Technical Memorandum

To: City of Perris

From: Jennifer Gillen, P.E., Senior Engineer

Date: February 28, 2025

Re: Rider Distribution Center II - FHYD Update

Introduction

This technical memorandum is prepared to complement the Final Drainage Study report titled "Rider Distribution Center II" prepared for IDI Logistics. Relevant excerpts are provided in Appendix B. This technical memo will provide updated calculations and exhibits based on the updated final site plan. 'Rider II' is bounded by Rider St to the south, Redlands Ave to the west, Perris Valley Storm Channel to the east, and MWD property to the north. Rider II project site consists of an industrial warehouse, parking and landscape on approximately 39.4 acres and currently drains to a basin in the southeast corner of the project. Water quality storm events are directed to an onsite storage basin in the southeast corner via a Stormgate Vault structure before being pumped into and treated by a Contech Filterra unit (See FWQMP for more information). Flows higher than the water quality event will bypass the Stormgate Vault and continue to the existing Line A-B in Rider Street and continue into the Perris Valley Storm Drain.

The redevelopment proposed in this memo would remove and replace approximately 2.2 acres of the existing improvements for additional truck parking and a revised landscaped area. The development will make use of the existing underground storm drain pipe and inlets. There is an existing 10' wide catch basin that will remain in place. The existing auto parking being replaced was included in the area tributary to the catch basin. Flows were conveyed via curb & gutter, ribbon gutters, and u-channels.

Due to an increase of 0.4% in total impervious area when compared to the original site plan, Lateral A-1 which connects to the existing catch basin, was reanalyzed hydrologically and hydraulically to show the additional flows will not negatively impact the existing improvements. The updated rational method map and calculations can be found in Appendix A.

Lateral-A1 (Onsite)

The revised eastern parking area of the project site will follow the existing drainage pattern and continue to drain to the existing 10' wide catch basin and be collected by Lateral-A1. Lateral-A1, is a 24-inch HDPE storm drain which currently conveys the 100-year peak flow rate of 9.4 cfs to Line-A. The hydraulic model for Lateral-A1 was recreated to properly model the pipe based on the revised site plan and flows. Using a new 100-year peak flow of 13.7 cfs, a new ponding WSE of 1439.7 shows an additional 5 inches of ponding when compared to the original ponding elevation of 1439.3. This is still more than 4-feet below the existing FEMA base flood elevation of 1444. This means that the onsite runoff does not contribute to a worsening flooding condition as is currently existing.

Appendices

APPENDIX A – Hydrology/Hydraulic Analysis and Map
APPENDIX B – Relevant Excerpts from the Approved Final Drainage Report

APPENDIX A

RATIONAL METHOD – 10 YEAR STORM

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2018 Version 9.0
Rational Hydrology Study Date: 02/28/25 File:PROP10.out

17-0357 RIDER DISTRIBUTION CENTER II
RATIONAL METHOD HYDROLOGY - ONSITE STORM DRAIN
10 YEAR STORM EVENT
FN: PROP10.OUT EA

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

English (in-lb) Units used in input data file

Program License Serial Number 6587

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.780(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 613.000(Ft.)
Top (of initial area) elevation = 1442.300(Ft.)
Bottom (of initial area) elevation = 1437.900(Ft.)
Difference in elevation = 4.400(Ft.)
Slope = 0.00718 s(percent)= 0.72
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.493 min.
Rainfall intensity = 1.833(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.878
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 9.493(CFS)
Total initial stream area = 5.900(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 101.000 to Point/Station 102.000

**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.400(Ft.)
Downstream point/station elevation = 1432.900(Ft.)
Pipe length = 34.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.493(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 9.493(CFS)
Normal flow depth in pipe = 11.58(In.)
Flow top width inside pipe = 17.25(In.)
Critical Depth = 14.27(In.)
Pipe flow velocity = 7.90(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 10.56 min.
End of computations, total study area = 5.90 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 69.0

RATIONAL METHOD – 100 YEAR STORM

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2018 Version 9.0
Rational Hydrology Study Date: 02/28/25 File:PROP100.out

17-0357 RIDER DISTRIBUTION CENTER II
RATIONAL METHOD HYDROLOGY - ONSITE STORM DRAIN
100 YEAR STORM EVENT
FN: PROP100.OUT EA

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

English (in-lb) Units used in input data file

Program License Serial Number 6587

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 613.000(Ft.)
Top (of initial area) elevation = 1442.300(Ft.)
Bottom (of initial area) elevation = 1437.900(Ft.)
Difference in elevation = 4.400(Ft.)
Slope = 0.00718 s(percent)= 0.72
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.493 min.
Rainfall intensity = 2.632(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 13.716(CFS)
Total initial stream area = 5.900(Ac.)
Pervious area fraction = 0.100

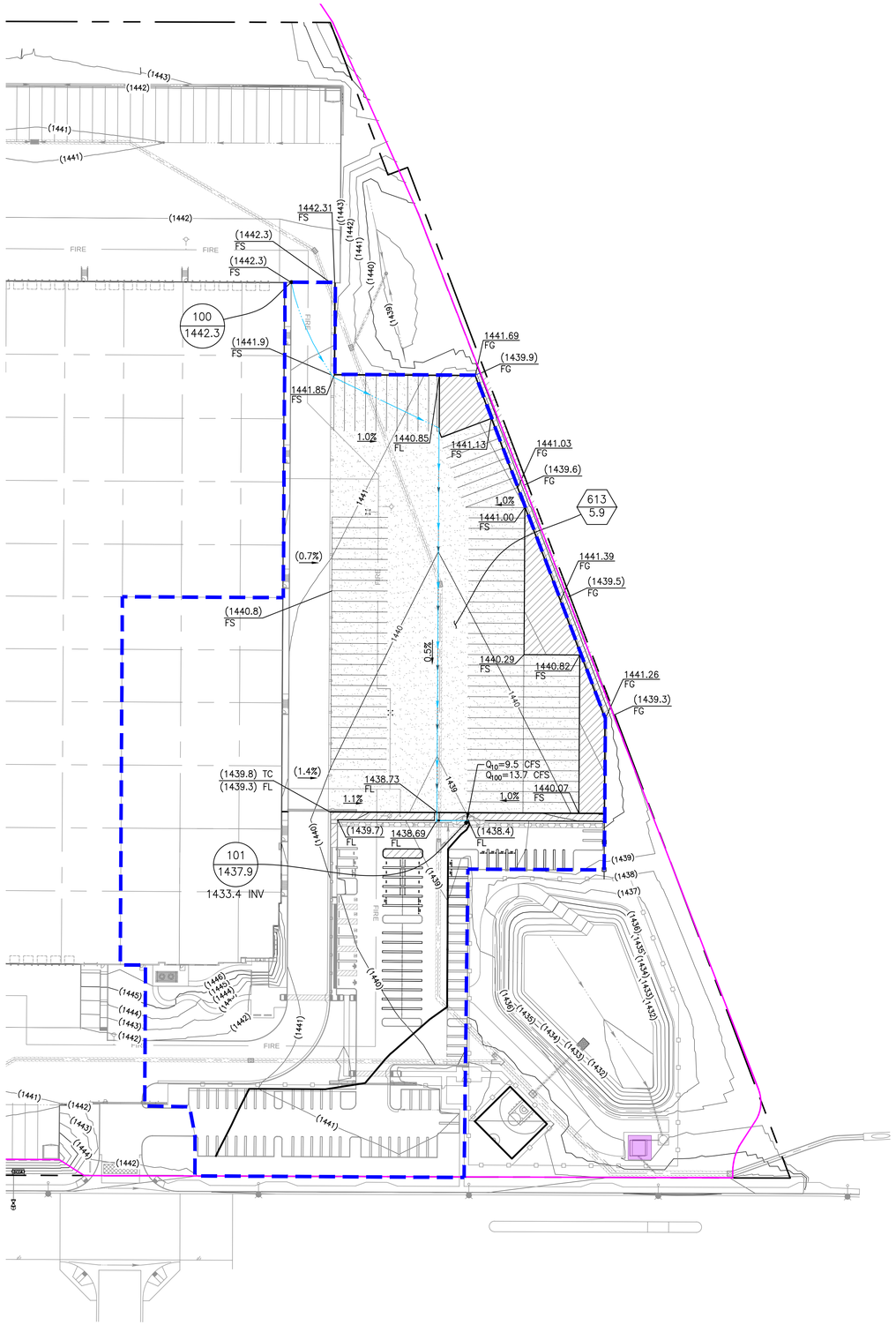
++
Process from Point/Station 101.000 to Point/Station 102.000

**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.400(Ft.)
Downstream point/station elevation = 1432.900(Ft.)
Pipe length = 34.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 13.716(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 13.716(CFS)
Normal flow depth in pipe = 13.13(In.)
Flow top width inside pipe = 20.33(In.)
Critical Depth = 16.52(In.)
Pipe flow velocity = 8.68(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 10.56 min.
End of computations, total study area = 5.90 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 69.0

HYDROLOGY MAP



LEGEND

- DRAINAGE MANAGEMENT BOUNDARY
- SUB-AREA BOUNDARY
- EXISTING STORM DRAIN
- FLOW DIRECTION
- NODE / ELEV — NODE NUMBER, ELEVATION (FT)
- *XXXX.X — INVERT ELEVATION (FT)
- FT / AC — LENGTH (FT), AREA (ACRES)

N
W WEBB E
S

1" = 60'

60 0 60 120 180

PRELIMINARY

G:\2017\17-0357\DRAINAGE\HYDROLOGY\FINAL\DWG FOLDER\17-0357-MM HYD MEMO.DWG 2/28/2025 4:43:55 AM EduardoA

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SHEET 1 OF 1 SHEETS

Lateral A-1 WSPG Analysis

```
T1 IDI LOGISTICS - RIDER DISTRIBUTION CENTER II                                                  0
T2 ONSITE STORM DRAIN LATERAL A1
T3 FN: LATA1.WSW
SO   1000.0001432.380  1                          1439.160
REM INITIAL HGL TAKEN FROM THE WSPG RESULTS OF LINE A
R    1002.3601432.910  2      .012                                  .000    .000 0
R    1008.4701432.990  2      .012                                  .000    .000 0
R    1039.4101433.370  2      .012                                  .000    .000 0
WE   1039.4101433.370  3      .500
R    1042.4101433.470  3      .012                                  .000    .000 0
SH   1042.4101433.470  3                          1433.470
CD   1  4   1    .000   2.000     .000  .000  .000   .00
CD   2  4   1    .000   2.000     .000  .000  .000   .00
CD   3  3   0    .000   5.000   10.000  .000  .000   .00
CD   4  3   0    .000   2.500    1.500  .000  .000   .00
Q           13.700   .0
```

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4	1		2.000														
CD	2	4	1		2.000														
CD	3	3	0	.000	5.000	10.000	.000	.000	.00										
CD	4	3	0	.000	2.500	1.500	.000	.000	.00										

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
IDI LOGISTICS - RIDER DISTRIBUTION CENTER II
HEADING LINE NO 2 IS -
ONSITE STORM DRAIN LATERAL A1
HEADING LINE NO 3 IS -
FN: LATA1.WSW

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.000	1432.380	1	1439.160

REMARKS: INITIAL HGL TAKEN FROM THE WSPG RESULTS OF LINE A

WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1002.360	1432.910	2	.012	.000	.000	.000	0

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1008.470	1432.990	2	.012	.000	.000	.000	0

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1039.410	1433.370	2	.012	.000	.000	.000	0

ELEMENT NO 5 IS A WALL ENTRANCE *

U/S DATA	STATION	INVERT	SECT	FP
	1039.410	1433.370	3	.500

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1042.410	1433.470	3	.012	.000	.000	.000	0

ELEMENT NO 7 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1042.410	1433.470	3	1433.470

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date: 2-28-2025 Time: 3:56:32

IDI LOGISTICS - RIDER DISTRIBUTION CENTER II

ONSITE STORM DRAIN LATERAL A1

FN: LATA1.WSW

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	1432.380	6.780	1439.160	13.70	4.36	.30	1439.46	.00	1.33	.00	2.000	.000	.00	1 .0
2.360	.2246					.0031	.01	6.78	.00	.46	.012	.00	.00	PIPE
1002.360	1432.910	6.257	1439.167	13.70	4.36	.30	1439.46	.00	1.33	.00	2.000	.000	.00	1 .0
6.110	.0131					.0031	.02	6.26	.00	.99	.012	.00	.00	PIPE
1008.470	1432.990	6.196	1439.186	13.70	4.36	.30	1439.48	.00	1.33	.00	2.000	.000	.00	1 .0
30.940	.0123					.0031	.10	6.20	.00	1.01	.012	.00	.00	PIPE
1039.410	1433.370	5.913	1439.283	13.70	4.36	.30	1439.58	.00	1.33	.00	2.000	.000	.00	1 .0
WALL	ENTRANCE													
1039.410	1433.370	6.354	1439.724	13.70	.27	.00	1439.73	.00	.39	10.00	5.000	10.000	.00	0 .0
3.000	.0333					.0000	.00	6.35	.02	.19	.012	.00	.00	BOX
1042.410	1433.470	6.254	1439.724	13.70	.27	.00	1439.73	.00	.39	10.00	5.000	10.000	.00	0 .0

APPENDIX B

Rider Distribution Center II
Design Review/Case No: 19-00004
City of Perris, Riverside County, California

Final Drainage Study

Prepared for:
IDI Logistics
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Prepared By:
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Original Date Published: October 2020
Revision Date(s): March 2021

DJ Arellano, P.E.
Senior Engineer

TABLE OF CONTENTS

SECTION 1 - SUMMARY

PURPOSE

The purpose of this report is to document the hydrologic and hydraulic analyses performed in support of the Rider Distribution Center II project located in the City of Perris, County of Riverside, California. The project site is located on the corner of Rider Street to the South and Redlands Avenue to the West. The Perris Valley Storm Drain is located directly to the East of the project site. The project proposes to build an industrial warehouse on approximately 40 acres. This report will summarize the hydrology and hydraulic analyses that were completed to determine the necessary drainage improvements required for the project to safely convey runoff through the site.

The scope of this report will include the following:

- Determine the peak 100-year and 10-year flow rates for the developed condition using the Riverside County Flood Control and Water Conservation District (RCFC&WCD) Rational Method.
- Determine the required storm drain facilities, alignment, and sizes required to flood protect the project site.
- Preparation of a final report summarizing the hydrology and hydraulic results.

DESCRIPTION OF WATERSHED

As previously described, the project is proposing to construct an industrial warehouse on approximately 37 acres. Existing elevations across the site vary from 1445 at the northwest corner to 1434 at the southeast corner (NAVD88 datum). The site is relatively flat and currently slopes at approximately 0.2%. The existing drainage pattern for the site is characterized by sheet flows that follow the approximate slope to the southeast corner of the project site. The sheet flow discharges southeasterly towards Rider Street where a portion of it pools at the southeast corner and some continues to flow along Rider Street and into a catch basin at the center of the bridge.

The project site is currently located within Zone AE and the Regulatory Floodway of FEMA map 06065C1430H effective 08-18-2014. Base flood elevations (BFE) vary from approximately 1444 in the north to approximately 1442 in the south. The project proposes to grade the building pad at least one foot above the highest BFE. It also proposes to expand the Perris Valley Storm Drain Channel on both sides along the project frontage; this will move the Regulatory Floodway out of the project site and within the expanded channel's top width.

The project is located within the Perris Valley Commerce Center Specific Plan (PVCCSP), and it is associated within the Perris Valley Storm Drain Master Drainage Plan (MDP). The backbone drainage facility for this area is the existing storm drain Line A-B (RFCF&WCD MS 94. No. 4-0-00537). The design of the Line A-B storm drain system accounts for the fully developed condition of the tributary watershed it serves. In addition, Line A-B drainage areas were reallocated to account for proposed impacts of RCTC's Mid County Parkway to the Line A-B and Line A-C MDP tributaries. Accounting for the reallocation, this project will still be able to discharge unrestricted flow from the site. The A-B/A-C Reallocation Memo has been provided in Appendix C; it contains the existing drainage study and Line A-B as-built plans.

PROPOSED CONDITIONS

The project site will be encompassed by existing streets on the west and south side of the property and prevent any runoff from the streets to impact it. On the east side of the property, where the Perris Valley Strom Drain (PVSD) is located, there is an access road that serves as a ridge line/berm; it prevents any normal runoff in the PVSD from encroaching on the project site. However, there is a natural ridgeline

within the Metropolitan Water District (MWD) right-of-way to the north side of the project boundary that splits half of its discharge to the north and the other half to the south. The site is projected to receive approximately 3.0 acres of pervious offsite sheet flows. The project proposes to use concrete v-ditches and wall openings to convey the offsite runoff onsite. Offsite flows are proposed to be conveyed using the onsite storm drain system.

Onsite flows generated by the proposed project will be collected and conveyed using a combination of surface flows, curb and gutter, ribbon gutter, and storm drain. Water quality storm events will be directed to an onsite storage basin in the southeast corner via a Stormgate Vault structure before being pumped into and treated by a Contech Filterra unit (See FWQMP for more information). Flows higher than the water quality event will bypass the Stormgate Vault and continue to the existing Line A-B in Rider Street and continue into the Perris Valley Storm Drain.

As stated before, this project also proposes to widen the Perris Valley Storm Drain Channel. The channel will be widened on both sides along the project frontage; it shall be completed before the start of this project's construction. A CLOMR/LOMR will be processed through FEMA as part of this development for the expanded channel.

METHODOLOGY

HYDROLOGY

Hydrologic calculations were performed in accordance with the RCFC&WCD Hydrology Manual, dated April 1978. The Rational Method was utilized in determining peak flow rates.

The hydrological parameters, including rainfall values and soil types were derived from the RCFC&WCD Hydrology Manual and have been included in Appendix A. The land use was assumed to be commercial for the developed as recommended in the hydrology manual.

The Rational Method was chosen to determine the peak flow rates that are used to size and design the subsurface storm drain systems to convey onsite flows to Line A-B. The flow rates were computed by generating a hydrologic "link-node" model in which the overall area is divided into separate drainage sub-areas, each tributary to a concentration point (node) determined by the proposed layout and grading.

Rational Method calculations were performed using a computer program developed by CivilDesign Corporation and Joseph E. Bonadiman and Associates Inc. The computer program is commonly referred to as CivilD which incorporates the hydrological parameters outlined in the RCFC&WCD Hydrology Manual

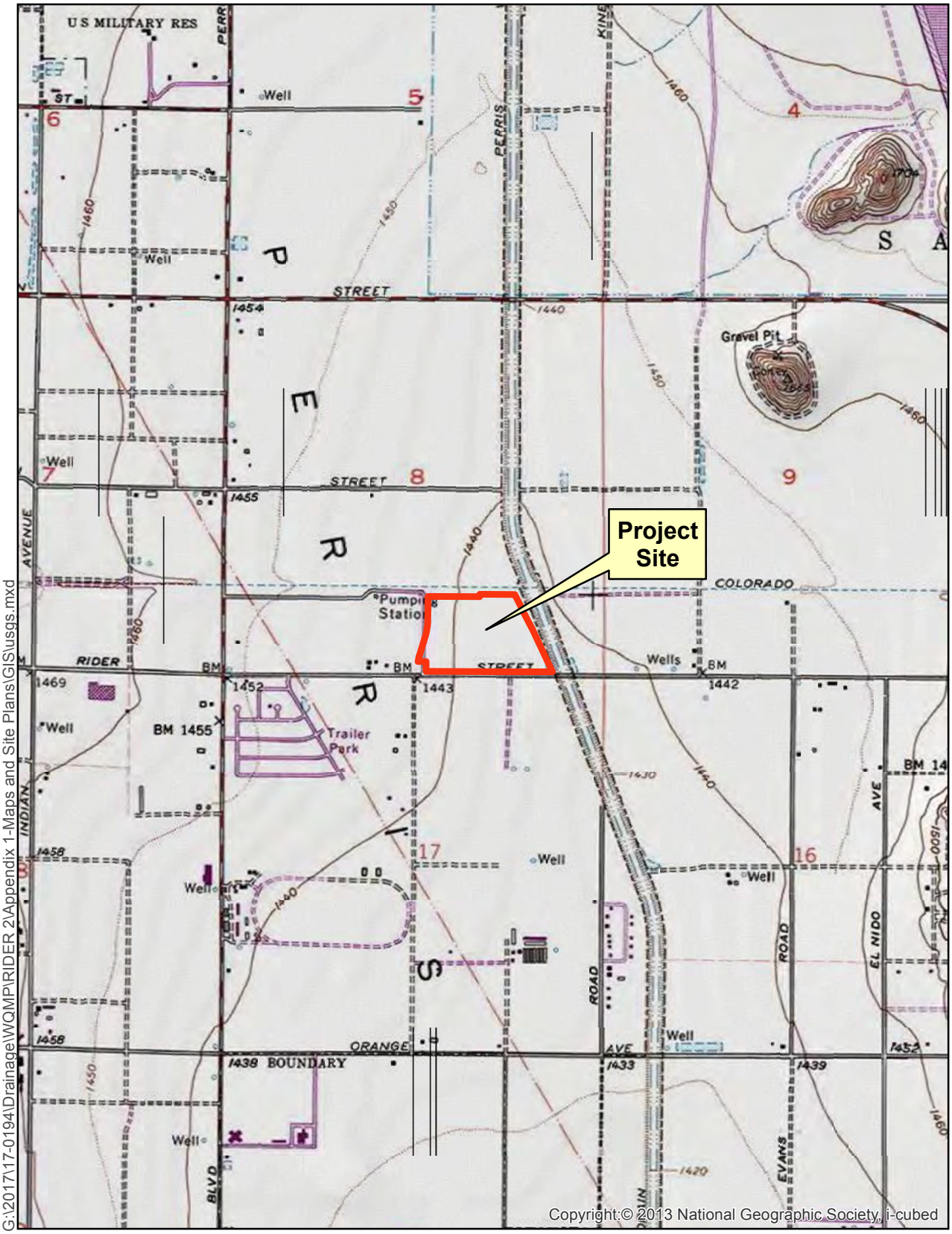
HYDRAULICS

Based on the results from the Rational Method Hydrology, a steady state hydraulic analysis of the storm drain system was performed to size/analyze onsite subsurface storm drain systems. The facilities were analyzed under the established 100-year flow rates. The computer program, Water Surface and Pressure Gradient (WSPG) from CivilDesign, Corp. Version 14.06 (originally Los Angeles County Flood Control District Program F0515P) was used to analyze the system. For additional information and results, see Appendix B.

Water quality basin calculations were performed using spreadsheets that were created by RCFC&WCD. Calculations and additional details can be found in the Final WQMP (FWQMP).

G:\2017\17-0194\Drainage\WQMP\RIDER 2\Appendix 1-Maps and Site Plans\GIS\vicinity.mxd

FIGURE 1: VICINITY MAP



G:\2017\17-0194\Drainage\WQMP\RIDER 2\Appendix 1-Maps and Site Plans\GIS\usgs.mxd

Sources: ESRI / USGS 7.5min Quad
DRGs: PERRIS

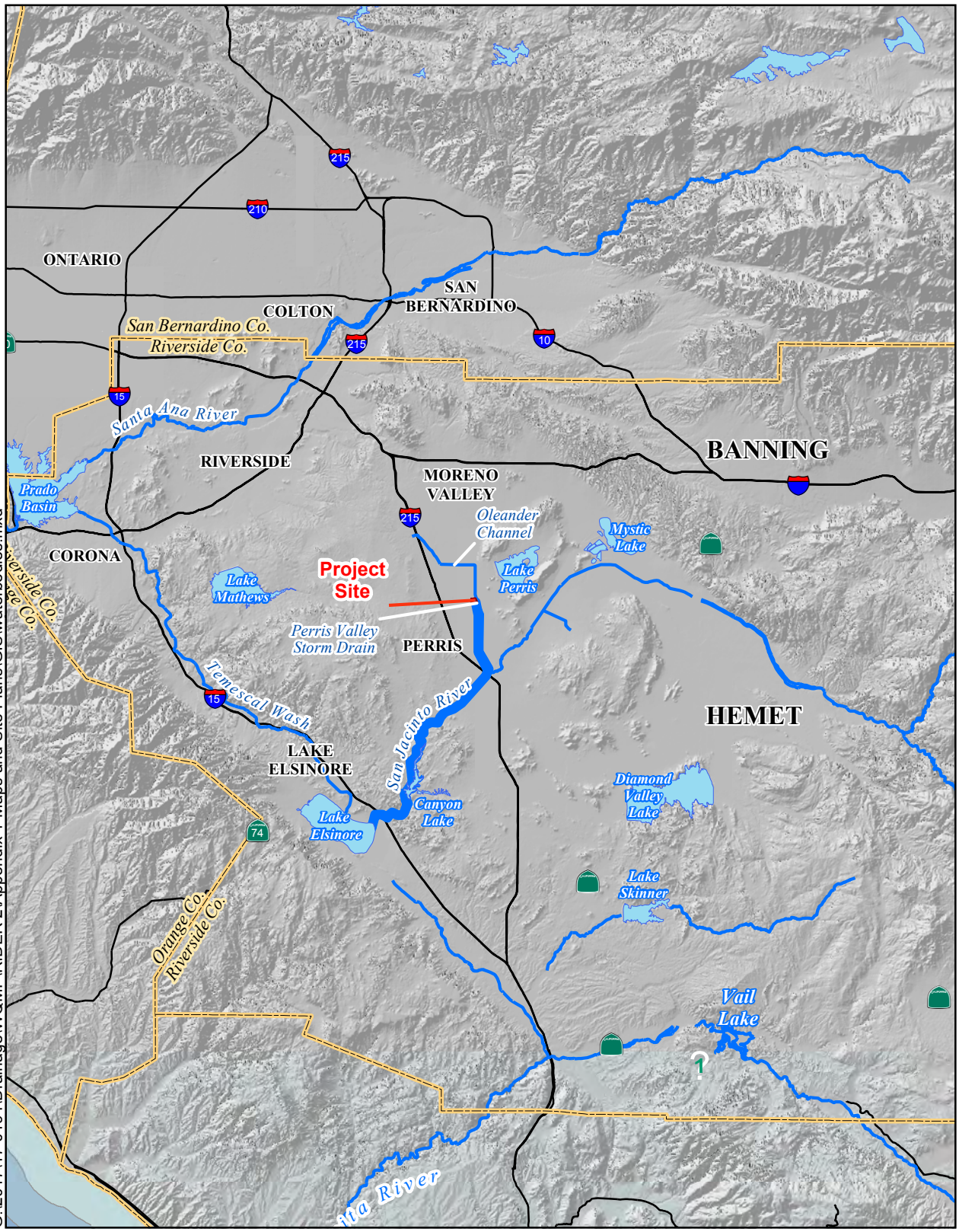
Figure 2. USGS Topography Map

0 1,000 2,000
Feet

Sources: County of Riverside GIS, 2013; Eagle Aerial, April 2012.

Figure 3. Aerial Photograph

0 400 800 Feet



G:\2017\17-0194\Drainage\WQMP\RIDER 2\Appendix 1-Maps and Site Plans\GIS\waterbodies.mxd

Sources: USGS 30 Meter DEM;
USGS Digital Line Graph

Figure 4. Receiving Waterbodies

0 2 4 6
Miles

Flowpath

G:\2017\17-0194\Drainage\WQMP\RIDER 2\Appendix 1-Maps and Site Plans\GIS\SOILS MAP.mxd

Eagle Aerial, April 2010;
Riverside County GIS, 2012
RCFC&WCD Hydology Manual Plate C-1.30

N
W E
S

0 500 1,000
Feet

Soils Map

SECTION 2 - HYDROLOGY ANALYSIS

HYDROLOGY PARAMETERS

The RCFC&WCD Hydrology Manual was used to determine several of the hydrological parameters. The following rainfall depths were utilized in the hydrology analyses, which were obtained from the standard intensity-duration curve for Perris Valley per Plate D-4.1:

Table 1 – Precipitation Values

	Duration
Storm Event	1-Hour (inches)
10-Year	0.78
100-Year	1.12

The value for slope of intensity was determined to be 0.49 from Plate D-4.1 and has been included in Appendix A.

Based on the Plate C-1.30 (Perris) in the RCFC&WCD Hydrology Manual, the project site is comprised of soil type C. The soils map is included in Appendix A.

The cover type was determined based on the proposed use of the site. The commercial landscaping cover type was used to represent the developed condition. The table below summarizes the runoff index values and recommended values for percentage each category of impervious cover:

Table 2 – Cover Type

Cover Type	Soil Group A	Soil Group B	Soil Group C	Soil Group D	Percentage of Impervious Cover
Commercial Landscaping	32	56	69	75	90
Undeveloped Poor	67	78	86	89	0

ONSITE RATIONAL METHOD HYDROLOGY

The rational method was used to determine peak flow rates in order to adequately size the proposed subsurface storm drains and associated inlets used to convey onsite flows through the site and into the existing Line A-B storm drain. The project site area was divided into 7 subareas and 2 watersheds (Watershed A and B).

Subarea-A1 and Subarea-A2 (approximately 18.2 acres) surface flow into 2 low points on the north side of the project. Runoff is conveyed westerly using storm drain system, Line-A. Line-A also captures the easterly tributaries Subarea-A3 and -A4 (approximately 6.3 acres); both subareas drain to Lateral-A1. A 100-year peak flow of 43.5 cfs is generated by these four sub areas.

Subarea-B1 and Subarea-B2 (approximately 15.1 acres) also surface flow the runoff into 2 low points on the south side of the project site. Runoff is conveyed westerly using a storm drain system, Line-B. A 100-year peak flow of 33.5 cfs is generated by these two subareas. Line-B will confluence with Line-A in the southeast corner of the project.

Subarea-Z (approximately 1.9 acres) is a self-contained pervious area. Runoff will drain to and be contained within the proposed water quality storage basin.

The following table summarizes the rational method results at key points:

Table 3 – Rational Method Results

Point of Interest	10-Year Peak Flow Rate (cfs)	100-Year Peak Flow Rate (cfs)
Node 108-Line-A Runoff tributary to Line-A	50.1	72.6
Node 202-Line-B Runoff tributary to Line-B	23.1	33.5
Node 106-Lateral-A1 Runoff tributary to Lateral-A1	6.4	9.4

The rational method output files and hydrology map have been included in Appendix A.

SECTION 3 - HYDRAULIC ANALYSIS

ONSITE STORM DRAIN FACILITIES

The project proposes two subsurface storm drain systems to convey onsite flows. As stated before, the water quality flows will be redirected to an onsite storage basin by a Stormgate Vault before being pumped into and treated by a Contech Filterra unit; high flows will bypass the Stormgate structure. The high flow runoff will confluence in the southeast corner before discharging into an existing 8'W x 7'H RCB storm drain, Line A-B. It then drains into the Perris Valley Storm Drain Channel. As stated before, the Perris Valley Storm Drain Channel will be widened before the completion of this project. However, that design is not in the scope of this report. See the applicable offsite storm drain report for more information.

A brief summary of each system has been provided and the results of the hydraulic analyses are included in Appendix B. The peak flow rates determined during the 100-year rational method onsite hydrology analysis were utilized in WSPGW models to evaluate the proposed storm drain systems.

Line-A (Onsite)

The northern portion and eastern portion (via Lateral-A1) of the project site will surface flow to various low points and be collected by Line-A. Line-A, is a 36-inch HDPE storm drain upstream that transitions into a 48-inch HDPE storm drain downstream. Line-A proposes to convey the 100-year peak flow rate to existing RCB Line A-B. A hydraulic model for Line-A was developed to evaluate the storm drain design. The initial HGL for the model is the WSE corresponding to the required head needed for the 100-year peak flow of 72.6 cfs to bypass the interior weir of the Stormgate Vault. A maximum ponding depth of 1.9-feet is present at the upstream end of Line-A; the ponding water surface elevation (WSE) of 1442.6 is approximately 1.5-feet below the existing FEMA base flood elevation of 1444. This means that the onsite runoff does not contribute to a worsening flooding condition as is currently existing.

Lateral-A1 (Onsite)

The eastern portion of the project site will surface flow to two low points and be collected by Lateral-A1. Lateral-A1, is a 24-inch HDPE storm drain and proposes to convey the 100-year peak flow rate to Line-A. A hydraulic model for Lateral-A1 was developed to evaluate the storm drain design. The initial HGL for the model is the WSE at the Lateral-A1 junction in the Line-A model. A ponding WSE of 1439.3 is approximately 4-feet below the existing FEMA base flood elevation of 1444. This means that the onsite runoff does not contribute to a worsening flooding condition as is currently existing.

Line-B (Onsite)

The southern portion of the project site will surface flow to two low points be collected by Line-B. Line-B, is a 30-inch HDPE storm drain upstream that transitions into a 36-inch HDPE storm drain downstream. Line-B proposes to convey the 100-year peak flow rate to Line A. A hydraulic model for Line-B was developed to evaluate the storm drain design. The initial HGL for the model is the WSE at the Line-B junction in the Line-A model. A maximum ponding depth of 0.7-feet is present at the upstream end of Line-B; the ponding water surface elevation (WSE) of 1441.2 is approximately 1.5-feet below the existing FEMA base flood elevation of 1443. This means that the onsite runoff does not contribute to a worsening flooding condition as is currently existing.

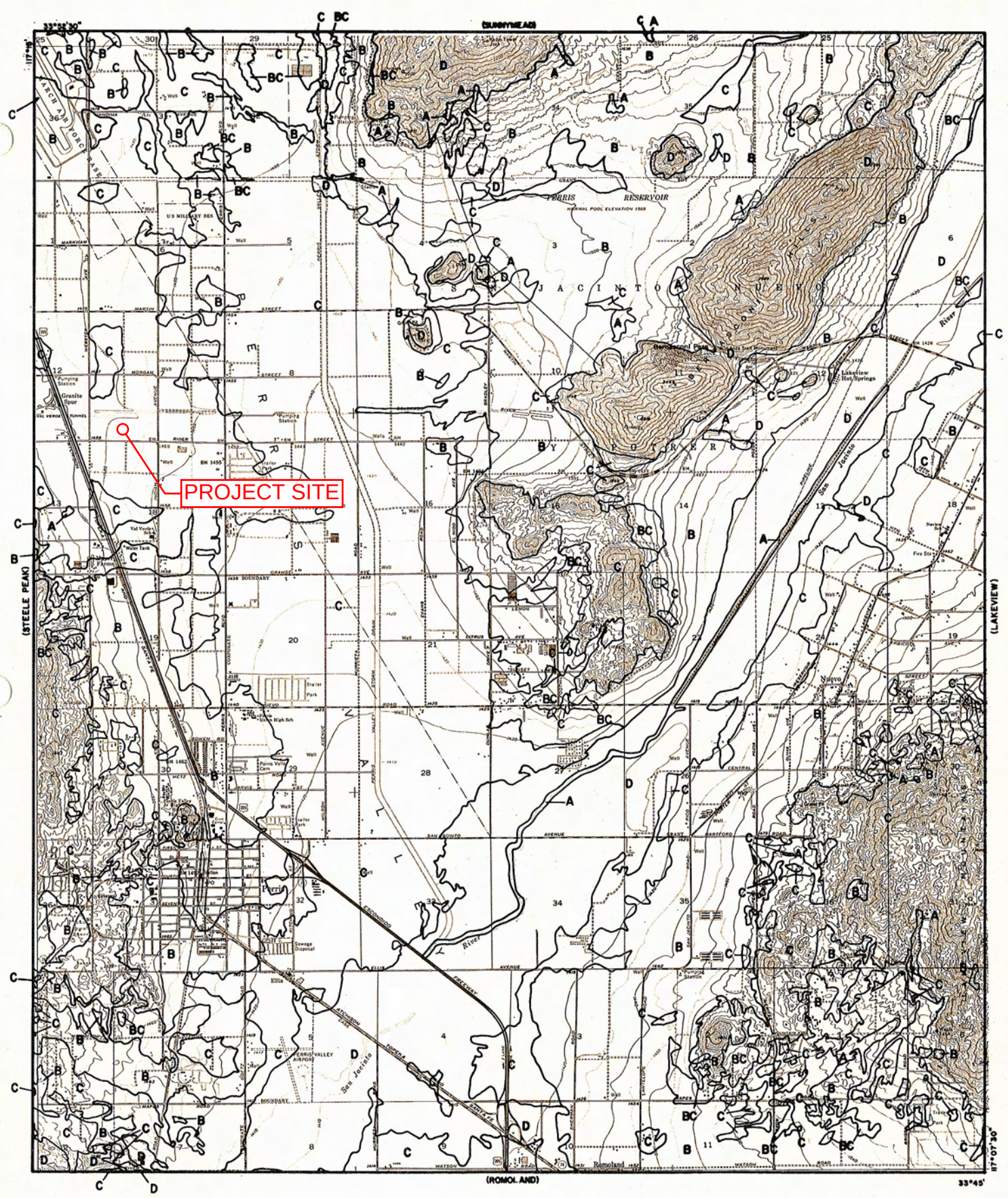
SECTION 4 - CONCLUSION

Based on the analyses and results of this report, the following conclusions were derived from the hydrology and hydraulic results:

- The proposed onsite subsurface storm drain systems will adequately convey flows to MDP Line A-B and provide flood protection for the 100-year storm event.
- The proposed project will not impact flooding conditions to upstream or downstream properties.

APPENDIX A – HYDROLOGY

HYDROLOGY PARAMETERS



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR PERRIS

PLATE C-1.30

RAINFALL INTENSITY–INCHES PER HOUR

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

RCFC & WCD

HYDROLOGY MANUAL

STANDARD INTENSITY–DURATION CURVES DATA

PLATE D-4.1 (4 of 6)

10-YEAR PROPOSED ONSITE HYDROLOGY (RATIONAL METHOD)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 10/06/20 File:PROP10.out

17-0357 RIDER DISTRIBUTION CENTER II
RATIONAL METHOD HYDROLOGY - ONSITE STORM DRAIN
10 YEAR STORM EVENT
FN: PROP10.OUT TSW

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

English (in-lb) Units used in input data file

Program License Serial Number 4010

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.780(In/Hr)
Slope of intensity duration curve = 0.4900

++

Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 967.000(Ft.)
Top (of initial area) elevation = 1445.700(Ft.)
Bottom (of initial area) elevation = 1440.600(Ft.)
Difference in elevation = 5.100(Ft.)
Slope = 0.00527 s(percent)= 0.53
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.393 min.
Rainfall intensity = 1.626(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 14.244(CFS)
Total initial stream area = 10.000(Ac.)
Pervious area fraction = 0.100

++

Process from Point/Station 101.000 to Point/Station 102.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1436.600(Ft.)
Downstream point/station elevation = 1435.000(Ft.)
Pipe length = 577.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 14.244(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 14.244(CFS)
Normal flow depth in pipe = 18.38(In.)
Flow top width inside pipe = 25.18(In.)
Critical Depth = 15.76(In.)
Pipe flow velocity = 4.94(Ft/s)
Travel time through pipe = 1.95 min.

Time of concentration (TC) = 15.34 min.

++
Process from Point/Station 102.000 to Point/Station 102.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.875
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 15.34 min.
Rainfall intensity = 1.522(In/Hr) for a 10.0 year storm
Subarea runoff = 10.914(CFS) for 8.200(Ac.)
Total runoff = 25.157(CFS) Total area = 18.200(Ac.)

++
Process from Point/Station 102.000 to Point/Station 103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1435.000(Ft.)
Downstream point/station elevation = 1432.400(Ft.)
Pipe length = 869.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 25.157(CFS)
Nearest computed pipe diameter = 30.00(In.)
Calculated individual pipe flow = 25.157(CFS)
Normal flow depth in pipe = 25.69(In.)
Flow top width inside pipe = 21.05(In.)
Critical Depth = 20.51(In.)
Pipe flow velocity = 5.63(Ft/s)
Travel time through pipe = 2.57 min.
Time of concentration (TC) = 17.91 min.

++
Process from Point/Station 102.000 to Point/Station 103.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 18.200(Ac.)
Runoff from this stream = 25.157(CFS)
Time of concentration = 17.91 min.
Rainfall intensity = 1.410(In/Hr)

++
Process from Point/Station 104.000 to Point/Station 105.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 646.000(Ft.)
Top (of initial area) elevation = 1443.600(Ft.)
Bottom (of initial area) elevation = 1436.500(Ft.)
Difference in elevation = 7.100(Ft.)
Slope = 0.01099 s(percent)= 1.10
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 23.289 min.
Rainfall intensity = 1.240(In/Hr) for a 10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.700
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 79.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 1.563(CFS)
Total initial stream area = 1.800(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 105.000 to Point/Station 106.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.000(Ft.)
Downstream point/station elevation = 1433.500(Ft.)
Pipe length = 51.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 1.563(CFS)

Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 1.563(CFS)
Normal flow depth in pipe = 6.55(In.)
Flow top width inside pipe = 8.01(In.)
Critical Depth = 6.90(In.)
Pipe flow velocity = 4.53(Ft/s)
Travel time through pipe = 0.19 min.
Time of concentration (TC) = 23.48 min.

++
Process from Point/Station 106.000 to Point/Station 106.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.871
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 23.48 min.
Rainfall intensity = 1.235(In/Hr) for a 10.0 year storm
Subarea runoff = 4.840(CFS) for 4.500(Ac.)
Total runoff = 6.402(CFS) Total area = 6.300(Ac.)

++
Process from Point/Station 106.000 to Point/Station 103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.500(Ft.)
Downstream point/station elevation = 1432.400(Ft.)
Pipe length = 15.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 6.402(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 6.402(CFS)
Normal flow depth in pipe = 6.79(In.)
Flow top width inside pipe = 11.90(In.)
Critical depth could not be calculated.
Pipe flow velocity = 13.98(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 23.49 min.

++
Process from Point/Station 106.000 to Point/Station 103.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 6.300(Ac.)
Runoff from this stream = 6.402(CFS)
Time of concentration = 23.49 min.
Rainfall intensity = 1.235(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	25.157	17.91	1.410
2	6.402	23.49	1.235

Largest stream flow has longer or shorter time of concentration
Qp = 25.157 + sum of
Qa Tb/Ta
6.402 * 0.762 = 4.881
Qp = 30.038

Total of 2 streams to confluence:
Flow rates before confluence point:
25.157 6.402
Area of streams before confluence:
18.200 6.300
Results of confluence:
Total flow rate = 30.038(CFS)
Time of concentration = 17.912 min.
Effective stream area after confluence = 24.500(Ac.)

++
Process from Point/Station 103.000 to Point/Station 107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

```
Upstream point/station elevation =  1432.400(Ft.)
Downstream point/station elevation =  1431.700(Ft.)
Pipe length  =   257.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    30.038(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    30.038(CFS)
Normal flow depth in pipe =   27.19(In.)
Flow top width inside pipe =   25.14(In.)
Critical Depth =   21.86(In.)
Pipe flow velocity =      5.74(Ft/s)
Travel time through pipe =    0.75 min.
Time of concentration (TC) =    18.66 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      107.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     24.500(Ac.)
Runoff from this stream =     30.038(CFS)
Time of concentration =   18.66 min.
Rainfall intensity =     1.382(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   768.000(Ft.)
Top (of initial area) elevation =  1447.300(Ft.)
Bottom (of initial area) elevation =  1440.500(Ft.)
Difference in elevation =     6.800(Ft.)
Slope =    0.00885  s(percent)=       0.89
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.011 min.
Rainfall intensity =      1.790(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     14.765(CFS)
Total initial stream area =        9.400(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1436.500(Ft.)
Downstream point/station elevation =  1434.400(Ft.)
Pipe length  =   504.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    14.765(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    14.765(CFS)
Normal flow depth in pipe =   18.38(In.)
Flow top width inside pipe =   20.33(In.)
Critical Depth =   16.61(In.)
Pipe flow velocity =      5.72(Ft/s)
Travel time through pipe =    1.47 min.
Time of concentration (TC) =    12.48 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    12.48 min.
Rainfall intensity =      1.684(In/Hr) for a    10.0 year storm
```

Subarea runoff = 8.411(CFS) for 5.700(Ac.)
Total runoff = 23.175(CFS) Total area = 15.100(Ac.)

++
Process from Point/Station 202.000 to Point/Station 107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.400(Ft.)
Downstream point/station elevation = 1431.700(Ft.)
Pipe length = 571.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 23.175(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 23.175(CFS)
Normal flow depth in pipe = 22.22(In.)
Flow top width inside pipe = 20.61(In.)
Critical Depth = 20.23(In.)
Pipe flow velocity = 6.61(Ft/s)
Travel time through pipe = 1.44 min.
Time of concentration (TC) = 13.92 min.

++
Process from Point/Station 202.000 to Point/Station 107.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 15.100(Ac.)
Runoff from this stream = 23.175(CFS)
Time of concentration = 13.92 min.
Rainfall intensity = 1.596(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	30.038	18.66	1.382
2	23.175	13.92	1.596

Largest stream flow has longer time of concentration
Qp = 30.038 + sum of
Qb Ia/Ib
23.175 * 0.866 = 20.075
Qp = 50.114

Total of 2 streams to confluence:
Flow rates before confluence point:
30.038 23.175
Area of streams before confluence:
24.500 15.100
Results of confluence:
Total flow rate = 50.114(CFS)
Time of concentration = 18.658 min.
Effective stream area after confluence = 39.600(Ac.)

++
Process from Point/Station 107.000 to Point/Station 108.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1431.700(Ft.)
Downstream point/station elevation = 1431.100(Ft.)
Pipe length = 195.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 50.114(CFS)
Nearest computed pipe diameter = 39.00(In.)
Calculated individual pipe flow = 50.114(CFS)
Normal flow depth in pipe = 32.34(In.)
Flow top width inside pipe = 29.35(In.)
Critical Depth = 27.12(In.)
Pipe flow velocity = 6.82(Ft/s)
Travel time through pipe = 0.48 min.
Time of concentration (TC) = 19.13 min.
End of computations, total study area = 39.60 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.141
Area averaged RI index number = 69.5

100-YEAR PROPOSED ONSITE HYDROLOGY (RATIONAL METHOD)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 10/06/20 File:PROP100.out

17-0357 RIDER DISTRIBUTION CENTER II
RATIONAL METHOD HYDROLOGY - ONSITE STORM DRAIN
100 YEAR STORM EVENT
FN: PROP100.OUT TSW

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

English (in-lb) Units used in input data file

Program License Serial Number 4010

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++

Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 967.000(Ft.)
Top (of initial area) elevation = 1445.700(Ft.)
Bottom (of initial area) elevation = 1440.600(Ft.)
Difference in elevation = 5.100(Ft.)
Slope = 0.00527 s(percent)= 0.53
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.393 min.
Rainfall intensity = 2.335(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 20.589(CFS)
Total initial stream area = 10.000(Ac.)
Pervious area fraction = 0.100

++

Process from Point/Station 101.000 to Point/Station 102.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1436.600(Ft.)
Downstream point/station elevation = 1435.000(Ft.)
Pipe length = 577.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 20.589(CFS)
Nearest computed pipe diameter = 30.00(In.)
Calculated individual pipe flow = 20.589(CFS)
Normal flow depth in pipe = 21.84(In.)
Flow top width inside pipe = 26.70(In.)
Critical Depth = 18.49(In.)
Pipe flow velocity = 5.38(Ft/s)
Travel time through pipe = 1.79 min.

Time of concentration (TC) = 15.18 min.

++
Process from Point/Station 102.000 to Point/Station 102.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.881
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 15.18 min.
Rainfall intensity = 2.196(In/Hr) for a 100.0 year storm
Subarea runoff = 15.861(CFS) for 8.200(Ac.)
Total runoff = 36.450(CFS) Total area = 18.200(Ac.)

++
Process from Point/Station 102.000 to Point/Station 103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1435.000(Ft.)
Downstream point/station elevation = 1432.400(Ft.)
Pipe length = 869.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 36.450(CFS)
Nearest computed pipe diameter = 36.00(In.)
Calculated individual pipe flow = 36.450(CFS)
Normal flow depth in pipe = 27.28(In.)
Flow top width inside pipe = 30.85(In.)
Critical Depth = 23.54(In.)
Pipe flow velocity = 6.35(Ft/s)
Travel time through pipe = 2.28 min.
Time of concentration (TC) = 17.46 min.

++
Process from Point/Station 102.000 to Point/Station 103.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 18.200(Ac.)
Runoff from this stream = 36.450(CFS)
Time of concentration = 17.46 min.
Rainfall intensity = 2.051(In/Hr)

++
Process from Point/Station 104.000 to Point/Station 105.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 646.000(Ft.)
Top (of initial area) elevation = 1443.600(Ft.)
Bottom (of initial area) elevation = 1436.500(Ft.)
Difference in elevation = 7.100(Ft.)
Slope = 0.01099 s(percent)= 1.10
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 23.289 min.
Rainfall intensity = 1.781(In/Hr) for a 100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.751
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 79.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 2.406(CFS)
Total initial stream area = 1.800(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 105.000 to Point/Station 106.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1434.000(Ft.)
Downstream point/station elevation = 1433.500(Ft.)
Pipe length = 51.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 2.406(CFS)

Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 2.406(CFS)
Normal flow depth in pipe = 6.90(In.)
Flow top width inside pipe = 11.86(In.)
Critical Depth = 7.97(In.)
Pipe flow velocity = 5.14(Ft/s)
Travel time through pipe = 0.17 min.
Time of concentration (TC) = 23.45 min.

++
Process from Point/Station 106.000 to Point/Station 106.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 23.45 min.
Rainfall intensity = 1.775(In/Hr) for a 100.0 year storm
Subarea runoff = 7.006(CFS) for 4.500(Ac.)
Total runoff = 9.412(CFS) Total area = 6.300(Ac.)

++
Process from Point/Station 106.000 to Point/Station 103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1433.500(Ft.)
Downstream point/station elevation = 1432.400(Ft.)
Pipe length = 15.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 9.412(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 9.412(CFS)
Normal flow depth in pipe = 8.91(In.)
Flow top width inside pipe = 10.50(In.)
Critical depth could not be calculated.
Pipe flow velocity = 15.06(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 23.47 min.

++
Process from Point/Station 106.000 to Point/Station 103.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 6.300(Ac.)
Runoff from this stream = 9.412(CFS)
Time of concentration = 23.47 min.
Rainfall intensity = 1.774(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	36.450	17.46	2.051
2	9.412	23.47	1.774

Largest stream flow has longer or shorter time of concentration
Qp = 36.450 + sum of
Qa Tb/Ta
9.412 * 0.744 = 7.003
Qp = 43.453

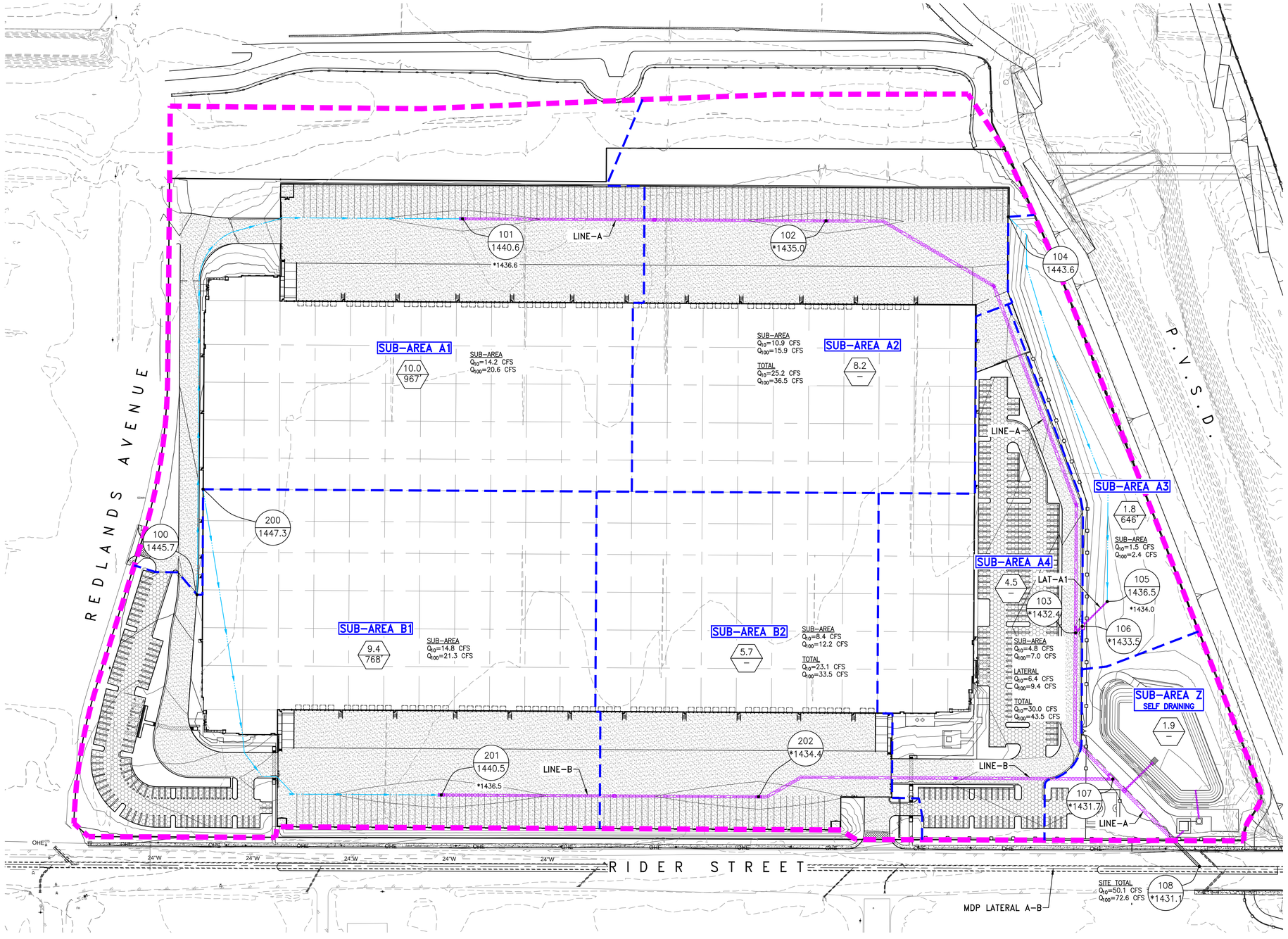
Total of 2 streams to confluence:
Flow rates before confluence point:
36.450 9.412
Area of streams before confluence:
18.200 6.300
Results of confluence:
Total flow rate = 43.453(CFS)
Time of concentration = 17.463 min.
Effective stream area after confluence = 24.500(Ac.)

++
Process from Point/Station 103.000 to Point/Station 107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

```
Upstream point/station elevation =  1432.400(Ft.)
Downstream point/station elevation =  1431.700(Ft.)
Pipe length  =   257.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    43.453(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    43.453(CFS)
Normal flow depth in pipe =   29.77(In.)
Flow top width inside pipe =   33.16(In.)
Critical Depth =   25.20(In.)
Pipe flow velocity =      6.39(Ft/s)
Travel time through pipe =    0.67 min.
Time of concentration (TC) =    18.13 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      107.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     24.500(Ac.)
Runoff from this stream =     43.453(CFS)
Time of concentration =   18.13 min.
Rainfall intensity =     2.013(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   768.000(Ft.)
Top (of initial area) elevation =  1447.300(Ft.)
Bottom (of initial area) elevation =  1440.500(Ft.)
Difference in elevation =     6.800(Ft.)
Slope =    0.00885  s(percent)=       0.89
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.011 min.
Rainfall intensity =      2.570(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     21.335(CFS)
Total initial stream area =        9.400(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1436.500(Ft.)
Downstream point/station elevation =  1434.400(Ft.)
Pipe length  =   504.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    21.335(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    21.335(CFS)
Normal flow depth in pipe =   21.80(In.)
Flow top width inside pipe =   21.30(In.)
Critical Depth =   19.41(In.)
Pipe flow velocity =      6.21(Ft/s)
Travel time through pipe =    1.35 min.
Time of concentration (TC) =    12.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    12.36 min.
Rainfall intensity =      2.429(In/Hr) for a   100.0 year storm
```

```
Subarea runoff =     12.212(CFS) for      5.700(Ac.)
Total runoff =     33.547(CFS)  Total area =      15.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      107.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.400(Ft.)
Downstream point/station elevation =  1431.700(Ft.)
Pipe length  =   571.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    33.547(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    33.547(CFS)
Normal flow depth in pipe =   23.39(In.)
Flow top width inside pipe =   29.98(In.)
Critical Depth =   23.13(In.)
Pipe flow velocity =      7.45(Ft/s)
Travel time through pipe =    1.28 min.
Time of concentration (TC) =    13.64 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      107.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     15.100(Ac.)
Runoff from this stream =     33.547(CFS)
Time of concentration =   13.64 min.
Rainfall intensity =     2.314(In/Hr)
Summary of stream data:

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


1       43.453     18.13                2.013
2       33.547     13.64                2.314
Largest stream flow has longer time of concentration
Qp =     43.453 + sum of
          Qb         Ia/Ib
          33.547 *    0.870 =     29.181
Qp =     72.634

Total of 2 streams to confluence:
Flow rates before confluence point:
      43.453      33.547
Area of streams before confluence:
       24.500       15.100
Results of confluence:
Total flow rate =     72.634(CFS)
Time of concentration =    18.133 min.
Effective stream area after confluence =     39.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1431.700(Ft.)
Downstream point/station elevation =  1431.100(Ft.)
Pipe length  =   195.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    72.634(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    72.634(CFS)
Normal flow depth in pipe =   36.84(In.)
Flow top width inside pipe =   34.67(In.)
Critical Depth =   31.50(In.)
Pipe flow velocity =      7.50(Ft/s)
Travel time through pipe =    0.43 min.
Time of concentration (TC) =    18.57 min.
End of computations, total study area =           39.60 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.141
Area averaged RI index number =  69.5
```

RATIONAL METHOD HYDROLOGY MAP



CITY OF PERRIS

RIDER DISTRIBUTION CENTER II
RATIONAL METHOD MAP
DEVELOPED CONDITION

SCALE: 1"=80'	ALBERT A. WEBB ASSOCIATES	ENGINEERING CONSULTANTS 3788 McCRAY STREET RIVERSIDE CA. 92506 PH. (951) 686-1070 FAX (951) 788-1256	W.O. 17-0357
DATE: 10/01/2020			SHEET 1
DESIGNED:			OF 1 SHEETS
CHECKED:			
PLN CK REF:			DWG. NO.
F.B.			

C:\2017\17-0357\DRAINAGE\HYDROLOGY\FINAL\DWG FOLDER\17-0357-FHYD-RATIONAL.DWG 10/20/2020 11:02:02 AM

APPENDIX B – HYDRAULICS

LINE-A

```
T1 IDI LOGISTICS - RIDER DISTRIBUTION CENTER II                                                    0

T2 ONSITE STORM DRAIN LINE A

T3 FN: LINEA.WSW

SO   1175.1401431.600  1                          1438.070
REM  INITIAL HGL TAKEN FROM 100 YEAR WATER SURFACE ELEVATION IN STORMGATE MANHOLE (WEIR INV. + H
= 1435.30 + 2.77' = 1438.07)
R    1199.0201431.670  1      .012                                  .000    .000 0

JX   1201.0201431.680  2  3   .012   33.500         1432.180        -45.0         .000

R    1286.7001431.930  2      .012                                  .000  45.000 0

R    1455.9501432.420  2      .012                                  .000    .000 0

JX   1457.9501432.430  3  5   .012    9.400         1432.930         45.0         .000

R    1660.5301433.020  3      .012                                  .000 -20.970 1

R    2032.8201434.100  3      .012                                  .000 -39.050 1

R    2236.8101434.690  3      .012                                  .000 -30.000 0

R    2323.8801434.940  3      .012                                  .000    .000 0

WE   2323.8801434.940  7      .200

JX   2327.1301434.950  7  7   .015   15.900         1434.950         00.0         .000

R    2330.3801434.960  7      .015                                  .000    .000 0

WX   2330.3801434.960  3
R    2600.0001435.740  3      .012                                  .000    .000 1

R    2897.0401436.610  3      .012                                  .000   0.000 0
WE   2897.0401436.610  7      .200

R    2900.0401436.620  7      .015                                  .000    .000 0

SH   2900.0401436.620  7                          1436.620

CD   1  4   1    .000   4.000     .000  .000  .000   .00

CD   2  4   1    .000   3.500     .000  .000  .000   .00
CD   3  4   1    .000   3.000     .000  .000  .000   .00
CD   4  4   1    .000   2.500     .000  .000  .000   .00
CD   5  4   1    .000   2.000     .000  .000  .000   .00
CD   6  4   1    .000   1.500     .000  .000  .000   .00
CD   7  2   0    .000   4.000    3.000  .000  .000   .00
Q            20.600   .0
```

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4	1		4.000														
CD	2	4	1		3.500														
CD	3	4	1		3.000														
CD	4	4	1		2.500														
CD	5	4	1		2.000														
CD	6	4	1		1.500														
CD	7	2	0	.000	4.000	3.000			.00										

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
IDI LOGISTICS - RIDER DISTRIBUTION CENTER II

HEADING LINE NO 2 IS -
ONSITE STORM DRAIN LINE A

HEADING LINE NO 3 IS -
FN: LINEA.WSW

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1175.140	1431.600	1	1438.070

REMARKS: INITIAL HGL TAKEN FROM 100 YEAR WATER SURFACE ELEVATION IN STORMGATE MANHOLE (WEIR INV. + H = 1

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1199.020	1431.670	1	.012	.000	.000	.000	0

ELEMENT NO 3 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1201.020	1431.680	2	3	0	.012	33.500	.000	1432.180	.000	-45.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1286.700	1431.930	2	.012	.000	.000	45.000	0

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1455.950	1432.420	2	.012	.000	.000	.000	0

ELEMENT NO 6 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1457.950	1432.430	3	5	0	.012	9.400	.000	1432.930	.000	45.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 7 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1660.530	1433.020	3	.012	.000	.000	-20.970	1

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2032.820	1434.100	3	.012	.000	.000	-39.050	1

ELEMENT NO 9 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N

```
 RADIUS    ANGLE     ANG PT  MAN H
                             2236.810 1434.690    3               .012
  .000     .000   -30.000     0
                                                    W S P G W
                     PAGE NO   3
                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
  ELEMENT NO  10 IS A REACH              *         *     *
                     U/S DATA   STATION    INVERT  SECT               N
 RADIUS    ANGLE     ANG PT  MAN H
                             2323.880 1434.940    3               .012
  .000     .000      .000     0
  ELEMENT NO  11 IS A  WALL  ENTRANCE                    *
                     U/S DATA   STATION    INVERT  SECT              FP
                             2323.880 1434.940    7               .200
  ELEMENT NO  12 IS A JUNCTION           *         *     *     *                 *
   *               *
                     U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4
INVERT-3 INVERT-4  PHI 3  PHI 4
                             2327.130 1434.950    7     7     0   .015    15.900      .000
1434.950      .000    .000     .000

 RADIUS    ANGLE

   .000    .000
  ELEMENT NO  13 IS A REACH              *         *     *
                     U/S DATA   STATION    INVERT  SECT               N
 RADIUS    ANGLE     ANG PT  MAN H
                             2330.380 1434.960    7               .015
  .000     .000      .000     0
  ELEMENT NO  14 IS A  WALL  EXIT                        *
                     U/S DATA   STATION    INVERT  SECT
                             2330.380 1434.960    3
  ELEMENT NO  15 IS A REACH              *         *     *
                     U/S DATA   STATION    INVERT  SECT               N
 RADIUS    ANGLE     ANG PT  MAN H
                             2600.000 1435.740    3               .012
  .000     .000      .000     1
  ELEMENT NO  16 IS A REACH              *         *     *
                     U/S DATA   STATION    INVERT  SECT               N
 RADIUS    ANGLE     ANG PT  MAN H
                             2897.040 1436.610    3               .012
  .000     .000      .000     0
  ELEMENT NO  17 IS A  WALL  ENTRANCE                    *
                     U/S DATA   STATION    INVERT  SECT              FP
                             2897.040 1436.610    7               .200
  ELEMENT NO  18 IS A REACH              *         *     *
                     U/S DATA   STATION    INVERT  SECT               N
 RADIUS    ANGLE     ANG PT  MAN H
                             2900.040 1436.620    7               .015
  .000     .000      .000     0
  ELEMENT NO  19 IS A SYSTEM HEADWORKS                   *                       *
                     U/S DATA   STATION    INVERT  SECT                                    W S
ELEV
                             2900.040 1436.620    7
1436.620
```

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date:10-21-2020 Time: 4:43:54

IDI LOGISTICS - RIDER DISTRIBUTION CENTER II

ONSITE STORM DRAIN LINE A

FN: LINEA.WSW

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1175.140	1431.600	6.470	1438.070	79.40	6.32	.62	1438.69	.00	2.70	.00	4.000	.000	.00	1 .0
23.880	.0029					.0026	.06	6.47	.00	3.09	.012	.00	.00	PIPE
1199.020	1431.670	6.462	1438.132	79.40	6.32	.62	1438.75	.00	2.70	.00	4.000	.000	.00	1 .0
JUNCT STR	.0050					.0022	.00	6.46	.00		.012	.00	.00	PIPE
1201.020	1431.680	6.934	1438.614	45.90	4.77	.35	1438.97	.00	2.11	.00	3.500	.000	.00	1 .0
85.680	.0029					.0018	.15	6.93	.00	2.32	.012	.00	.00	PIPE
1286.700	1431.930	6.888	1438.818	45.90	4.77	.35	1439.17	.00	2.11	.00	3.500	.000	.00	1 .0
169.250	.0029					.0018	.30	6.89	.00	2.33	.012	.00	.00	PIPE
1455.950	1432.420	6.698	1439.118	45.90	4.77	.35	1439.47	.00	2.11	.00	3.500	.000	.00	1 .0
JUNCT STR	.0050					.0022	.00	6.70	.00		.012	.00	.00	PIPE
1457.950	1432.430	6.732	1439.162	36.50	5.16	.41	1439.58	.00	1.96	.00	3.000	.000	.00	1 .0
202.580	.0029					.0026	.52	6.73	.00	2.30	.012	.00	.00	PIPE
1660.530	1433.020	6.708	1439.728	36.50	5.16	.41	1440.14	.00	1.96	.00	3.000	.000	.00	1 .0
372.290	.0029					.0026	.95	6.71	.00	2.31	.012	.00	.00	PIPE
2032.820	1434.100	6.652	1440.752	36.50	5.16	.41	1441.17	.00	1.96	.00	3.000	.000	.00	1 .0
203.990	.0029					.0026	.52	6.65	.00	2.31	.012	.00	.00	PIPE
2236.810	1434.690	6.624	1441.314	36.50	5.16	.41	1441.73	.00	1.96	.00	3.000	.000	.00	1 .0
87.070	.0029					.0026	.22	6.62	.00	2.32	.012	.00	.00	PIPE

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date:10-21-2020 Time: 4:43:54

IDI LOGISTICS - RIDER DISTRIBUTION CENTER II

ONSITE STORM DRAIN LINE A

FN: LINEA.WSW

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2323.880	1434.940	6.596	1441.536	36.50	5.16	.41	1441.95	.00	1.96	.00	3.000	.000	.00	1 .0
WALL	ENTRANCE													
2323.880	1434.940	7.038	1441.978	36.50	1.73	.05	1442.02	.00	1.66	3.00	4.000	3.000	.00	0 .0
JUNCT STR	.0031					.0002	.00	7.04	.11		.015	.00	.00	RECTANG
2327.130	1434.950	7.060	1442.010	20.60	.97	.01	1442.02	.00	1.14	3.00	4.000	3.000	.00	0 .0
3.250	.0031					.0001	.00	7.06	.06	1.51	.015	.00	.00	RECTANG
2330.380	1434.960	7.051	1442.011	20.60	.97	.01	1442.03	.00	1.14	3.00	4.000	3.000	.00	0 .0
WALL	EXIT													
2330.380	1434.960	7.051	1442.011	20.60	2.91	.13	1442.14	.00	1.46	.00	3.000	.000	.00	1 .0
269.620	.0029					.0008	.22	7.05	.00	1.55	.012	.00	.00	PIPE
2600.000	1435.740	6.497	1442.237	20.60	2.91	.13	1442.37	.00	1.46	.00	3.000	.000	.00	1 .0
297.040	.0029					.0008	.24	6.50	.00	1.55	.012	.00	.00	PIPE
2897.040	1436.610	5.868	1442.478	20.60	2.91	.13	1442.61	.00	1.46	.00	3.000	.000	.00	1 .0
WALL	ENTRANCE													
2897.040	1436.610	6.002	1442.612	20.60	1.14	.02	1442.63	.00	1.14	3.00	4.000	3.000	.00	0 .0
3.000	.0033					.0001	.00	6.00	.08	1.47	.015	.00	.00	RECTANG
2900.040	1436.620	5.993	1442.613	20.60	1.15	.02	1442.63	.00	1.14	3.00	4.000	3.000	.00	0 .0

LINE-B

```
T1 IDI LOGISTICS - RIDER DISTRIBUTION CENTER II                                 0

T2 ONSITE STORM DRAIN LINE B

T3 FN: LINEB.WSW

SO   1000.0001432.180  1                        1438.070
REM  INITIAL HGL TAKEN FROM 100 YEAR WATER SURFACE ELEVATION IN LINE A MODEL

R    1250.0001433.180  1      .012                                .000    .000 1

R    1495.1001434.160  1      .012                                .000 -30.000 0

R    1557.8701434.410  1      .012                                .000  30.000 1

R    1567.8701434.450  1      .012                                .000    .000 0

WE   1567.8701434.450  3      .200

JX   1571.1201434.470  3  3   .015   12.200         1434.470         00.0         .000

R    1574.3701434.480  3      .015                                .000    .000 0

WX   1574.3701434.480  2
R    1800.0001435.380  2      .012                                .000    .000 1

R    2067.3701436.450  2      .012                                .000    .000 0
WE   2067.3701436.450  3      .200

R    2070.3701436.470  3      .015                                .000    .000 0

SH   2070.3701436.470  3                          1436.470

CD   1  4   1    .000   3.000     .000  .000  .000   .00

CD   2  4   1    .000   2.500     .000  .000  .000   .00
CD   3  2   0    .000   4.000    3.000  .000  .000   .00
Q            21.300   .0
```

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4	1		3.000														
CD	2	4	1		2.500														
CD	3	2	0	.000	4.000	3.000			.00										

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
IDI LOGISTICS - RIDER DISTRIBUTION CENTER II

HEADING LINE NO 2 IS -
ONSITE STORM DRAIN LINE B

HEADING LINE NO 3 IS -
FN: LINEB.WSW

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.000	1432.180	1	1438.070

REMARKS: INITIAL HGL TAKEN FROM 100 YEAR WATER SURFACE ELEVATION IN LINE A MODEL

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1250.000	1433.180	1	.012	.000	.000	.000	1

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1495.100	1434.160	1	.012	.000	.000	-30.000	0

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1557.870	1434.410	1	.012	.000	.000	30.000	1

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1567.870	1434.450	1	.012	.000	.000	.000	0

ELEMENT NO 6 IS A WALL ENTRANCE *

U/S DATA	STATION	INVERT	SECT	FP
	1567.870	1434.450	3	.200

ELEMENT NO 7 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4	RADIUS	ANGLE
	1571.120	1434.470	3	3	0	.015	12.200	.000	1434.470	.000	.000	.000	.000	.000

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1574.370	1434.480	3	.015	.000	.000	.000	0

ELEMENT NO 9 IS A WALL EXIT *

U/S DATA	STATION	INVERT	SECT
	1574.370	1434.480	2

ELEMENT NO 10 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1800.000	1435.380	2	.012	.000	.000	.000	1

ELEMENT NO 11 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2067.370	1436.450	2	.012	.000	.000	.000	0

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 12 IS A WALL ENTRANCE *

U/S DATA STATION INVERT SECT FP
2067.370 1436.450 3 .200

ELEMENT NO 13 IS A REACH * * *

U/S DATA STATION INVERT SECT N
RADIUS ANGLE ANG PT MAN H
2070.370 1436.470 3 .015
.000 .000 .000 0

ELEMENT NO 14 IS A SYSTEM HEADWORKS * *

U/S DATA STATION INVERT SECT W S ELEV
2070.370 1436.470 3 1436.470

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date:10-21-2020 Time: 5:34:48

IDI LOGISTICS - RIDER DISTRIBUTION CENTER II

ONSITE STORM DRAIN LINE B

FN: LINEB.WSW

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	1432.180	5.890	1438.070	33.50	4.74	.35	1438.42	.00	1.88	.00	3.000	.000	.00	1 .0
250.000	.0040					.0021	.54	5.89	.00	1.91	.012	.00	.00	PIPE
1250.000	1433.180	5.445	1438.625	33.50	4.74	.35	1438.97	.00	1.88	.00	3.000	.000	.00	1 .0
245.100	.0040					.0021	.53	5.44	.00	1.91	.012	.00	.00	PIPE
1495.100	1434.160	5.026	1439.186	33.50	4.74	.35	1439.53	.00	1.88	.00	3.000	.000	.00	1 .0
62.770	.0040					.0021	.13	5.03	.00	1.91	.012	.00	.00	PIPE
1557.870	1434.410	4.963	1439.373	33.50	4.74	.35	1439.72	.00	1.88	.00	3.000	.000	.00	1 .0
10.000	.0040					.0021	.02	4.96	.00	1.91	.012	.00	.00	PIPE
1567.870	1434.450	4.945	1439.395	33.50	4.74	.35	1439.74	.00	1.88	.00	3.000	.000	.00	1 .0
WALL	ENTRANCE													
1567.870	1434.450	5.279	1439.729	33.50	2.12	.07	1439.80	.00	1.57	3.00	4.000	3.000	.00	0 .0
JUNCT STR	.0062					.0003	.00	5.28	.16		.015	.00	.00	RECTANG
1571.120	1434.470	5.318	1439.788	21.30	1.34	.03	1439.82	.00	1.16	3.00	4.000	3.000	.00	0 .0
3.250	.0031					.0001	.00	5.32	.10	1.55	.015	.00	.00	RECTANG
1574.370	1434.480	5.309	1439.789	21.30	1.34	.03	1439.82	.00	1.16	3.00	4.000	3.000	.00	0 .0
WALL	EXIT													
1574.370	1434.480	5.309	1439.789	21.30	4.34	.29	1440.08	.00	1.57	.00	2.500	.000	.00	1 .0
225.630	.0040					.0023	.52	5.31	.00	1.63	.012	.00	.00	PIPE

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date:10-21-2020 Time: 5:34:48

IDI LOGISTICS - RIDER DISTRIBUTION CENTER II

ONSITE STORM DRAIN LINE B

FN: LINEB.WSW

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1800.000	1435.380	4.942	1440.322	21.30	4.34	.29	1440.61	.00	1.57	.00	2.500	.000	.00	1 .0
267.370	.0040					.0023	.61	4.94	.00	1.63	.012	.00	.00	PIPE
2067.370	1436.450	4.487	1440.937	21.30	4.34	.29	1441.23	.00	1.57	.00	2.500	.000	.00	1 .0
WALL	ENTRANCE													
2067.370	1436.450	4.797	1441.247	21.30	1.48	.03	1441.28	.00	1.16	3.00	4.000	3.000	.00	0 .0
3.000	.0067					.0002	.00	4.80	.12	1.16	.015	.00	.00	RECTANG
2070.370	1436.470	4.778	1441.248	21.30	1.49	.03	1441.28	.00	1.16	3.00	4.000	3.000	.00	0 .0

LATERAL-A1

```
T1 IDI LOGISTICS - RIDER DISTRIBUTION CENTER II                                                    0

T2 ONSITE STORM DRAIN LATERAL A1

T3 FN: LATA1.WSW

SO   1000.0001432.930  1                          1439.160
REM INITIAL HGL TAKEN FROM THE WSPG RESULTS OF LINE A
R    1014.8501433.380  1      .012                                  .000    .000 0

WE   1014.8501433.380  3      .200

JX   1017.0901433.440  3  3   .015    7.000         1433.440         00.0         .000

R    1019.3301433.510  3      .015                                  .000    .000 0

WX   1019.3301433.510  2
R    1067.7101433.960  2      .012                                  .000    .000 0

WE   1067.7101433.960  4      .500

R    1070.7101433.980  4      .012                                  .000    .000 0

SH   1070.7101433.980  4                          1433.980

CD   1  4   1    .000   2.000     .000  .000  .000   .00

CD   2  4   1    .000   2.000     .000  .000  .000   .00

CD   3  3   0    .000   5.000   10.000  .000  .000   .00

CD   4  3   0    .000   2.500    1.500  .000  .000   .00

Q             2.400   .0
```

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4	1		2.000														
CD	2	4	1		2.000														
CD	3	3	0	.000	5.000	10.000	.000	.000	.00										
CD	4	3	0	.000	2.500	1.500	.000	.000	.00										

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
IDI LOGISTICS - RIDER DISTRIBUTION CENTER II

HEADING LINE NO 2 IS -
ONSITE STORM DRAIN LATERAL A1

HEADING LINE NO 3 IS -
FN: LATA1.WSW

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.000	1432.930	1	1439.160

REMARKS: INITIAL HGL TAKEN FROM THE WSPG RESULTS OF LINE A

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1014.850	1433.380	1	.012	.000	.000	.000	0

ELEMENT NO 3 IS A WALL ENTRANCE *

U/S DATA	STATION	INVERT	SECT	FP
	1014.850	1433.380	3	.200

ELEMENT NO 4 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1017.090	1433.440	3	3	0	.015	7.000	.000	1433.440	.000	.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1019.330	1433.510	3	.015	.000	.000	.000	0

ELEMENT NO 6 IS A WALL EXIT *

U/S DATA	STATION	INVERT	SECT
	1019.330	1433.510	2

ELEMENT NO 7 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1067.710	1433.960	2	.012	.000	.000	.000	0

ELEMENT NO 8 IS A WALL ENTRANCE *

U/S DATA	STATION	INVERT	SECT	FP
	1067.710	1433.960	4	.500

ELEMENT NO 9 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1070.710	1433.980	4	.012	.000	.000	.000	0

ELEMENT NO 10 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1070.710	1433.980	4	1433.980

Program Package Serial Number: 1585

WATER SURFACE PROFILE LISTING Date:10-22-2020 Time: 5:22:55

IDI LOGISTICS - RIDER DISTRIBUTION CENTER II

ONSITE STORM DRAIN LATERAL A1

FN: LATA1.WSW

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	1432.930	6.230	1439.160	9.40	2.99	.14	1439.30	.00	1.10	.00	2.000	.000	.00	1 .0
14.850	.0303					.0015	.02	6.23	.00	.64	.012	.00	.00	PIPE
1014.850	1433.380	5.802	1439.182	9.40	2.99	.14	1439.32	.00	1.10	.00	2.000	.000	.00	1 .0
WALL	ENTRANCE													
1014.850	1433.380	5.968	1439.348	9.40	.19	.00	1439.35	.00	.30	10.00	5.000	10.000	.00	0 .0
JUNCT STR	.0268					.0000	.00	5.97	.01		.015	.00	.00	BOX
1017.090	1433.440	5.909	1439.349	2.40	.05	.00	1439.35	.00	.12	10.00	5.000	10.000	.00	0 .0
2.240	.0313					.0000	.00	5.91	.00	.08	.015	.00	.00	BOX
1019.330	1433.510	5.839	1439.349	2.40	.05	.00	1439.35	.00	.12	10.00	5.000	10.000	.00	0 .0
WALL	EXIT													
1019.330	1433.510	5.839	1439.349	2.40	.76	.01	1439.36	.00	.54	.00	2.000	.000	.00	1 .0
48.380	.0093					.0001	.00	5.84	.00	.43	.012	.00	.00	PIPE
WALL	ENTRANCE													
1067.710	1433.960	5.397	1439.357	2.40	.64	.01	1439.36	.00	.43	1.50	2.500	1.500	.00	0 .0
3.000	.0067					.0001	.00	5.40	.07	.39	.012	.00	.00	BOX
1070.710	1433.980	5.378	1439.358	2.40	.64	.01	1439.36	.00	.43	1.50	2.500	1.500	.00	0 .0

APPENDIX C – REFERENCES

LINE A-B REALLOCATION MEMO

CITY OF PERRIS

STUART E. MCKIBBIN, CITY ENGINEER

P8-000

MEMORANDUM

TO: Tyler Webb and DJ Arellano
Webb and Associates

FROM: Stuart E. McKibbin, City Engineer

DATE: April 8, 2020

RE: Perris Valley MDP; Line A-B and A-C
Tributary Watershed Modification

The submitted technical memorandum explains the modification to the tributary watershed for the Perris Valley MDP facilities Line A-B and A-C. This change is being made to take advantage of excess capacity in Line A-B and establishing drainage boundaries to account for future Mid-County Parkway.

The following items were submitted to the City of Perris for review:

1. Technical Memorandum dated February 12, 2020

After reviewing the technical memorandum entitled, Perris Valley MDP: Line A-B and Line A-C Tributary Watershed Modification, in concept, the revisions of the master drainage plan lines do not exceed the existing capacities and appear to satisfactorily account for upcoming Mid-County Parkway, see attached exhibit. This memorandum may be used for the initial design of affected developments within the drainage study boundaries.

Should you have any questions, please contact Cassandra Sanchez via email at Cassandra@trilakeconsultants.com or by phone at (951) 963-9952.

Technical Memorandum

To: Stuart E. McKibbin, P.E. (City of Perris)

From: Tyler Webb, E.I.T. (Webb)
DJ Arellano, P.E. (Webb)

Date: February 12, 2020

Re: Perris Valley MDP: Line A-B and Line A-C Tributary Watershed Modification

This technical memorandum has been prepared to document to the City of Perris and Riverside County Flood Control that the modification of tributary watersheds for Perris Valley MDP facilities Line A-B and Line A-C will not significantly impact the existing design of Line A-B or the design flow rate for the Perris Valley Storm Drain (PVSD). Master Drainage Plans are prepared based on the best data available at the time, and they provide guidance on how drainage in a particular area can be handled. It is often the case that development patterns required the modification of MDPs. Perris Valley Line A-B was designed by Thienes Engineering in conjunction with the development of an industrial building that is located on the southwesterly side of the intersection of Rider Street and Redlands Avenue. The design was sized based on assumed land uses and drainage strategies for the tributary watershed. Subsequent to the construction of Line A-B, several additional industrial buildings have either been constructed, or are planned to be constructed. The drainage design for these sites, coupled with site specific drainage strategies, has resulted in reduced flow rates for Line A-B compared to the original design assumptions. This memo documents the changes from the original design assumptions and proposes to introduce additional tributary area into Line A-B to take advantage of the unused capacity in the facility. This is done in such a manner that the peak design flows of PVSD are not changed and the tributary area for Line A-C can be reduced. This change in the MDP will accommodate the forthcoming construction of RCTC's Mid-County Parkway as well.

Section 1-A: Line A-B Capacity

Line A-B is located in Rider Street and has been constructed to accommodate the peak flowrates determined by Thienes Engineering when they designed the facility. As-built plans, to the intersection of Rider Street and Perris Boulevard, are included as part of this memorandum as reference. The facility is designed to accommodate runoff as depicted in the line A-B rational method map and analysis completed by Thienes Engineering (see Appendix A).

The proposed modification of tributary watershed areas, and the corresponding peak flow rates were determined using an area-yield analysis. The yield is based on the Line A-B rational method map and analysis stated above. The average yield was rounded up to the nearest whole number of 2.0 cfs/acre to conservatively calculate the peak flow rates (see Appendix A for modified drainage areas).

Hydraulic models were developed, based on the as-built plans for Line A-B. One model used the modified flow rates (revised model) determined using the methodology outlined above. The revised model was compared to a model using the original tributary flowrates (original model) to determine if Line A-B has adequate capacity. The hydraulic models were only completed to just before Lateral AB-11; this is because the tributary flowrates upstream of Lateral AB-10 remained unchanged. It should be noted that the revised model shows an increase in total flowrate for Line A-B; the area-yield method does not utilize confluences between the laterals and Line A-B which can lower the total flowrate by considering the time of concentration. The initial HGL for this model was taken from the ultimate Perris Valley Storm Drain Channel plans and double checked with the initial HGL in the Line A-B as-built plans, which both match and use the NGVD29 datum. The hydraulic analyses of Line A-B, even the one initially conducted by Thienes Engineering, assume ultimate improvements of the Channel have been completed. Capacity will be limited until the ultimate Channel improvements have been made.

The following are brief descriptions of the revised laterals for reference: **Lateral AB-1** is unchanged, **Lateral AB-2** is the single discharge point for the Rider II Distribution Center (DPR No. 19-00004) and removes flow from laterals AB-3 and AB-6, **Lateral AB-4** is the single discharge point for the Core 5 Rider Industrial project (DPR No. 19-05267) and removes flow from laterals AB-5 and AB-7, **Lateral AB-7.5** is the single discharge point for the FIR Rider Industrial project (DPR No. 19-05161) and removes flow from Lateral AB-8, **Lateral AB-9** is the single discharge point for the constructed Rider III Distribution Center which will discharge via pump at a constant 8 cfs instead of the original gravity flow of 61 cfs, **Lateral AB-10** will not remove flow from any laterals and be extended further south to add an additional 33 cfs.

Table 1 shows the HGL's (NGVD29) and total tributary flowrates at significant points for the original and revised Line A-B hydraulic models. For reference, Line A-B is an 8'x7' RCB from STA. 9+97.60 (outlet) to STA. 17+77.51 (Lateral AB-4), an 8'x6' RCB from STA. 17+77.51 (Lateral AB-4) to STA. 30+93.93 (Lateral AB-9), and a 7'x5' RCB from STA. 30+93.93 (Lateral AB-9) to the end of the model.

Table 1 – Line A-B hydraulics

Station and Lateral	Lateral Q's Original/Revised (cfs)	Line A-B Original Model HGL/Q* (ft/cfs)	Line A-B Revised Model HGL/Q* (ft/cfs)	Line A-B Revised minus Original ΔHGL/ΔQ (ft/cfs)
9+97.60 (Outlet)	--	1433.0/483.0	1433.0/506.1	0.0/23.1
12+63.33 (Lat AB-1)	21.1/21.1	1433.9/461.9	1434.0/485.0	0.1/23.1
12+75.33 (Lat AB-2)	15.9/87.0	1434.2/446.0	1434.7/398.0	0.5/-48.0
17+71.51 (Lat AB-4)	12.8/25.0	1435.0/413.0	1434.9/373.0	-0.1/-40.0
25+00.00 (Lat AB-7.5)	0.0/35.0	**1437.5/367.0	1437.4/338.0	-0.1/-29.0
30+83.49 (Lat AB-9)	61.0/8.0	1439.1/295.0	1438.1/330.0	***-1.0/35.0
31+16.47 (Lat AB-10)	13.0/48.0	1439.4/282.0	1439.2/282.0	-0.2/0.0

*Q is the flowrate in Line A-B directly upstream of the lateral junction
**Approximate HGL for proposed Lat AB-7.5 in the original model
***HGL is lower with higher Q because of downstream hydraulic jump, flow at Lat AB-9 is super critical

Per the results above, the flow reallocation will not significantly impact the hydraulics in Line A-B. The greatest HGL increase of 0.5-feet was located at Lateral AB-2 (Rider II Distribution Center outlet); all other HGL changes either decreased or were insignificant. This means the Line A-B HGL will not rise above the Rider Street pavement surface as previously designed. It should be mentioned that the revised lateral hydraulics will need to be analyzed separately with the construction of the proposed projects, and they might need to be upsized given the onsite designs.

See Appendix B for the Line A-B hydraulic calculations and plan and profile.

See Appendix D for the Line A-B as-built plans for reference.

See Appendix E for Ultimate Perris Valley Storm Drain Channel plans for reference.

Section 1-B: Line A-C Capacity

Line A-C is a proposed storm drain line whose MDP alignment is disrupted by the Mid County Parkway. As stated above, the tributary areas for Line A-C and Line A-B will be reduced because of this. The modified area for Line A-C was roughly cut in half from the original MDP area; it is our understanding through preliminary correspondence with Mark Lancaster at Riverside County Transportation Commission (RCTC), that the Mid County Parkway will address its own generated runoff by constructing and draining to MDP facility Line H. The proposed tributary flowrate to Line A-C was calculated using area-yield method of 2.0 cfs/acre which yields a total flowrate of 72.6 cfs (see Appendix A for reallocated drainage areas).

A preliminary hydraulic model, in NAVD88, was developed to analyze the proposed alignment and profile of Line A-C. The initial HGL for this model was taken from the ultimate Perris Valley Storm Drain Channel plans, which use the NGVD29 datum and were converted to NAVD88 (NAVD88 = NGVD29 + 2.6'). The hydraulic analysis of Line A-C assumes ultimate improvements of the PVSD have been completed. Capacity will be limited, just like other Channel connections, until the ultimate PVSD improvements have been completed. Based upon our analysis a 42-inch storm drain downstream and 36-inch storm drain upstream will adequately convey the modified flow; the HGL will be below the street and ground surface, and the facilities should provide backbone drainage for the tributary area.

See Appendix C for Line A-C hydraulic calculations and plan and profile.

See Appendix E for Ultimate Perris Valley Storm Drain Channel plans for reference.

Section 2: Impacts to the Perris Valley Storm Drain Channel

Per the area-yield flow analysis, an additional 23.1 cfs will be added upstream to the Perris Valley Storm Drain Channel via Line A-B. This change is insignificant – roughly 0.17% of the peak design flow of the Perris Valley Storm Drain Channel. This is especially inconsequential since variations in the peak flow timing were not considered.

Section 3: Conclusions

Per the hydrologic and hydraulic analyses listed above, we conclude that the revised MDP tributary areas and updated flowrates will not significantly impact the hydraulics of Line A-B. The greatest increase in HGL is only 6-inches, which remains well under the Rider Street pavement surface. The change in HGL at other

stations was either negligible or decreased. Also, the proposed alignment and profile of Line A-C will work hydraulically with the updated flow rates.

The Perris Valley Storm Drain Channel will not be impacted hydraulically since the increase in tributary flow reallocated upstream is one-one thousandth of a percent of the 100-year design flow per the MDP. Finally, this update is consistent with the forthcoming impacts of RCTC's Mid County Parkway to the original MDP drainage areas. It is our understanding through preliminary correspondence with Mark Lancaster at RCTC, that Mid County Parkway will accommodate their own generated runoff by constructing and draining to MDP facility Line H.

Should you have any questions regarding this analysis, please give me a call at (951) 320-6039 or email me at tyler.webb@webbassociates.com

Appendix A: Original and Revised Hydrology

SEE PERRIS VALLEY HYDROLOGY FOR LATERAL H-1

PERRIS BLVD.

EXISTING N'LY 1/2 OF SINCLAIR

FLOW IN STREET

SINCLAIR STREET

FLOW IN STREET

EXISTING RIBBON GUTTER

FLOW

EXISTING VEGETATED SWALE

FLOW

SPILLOVER FROM CHANNEL (TO NORTH)

FLOW

FLOW

100

5.00 AC.

6.20 AC.

5.80 AC.

6.00 AC.

6.60 AC.

7.10 AC.

103 Q100=38.2 CFS Tc=18.6 MIN.

101 Q100=12.7 CFS Tc=12.5 MIN.

102 Q100=25.5 CFS Tc=15.8 MIN.

190

191 Q100=13.0 CFS Tc=8.3 MIN.

192 Q100=27.5 CFS Tc=10.4 MIN.

193 Q100=40.3 CFS Tc=11.8 MIN.

3.90 AC.

COMMERCE DRIVE

BUSINESS PARK DRIVE

LAKEVIEW DRIVE

104 Q100=62.0 CFS Tc=19.7 MIN.

13.7 AC.

13.1 AC.

194 Q100=72.0 CFS Tc=15.4 MIN.

120

170

171 Q100=5.0 CFS Q(in basin)=6.8 CFS Tc=10.8 MIN.

2.70 AC.

2.30 AC.

4.20 AC.

2.20 AC.

LAT. "A-20"

4 Q100=133.3 CFS Tc=18.5 MIN.

121 Q100=6.0 CFS Tc=11.4 MIN.

122 Q100=10.5 CFS Q(in basin)=9.4 CFS Tc=14.8 MIN.

123 Q100(conf)=164.5 CFS Tc=20.8 MIN.

LAT. "A-18"

130 140 1.1 CFS FLOWBY

LAT. "A-16"

Q100=225.6 CFS Tc=21.3 MIN.

124

141 Q100=8.3 CFS Q(in basin)=7.6 CFS Tc=14.9 MIN.

LAT. "A-14"

132 Q100=227.2 CFS Tc=22.6 MIN.

Q100=234.1 CFS Tc=22.7 MIN.

142

Q100=277.4 CFS Tc=22.8 MIN.

1.8 CFS FLOWBY

154

LAT. "A-11"

Q100=282.1 CFS Tc=23.3 MIN.

172

LAT. "A-9"

RIDER STREET

0.70 AC.

LAT. "A-17"

11.5 CFS FLOWBY

LAT. "A-15"

LAT. "A-13"

6.5 CFS FLOWBY

0.70 AC.

LAT. "A-12"

LAT. "A-10"

111 Q100=6.3 CFS Tc=11.8 MIN.

113 Q100=155.4 CFS Tc=20.8 MIN.

112 Q100=25.2 CFS Q(in basin)=13.7 CFS Tc=15.5 MIN.

LAT. "A-19"

1.00 AC.

131 Q100=2.0 CFS Q(in basin)=7.0 CFS Tc=14.8 MIN.

160 162 Q100=278.5 CFS Tc=23.3 MIN.

Q100=1.7 CFS Q(in basin)=8.2 CFS Tc=10.2 MIN.

161

181 Q100=15.4 CFS Tc=15.4 MIN.

9.70 AC.

153 Q100=49.4 CFS Tc=28.4 MIN.

2.90 AC.

80 110

9.6 AC.

7.90 AC.

4.40 AC.

3.60 AC.

151 Q100=29.6 CFS Tc=24.9 MIN.

152 Q100=35.1 CFS Tc=26.0 MIN.

REDLANDS AVENUE

2.90 AC.

90

2.10 AC.

91 Q100=4.0 CFS Tc=14.2 MIN.

1.80 AC.

180

200

Q100=5.9 CFS Tc=12.3 MIN.

81

4.20 AC.

92 Q100=22.5 CFS Tc=23.5 MIN.

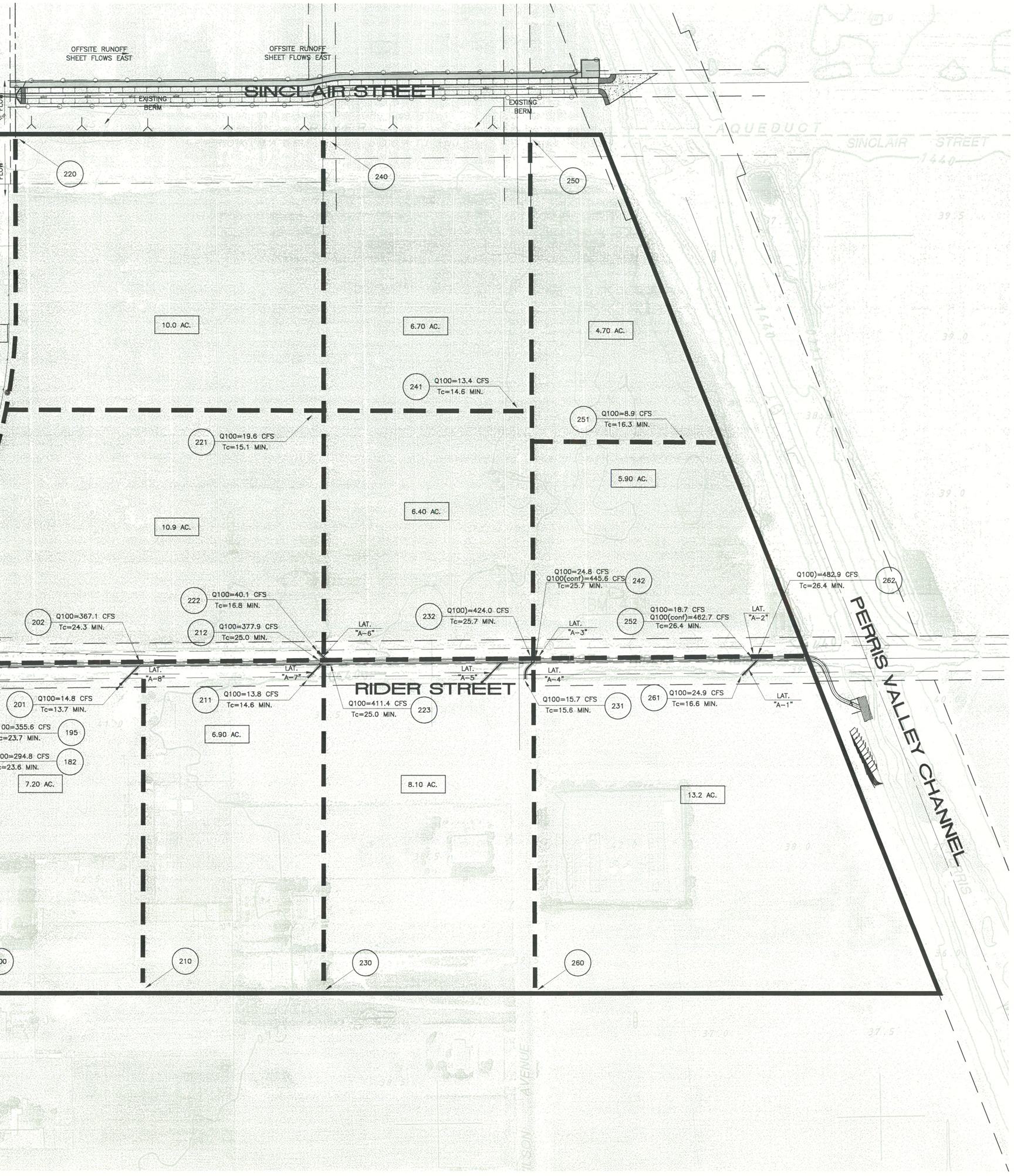
0.10 AC.

Q100=22.7 CFS Tc=24.4 MIN.

93

82 Q100=12.8 CFS Tc=19.5 MIN.

2.20 AC.



LEGEND

- PROJECT BOUNDARY
- SUBAREA BOUNDARY
- 1.00 AC. — SUBAREA AREA
- (100) — NODE NUMBER
- ANTICIPATED PONDING AREA

Last Update: 8/26/09
G:\2700-2799\2702\2702-hyd-mtd-box.dwg

CITY OF PERRIS
PUBLIC WORKS DEPARTMENT

HYDROLOGY MAP
PROPOSED CONDITIONS

PERRIS VALLEY MDP
LINE A-B (RIDER ST.)

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

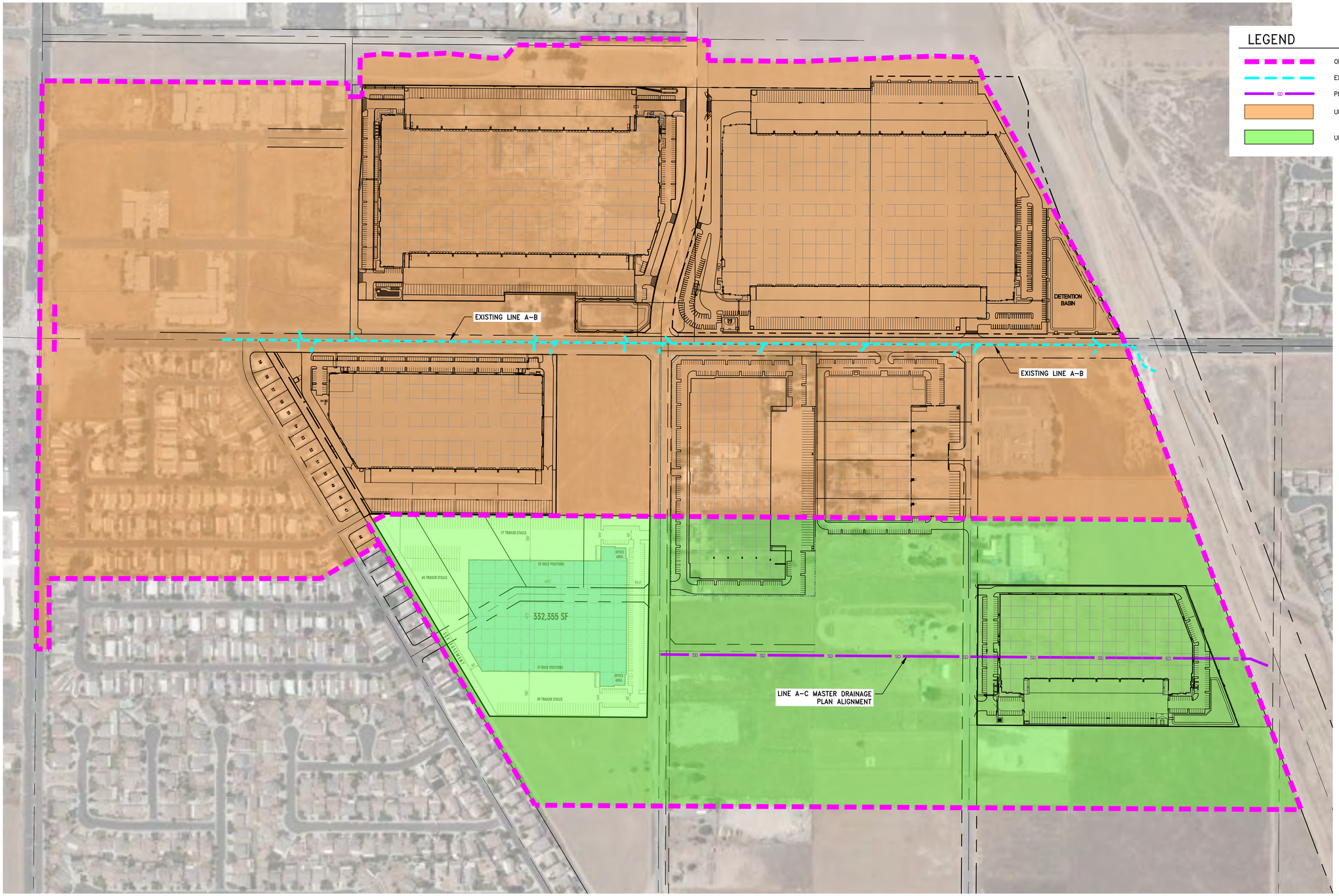
Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Aproved by _____ Date _____

Public Works Director _____ R.C.E. 28129

Sheet 2 of 2 Sheets

2702/ 2 OF 2 SHEET



N
W WEBB E
S

1" = 200'

100 0 200 400 600

CITY OF PERRIS

LINE A–B, LINE A–C
ORIGINAL TRIBUTARIES

SCALE: AS SHOWN	ALBERT A. WEBB ASSOCIATES	W.O. 18–0305
DATE: 1/30/20	ENGINEERING CONSULTANTS 3788 McCRAY STREET RIVERSIDE CA. 92506 PH. (951) 686–1070 FAX (951) 788–1256	SHEET 1
DESIGNED: TSW		OF 2 SHEETS
CHECKED: DJA		DWG. NO.
PLN CK REF:		
F.B.		

G:\2018\18-0305\DRAINAGE\PHYD\DWG FOLDER\LINEAB_LINEAC_TRIBUTARIES.DWG 1/29/2020 6:09:16 PM

XYZ DRW

LEGEND

- PROPOSED LINE A–B BOUNDARY
- PROPOSED LINE A–C BOUNDARY
- PROJECT BOUNDARIES
- EXISTING STORM DRAIN
- PLANNED STORM DRAIN (SD)
- UNDEVELOPED/DEVELOPED AREA CURRENTLY TRIBUTARY TO LINE A–B
- RIDER DISTRIBUTION CENTER III – MITIGATES FLOWS FROM 72 CFS TO 8 CFS
- AREA PROPOSED TRIBUTARY TO LINE A–C
- UNDEVELOPED AREA PROPOSED TRIBUTARY TO LATERAL AB–10
- UNDEVELOPED AREA PROPOSED TRIBUTARY TO LATERAL AB–7
- UNDEVELOPED AREA PROPOSED TRIBUTARY TO LATERAL AB–4
- RCTC MID COUNTY PARKWAY IMPACT AREA
- 10.0 — DRAINAGE AREA

RIDER DISTRIBUTION CENTER III PROJECT TRIBUTARY TO LATERAL AB–9
(CONSTRUCTED)
37.2
Q_{100}= 8.0 CFS

RIDER DISTRIBUTION CENTER II PROJECT TRIBUTARY TO LATERAL AB–2
DPR NO. 19–00004
42.2

EX. LAT AB–9
OLD=61.0 CFS
NEW=8.0 CFS

EX. LAT AB–6
OLD=32.7 CFS
NEW=0.0 CFS

EX. LAT AB–3
OLD=20.2 CFS
NEW=0.0 CFS

DETENTION BASIN

EX. LAT AB–2
OLD=15.9 CFS
NEW=87.0 CFS

EX. LINE A–B

EX. LAT AB–1
NO CHANGE

EX. LAT AB–4
OLD=12.8 CFS
NEW=25.0 CFS

EX. LINE A–B OUTLET
OLD=483.0 CFS
*NEW=506.1 CFS

RIDER DISTRIBUTION CENTER I PROJECT TRIBUTARY TO LATERAL AB–13
(CONSTRUCTED)
17.4

EX. LAT AB–10
OLD=13.0 CFS
NEW=48.0 CFS

7.8
PROP. LAT AB–10 EXTENSION

EX. LAT AB–8
OLD=11.0 CFS
NEW=0.0 CFS

PROP. LAT AB–7.5
OLD=0.0 CFS
NEW=34.6 CFS

FIRST RIDER INDUSTRIAL PROJECT TRIBUTARY TO LATERAL AB–7
DPR NO. 19–05161
17.3
Q_{100}=(17.3 ACRES * 2.0 CFS/ACRE) = 34.6 CFS

EX. LAT AB–7
OLD=11.3 CFS
NEW=0.0 CFS

EX. LAT AB–5
OLD=2.0 CFS
NEW=0.0 CFS

CORE 5 RIDER INDUSTRIAL PROJECT TRIBUTARY TO LATERAL AB–4
DPR NO. 19–05267
12.5
Q_{100}=(12.5 ACRES * 2.0 CFS/ACRE) = 25.0 CFS

9.6
Q_{100}=(9.6 ACRES * 2.0 CFS/ACRE) = 19.2 CFS

PROP. LINE A–C

LINE A–C TRIBUTARY TOTALS
72.6 CFS

IPT – REDLANDS PROJECT TRIBUTARY TO LAT AB–10
16.3
Q_{100}=(16.3 ACRES * 2.0 CFS/ACRE) = 32.6 CFS

PROPOSED AREA TRIBUTARY TO LINE A–C
11.1
Q_{100}=(11.1 ACRES * 2.0 CFS/ACRE) = 22.2 CFS

FIRST WILSON INDUSTRIAL PROJECT TRIBUTARY TO LINE A–C
DPR NO. 19–00007
15.6
Q_{100}=(15.6 ACRES * 2.0 CFS/ACRE) = 31.2 CFS

LOTS TRIBUTARY TO PVSD

MID COUNTY PARKWAY IMPACT AREA, PARKWAY WILL DRAIN TO AND CONSTRUCT LINE H

***NOTE**
NEW OUTLET FLOWRATE IS GREATER THAN OLD OUTLET FLOWRATE BECAUSE OF AREA–YIELD FLOW REALLOCATION METHOD. THIS WAS DONE TO BE MORE CONSERVATIVE IN THE REVISED HYDRAULIC MODEL EVALUATION. THE AREA–YIELD METHOD IS MORE CONSERVATIVE BECAUSE IT IGNORES STREAM CONFLUENCES WHICH CAN LOWER THE TRIBUTARY FLOWRATES.

N W E S WEBB

1" = 200'
100 0 200 400 600

CITY OF PERRIS

LINE A–B, LINE A–C PROPOSED TRIBUTARIES

SCALE: AS SHOWN	W.O. 18–0305
DATE: 1/30/20	SHEET 2
DESIGNED: TSW	OF 2 SHEETS
CHECKED: DJA	
PLN CK REF:	DWG. NO.
F.B.	

ALBERT A. WEBB ASSOCIATES
ENGINEERING CONSULTANTS
3788 McCRAY STREET
RIVERSIDE, CA. 92506
PH. (951) 686–1070
FAX (951) 788–1256

Appendix B: Line A-B Original and Revised Hydraulics, Plan and Profile

```
T1 LINE A-B HYDRAULIC MODEL - ORIGINAL TRIBUTARIES

T2 FN:LINEABORIGINAL.WSW
SO    997.6001426.790  1                          1433.000
R    1019.8401426.870  1      .013                                .000    .000 0
R    1055.1801426.990  1      .014                              45.000    .000 0
R    1099.8201427.160  1      .013                                .000    .000 0
R    1154.0801427.350  1      .014                             -69.080    .000 0
R    1263.3301427.730  1      .013                                .000    .000 1
JX   1263.3301427.740  1  3   .013   21.100         1428.810       -45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-1
R    1275.3301427.760  1      .013                                .000    .000 0
JX   1275.3301427.770  1  2   .013   15.900         1428.840        45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-2
R    1758.8201429.460  1      .013                                .000    .000 0
JX   1758.8201429.470  1  3   .013   20.200         1430.540        45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-3
R    1771.5101429.500  1      .013                                .000    .000 1
JX   1777.5101430.000  7  2   .013   12.800         1430.000       -45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-4
R    1841.8901430.190  7      .013                                .000    .000 0
JX   1841.8901430.200  7  8   .013    2.000         1431.690       -45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-5
R    2236.2101431.380  7      .013                                .000    .000 1
JX   2236.2101431.390  7  6   .013   32.700         1431.970        45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-6
R    2249.4101431.420  7      .013                                .000    .000 0
JX   2249.4101431.430  7  2   .013   11.300         1432.000       -45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-7
R    2690.0001432.740  7      .013                                .000    .000 1
JX   2690.0001432.750  7  2   .013   11.000         1433.830       -60.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-8
R    3083.4901433.930  7      .013                                .000    .000 1
JX   3093.9301433.960  4  9   .013   61.000         1434.520        45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-9
R    3116.4701434.030  4      .013                                .000    .000 0
JX   3116.4701434.040  4  2   .013   13.000         1434.620        45.0        0.000
REM  EXISTING TRIBUTARY TO LATERAL AB-10
R    3271.3701434.490  4      .013                                .000    .000 1
SH   3271.3701434.490  4                          1434.490
CD   2  4   1    .000   2.000     .000  .000  .000   .00
CD   3  4   1    .000   2.500     .000  .000  .000   .00
CD   6  4   1    .000   3.000     .000  .000  .000   .00
CD   8  4   1    .000   1.500     .000  .000  .000   .00
CD   9  4   1    .000   3.500     .000  .000  .000   .00
CD   1  6   0    .000             .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   4  6   0    .000             .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   5  6   0    .000             .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   6  6   0    .000             .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   7  6   0    .000             .00   .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
PTS  1 8  1.000  7.330  1.000  1.670  1.670  1.000  8.330  1.000  9.000  1.670
PTS       9.000  7.330  8.330  8.000  1.670  8.000
PTS  4 8  1.000  5.330  1.000  1.670  1.670  1.000  7.330  1.000  8.000  1.670
PTS       8.000  5.330  7.330  6.000  1.670  6.000
PTS  5 8  1.000  4.830  1.000  1.670  1.670  1.000  7.330  1.000  8.000  1.670
PTS       8.000  4.830  7.330  5.500  1.670  5.500
PTS  6 8  1.000  4.420  1.000  1.580  1.580  1.000  6.420  1.000  7.000  1.580
PTS       7.000  4.420  6.420  5.000  1.580  5.000
PTS  7 8  1.000  6.330  1.000  1.670  1.670  1.000  8.330  1.000  9.000  1.670
PTS       9.000  6.330  8.330  7.000  1.670  7.000
Q           282.000   .0
```

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	2	4	1		2.000														
CD	3	4	1		2.500														
CD	6	4	1		3.000														
CD	8	4	1		1.500														
CD	9	4	1		3.500														
CD	1	6	0	.000															
CD	4	6	0	.000															
CD	5	6	0	.000															
CD	6	6	0	.000															
CD	7	6	0	.000															

WATER SURFACE PROFILE - CROSS SECTION POINT LISTING

CARD CODE	SECT NO	NO OF POINTS	X(1) , Y(1)	X(2) , Y(2)	X(3) , Y(3)	X(4) , Y(4)	X(5) , Y(5)	X(6) , Y(6)	X(7) , Y(7)	X(8) , Y(8)	X(9) , Y(9)	X(10) ,Y(10)	X(11) ,Y(11)	X(N) , Y(N)	X(N+1),Y(N+1)	X(35) ,Y(35)
PTS	1	8	1.000	7.330	1.000	1.670	1.670	1.000	8.330	1.000	9.000	1.670	9.000	7.330	8.000	
PTS			1.670	8.000												
PTS	4	8	1.000	5.330	1.000	1.670	1.670	1.000	7.330	1.000	8.000	1.670	8.000	5.330	7.330	6.000
PTS			1.670	6.000												
PTS	5	8	1.000	4.830	1.000	1.670	1.670	1.000	7.330	1.000	8.000	1.670	8.000	4.830	7.330	5.500
PTS			1.670	5.500												
PTS	6	8	1.000	4.420	1.000	1.580	1.580	1.000	6.420	1.000	7.000	1.580	7.000	4.420	6.420	5.000
PTS			1.580	5.000												
PTS	7	8	1.000	6.330	1.000	1.670	1.670	1.000	8.330	1.000	9.000	1.670	9.000	6.330	8.330	7.000
PTS			1.670	7.000												

W S P G W

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

LINE A-B HYDRAULIC MODEL - ORIGINAL TRIBUTARIES

HEADING LINE NO 2 IS -

FN:LINEABORIGINAL.WSW

HEADING LINE NO 3 IS -

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	997.600	1426.790	1	1433.000

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1019.840	1426.870	1	.013	.000	.000	.000	0

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1055.180	1426.990	1	.014	44.996	45.000	.000	0

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1099.820	1427.160	1	.013	.000	.000	.000	0

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1154.080	1427.350	1	.014	45.004	-69.080	.000	0

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS

```
   ANGLE     ANG PT  MAN H
                              1263.330 1427.730    1               .013                          .000
   .000      .000     1
  ELEMENT NO   7 IS A JUNCTION          *         *     *     *                *                  *
           *
                      U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3         Q4     INVERT-3
INVERT-4  PHI 3  PHI 4
                              1263.330 1427.740    1     3     0   .013    21.100       .000  1428.810
    .000 -45.000     .000
                                                                                              RADIUS
   ANGLE
                                                                                               .000
   .000
  REMARKS:   EXISTING TRIBUTARY TO LATERAL AB-1

  ELEMENT NO   8 IS A REACH             *         *     *
                      U/S DATA   STATION    INVERT  SECT               N                      RADIUS
   ANGLE     ANG PT  MAN H
                              1275.330 1427.760    1               .013                          .000
   .000      .000     0
  ELEMENT NO   9 IS A JUNCTION          *         *     *     *                *                  *
           *
                      U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3         Q4     INVERT-3
INVERT-4  PHI 3  PHI 4
                              1275.330 1427.770    1     2     0   .013    15.900       .000  1428.840
    .000  45.000     .000
                                                                                              RADIUS
   ANGLE
                                                                                               .000
   .000
                                                        W S P G W
            PAGE NO   3
                              WATER SURFACE PROFILE - ELEMENT CARD LISTING
  REMARKS:   EXISTING TRIBUTARY TO LATERAL AB-2

  ELEMENT NO  10 IS A REACH             *         *     *
                      U/S DATA   STATION    INVERT  SECT               N                      RADIUS
   ANGLE     ANG PT  MAN H
                              1758.820 1429.460    1               .013                          .000
   .000      .000     0
  ELEMENT NO  11 IS A JUNCTION          *         *     *     *                *                  *
           *
                      U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3         Q4     INVERT-3
INVERT-4  PHI 3  PHI 4
                              1758.820 1429.470    1     3     0   .013    20.200       .000  1430.540
    .000  45.000     .000
                                                                                              RADIUS
   ANGLE
                                                                                               .000
   .000
  REMARKS:   EXISTING TRIBUTARY TO LATERAL AB-3

  ELEMENT NO  12 IS A REACH             *         *     *
                      U/S DATA   STATION    INVERT  SECT               N                      RADIUS
   ANGLE     ANG PT  MAN H
                              1771.510 1429.500    1               .013                          .000
   .000      .000     1
  ELEMENT NO  13 IS A JUNCTION          *         *     *     *                *                  *
           *
                      U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3         Q4     INVERT-3
INVERT-4  PHI 3  PHI 4
                              1777.510 1430.000    7     2     0   .013    12.800       .000  1430.000
    .000 -45.000     .000
                                                                                              RADIUS
   ANGLE
                                                                                               .000
   .000
  REMARKS:   EXISTING TRIBUTARY TO LATERAL AB-4

  ELEMENT NO  14 IS A REACH             *         *     *
                      U/S DATA   STATION    INVERT  SECT               N                      RADIUS
   ANGLE     ANG PT  MAN H
                              1841.890 1430.190    7               .013                          .000
   .000      .000     0
  ELEMENT NO  15 IS A JUNCTION          *         *     *     *                *                  *
           *
                      U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3         Q4     INVERT-3
INVERT-4  PHI 3  PHI 4
                              1841.890 1430.200    7     8     0   .013     2.000       .000  1431.690
```

.000 -45.000 .000

RADIUS

ANGLE

.000

.000

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

REMARKS: EXISTING TRIBUTARY TO LATERAL AB-5

ELEMENT NO 16 IS A REACH * * *

	U/S DATA	STATION	INVERT	SECT		N		RADIUS
ANGLE	ANG PT	MAN H						
		2236.210	1431.380	7		.013		.000
.000	.000	1						

ELEMENT NO 17 IS A JUNCTION * * * * * *

	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3
INVERT-4	PHI 3	PHI 4								
		2236.210	1431.390	7	6	0	.013	32.700	.000	1431.970
.000	45.000	.000								

RADIUS

ANGLE

.000

.000

REMARKS: EXISTING TRIBUTARY TO LATERAL AB-6

ELEMENT NO 18 IS A REACH * * *

	U/S DATA	STATION	INVERT	SECT		N		RADIUS
ANGLE	ANG PT	MAN H						
		2249.410	1431.420	7		.013		.000
.000	.000	0						

ELEMENT NO 19 IS A JUNCTION * * * * * *

	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3
INVERT-4	PHI 3	PHI 4								
		2249.410	1431.430	7	2	0	.013	11.300	.000	1432.000
.000	-45.000	.000								

RADIUS

ANGLE

.000

.000

REMARKS: EXISTING TRIBUTARY TO LATERAL AB-7

ELEMENT NO 20 IS A REACH * * *

	U/S DATA	STATION	INVERT	SECT		N		RADIUS
ANGLE	ANG PT	MAN H						
		2690.000	1432.740	7		.013		.000
.000	.000	1						

ELEMENT NO 21 IS A JUNCTION * * * * * *

	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3
INVERT-4	PHI 3	PHI 4								
		2690.000	1432.750	7	2	0	.013	11.000	.000	1433.830
.000	-60.000	.000								

RADIUS

ANGLE

.000

.000

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

REMARKS: EXISTING TRIBUTARY TO LATERAL AB-8

ELEMENT NO 22 IS A REACH * * *

	U/S DATA	STATION	INVERT	SECT		N		RADIUS
ANGLE	ANG PT	MAN H						
		3083.490	1433.930	7		.013		.000
.000	.000	1						

ELEMENT NO 23 IS A JUNCTION * * * * * *

	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3
INVERT-4	PHI 3	PHI 4								
		3093.930	1433.960	4	9	0	.013	61.000	.000	1434.520
.000	45.000	.000								

RADIUS

ANGLE

.000

.000