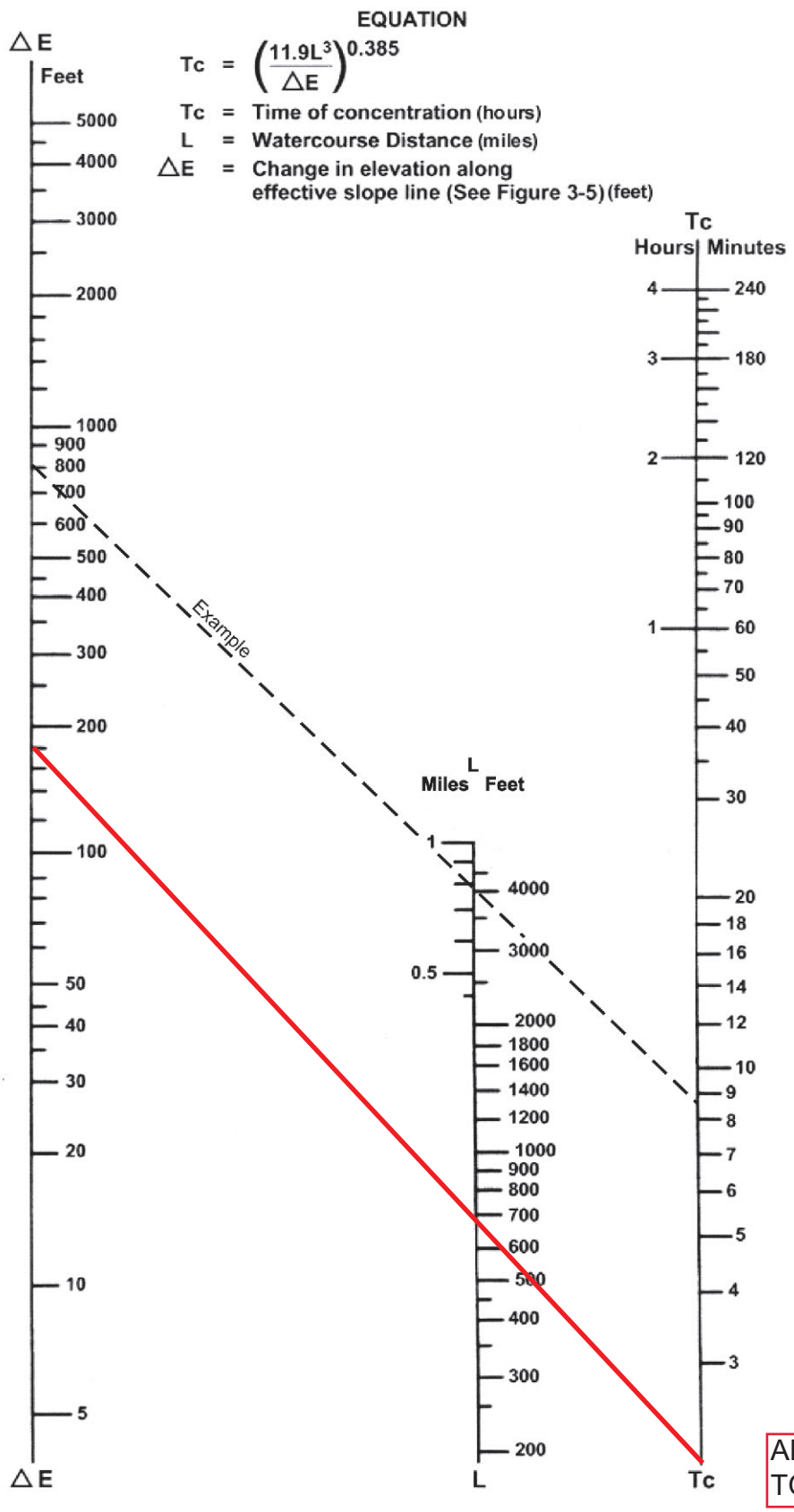
Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2								.8	100	7.4	100	5.8
LDR	2.9								.1	100	7.0	100	5.6
MDR	4.3								.8	100	6.7	100	5.3
MDR	7.2								.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

Base tci for Node 100-102 in pre-project and post-project conditions; Kirpich formula used to increase tci for additional natural hillside overland flow

*See Table 3-1 for more detailed description



SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE

3-4

Nomograph for Determination of Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

Attachment 3

AES Rational Method Output

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1532

                              Analysis prepared by:

                         Tory R. Walker Engineering, Inc.
                              122 Civic Center Drive
                                    Suite 206
                                 Vista, CA 92084

 ************************* DESCRIPTION OF STUDY *************************
* PM 14659 PARCEL E                                                     *
* EXISTING CONDITION AT DISCHARGE POINT 1                               *
* 100-YEAR PEAK FLOW                                                    *
 ************************************************************************

  FILE NAME: PCLE_EX1.DAT
  TIME/DATE OF STUDY: 15:20 08/22/2023
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  6
   1)   5.000;  4.450
   2)  10.000;  3.190
   3)  15.000;  2.580
   4)  30.000;  1.840
   5)  60.000;  1.310
   6) 120.000;  0.906
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
 USER SPECIFIED Tc(MIN.) =    8.900
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.467
 SUBAREA RUNOFF(CFS) =      1.54
 TOTAL AREA(ACRES) =      0.74   TOTAL RUNOFF(CFS) =      1.54

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    960.00  DOWNSTREAM(FEET) =    850.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   650.00   CHANNEL SLOPE =  0.1692
 CHANNEL BASE(FEET) =   14.00   "Z" FACTOR =   1.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.122
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .6900
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.36
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.55
 AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.65
 Tc(MIN.) =   10.55
 SUBAREA AREA(ACRES) =     3.55       SUBAREA RUNOFF(CFS) =    7.65
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.674
 TOTAL AREA(ACRES) =        4.3         PEAK FLOW RATE(CFS) =       9.03

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   7.92
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     800.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   850.00  DOWNSTREAM(FEET) =   848.00
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.024
 DEPTH OF FLOW IN  24.0 INCH PIPE IS   8.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.52
 GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       9.03
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   10.61
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     830.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    108.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    848.00  DOWNSTREAM(FEET) =    825.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   150.00   CHANNEL SLOPE =  0.1533
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  10.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
 CHANNEL FLOW THRU SUBAREA(CFS) =       9.03
 FLOW VELOCITY(FEET/SEC.) =   6.37   FLOW DEPTH(FEET) =   0.38
 TRAVEL TIME(MIN.) =   0.39   Tc(MIN.) =   11.00
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     980.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    108.10 TO NODE    108.00 IS CODE =  81
```

```
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.067
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6326
  SUBAREA AREA(ACRES) =    7.94   SUBAREA RUNOFF(CFS) =   14.86
  TOTAL AREA(ACRES) =       12.2   TOTAL RUNOFF(CFS) =      23.73
  TC(MIN.) =   11.00

********************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  41
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   812.40  DOWNSTREAM(FEET) =   808.60
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.024
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.11
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =      23.73
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   11.03
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =    1005.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    808.60  DOWNSTREAM(FEET) =    792.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   105.00   CHANNEL SLOPE =  0.1581
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.039
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      27.40
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.51
  AVERAGE FLOW DEPTH(FEET) =   0.57   TRAVEL TIME(MIN.) =   0.21
  Tc(MIN.) =   11.24
  SUBAREA AREA(ACRES) =     4.02       SUBAREA RUNOFF(CFS) =    7.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.625
  TOTAL AREA(ACRES) =       16.2         PEAK FLOW RATE(CFS) =      30.84

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.59   FLOW VELOCITY(FEET/SEC.) =   8.79
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =    1110.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       16.2  TC(MIN.) =     11.24
  PEAK FLOW RATE(CFS)   =      30.84
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
_____
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1532

                              Analysis prepared by:

                         Tory R. Walker Engineering, Inc.
                              122 Civic Center Drive
                                    Suite 206
                                 Vista, CA 92084

 ************************* DESCRIPTION OF STUDY *************************
* PM 14659 PARCEL E                                                     *
* EXISTING CONDITION AT DISCHARGE POINT 2                               *
* 100-YEAR PEAK FLOW                                                    *
 ************************************************************************

  FILE NAME: PCLE_EX2.DAT
  TIME/DATE OF STUDY: 15:26 08/22/2023
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  6
   1)   5.000;  4.450
   2)  10.000;  3.190
   3)  15.000;  2.580
   4)  30.000;  1.840
   5)  60.000;  1.310
   6) 120.000;  0.906
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  USER SPECIFIED Tc(MIN.) =    6.900
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.971
  SUBAREA RUNOFF(CFS) =      0.24
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.24

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    820.00  DOWNSTREAM(FEET) =    764.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   390.00   CHANNEL SLOPE =  0.1436
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.679
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6200
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.19
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.61
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.16
  Tc(MIN.) =    8.06
  SUBAREA AREA(ACRES) =     2.59       SUBAREA RUNOFF(CFS) =    5.91
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.619
  TOTAL AREA(ACRES) =        2.7         PEAK FLOW RATE(CFS) =       6.13

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   6.94
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     495.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.10 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.679
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6128
  SUBAREA AREA(ACRES) =    1.36   SUBAREA RUNOFF(CFS) =    3.00
  TOTAL AREA(ACRES) =        4.0   TOTAL RUNOFF(CFS) =       9.13
  TC(MIN.) =    8.06

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    206.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    764.00  DOWNSTREAM(FEET) =    695.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   600.00   CHANNEL SLOPE =  0.1150
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.362
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6800
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.95
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   1.26
  Tc(MIN.) =    9.32
```

```
  SUBAREA AREA(ACRES) =     0.92       SUBAREA RUNOFF(CFS) =    2.10
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.625
  TOTAL AREA(ACRES) =        5.0         PEAK FLOW RATE(CFS) =      10.45

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   8.16
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =    1095.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.10 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.362
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6296
  SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.24
  TOTAL AREA(ACRES) =        5.0   TOTAL RUNOFF(CFS) =      10.69
  TC(MIN.) =    9.32
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.0  TC(MIN.) =      9.32
  PEAK FLOW RATE(CFS)   =      10.69
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
_____
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 23.0 Release Date: 07/01/2016  License ID 1532

                              Analysis prepared by:

                         Tory R. Walker Engineering, Inc.
                              122 Civic Center Drive
                                    Suite 206
                                 Vista, CA 92084

 ************************* DESCRIPTION OF STUDY *************************
* PM 14659 PARCEL E                                                     *
* PROPOSED CONDITION AT DISCHARGE POINT 1 (UNDETAINED)                  *
* 100-YEAR PEAK FLOW                                                    *
 ************************************************************************

  FILE NAME: PCLE_PR1.DAT
  TIME/DATE OF STUDY: 17:06 08/22/2023
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  6
   1)   5.000;  4.450
   2)  10.000;  3.190
   3)  15.000;  2.580
   4)  30.000;  1.840
   5)  60.000;  1.310
   6) 120.000;  0.906
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  USER SPECIFIED Tc(MIN.) =    8.900
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.467
  SUBAREA RUNOFF(CFS) =      1.54
  TOTAL AREA(ACRES) =      0.74   TOTAL RUNOFF(CFS) =      1.54

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    960.00  DOWNSTREAM(FEET) =    835.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   800.00   CHANNEL SLOPE =  0.1562
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.250
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.25
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.106
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.47
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.46
  AVERAGE FLOW DEPTH(FEET) =   0.77   TRAVEL TIME(MIN.) =   1.79
  Tc(MIN.) =   10.69
  SUBAREA AREA(ACRES) =     3.67       SUBAREA RUNOFF(CFS) =    7.87
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.675
  TOTAL AREA(ACRES) =        4.4         PEAK FLOW RATE(CFS) =       9.25

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.93   FLOW VELOCITY(FEET/SEC.) =   8.59
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.10 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.106
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6661
  SUBAREA AREA(ACRES) =    0.59   SUBAREA RUNOFF(CFS) =    1.10
  TOTAL AREA(ACRES) =        5.0   TOTAL RUNOFF(CFS) =      10.34
  TC(MIN.) =   10.69

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   829.22  DOWNSTREAM(FEET) =   828.56
  FLOW LENGTH(FEET) =    33.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS   9.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.91
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.34
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   10.75
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    1433.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    108.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    826.22  DOWNSTREAM(FEET) =    813.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   180.00   CHANNEL SLOPE =  0.0707
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.200
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.25
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.043
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.61
  AVERAGE FLOW DEPTH(FEET) =   1.16   TRAVEL TIME(MIN.) =   0.45
  Tc(MIN.) =   11.20
  SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.672
  TOTAL AREA(ACRES) =        5.2         PEAK FLOW RATE(CFS) =      10.69

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.16   FLOW VELOCITY(FEET/SEC.) =   6.59
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =    1613.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   810.34  DOWNSTREAM(FEET) =   810.00
  FLOW LENGTH(FEET) =    26.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.43
  GIVEN PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =      10.69
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   11.27
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =    1639.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.10 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.035
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6678
  SUBAREA AREA(ACRES) =    0.29   SUBAREA RUNOFF(CFS) =    0.53
  TOTAL AREA(ACRES) =        5.5   TOTAL RUNOFF(CFS) =      11.19
  TC(MIN.) =   11.27

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   805.12  DOWNSTREAM(FEET) =   804.40
  FLOW LENGTH(FEET) =    72.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  12.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.04
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =      11.19
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =   11.44
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =    1711.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.44
  RAINFALL INTENSITY(INCH/HR) =   3.01
  TOTAL STREAM AREA(ACRES) =     5.52
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.19

****************************************************************************
  FLOW PROCESS FROM NODE    114.10 TO NODE    114.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  11.00   RAIN INTENSITY(INCH/HOUR) =  3.07
  TOTAL AREA(ACRES) =     9.37   TOTAL RUNOFF(CFS) =     17.53

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    112.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   812.40  DOWNSTREAM(FEET) =   808.60
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.024
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.16
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =      17.53
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   11.04
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE    112.00 =      25.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.04
  RAINFALL INTENSITY(INCH/HR) =   3.06
  TOTAL STREAM AREA(ACRES) =     9.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.53

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER       (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       11.19    11.44        3.014          5.52
      2       17.53    11.04        3.063          9.37

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

```
  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       28.32    11.04       3.063
      2       28.44    11.44       3.014

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      28.44   Tc(MIN.) =   11.44
  TOTAL AREA(ACRES) =       14.9
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =    1711.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    804.40  DOWNSTREAM(FEET) =    792.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    78.00   CHANNEL SLOPE =  0.1590
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.996
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6100
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      30.37
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.71
  AVERAGE FLOW DEPTH(FEET) =   0.59   TRAVEL TIME(MIN.) =   0.15
  Tc(MIN.) =   11.59
  SUBAREA AREA(ACRES) =     2.11       SUBAREA RUNOFF(CFS) =    3.86
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.629
  TOTAL AREA(ACRES) =       17.0         PEAK FLOW RATE(CFS) =      32.02

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.60   FLOW VELOCITY(FEET/SEC.) =   8.90
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    114.00 =    1789.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.10 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.996
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6289
  SUBAREA AREA(ACRES) =    0.02   SUBAREA RUNOFF(CFS) =    0.05
  TOTAL AREA(ACRES) =       17.0   TOTAL RUNOFF(CFS) =      32.07
  TC(MIN.) =   11.59
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       17.0  TC(MIN.) =     11.59
  PEAK FLOW RATE(CFS)   =      32.07
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
_____
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1532

                              Analysis prepared by:

                         Tory R. Walker Engineering, Inc.
                              122 Civic Center Drive
                                    Suite 206
                                 Vista, CA 92084

 ************************* DESCRIPTION OF STUDY *************************
* PM 14659 PARCEL E                                                     *
* PROPOSED CONDITION AT DISCHARGE POINT 2                               *
* 100-YEAR PEAK FLOW                                                    *
 ************************************************************************

  FILE NAME: PCLE_PR2.DAT
  TIME/DATE OF STUDY: 15:56 08/22/2023
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  6
   1)   5.000;  4.450
   2)  10.000;  3.190
   3)  15.000;  2.580
   4)  30.000;  1.840
   5)  60.000;  1.310
   6) 120.000;  0.906
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  USER SPECIFIED Tc(MIN.) =    6.900
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.971
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    837.75  DOWNSTREAM(FEET) =    792.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   310.00   CHANNEL SLOPE =  0.1476
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.500
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.763
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.94
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.26
  AVERAGE FLOW DEPTH(FEET) =   0.45   TRAVEL TIME(MIN.) =   0.83
  Tc(MIN.) =    7.73
  SUBAREA AREA(ACRES) =     1.34       SUBAREA RUNOFF(CFS) =    3.03
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.600
  TOTAL AREA(ACRES) =        1.5         PEAK FLOW RATE(CFS) =       3.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.56   FLOW VELOCITY(FEET/SEC.) =   7.25
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     388.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    206.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   790.00  DOWNSTREAM(FEET) =   782.48
  FLOW LENGTH(FEET) =    13.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  23.20
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.43
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    7.74
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =     401.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.10 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.761
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6132
  SUBAREA AREA(ACRES) =    0.30   SUBAREA RUNOFF(CFS) =    0.77
  TOTAL AREA(ACRES) =        1.8   TOTAL RUNOFF(CFS) =       4.20
  TC(MIN.) =    7.74

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    208.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    782.48  DOWNSTREAM(FEET) =    764.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   105.00   CHANNEL SLOPE =  0.1693
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.500
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.699
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7200
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.26
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.15
  AVERAGE FLOW DEPTH(FEET) =   0.63   TRAVEL TIME(MIN.) =   0.24
  Tc(MIN.) =    7.98
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.13
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.616
  TOTAL AREA(ACRES) =        1.9         PEAK FLOW RATE(CFS) =       4.26

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.63   FLOW VELOCITY(FEET/SEC.) =   7.15
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    208.00 =     506.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    208.10 TO NODE    208.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.699
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6095
  SUBAREA AREA(ACRES) =    1.29   SUBAREA RUNOFF(CFS) =    2.86
  TOTAL AREA(ACRES) =        3.2   TOTAL RUNOFF(CFS) =       7.12
  TC(MIN.) =    7.98

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    210.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    764.70  DOWNSTREAM(FEET) =    721.18
  CHANNEL LENGTH THRU SUBAREA(FEET) =   400.00   CHANNEL SLOPE =  0.1088
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.500
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.458
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6800
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.44
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.96
  AVERAGE FLOW DEPTH(FEET) =   0.84   TRAVEL TIME(MIN.) =   0.96
  Tc(MIN.) =    8.94
  SUBAREA AREA(ACRES) =     0.27       SUBAREA RUNOFF(CFS) =    0.63
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.615
  TOTAL AREA(ACRES) =        3.4         PEAK FLOW RATE(CFS) =       7.29

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.84   FLOW VELOCITY(FEET/SEC.) =   6.95
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    210.00 =     906.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    210.10 TO NODE    210.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.458
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6142
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.41
  TOTAL AREA(ACRES) =        3.6   TOTAL RUNOFF(CFS) =       7.71
  TC(MIN.) =    8.94

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    212.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    721.18  DOWNSTREAM(FEET) =    693.54
  CHANNEL LENGTH THRU SUBAREA(FEET) =   240.00   CHANNEL SLOPE =  0.1152
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  16.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.334
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.92
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.11
  AVERAGE FLOW DEPTH(FEET) =   0.25   TRAVEL TIME(MIN.) =   0.49
  Tc(MIN.) =    9.43
  SUBAREA AREA(ACRES) =     0.14       SUBAREA RUNOFF(CFS) =    0.42
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.625
  TOTAL AREA(ACRES) =        3.8         PEAK FLOW RATE(CFS) =       7.85

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   8.43
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    212.00 =    1146.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    212.10 TO NODE    212.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.334
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6433
  SUBAREA AREA(ACRES) =    0.51   SUBAREA RUNOFF(CFS) =    1.33
  TOTAL AREA(ACRES) =        4.3   TOTAL RUNOFF(CFS) =       9.18
  TC(MIN.) =    9.43

****************************************************************************
  FLOW PROCESS FROM NODE    212.20 TO NODE    212.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.334
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6499
  SUBAREA AREA(ACRES) =    0.14   SUBAREA RUNOFF(CFS) =    0.40
  TOTAL AREA(ACRES) =        4.4   TOTAL RUNOFF(CFS) =       9.58
  TC(MIN.) =    9.43
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.4  TC(MIN.) =      9.43
  PEAK FLOW RATE(CFS)   =       9.58
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
_____
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1532

                              Analysis prepared by:

                         Tory R. Walker Engineering, Inc.
                              122 Civic Center Drive
                                    Suite 206
                                 Vista, CA 92084

 ************************* DESCRIPTION OF STUDY *************************
* PM 14659 PARCEL E                                                      *
* PROPOSED CONDITION AT DISCHARGE POINT 1 (DETAINED)                     *
* 100-YEAR PEAK FLOW                                                     *
 ************************************************************************

  FILE NAME: PCLE_P1D.DAT
  TIME/DATE OF STUDY: 17:10 08/22/2023
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  6
   1)   5.000;  4.450
   2)  10.000;  3.190
   3)  15.000;  2.580
   4)  30.000;  1.840
   5)  60.000;  1.310
   6) 120.000;  0.906
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  USER SPECIFIED Tc(MIN.) =    8.900
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.467
  SUBAREA RUNOFF(CFS) =      1.54
  TOTAL AREA(ACRES) =      0.74   TOTAL RUNOFF(CFS) =      1.54

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    960.00  DOWNSTREAM(FEET) =    835.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   800.00   CHANNEL SLOPE =  0.1562
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.250
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.25
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.106
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.47
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.46
  AVERAGE FLOW DEPTH(FEET) =   0.77   TRAVEL TIME(MIN.) =   1.79
  Tc(MIN.) =   10.69
  SUBAREA AREA(ACRES) =     3.67       SUBAREA RUNOFF(CFS) =    7.87
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.675
  TOTAL AREA(ACRES) =        4.4         PEAK FLOW RATE(CFS) =       9.25

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.93   FLOW VELOCITY(FEET/SEC.) =   8.59
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.10 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.106
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6661
  SUBAREA AREA(ACRES) =    0.59   SUBAREA RUNOFF(CFS) =    1.10
  TOTAL AREA(ACRES) =        5.0   TOTAL RUNOFF(CFS) =      10.34
  TC(MIN.) =   10.69

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   829.22  DOWNSTREAM(FEET) =   828.56
  FLOW LENGTH(FEET) =    33.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS   9.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.91
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.34
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   10.75
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    1433.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    108.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    826.22  DOWNSTREAM(FEET) =    813.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   180.00   CHANNEL SLOPE =  0.0707
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.200
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.25
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.043
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.61
  AVERAGE FLOW DEPTH(FEET) =   1.16   TRAVEL TIME(MIN.) =   0.45
  Tc(MIN.) =   11.20
  SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.672
  TOTAL AREA(ACRES) =        5.2         PEAK FLOW RATE(CFS) =      10.69

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.16   FLOW VELOCITY(FEET/SEC.) =   6.59
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =    1613.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   810.34  DOWNSTREAM(FEET) =   810.00
  FLOW LENGTH(FEET) =    26.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.43
  GIVEN PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =      10.69
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   11.27
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =    1639.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.10 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.035
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6678
  SUBAREA AREA(ACRES) =    0.29   SUBAREA RUNOFF(CFS) =    0.53
  TOTAL AREA(ACRES) =        5.5   TOTAL RUNOFF(CFS) =      11.19
  TC(MIN.) =   11.27

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  16.23   RAIN INTENSITY(INCH/HOUR) =  2.52
  TOTAL AREA(ACRES) =     5.50   TOTAL RUNOFF(CFS) =      7.17

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  41
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   805.12  DOWNSTREAM(FEET) =   804.40
  FLOW LENGTH(FEET) =    72.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS   9.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.27
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.17
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =   16.42
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =    1711.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   16.42
  RAINFALL INTENSITY(INCH/HR) =   2.51
  TOTAL STREAM AREA(ACRES) =     5.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.17

****************************************************************************
  FLOW PROCESS FROM NODE    114.10 TO NODE    114.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  11.00   RAIN INTENSITY(INCH/HOUR) =  3.07
  TOTAL AREA(ACRES) =     9.37   TOTAL RUNOFF(CFS) =     17.53

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    112.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   812.40  DOWNSTREAM(FEET) =   808.60
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.024
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.16
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =      17.53
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   11.04
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE    112.00 =      25.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.04
  RAINFALL INTENSITY(INCH/HR) =   3.06
  TOTAL STREAM AREA(ACRES) =     9.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.53
```

```
  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.17    16.42        2.510          5.50
      2       17.53    11.04        3.063          9.37

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       22.35    11.04       3.063
      2       21.53    16.42       2.510

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      22.35   Tc(MIN.) =   11.04
  TOTAL AREA(ACRES) =       14.9
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =    1711.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    804.40  DOWNSTREAM(FEET) =    792.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    78.00   CHANNEL SLOPE =  0.1590
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.044
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6100
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      24.31
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.20
  AVERAGE FLOW DEPTH(FEET) =   0.54   TRAVEL TIME(MIN.) =   0.16
  Tc(MIN.) =   11.20
  SUBAREA AREA(ACRES) =     2.11       SUBAREA RUNOFF(CFS) =    3.92
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.580
  TOTAL AREA(ACRES) =       17.0         PEAK FLOW RATE(CFS) =      29.98

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.58   FLOW VELOCITY(FEET/SEC.) =   8.77
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    114.00 =    1789.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.10 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.044
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5802
  SUBAREA AREA(ACRES) =    0.02   SUBAREA RUNOFF(CFS) =    0.05
  TOTAL AREA(ACRES) =       17.0   TOTAL RUNOFF(CFS) =      30.03
  TC(MIN.) =   11.20
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       17.0  TC(MIN.) =     11.20
  PEAK FLOW RATE(CFS)   =      30.03
```

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

Attachment 4

Rational Method Hydrograph Development

Rational Method Hydrograph Calculations
for Pre Project Condition
PM 14659 Parcel E
Northern Discharge Point (Node 112.0)

		Q_{100}=	30.84	cfs				
		Tc=	11	min	C=	0.62		
#=	33	$P_{100,6}$=	2.94	in	A=	16.24	acres	

		*(7.44*P6*D^-.645)*	*(I*D/60)*	*(V1-V0)*	*(ΔV/ΔT)*	*(Q=ciA)*		*(Re-ordered)*
	D	**I**	**VOL**	**ΔVOL**	**I (INCR)**	**Q**	**VOL**	**ORDINATE**
#	**(MIN)**	**(IN/HR)**	**(IN)**	**(IN)**	**(IN/HR)**	**(CFS)**	**(CF)**	**SUM=**
0	0	0.00	0.00	0.85	4.66	30.84	20354	
1	11	4.66	0.85	0.24	1.30	13.09	8636	1.80
2	22	2.98	1.09	0.17	0.92	9.29	6129	1.88
3	33	2.29	1.26	0.14	0.74	7.45	4916	1.92
4	44	1.90	1.40	0.12	0.63	6.32	4174	2.01
5	55	1.65	1.51	0.10	0.55	5.55	3665	2.06
6	66	1.47	1.61	0.09	0.49	4.98	3289	2.17
7	77	1.33	1.70	0.08	0.45	4.54	2998	2.24
8	88	1.22	1.79	0.08	0.42	4.19	2765	2.37
9	99	1.13	1.86	0.07	0.39	3.90	2574	2.45
10	110	1.05	1.93	0.07	0.36	3.66	2413	2.63
11	121	0.99	2.00	0.06	0.34	3.45	2275	2.73
12	132	0.94	2.06	0.06	0.32	3.27	2156	2.97
13	143	0.89	2.12	0.06	0.31	3.11	2051	3.11
14	154	0.85	2.18	0.05	0.29	2.97	1959	3.45
15	165	0.81	2.23	0.05	0.28	2.84	1876	3.66
16	176	0.78	2.29	0.05	0.27	2.73	1802	4.19
17	187	0.75	2.33	0.05	0.26	2.63	1735	4.54
18	198	0.72	2.38	0.05	0.25	2.54	1674	5.55
19	209	0.70	2.43	0.04	0.24	2.45	1618	6.32
20	220	0.67	2.47	0.04	0.24	2.37	1567	9.29
21	231	0.65	2.52	0.04	0.23	2.30	1519	13.09
22	242	0.63	2.56	0.04	0.22	2.24	1475	30.84
23	253	0.62	2.60	0.04	0.22	2.17	1434	7.45
24	264	0.60	2.64	0.04	0.21	2.12	1396	4.98
25	275	0.58	2.68	0.04	0.20	2.06	1361	3.90
26	286	0.57	2.72	0.04	0.20	2.01	1327	3.27
27	297	0.56	2.75	0.04	0.20	1.96	1296	2.84
28	308	0.54	2.79	0.03	0.19	1.92	1267	2.54
29	319	0.53	2.82	0.03	0.19	1.88	1239	2.30
30	330	0.52	2.86	0.03	0.18	1.84	1212	2.12
31	341	0.51	2.89	0.03	0.18	1.80	1187	1.96
32	352	0.50	2.92	0.03	0.18	1.76	1164	1.84
33	363	0.49	2.95	0.00	0.00	0.00	0	0.00
						SUM=	**96505**	**cubic feet**
							2.22	**acre-feet**

Rational Method Hydrograph Calculations
for Post Project Condition (Undetained)
PM 14659 Parcel E
Northern Discharge Point (Node 114.0)

		Q_{100}=	32.07	cfs				
		Tc=	11	min	C=	0.63		
#=	33	$P_{100,6}$=	2.94	in	A=	17	acres	

		*(7.44*P6*D^-.645)*	*(I*D/60)*	*(V1-V0)*	*(ΔV/ΔT)*	*(Q=ciA)*		*(Re-ordered)*
	D	**I**	**VOL**	**ΔVOL**	**I (INCR)**	**Q**	**VOL**	**ORDINATE**
#	**(MIN)**	**(IN/HR)**	**(IN)**	**(IN)**	**(IN/HR)**	**(CFS)**	**(CF)**	**SUM=**
0	0	0.00	0.00	0.85	4.66	32.07	21166	
1	11	4.66	0.85	0.24	1.30	13.92	9186	1.91
2	22	2.98	1.09	0.17	0.92	9.88	6520	2.00
3	33	2.29	1.26	0.14	0.74	7.92	5229	2.04
4	44	1.90	1.40	0.12	0.63	6.73	4440	2.14
5	55	1.65	1.51	0.10	0.55	5.91	3898	2.19
6	66	1.47	1.61	0.09	0.49	5.30	3499	2.31
7	77	1.33	1.70	0.08	0.45	4.83	3189	2.38
8	88	1.22	1.79	0.08	0.42	4.46	2942	2.52
9	99	1.13	1.86	0.07	0.39	4.15	2738	2.61
10	110	1.05	1.93	0.07	0.36	3.89	2566	2.80
11	121	0.99	2.00	0.06	0.34	3.67	2420	2.90
12	132	0.94	2.06	0.06	0.32	3.47	2293	3.16
13	143	0.89	2.12	0.06	0.31	3.31	2182	3.31
14	154	0.85	2.18	0.05	0.29	3.16	2083	3.67
15	165	0.81	2.23	0.05	0.28	3.02	1996	3.89
16	176	0.78	2.29	0.05	0.27	2.90	1917	4.46
17	187	0.75	2.33	0.05	0.26	2.80	1845	4.83
18	198	0.72	2.38	0.05	0.25	2.70	1780	5.91
19	209	0.70	2.43	0.04	0.24	2.61	1721	6.73
20	220	0.67	2.47	0.04	0.24	2.52	1666	9.88
21	231	0.65	2.52	0.04	0.23	2.45	1616	13.92
22	242	0.63	2.56	0.04	0.22	2.38	1569	32.07
23	253	0.62	2.60	0.04	0.22	2.31	1526	7.92
24	264	0.60	2.64	0.04	0.21	2.25	1485	5.30
25	275	0.58	2.68	0.04	0.20	2.19	1447	4.15
26	286	0.57	2.72	0.04	0.20	2.14	1412	3.47
27	297	0.56	2.75	0.04	0.20	2.09	1379	3.02
28	308	0.54	2.79	0.03	0.19	2.04	1347	2.70
29	319	0.53	2.82	0.03	0.19	2.00	1318	2.45
30	330	0.52	2.86	0.03	0.18	1.95	1290	2.25
31	341	0.51	2.89	0.03	0.18	1.91	1263	2.09
32	352	0.50	2.92	0.03	0.18	1.88	1238	1.95
33	363	0.49	2.95	0.00	0.00	0.00	0	0.00
						SUM=	**102166**	**cubic feet**
							2.35	**acre-feet**

Rational Method Hydrograph Calculations
for Post Project Condition
PM 14659 Parcel E
Flow into Northern Detention Basin (Node 110.0)

		Q_{100}=	11.2	cfs				
		Tc=	11	min	C=	0.67		
#=	33	$P_{100,6}$=	2.94	in	A=	5.5	acres	
		*(7.44*P6*D^-.645)*	*(I*D/60)*	*(V1-V0)*	*(ΔV/ΔT)*	*(Q=ciA)*		*(Re-ordered)*
	D	**I**	**VOL**	**ΔVOL**	**I (INCR)**	**Q**	**VOL**	**ORDINATE**
#	**(MIN)**	**(IN/HR)**	**(IN)**	**(IN)**	**(IN/HR)**	**(CFS)**	**(CF)**	**SUM=**
0	0	0.00	0.00	0.85	4.66	11.20	7392	
1	11	4.66	0.85	0.24	1.30	4.77	3150	0.66
2	22	2.98	1.09	0.17	0.92	3.39	2236	0.68
3	33	2.29	1.26	0.14	0.74	2.72	1793	0.70
4	44	1.90	1.40	0.12	0.63	2.31	1523	0.73
5	55	1.65	1.51	0.10	0.55	2.03	1337	0.75
6	66	1.47	1.61	0.09	0.49	1.82	1200	0.79
7	77	1.33	1.70	0.08	0.45	1.66	1094	0.82
8	88	1.22	1.79	0.08	0.42	1.53	1009	0.87
9	99	1.13	1.86	0.07	0.39	1.42	939	0.89
10	110	1.05	1.93	0.07	0.36	1.33	880	0.96
11	121	0.99	2.00	0.06	0.34	1.26	830	1.00
12	132	0.94	2.06	0.06	0.32	1.19	786	1.08
13	143	0.89	2.12	0.06	0.31	1.13	748	1.13
14	154	0.85	2.18	0.05	0.29	1.08	715	1.26
15	165	0.81	2.23	0.05	0.28	1.04	684	1.33
16	176	0.78	2.29	0.05	0.27	1.00	657	1.53
17	187	0.75	2.33	0.05	0.26	0.96	633	1.66
18	198	0.72	2.38	0.05	0.25	0.93	611	2.03
19	209	0.70	2.43	0.04	0.24	0.89	590	2.31
20	220	0.67	2.47	0.04	0.24	0.87	571	3.39
21	231	0.65	2.52	0.04	0.23	0.84	554	4.77
22	242	0.63	2.56	0.04	0.22	0.82	538	11.20
23	253	0.62	2.60	0.04	0.22	0.79	523	2.72
24	264	0.60	2.64	0.04	0.21	0.77	509	1.82
25	275	0.58	2.68	0.04	0.20	0.75	496	1.42
26	286	0.57	2.72	0.04	0.20	0.73	484	1.19
27	297	0.56	2.75	0.04	0.20	0.72	473	1.04
28	308	0.54	2.79	0.03	0.19	0.70	462	0.93
29	319	0.53	2.82	0.03	0.19	0.68	452	0.84
30	330	0.52	2.86	0.03	0.18	0.67	442	0.77
31	341	0.51	2.89	0.03	0.18	0.66	433	0.72
32	352	0.50	2.92	0.03	0.18	0.64	424	0.67
33	363	0.49	2.95	0.00	0.00	0.00	0	0.00
						SUM=	**35170**	**cubic feet**
							0.81	**acre-feet**

Rational Method Hydrograph Calculations
for Post Project Condition (Detained)
PM 14659 Parcel E
Northern Discharge Point (Node 114.0)

		Q_{100}=	30.03	cfs				
		Tc=	11	min	C=	0.58		
#=	33	$P_{100,6}$=	2.94	in	A=	17	acres	

		*(7.44*P6*D^-.645)*	*(I*D/60)*	*(V1-V0)*	*(ΔV/ΔT)*	*(Q=ciA)*		*(Re-ordered)*
	D	**I**	**VOL**	**ΔVOL**	**I (INCR)**	**Q**	**VOL**	**ORDINATE**
#	**(MIN)**	**(IN/HR)**	**(IN)**	**(IN)**	**(IN/HR)**	**(CFS)**	**(CF)**	**SUM=**
0	0	0.00	0.00	0.85	4.66	30.03	19820	
1	11	4.66	0.85	0.24	1.30	12.81	8457	1.76
2	22	2.98	1.09	0.17	0.92	9.09	6002	1.84
3	33	2.29	1.26	0.14	0.74	7.29	4814	1.88
4	44	1.90	1.40	0.12	0.63	6.19	4088	1.97
5	55	1.65	1.51	0.10	0.55	5.44	3589	2.02
6	66	1.47	1.61	0.09	0.49	4.88	3221	2.13
7	77	1.33	1.70	0.08	0.45	4.45	2936	2.19
8	88	1.22	1.79	0.08	0.42	4.10	2708	2.32
9	99	1.13	1.86	0.07	0.39	3.82	2520	2.40
10	110	1.05	1.93	0.07	0.36	3.58	2363	2.57
11	121	0.99	2.00	0.06	0.34	3.38	2228	2.67
12	132	0.94	2.06	0.06	0.32	3.20	2111	2.91
13	143	0.89	2.12	0.06	0.31	3.04	2009	3.04
14	154	0.85	2.18	0.05	0.29	2.91	1918	3.38
15	165	0.81	2.23	0.05	0.28	2.78	1837	3.58
16	176	0.78	2.29	0.05	0.27	2.67	1765	4.10
17	187	0.75	2.33	0.05	0.26	2.57	1699	4.45
18	198	0.72	2.38	0.05	0.25	2.48	1639	5.44
19	209	0.70	2.43	0.04	0.24	2.40	1584	6.19
20	220	0.67	2.47	0.04	0.24	2.32	1534	9.09
21	231	0.65	2.52	0.04	0.23	2.25	1488	12.81
22	242	0.63	2.56	0.04	0.22	2.19	1445	30.03
23	253	0.62	2.60	0.04	0.22	2.13	1405	7.29
24	264	0.60	2.64	0.04	0.21	2.07	1367	4.88
25	275	0.58	2.68	0.04	0.20	2.02	1333	3.82
26	286	0.57	2.72	0.04	0.20	1.97	1300	3.20
27	297	0.56	2.75	0.04	0.20	1.92	1269	2.78
28	308	0.54	2.79	0.03	0.19	1.88	1240	2.48
29	319	0.53	2.82	0.03	0.19	1.84	1213	2.25
30	330	0.52	2.86	0.03	0.18	1.80	1187	2.07
31	341	0.51	2.89	0.03	0.18	1.76	1163	1.92
32	352	0.50	2.92	0.03	0.18	1.73	1140	1.80
33	363	0.49	2.95	0.00	0.00	0.00	0	0.00
						SUM=	**94391**	**cubic feet**
							2.17	**acre-feet**

Attachment 5

EPA SWMM Reports

```
[TITLE]
;;Project Title/Notes
Parcel E Road Widening
100-Year Storm Hydrograph Detention
Proposed Condition
Northern Discharge Point

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2000
START_TIME           00:00:00
REPORT_START_DATE    01/01/2000
REPORT_START_TIME    00:00:00
END_DATE             01/02/2000
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:01:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.566
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.030  0.050  0.080  0.110  0.130  0.150  0.150  0.130  0.110  0.080  0.040  0.020
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
NORAIN           INTENSITY 1:00     1.0      TIMESERIES NORAIN

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
```

```
;;-------------- ---------- ---------- ---------------- -------- ----------------
NORTHERN_DISCHARGE_POINT 0          FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Type/Params            SurDepth  Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- --------- --------          -------- --------
BASIN_2_SURF     810      3.8        0          TABULAR    BASIN_SURF                   0         1

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- --------
BASIN_2_OUT      BASIN_2_SURF     NORTHERN_DISCHARGE_POINT 0          TABULAR/DEPTH   BASIN_1_OUT                NO

[INFLOWS]
;;Node           Constituent      Time Series      Type     Mfactor  Sfactor  Baseline Pattern
;;-------------- ---------------- ---------------- -------- -------- -------- -------- --------
BASIN_2_SURF     FLOW             Q100_110         FLOW     1.0      1.0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
BASIN_1_OUT      Rating     0.000      0.000
BASIN_1_OUT                 0.083      0.048
BASIN_1_OUT                 0.167      0.186
BASIN_1_OUT                 0.250      0.409
BASIN_1_OUT                 0.333      0.712
BASIN_1_OUT                 0.417      1.089
BASIN_1_OUT                 0.500      1.533
BASIN_1_OUT                 0.583      2.037
BASIN_1_OUT                 0.667      2.594
BASIN_1_OUT                 0.750      3.196
BASIN_1_OUT                 0.833      3.836
BASIN_1_OUT                 0.917      4.504
BASIN_1_OUT                 1.000      5.195
BASIN_1_OUT                 1.083      5.899
BASIN_1_OUT                 1.167      6.083
BASIN_1_OUT                 1.250      6.452
BASIN_1_OUT                 1.333      6.801
BASIN_1_OUT                 1.417      7.133
BASIN_1_OUT                 1.500      7.450
BASIN_1_OUT                 1.583      8.698
BASIN_1_OUT                 1.667      10.724
BASIN_1_OUT                 1.750      13.249
BASIN_1_OUT                 1.833      16.176
BASIN_1_OUT                 1.917      19.452
BASIN_1_OUT                 2.000      23.030
BASIN_1_OUT                 2.083      26.898
BASIN_1_OUT                 2.167      31.028
BASIN_1_OUT                 2.250      35.404
BASIN_1_OUT                 2.333      40.010
BASIN_1_OUT                 2.417      44.827
BASIN_1_OUT                 2.500      49.853
BASIN_1_OUT                 2.583      55.079
BASIN_1_OUT                 2.667      60.501
BASIN_1_OUT                 2.750      66.108
BASIN_1_OUT                 2.833      71.895
BASIN_1_OUT                 2.917      77.855
BASIN_1_OUT                 3.000      83.984
```

```
BASIN_1_OUT                3.083      90.273
BASIN_1_OUT                3.167      96.725
BASIN_1_OUT                3.250      103.333
BASIN_1_OUT                3.333      110.093
BASIN_1_OUT                3.417      117.002
BASIN_1_OUT                3.500      124.056
BASIN_1_OUT                3.583      131.247
BASIN_1_OUT                3.667      138.574
BASIN_1_OUT                3.750      146.038
BASIN_1_OUT                3.800      150.583
;
BASIN_SURF       Storage   0          3785
BASIN_SURF                 2          4690
BASIN_SURF                 3.8        5570

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Q100_110         1/1/2000   0:00       0
Q100_110                    0:11       0.66
Q100_110                    0:22       0.68
Q100_110                    0:33       0.70
Q100_110                    0:44       0.73
Q100_110                    0:55       0.75
Q100_110                    1:06       0.79
Q100_110                    1:17       0.82
Q100_110                    1:28       0.87
Q100_110                    1:39       0.89
Q100_110                    1:50       0.96
Q100_110                    2:01       1.00
Q100_110                    2:12       1.08
Q100_110                    2:23       1.13
Q100_110                    2:34       1.26
Q100_110                    2:45       1.33
Q100_110                    2:56       1.53
Q100_110                    3:07       1.66
Q100_110                    3:18       2.03
Q100_110                    3:29       2.31
Q100_110                    3:40       3.39
Q100_110                    3:51       4.77
Q100_110                    4:02       11.20
Q100_110                    4:13       2.72
Q100_110                    4:24       1.82
Q100_110                    4:35       1.42
Q100_110                    4:46       1.19
Q100_110                    4:57       1.04
Q100_110                    5:08       0.93
Q100_110                    5:19       0.84
Q100_110                    5:30       0.77
Q100_110                    5:41       0.72
Q100_110                    5:52       0.67
Q100_110                    6:03       0.00
;
NORAIN           1/1/2000   00:00      0
NORAIN           1/2/2000   00:00      0

[REPORT]
;;Reporting Options
```

```
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 191.920 4920.830 1021.827 5718.627
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
NORTHERN_DISCHARGE_POINT 753.080           4957.093
BASIN_2_SURF     666.636            5188.928

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Storage Node   X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
NORAIN           400.969            5660.022
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.3)
-------------------------------------------------------------

Parcel E Road Widening
100-Year Storm Hydrograph Detention
Proposed Condition

***************
Analysis Options
***************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... KINWAVE
Starting Date ............ 01/01/2000 00:00:00
Ending Date .............. 01/02/2000 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Routing Time Step ........ 60.00 sec


*************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.000         0.000
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.798         0.260
External Outflow .........         0.798         0.260
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.032


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
Maximum Time Step           :    60.00 sec
% of Time in Steady State   :     0.00
```

Average Iterations per Step : 1.00
% of Steps Not Converging : 0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
NORTHERN_DISCHARGE_POINT	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
BASIN_2_SURF	STORAGE	0.13	1.43	811.43	0 04:08	1.43

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
NORTHERN_DISCHARGE_POINT	OUTFALL	0.00	7.17	0 04:08	0	0.26	0.000
BASIN_2_SURF	STORAGE	11.20	11.20	0 04:03	0.26	0.26	-0.032

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
BASIN_2_SURF	0.514	2.9	0.0	0.0	5.866	33.1	0 04:08	7.17

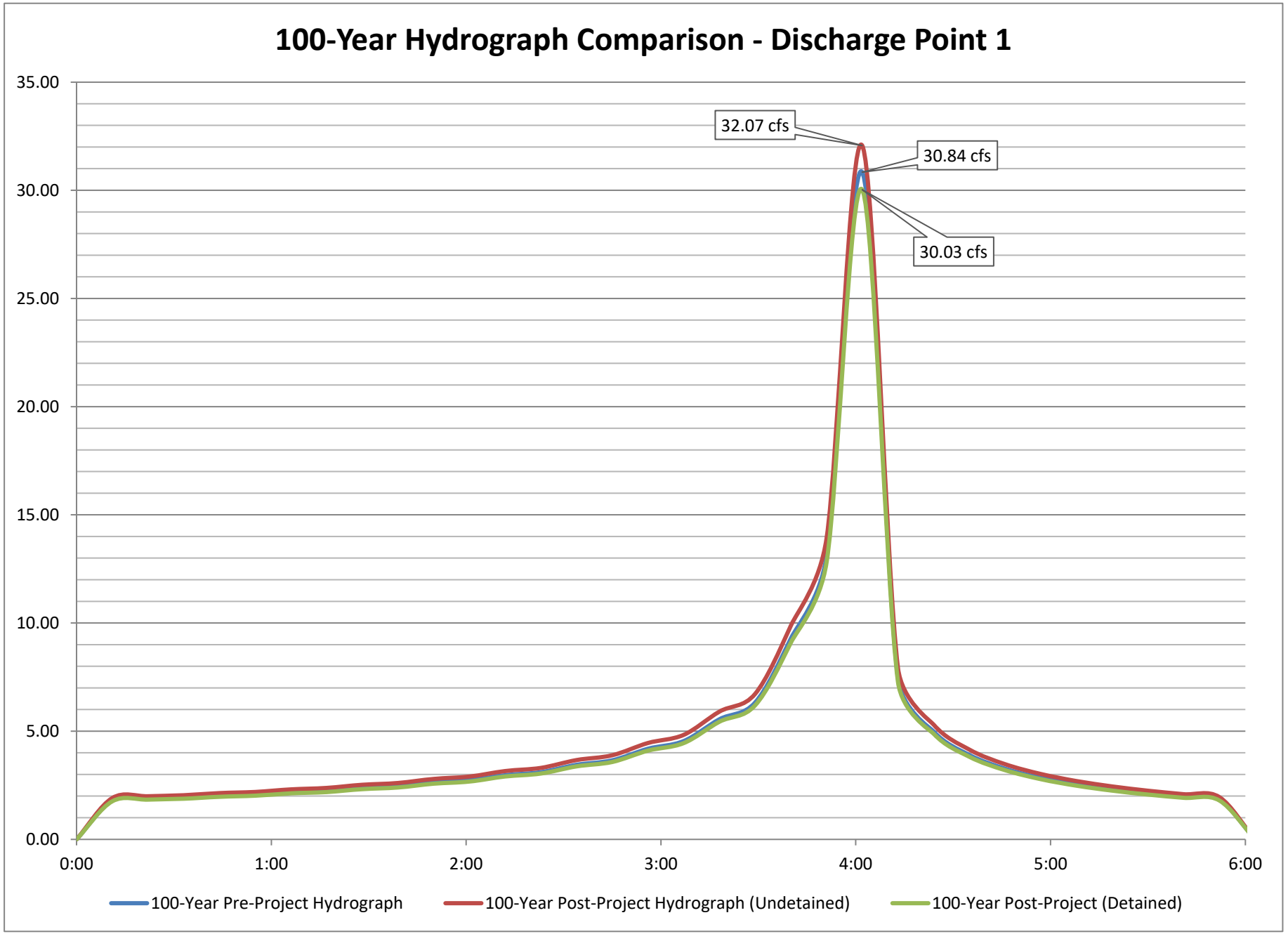
****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal

```
-------------------------------------------------------------
NORTHERN_DISCHARGE_POINT  58.82      0.68      7.17       0.260
-------------------------------------------------------------
System                    58.82      0.68      7.17       0.260


********************
Link Flow Summary
********************

-------------------------------------------------------------------------------
                                Maximum  Time of Max   Maximum    Max/    Max/
                                 |Flow|   Occurrence   |Veloc|    Full    Full
Link                  Type          CFS  days hr:min    ft/sec    Flow   Depth
-------------------------------------------------------------------------------
BASIN_2_OUT           DUMMY        7.17     0  04:08


************************
Conduit Surcharge Summary
************************

No conduits were surcharged.


Analysis begun on:  Tue Aug 22 16:51:47 2023
Analysis ended on:  Tue Aug 22 16:51:47 2023
Total elapsed time: < 1 sec
```

Attachment 6

Hydrograph Comparison


100-Year Hydrograph Comparison - Discharge Point 1
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0:00
1:00
2:00
3:00
4:00
5:00
6:00
32.07 cfs
30.84 cfs
30.03 cfs
100-Year Pre-Project Hydrograph
100-Year Post-Project Hydrograph (Undetained)
100-Year Post-Project (Detained)

Attachment 7

Detention Facility Storage and Discharge Curves

Stage-Area for Detention Basin

Depth (ft)	Area (ft^2)	Volume (ft^3)
0.00	3785	0
0.08	3821	317
0.17	3857	637
0.25	3894	960
0.33	3931	1286
0.42	3967	1615
0.50	4004	1947
0.58	4041	2282
0.67	4078	2621
0.75	4115	2962
0.83	4153	3306
0.92	4190	3654
1.00	4228	4005
1.08	4266	4359
1.17	4304	4716
1.25	4342	5076
1.33	4380	5439
1.42	4418	5806
1.50	4457	6176
1.58	4495	6549
1.67	4534	6925
1.75	4573	7304
1.83	4612	7687
1.92	4651	8073
2.00	4690	8462
2.08	4729	8855
2.17	4769	9250
2.25	4809	9650
2.33	4848	10052
2.42	4888	10458
2.50	4928	10867
2.58	4968	11279
2.67	5009	11695
2.75	5049	12114
2.83	5090	12536
2.92	5130	12962
3.00	5171	13391
3.08	5212	13824
3.17	5253	14260
3.25	5295	14699
3.33	5336	15142
3.42	5377	15589
3.50	5419	16039
3.58	5461	16492
3.67	5503	16949
3.75	5545	17409
3.80	5570	17687

DETENTION BASIN DISCHARGE RATING CURVE

Lowest Orifice

Diameter:	12.000	inches
Quantity:	2	
Invert Elevation:	0.000	ft
Type	Vertical	

Lower Slot

Quantity:		
Invert Elevation:		ft
Width:		ft
Height:		in
	0.000	ft
H_w:	810.00	ft

Lower Weir

Quantity:	1	
Invert Elevation:	1.50	ft
Length:	12.00	ft
H_w:	811.50	ft
Type	Sharp	

Upper Orifice

Diameter:		inches
Quantity:		
Invert Elevation:		ft

Upper Slot

Quantity:		
Invert Elevation:		ft
Width:		ft
Height:		in
	0.000	ft
H_w:	810.00	ft

Emergency Weir

Invert Elevation:		ft
Length:		ft
Breadth:		ft
H_w:	810.00	ft
Type	Sharp	

Absolute Invert Elevation of Lowest Discharge Opening

Invert Elevation: 810.00 ft

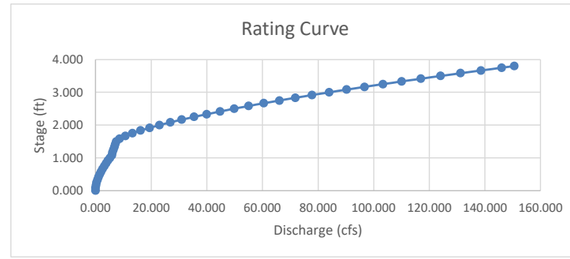
Notes:

h taken as total depth above the invert of the lowest discharge opening.

H_w = height of slot/weir invert above basin bottom

Infiltration

Basin Footprint:		sf
Infiltration Rate		in/hr
Factor of Safety		
Design Infiltration Rate		in/hr



Elevation (ft)	*h* (ft)	LOWEST ORIFICE				UPPER ORIFICE				LOWER SLOT					UPPER SLOT					LOWER WEIR		EMERGENCY WEIR		Q_{inf} (cfs)	Q_{TOTAL} (cfs)
		Orifice Discharge Coefficient	Orifice Flow	Weir Flow	$Q_{control}$ (cfs)	Orifice Discharge Coefficient	Orifice Flow	Weir Flow	$Q_{control}$ (cfs)	Orifice Discharge Coefficient	Orifice Flow	Weir Discharge Coefficient	Weir Flow	$Q_{control}$ (cfs)	Orifice Discharge Coefficient	Orifice Flow	Weir Discharge Coefficient	Weir Flow	$Q_{control}$ (cfs)	Weir Discharge Coefficient	Q (cfs)	Weir Discharge Coefficient	Q (cfs)		
810.00	0.000	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.000
810.08	0.083	N/A	N/A	0.048	0.048	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.048
810.17	0.167	N/A	N/A	0.186	0.186	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.186
810.25	0.250	N/A	N/A	0.409	0.409	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.409
810.33	0.333	N/A	N/A	0.712	0.712	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.712
810.42	0.417	N/A	N/A	1.089	1.089	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.089
810.50	0.500	N/A	N/A	1.533	1.533	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.533
810.58	0.583	N/A	N/A	2.037	2.037	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.037
810.67	0.667	N/A	N/A	2.594	2.594	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.594
810.75	0.750	N/A	N/A	3.196	3.196	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.196
810.83	0.833	N/A	N/A	3.836	3.836	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.836
810.92	0.917	N/A	N/A	4.504	4.504	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.504
811.00	1.000	N/A	N/A	5.195	5.195	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.195
811.08	1.083	N/A	N/A	5.899	5.899	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.899
811.17	1.167	0.591	6.083	N/A	6.083	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.083
811.25	1.250	0.591	6.452	N/A	6.452	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.452
811.33	1.333	0.591	6.801	N/A	6.801	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.801
811.42	1.417	0.591	7.133	N/A	7.133	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.133
811.50	1.500	0.591	7.450	N/A	7.450	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.270	0.000	N/A	N/A	N/A	7.450
811.58	1.583	0.591	7.754	N/A	7.754	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.270	0.944	N/A	N/A	N/A	8.698
811.67	1.667	0.592	8.054	N/A	8.054	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.270	2.670	N/A	N/A	N/A	10.724
811.75	1.750	0.592	8.343	N/A	8.343	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.270	4.905	N/A	N/A	N/A	13.249
811.83	1.833	0.593	8.624	N/A	8.624	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.270	7.552	N/A	N/A	N/A	16.176
811.92	1.917	0.593	8.897	N/A	8.897	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.270	10.555	N/A	N/A	N/A	19.452
812.00	2.000	0.593	9.155	N/A	9.155	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.270	13.874	N/A	N/A	N/A	23.030
812.08	2.083	0.594	9.414	N/A	9.414	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.270	17.484	N/A	N/A	N/A	26.898
812.17	2.167	0.594	9.667	N/A	9.667	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.270	21.362	N/A	N/A	N/A	31.028
812.25	2.250	0.595	9.914	N/A	9.914	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.270	25.490	N/A	N/A	N/A	35.404
812.33	2.333	0.595	10.155	N/A	10.155	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.270	29.855	N/A	N/A	N/A	40.010
812.42	2.417	0.595	10.384	N/A	10.384	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.270	34.443	N/A	N/A	N/A	44.827
812.50	2.500	0.595	10.607	N/A	10.607	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.270	39.246	N/A	N/A	N/A	49.853
812.58	2.583	0.595	10.826	N/A	10.826	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	44.253	N/A	N/A	N/A	55.079
812.67	2.667	0.595	11.044	N/A	11.044	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	49.457	N/A	N/A	N/A	60.501
812.75	2.750	0.595	11.258	N/A	11.258	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	54.850	N/A	N/A	N/A	66.108
812.83	2.833	0.596	11.468	N/A	11.468	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	60.426	N/A	N/A	N/A	71.895
812.92	2.917	0.596	11.675	N/A	11.675	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	66.179	N/A	N/A	N/A	77.855
813.00	3.000	0.596	11.879	N/A	11.879	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	72.105	N/A	N/A	N/A	83.984
813.08	3.083	0.596	12.075	N/A	12.075	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	78.197	N/A	N/A	N/A	90.273
813.17	3.167	0.596	12.273	N/A	12.273	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	84.452	N/A	N/A	N/A	96.725
813.25	3.250	0.596	12.467	N/A	12.467	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	90.866	N/A	N/A	N/A	103.333
813.33	3.333	0.597	12.659	N/A	12.659	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	97.434	N/A	N/A	N/A	110.093
813.42	3.417	0.597	12.848	N/A	12.848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	104.154	N/A	N/A	N/A	117.002

DETENTION BASIN DISCHARGE RATING CURVE

Lowest Orifice

Diameter:	12.000	inches
Quantity:	2	
Invert Elevation:	0.000	ft
Type	Vertical	

Lower Slot

Quantity:		
Invert Elevation:		ft
Width:		ft
Height:		in
	0.000	ft
H_w:	810.00	ft

Lower Weir

Quantity:	1	
Invert Elevation:	1.50	ft
Length:	12.00	ft
H_w:	811.50	ft
Type	Sharp	

Upper Orifice

Diameter:		inches
Quantity:		
Invert Elevation:		ft

Upper Slot

Quantity:		
Invert Elevation:		ft
Width:		ft
Height:		in
	0.000	ft
H_w:	810.00	ft

Emergency Weir

Invert Elevation:		ft
Length:		ft
Breadth:		ft
H_w:	810.00	ft
Type	Sharp	

Absolute Invert Elevation of Lowest Discharge Opening

Invert Elevation: 810.00 ft

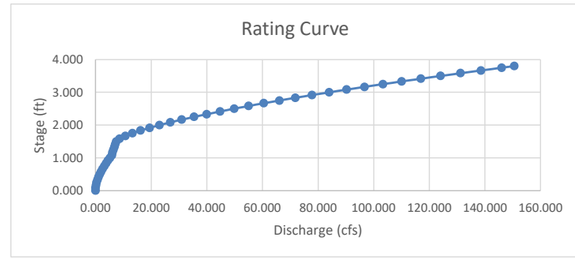
Notes:

h taken as total depth above the invert of the lowest discharge opening.

H_w = height of slot/weir invert above basin bottom

Infiltration

Basin Footprint:		sf
Infiltration Rate		in/hr
Factor of Safety		
Design Infiltration Rate		in/hr



Elevation (ft)	*h* (ft)	LOWEST ORIFICE				UPPER ORIFICE				LOWER SLOT					UPPER SLOT					LOWER WEIR		EMERGENCY WEIR		Q_{inf} (cfs)	Q_{TOTAL} (cfs)
		Orifice Discharge Coefficient	Orifice Flow	Weir Flow	$Q_{control}$ (cfs)	Orifice Discharge Coefficient	Orifice Flow	Weir Flow	$Q_{control}$ (cfs)	Orifice Discharge Coefficient	Orifice Flow	Weir Discharge Coefficient	Weir Flow	$Q_{control}$ (cfs)	Orifice Discharge Coefficient	Orifice Flow	Weir Discharge Coefficient	Weir Flow	$Q_{control}$ (cfs)	Weir Discharge Coefficient	Q (cfs)	Weir Discharge Coefficient	Q (cfs)		
813.50	3.500	0.597	13.035	N/A	13.035	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	111.021	N/A	N/A	N/A	124.056
813.58	3.583	0.597	13.214	N/A	13.214	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	118.033	N/A	N/A	N/A	131.247
813.67	3.667	0.597	13.387	N/A	13.387	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	125.187	N/A	N/A	N/A	138.574
813.75	3.750	0.597	13.558	N/A	13.558	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	132.480	N/A	N/A	N/A	146.038
813.80	3.800	0.597	13.662	N/A	13.662	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.271	136.921	N/A	N/A	N/A	150.583

Attachment 8

Hydraulic Sizing Calculations

5.6.6 Side Slopes

Side slopes of wetland-bottom channels shall not be steeper than 3H:1V whenever practical. When the side slopes of a wetland-bottom channel are grass-lined, refer to the guidelines provided in Section 5.5.

5.6.7 Horizontal Channel Alignment and Bend Protection

Channel bends shall be designed according to the criteria provided in Section 5.5.8.

5.6.8 Maintenance

Wetland-bottom channels require a maintenance and operation plan, along with appropriate easements and mechanisms for assuring the perpetual maintenance of the facility. The project owner shall ensure that appropriate mechanism is in place to provide maintenance for the lifetime of the facility.

5.7 DESIGN CRITERIA – RIPRAP-LINED CHANNELS

This Section presents minimum design criteria for rock riprap-lined channels. Riprapped transitions and bends in otherwise non-riprap channels are also considered riprap-lined channels, and shall be designed in accordance with the design standards outlined in this Section. The design engineer is responsible for confirming that a channel design meets these criteria, the general open-channel criteria outlined in Section 5.3, and any special considerations for a particular design situation.

5.7.1 Longitudinal Channel Slope

The longitudinal slope of riprap-lined channels shall be dictated by maximum permissible velocity requirements. Table 5-3 summarizes the maximum permissible velocity for standard riprap gradations. Where topography is steeper than desirable, drop structures may be used to maintain design velocities (see Section 5.12).

Table 5-3 Channel Bottom Riprap Protection

Design Velocity (ft/s)	Rock Gradation
6-10	No. 2 Backing
10-12	¼ ton
12-14	½ ton
14-16	1 ton
16-18	2 ton
> 18	Special Design

5.7.2 Roughness Coefficients

The Manning roughness coefficient (n) for hydraulic computations shall be estimated for loose rock riprap using the Manning-Strickler equation (Equation 5-5). Equation 5-5 (Chang, 1992) does not apply to grouted rock riprap or to very shallow flow. Table 5-4provides Manning roughness coefficients for standard rock riprap classifications based on the Manning-Strickler method.

$$n = 0.0395 d_{50}^{1/6} \qquad (5\text{-}5)$$

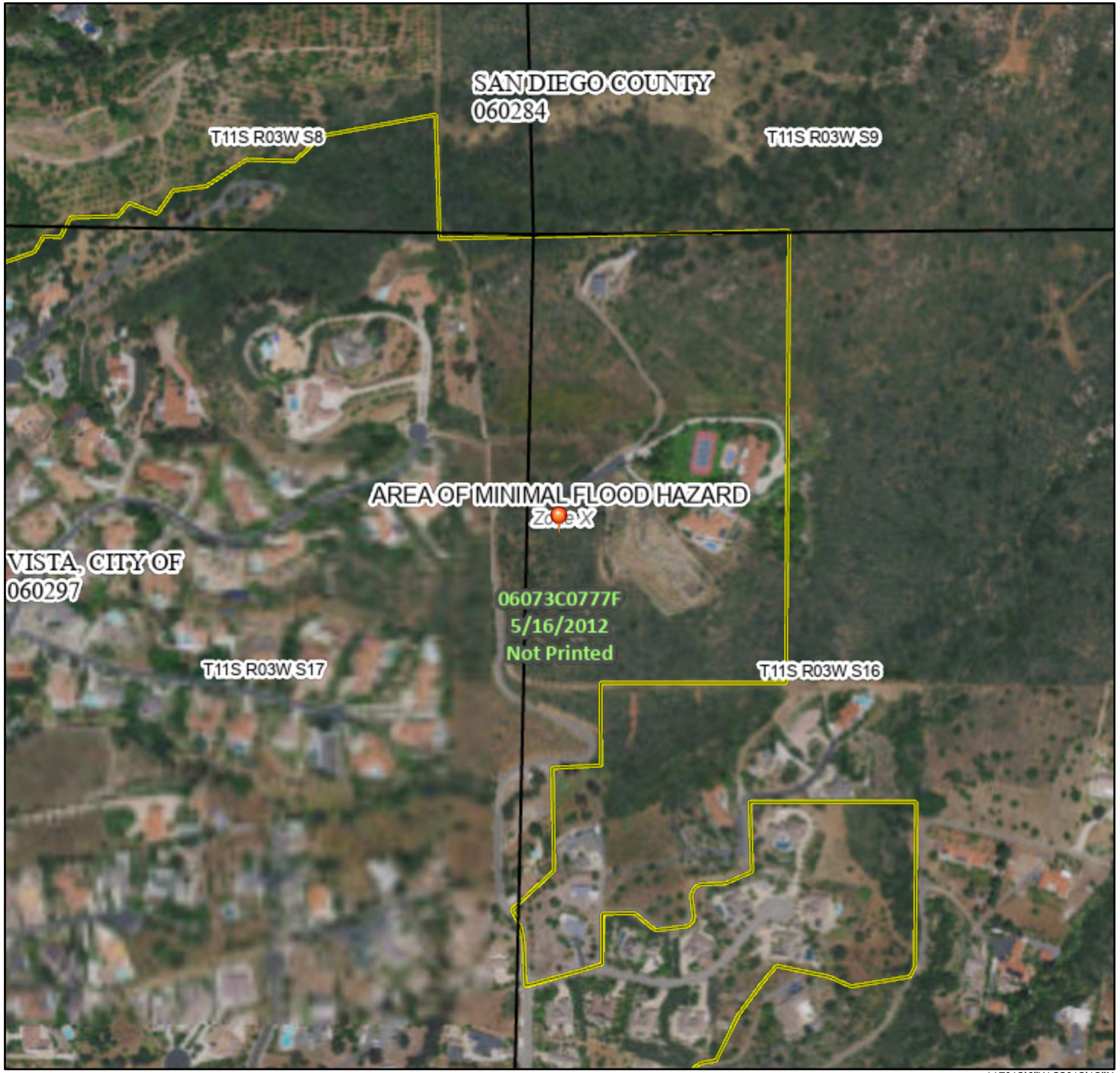
Attachment 9

Referenced Documents

National Flood Hazard Layer FIRMette

FEMA

117°12'44"W 33°13'42"N



117°12'6"W 33°13'12"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

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

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

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

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

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

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

N

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

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

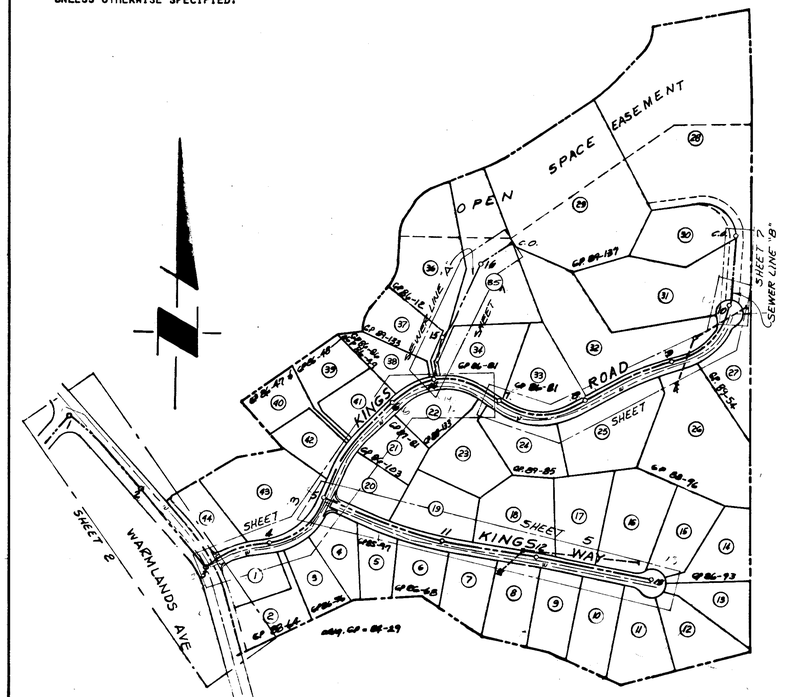
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/24/2022 at 6:05 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

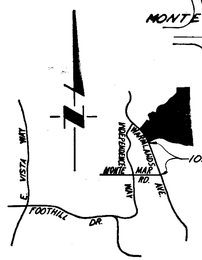
WARMLANDS HIGHLANDS

WATER NOTES CONTINUED

11. CONTRACTOR TO TEST HIS LINES AGAINST HIS OWN BLOCKING AND NOT AGAINST DISTRICT VALVES.
12. ALL FIRE CONNECTIONS ARE TO BE MONITORED BY TELEPHONE TO A RESPONSIBLE AGENCY TO THE SATISFACTION OF THE VISTA IRRIGATION DISTRICT PER DWG W-32.
13. THE ACTUAL LOCATION AND DEPTH OF ALL EXISTING WATERLINES ARE TO BE VERIFIED BY THE CONTRACTOR AND ANY DISCREPANCY IS TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER OF WORK FOR CORRECTION.
14. ALL WATER SERVICE OUTLETS SHALL BE ONE INCH (1") DIAMETER PLASTIC PIPE, UNLESS OTHERWISE NOTED, SHALL BE MARKED ON THE FACE OF CURB WITH "W", AND SHALL NOT BE INSTALLED IN PRESSURE ZONES EXCEEDING 160 PSI.
15. ALL WATER METER SERVICE OUTLETS SHALL BE LOCATED WITHIN LANDSCAPED AREAS. PLACEMENT OF WATER METER SERVICE OUTLETS IN PAVED AREAS REQUIRE PRIOR APPROVAL AND SHALL BE IDENTIFIED ON THESE PLANS WITH THE SYMBOL "*".
16. ALL VALVES SHALL BE GATE VALVES EXCEPT FIRE HYDRANTS, WHICH SHALL BE BUTTERFLY VALVES.
17. ALL VALVES ON VAC PIPING SYSTEMS SHALL BE RING-TITE BY FLANGE, UNLESS OTHERWISE SPECIFIED.



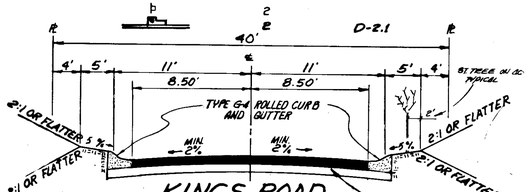
KEY MAP
SCALE 1"=200'



VICINITY MAP
NO SCALE

WORK TO BE DONE

ITEM	QUANTITY	ST'D.
A.C. PAVEMENT & BASE	75,800 S.F.	SEE TYP. SECTION
CURB & GUTTER	625 L.F. 6800 L.F.	G-4 G-2
CROSS GUTTER	1920 S.F.	G-12
CONSTRUCTION OF V.C.P. OR P.V.C.	4331 L.F. (8")	S-4
CONSTRUCTION OF MAN HOLE	14	S-1
CONSTRUCTION OF 4" LATERAL	44	S-13
CONSTRUCTION OF CLEAN OUT	2	S-3
CONSTRUCTION OF 8" A.C.P.	2920 L.F.	
INSTALLATION OF FIRE HYDRANT	7	W-16, W-18 (J-3700)
INSTALLATION OF WATER SERVICE	44	W-1, (Type B), W-23
INSTALLATION OF BLOWOFF	6	W-12 (Type E)
INSTALLATION OF AIR VENT	3	W-5 (Type B)
INSTALLATION OF GATE VALVE	8	
STREET LIGHT 135 WATTS 22,500 LUMENS L.P.S.V. NORELCO	3	S.D.G.& E.
DRIVE APPROACH	44	
STREET TREE	150	L-1 L-2
BROW DITCH	220 L.F.	D-75
STREET NAME SIGN	2	
STOP SIGN	2	
CURB INLET OR C.B	2 3 1	D-2 D-8 D-6
RIP-RAP	2	D-40
MONUMENT	19	M-13
A.C. SPILLWAY	20 L.F.	D-22
STORM DRAIN	180 L.F. - 18" RCP 182 L.F. - 36" CSP 118 L.F. - 30" CSP.	198 L.F. - 18" CSP. 217 L.F. 24" RCP 96 L.F. - 18" - 80 L.F. 36" CMP
STORM DRAIN CLEANOUT	1	D-9
NOT A THRU STREET SIGN	2	
CURB INLET		D-2.1



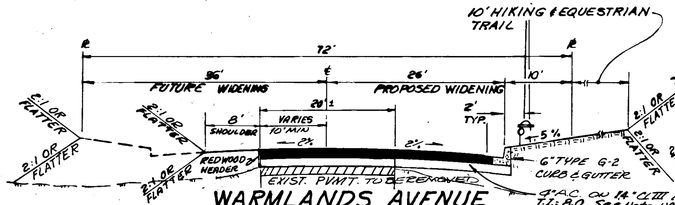
KINGS ROAD
STA. 4+10 - 18+45

SEE CHART @ LEFT FOR STRUCT. SECT.

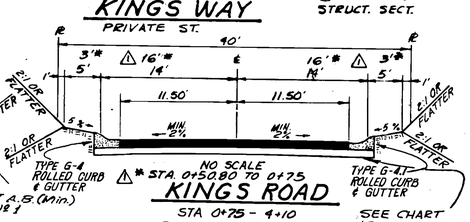
STRUCTURAL SECTIONS	
KINGS ROAD	
STA	SECTION
0+00 TO 10+50	2"A.C. ON 4"CL II BASE
10+50 TO 11+50	3"A.C. ON 4"CL II BASE
11+50 TO 15+40	3½"A.C. ON 4"CL II BASE
15+40 TO 16+10	3"A.C. ON 4"CL II BASE
16+10 TO END	2½"A.C. ON 4"CL II BASE
KINGS WAY	
0+00 TO 7+85	2"A.C. ON 4"CL II BASE
7+85 TO 8+50	2½"A.C. ON 4"CL II BASE
8+50 TO 9+40	3"A.C. ON 4"CL II BASE
9+40 TO END	2½"A.C. ON 4"CL II BASE

12" Min. D.G. Sub-base (R-50 Min.)

STREET LIGHT & F.H. LOCATIONS



WARMLANDS AVENUE
NO SCALE



⚠* STA. 0+50.80 TO 0+75
KINGS ROAD
STA 0+75 - 4+10
PRIVATE ST.

SEE CHART @ LEFT FOR STRUCT. SECT.

GENERAL NOTES

1. THE STRUCTURAL SECTION SHALL BE DESIGNED BASED ON "R" VALUE OF SOILS AND FOR A T.I.= * MINIMUM SECTION TO BE 3" A.C. ON 8" D.G BASE. STRUCTURAL SECTION DESIGN TO BE CERTIFIED BY THE CITY ENGINEER PRIOR TO CONSTRUCTION. * T.I.= 8.0 FOR WARMLANDS AVENUE
2. ALL BACKFILL IN TRENCHES TO BE COMPACTED IN ACCORDANCE WITH THE CITY OF VISTA STANDARD SPECIFICATIONS.
3. AN "AS BUILT" DRAWING SHALL BE SUBMITTED TO THE DIRECTOR OF PUBLIC WORKS PRIOR TO THE ACCEPTANCE OF THE IMPROVEMENTS.
4. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THIS PLAN, THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION AND THE SAN DIEGO REGIONAL STANDARD DRAWINGS.
5. ALL PROPERTY CORNERS SHALL BE UNDISTURBED BY THE CONSTRUCTION OF IMPROVEMENTS OR RESET AT CONTRACTOR EXPENSE.
6. FOR LOCATION OF UNDERGROUND UTILITIES, OR FOR EMERGENCY ASSISTANCE CALL:

SAN DIEGO GAS & ELECTRIC CO.	232-4252
VISTA SANITATION DISTRICT	726-1340
VISTA IRRIGATION DISTRICT	724-8811
PACIFIC TELEPHONE COMPANY	298-0595
CITY OF VISTA	726-1340
UNDERGROUND SERVICE ALERT	1-800-422-4133

7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL UTILITIES.
8. NO CONSTRUCTION IS AUTHORIZED WITHOUT CONSTRUCTION PERMITS FROM THE CITY OF VISTA AND THE VISTA SANITATION DISTRICT
9. THE PERMITTEE SHALL GIVE NOTICE TO THE CITY OF VISTA PUBLIC WORKS DEPARTMENT AT LEAST 48 HOURS PRIOR TO COMMENCING THE WORK. ANY WORK DONE WITHOUT PROPER INSPECTION WILL BE SUBJECT TO REJECTION. PHONE: 726-1340 FOR INSPECTIONS.
10. EXISTING SEWER MAINS TO BE JOINED SHALL BE UNCOVERED AND FLOWLINE ELEVATIONS VERIFIED PRIOR TO BREAKING INTO EXISTING LINES. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER OF WORK BEFORE CONTINUING THE WORK.
11. THE ENGINEER OF WORK SHALL BE NOTIFIED WHEN CONSTRUCTION IS COMMENCED, AND OF CHANGES OR ADDITIONS MADE DURING THE PROGRESS OF CONSTRUCTION. NO DEVIATION OF THESE PLANS IS PERMITTED WITHOUT THE APPROVAL OF THE DIRECTOR OF PUBLIC WORKS.
12. NAME OF AUTHORITY ON MANHOLE COVER: "VISTA SANITATION DISTRICT SEWER." PIPE ON HORIZONTAL AND VERTICAL CURVES SHALL BE EXTRA STRENGTH. PLAIN END VITRIFIED CLAY WITH BAND SEAL TYPE II - MECHANICAL COMPRESSION COUPLINGS, (ASTM-C-700; ASTM-C-594), SIX FEET MAXIMUM LENGTH OF PIPE WITH DEFLECTED JOINTS.
13. ALL EXISTING FEATURES AND STRUCTURES IN CONFLICT WITH THESE PLANS SHALL BE RELOCATED OR REMOVED AT DEVELOPER'S EXPENSE.
14. SHOULD DRIVEWAY LOCATIONS INDICATED HEREON BE ADJUSTED AT TIME OF CONSTRUCTION, REVISION TO WATER AND SEWER SERVICES MAY BE REQUIRED.

WATER NOTES

1. ALL WATER MAIN CONSTRUCTION SHALL BE IN ACCORDANCE WITH THESE SIGNED IMPROVEMENT PLANS AND WITH THE "STANDARD SPECIFICATIONS FOR CONSTRUCTION OF WATER LINES" OF THE VISTA IRRIGATION DISTRICT.
2. A SIGNED SET OF IMPROVEMENT PLANS DOES NOT IMPLY THAT CONSTRUCTION MAY BEGIN. CONTRACTOR TO CONTACT ENGINEERING DEPARTMENT AND CONFIRM.
3. ANY CHANGES IN THE APPROVED IMPROVEMENT PLANS MUST BE REVIEWED AND APPROVED BY THE DISTRICT PRIOR TO THE INSTALLATION OF SUCH CHANGES AND THE CHANGES SHALL BE SHOWN ON THE IMPROVEMENT PLANS.
4. DISTRICT WILL PERFORM ALL CONSTRUCTION TO EXISTING LINES AND APPURTENANCES UNLESS OTHERWISE NOTED.
5. ALL WATER APPURTENANCES ARE TO BE LOCATED WITHIN PUBLIC STREET RIGHT-OF-WAY OR DISTRICT EASEMENTS PER DWG W-37.
6. AN APPROVED "AS-BUILT" MYLAR SHALL BE TURNED OVER TO THE DISTRICT SHOWING CORRECT LOCATIONS OF ALL APPURTENANCES.
7. ALL WATER PIPING TO BE COLOR CODED PER DISTRICT SPECIFICATIONS DUE TO PRESENCE OF RECLAIMED WATER LINES, IF APPLICABLE.
8. ALL PIPE AND APPURTENANCES TO BE REMOVED ARE TO BE SALVAGED PER VISTA IRRIGATION DISTRICT SPECIFICATION 306-1.2.19, UNLESS OTHERWISE SPECIFIED.
9. DEVELOPER OR CONTRACTOR TO NOTIFY THE DISTRICT 24 HOURS IN ADVANCE FOR INSPECTION AT 724-8811 EXTENSION 31.
10. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UTILITIES DURING CONSTRUCTION.

NOTES CONTINUED UPPER LEFT

AS-BUILT IMPROVEMENT PLANS

Stephen R Bobbett — 11-8-85
ENGINEER — DATE

CITY — DATE

AS-BUILT WATER 9-30-85

Stephen R Bobbett
APPROVED BY

ENGINEER OF WORK
Stephen R Bobbett 3-14-84
STEPHEN R. BOBBETT DATE
R.C.E. 27711

PREPARED FOR:
WARMLANDS HIGHLAND
133 S. SANTA FE
VISTA, CALIFORNIA 92083
(714)-758-1710

PREPARED BY:
Brosnne & Vogt
civil engineers, land surveyors, planning consultants
726-0920
630 ALTA VISTA DR., SUITE 203 VISTA, CA. 92083

T.S.M # 78-23

CITY APPROVED CHANGES			
NO.	DESCRIPTION	APPROVED BY	DATE
⚠	REVISED TYP. SECTION KINGS ROAD	[illegible]	5-28-85

BENCH MARK
STD. U.S.C. & G.S. DISK NO. Q 0307
CITY REF. CVS-52
LOCATION: 135 FT. S.E. OF VISTA WAY AND 17 FT. EASTERLY OF & OF MEADOW LAKE DR. IN TOP OF SOUTH END OF THE EASTERLY HEADWALL.
ELEV. 402.152 DATUM: U.S.C. & G.S.

Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this Project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineer harmless from any and all liability, real or alleged, in connection with the performance of work on this Project, excepting for liability arising from the sole negligence of the Owner or the Engineer.

VISTA IRRIGATION DISTRICT
APPROVED:
THOMAS M. WILSON R.C.E. 15995

CITY OF VISTA
IMPROVEMENT PLANS FOR WARMLANDS HIGHLANDS

APPROVED: DIRECTOR OF PUBLIC WORKS	RCE	9417 DATE 5-14-84	SHEET 1 OF 8
CONTRACTOR:	DATE STARTED:	W.O. NO: 1707	DRAWING NO. 1654
INSPECTOR:	DATE COMPLETED:	CHECKED BY:	

MAP 1-23 AND 5-1 AP 174-03 & 173-04 J-10125A

LN 80-24

1654 1 of 8 VIT 78-23 WARMLANDS HIGHLANDS 1654 1 of 8

"PERFECT" PROFILE
PLATE A
RODNEY STOKES CO.

* SDG&E Note
Street lights have been installed at stations 11+63 R, 13+40 L and 16+34 R. All lights are 135 W/ L.P.S.V. 22,500 Lumens per City of Vista Std 3 & 4. Connections: 1" sch 40 with #10 wire THHN. Total L.F. = 400 ±

AS-BUILT

△8 REV. STA. OF 1" A.V., 2" B.O. & 8"x8"x8" TEE 9-30-85

WARMLANDS AVENUE

CITY APPROVED CHANGES			
No.	DESCRIPTION	APP'D BY	DATE
4	Delete street lights	[signature]	5-30-85
5	Add standard dwg. #	[signature]	5-30-85
6	Construct street light	[signature]	5-30-85
7	Construct gunite swale	[signature]	5-30-85
8	Relocate street lights		

CITY APPROVED CHANGES			
No.	Description	Approved by	Date
1	Revised Grade 9+88 to 13+30, Revised Curb Inlets & 24" RCP & Offsite Drain. Structure		
2	Delete Wing Wall	[signature]	5-30-85
3	Abandon storm dr. & headwall	[signature]	5-30-85 J.R.V.

T.S.M.# 78-23

CITY OF VISTA

IMPROVEMENT PLANS FOR WARMLANDS AVE.

APPROVED: [signature] DIRECTOR OF PUBLIC WORKS RCE 9417 DATE 5-14-84

SHEET 2 OF 8

CONTRACTOR:
INSPECTOR:
DATE STARTED:
DATE COMPLETED:
W.O. NO: 1707
CHECKED BY:
DRAWING NO. 1654

J-10125A

1654 2/8 V.T. 78-23 WARMLANDS

"PERFECT" PROFILE PLATE A RODNEY STOKES CO.

KINGS ROAD PROFILE
HORIZ. 1"=40'
VERT. 1"=8'

SEE SHEET 4

SEWER CURVE DATA
Δ=60°16'31"
R=205.00'
L=215.66'

SEWER CURVE DATA
Δ=25°18'38"
R=205.00'
L=90.55'

SEWER CURVE DATA
Δ=21°30'00"
R=365.00'
L=136.96'

SEWER CURVE DATA
Δ=58°00'00"
R=195.00'
L=197.40'

℄ CURVE DATA
Δ=21°30'00"
R=200.00
L=75.05'

℄ CURVE DATA
Δ=58°00'00"
R=200.00'
L=202.46'

℄ CURVE DATA
Δ=21°30'00"
R=360.00'
L=135.09'

℄ CURVE DATA
Δ=60°16'31"
R=200.00'
L=210.40'

EXISTING EASEMENT GRANTED TO VISTA IRRIGATION DISTRICT PER DOC. Nº 80-429169 REC. 12-22-80

EXISTING 10 SEWER EASEMENT GRANTED TO VISTA SANITATION DISTRICT PER DOC Nº 81-032705 REC. 2-2-81

AS-BUILT

⚠ Install 8" PVC sewer main

SCALE 1"=40'

CITY APPROVED CHANGES

No.	Description	Approved by	Date
⚠	Revised Paved width	JRV	5-20-85

CITY OF VISTA

IMPROVEMENT PLANS FOR
KINGS ROAD
(PRIVATE ROAD)

T.S.M.# 78-23

APPROVED: Director of Public Works — DATE 5-14-84 — SHEET 3 OF 8

CONTRACTOR: — DATE STARTED: — W.O. NO. 1707 — DRAWING NO. 1654

INSPECTOR: — DATE COMPLETED: — CHECKED BY:

J-10125A

REVISIONS	APPROVED	DATE
STORM DRAIN INLET BOX △		7-2-84
Lowered Cul-De-Sac ℄ Sewer △		10-25-84
Extend 8" P.V.C. 72'± ely △		10-15-86

CITY OF VISTA

IMPROVEMENT PLANS FOR KINGS ROAD (PRIVATE ROAD)

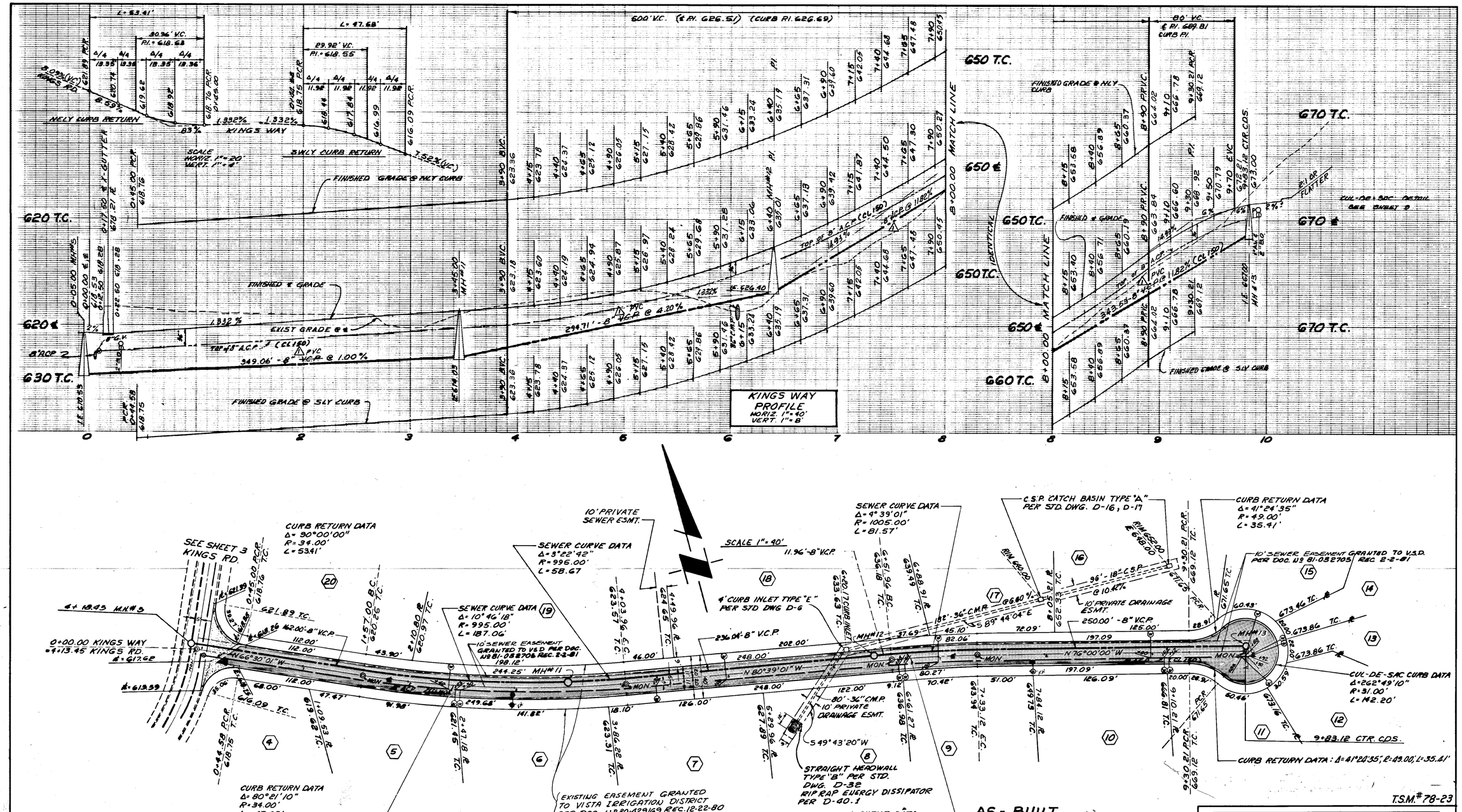
APPROVED: [signature] 9417 5-14-84 DIRECTOR OF PUBLIC WORKS R.C.E. DATE

SHEET 4 OF 8

CONTRACTOR: | DATE STARTED: | W.O. NO. 1707 | DRAWING NO. 1654

INSPECTOR: | DATE COMPLETED: | CHECKED BY:

"PERFECT" PROFILE
PLATE A
RODNEY STOKES CO.



T.S.M.# 78-23

CITY OF VISTA

IMPROVEMENT PLANS FOR
KINGS WAY
(PRIVATE ROAD)

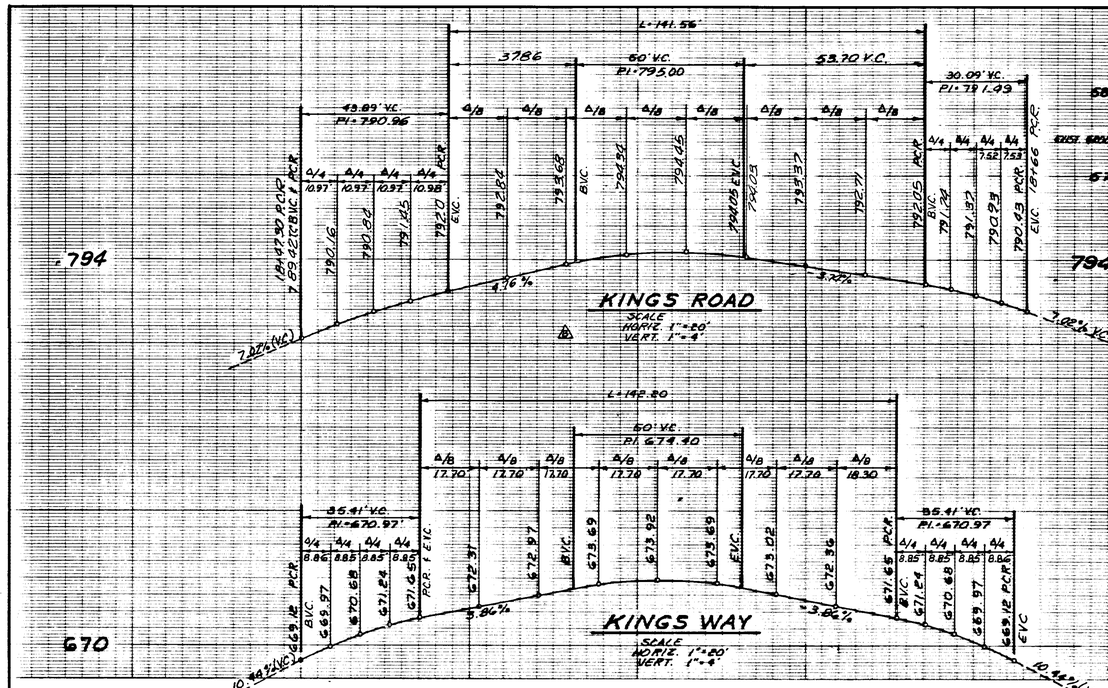
APPROVED: DIRECTOR OF PUBLIC WORKS / CITY ENGINEER — DATE 6-14-84		SHEET 5 OF 8
CONTRACTOR:	DATE STARTED:	W.O. NO: 1707
INSPECTOR:	DATE COMPLETED:	CHECKED BY:
		DRAWING NO. 1654

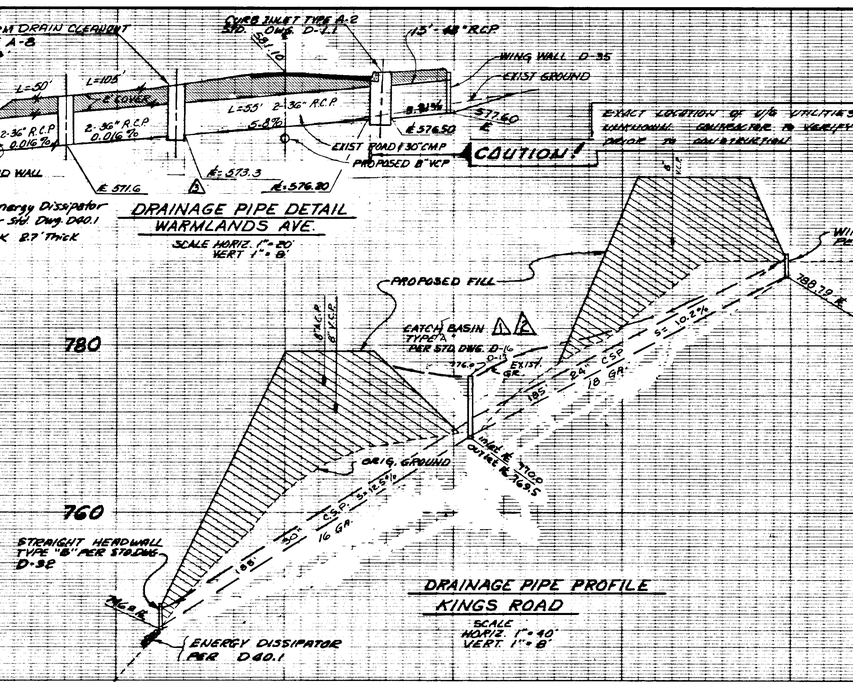
JRV

J-10125A

1654
5 of 8
KINGS WAY PROF.
T.M. 7823
5 of 8
1654

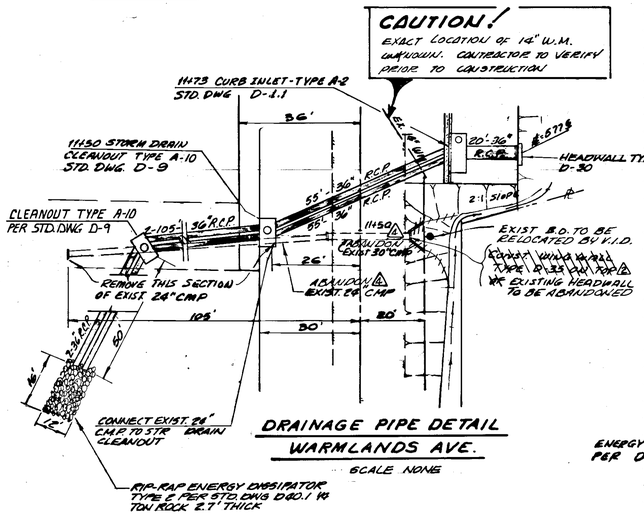
"PERFECT" PROFILE
PLATE A
RODNEY STOKES CO.

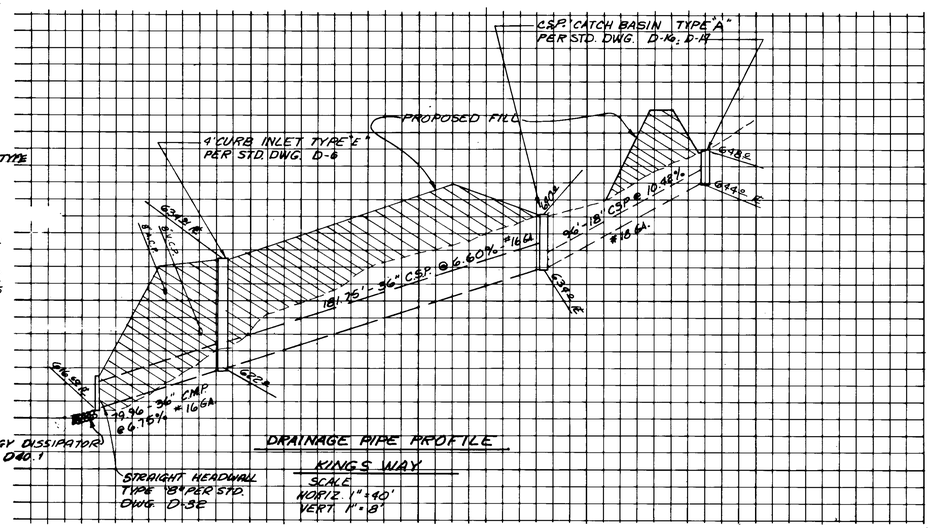




CUL-DE-SAC PROFILE

LATERAL TABLE			
LOT	* STATION	LENGTH	COMMENT
KINGS ROAD			
44	0+90	15'	
1	1+00	25'	
43	1+50	15'	
2	2+90	25'	
3	2+60	25'	
4	3+50	25'	
20	5+00	25'	
42	5+50	15'	
40	6+10	16'	
39	6+15	15'	
21	6+90	25'	
41	7+50	15'	
22	7+85	25'	
38	8+10	15'	
37	9+15	15'	
36	9+35	15'	
34	10+00	15'	
24	11+75	25'	
33	12+00	15'	
26	13+25	25'	
	14+09.51	LINE "A"	
35	3+12	5'	
32	3+66	5'	
29	5+27	5'	
26	15+95	25'	
27	18+00	25'	
	LINE "B"		
31	1+26	5'	
30	2+72	5'	
28	END	5'	
KINGS WAY			
5	2+00	25'	
19	3+00	15'	
6	3+30	25'	
7	4+00	25'	
23	4+48	15'	
18	5+50	15'	
8	6+10	25'	
9	7+20	25'	
17	7+50	15'	
10	8+60	25'	
16	8+90	15'	
11	9+65	35'	
15	9+73	35'	
14	9+75	45'	
13	9+77	45'	
12	9+79	45'	





REVISIONS		
	APPROVED	DATE
DRAINAGE PIPE PROFILE STORM DRAIN INLET BOX (1) (2)		7-2-84
LOWERED CUL-DE-SAC GRADES		10-25-84
Revise drainage pipe profile on Warmlands (3)		
Abandon exist. C.M.P. and headwall/ delete wingwall (4)		

T.SM.* 78-23

* NOTE: SEWER LATERAL LOCATION MAY BE ADJUSTED AT TIME OF CONSTRUCTION.

NOTE:
ALL C.S.P. TO BE FULL ASPHALT DIPPED & 6" NEUTRAL SAND ENCASED.

JRV

CITY OF VISTA

CUL-DE-SAC & DRAINAGE DETAILS

APPROVED: Jesse Riddle (DIRECTOR OF PUBLIC WORKS)	9417 R.C.E.	5-14-84 DATE	SHEET 6 OF 8
CONTRACTOR:	DATE STARTED:	W.O. NO. 1707	DRAWING NO. 1654
INSPECTOR:	DATE COMPLETED:	CHECKED BY:	

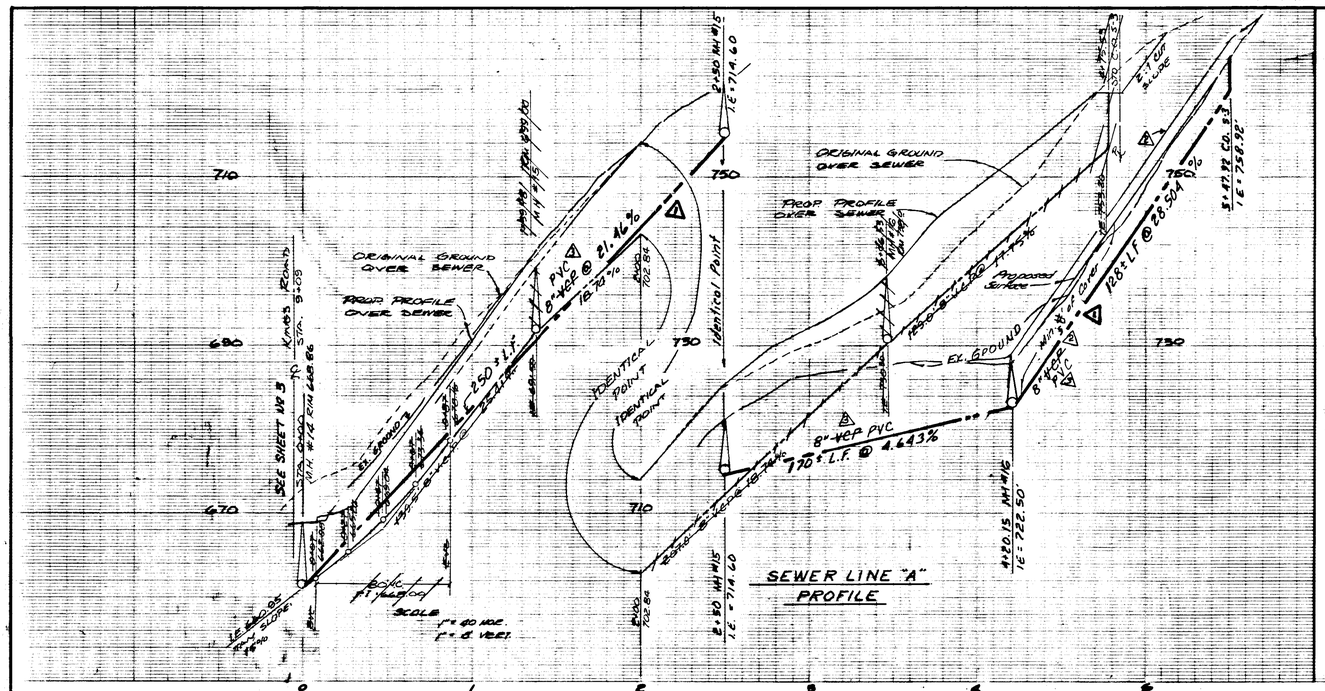
J-10125 A

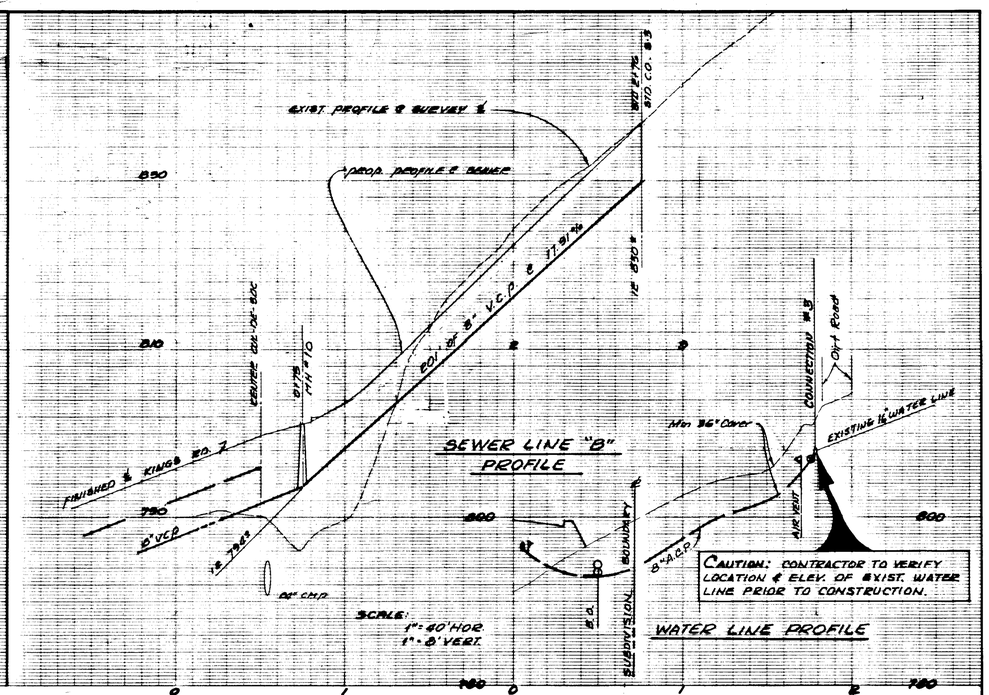
1654
6 of 8

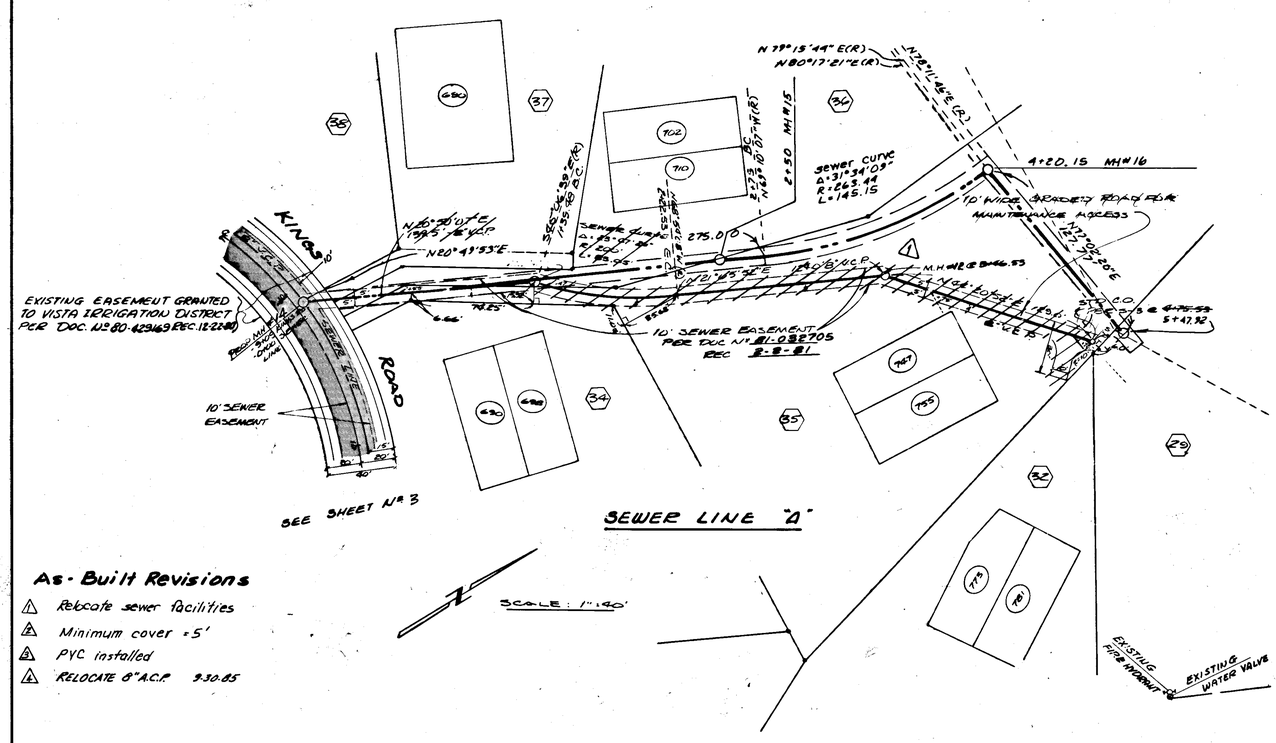
CUL-DE-SAC & DRAINAGE DETAILS

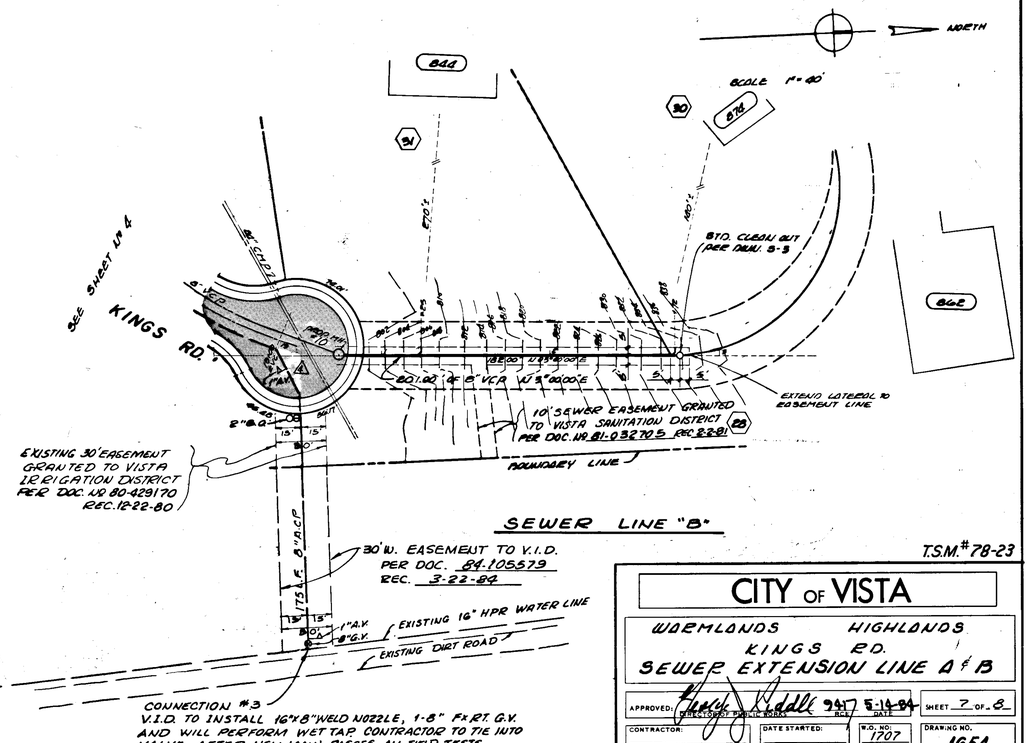
1654
6 of 8

"PERFECT" PROFILE
PLATE A
ROONEY STOKES CO.









As-Built Revisions

1. Relocate sewer facilities
2. Minimum cover = 5'
3. PVC installed
4. RELOCATE 8" A.C.P. 9-30-85

T.S.M. # 78-23

CITY OF VISTA

WARMLANDS HIGHLANDS
KINGS RD.
SEWER EXTENSION LINE A & B

APPROVED: Harold Riddle DIRECTOR OF PUBLIC WORKS	R.C.E. 9417	DATE 5-14-84	SHEET 7 OF 8
CONTRACTOR:	DATE STARTED:	W.O. NO. 1707	DRAWING NO. 1654
INSPECTOR:	DATE COMPLETED:	CHECKED BY:	

J-101,25A

1654-S
7 of 8
W.T. 78-23
KINGS RD SEWER "A" & "B"
1654-S
7 of 8

SEE SHEET 4

SEE SHEET 4

KINGS WAY

SCALE 1"=40'

NOTE: SEE GRADING PLAN SHEET 3 OF 5 FOR COMPLETE GRADING DETAILS

EXISTING 10' SEWER EASEMENT GRANTED TO VISTA SANITATION DISTRICT PER DOC. 81-032725 DEC. 2, 1981

EXISTING EASEMENT GRANTED TO VISTA IRRIGATION DISTRICT DOC. NO. 80-428169 DEC. 12, 1980

20' DRAINAGE EASEMENT

10' DRAINAGE EASEMENT

10' SEWER ESMT

Limits of Retention Basin

STEEL PIPE INLET TYPE A PER STD. DWG D-16, D-17

PROPOSED FILL

2'-6" SQ. CURB INLET TYP. B PER STD. DWG. D-2

EXIST. GROUND

STRAIGHT HEADWALL TYPE "B" PER STD. DWG. D-32

ENERGY DISSIPATOR PER DGO.1

DRAINAGE PIPE PROFILE KINGS WAY

SCALE 1" = 40' HOR.

DETAILED PLAN VIEW OF DET. STRUCT. ENDS

NO SCALE

BACK FILL WITH 5 SACK MIX OF CEMENT & SAND (TYPICAL ENDS OF ALL DETENTION STRUCTURES)

8"x8"x16" CONC. BLK. WALL

"A" RETAINING WALL LG.	"B" SPILLWAY OPENING	"C" DISCHARGE OPENING
*1. 40'±	8' x 30.0'	1-15" C.S.P.
*2. 40'±	8' x 30.0'	1-15" C.S.P.
*3. 70'±	8' x 45.0'	3-15" C.S.P.

DUCT LENGTH TO BE DETERMINED AT CONSTRUCTION

DETENTION BASIN RETAINING WALL DETAIL

LIGHT ROCK CL II RIP RAP PER MOD. D-40 "1.2 G"S

REVISIONS	APPROVED	DATE
STORM DRAIN INLET BOXES		1-2-84

VT 78-23

CITY OF VISTA

IMPROVEMENT PLANS FOR WARMLANDS HIGHLANDS

APPROVED: DIRECTOR OF PUBLIC WORKS — DATE 5-10-84

CONTRACTOR: DATE STARTED:

INSPECTOR: DATE COMPLETED:

W.O. NO. 1707 CHECKED BY:

SHEET 8 OF 8

DRAWING NO. 1654

1654

8 of 8

VT 78-23

GRADING

1654