Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING

PRELIMINARY HYDROLOGY CALCULATIONS

FOR

FIRST MARCH LOGISTICS
NATWAR LANE
PERRIS, CA

PREPARED FOR

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JOB NO. 3788

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PRELIMINARY HYDROLOGY CALCULATIONS

FOR

FIRST MARCH LOGISITICS

PREPARED UNDER
THE SUPERVISION OF

REINHARD STENZEL DATE:
R.C.E. 56155
EXP. 12/31/2022

INTRODUCTION

A: PROJECT LOCATION

The project site is located on the westerly side of Natwar Lane north of Nandina Drive in the city of Perris. Interstate 215 is adjacent to the site on the west. See following page for vicinity map.

B: STUDY PURPOSE

The purpose of this study is to determine the existing and proposed condition 100-year peak flow rates for the project site that ultimately discharges into a proposed Master Plan storm drain in Natwar Lane.

C: PROJECT STAFF:

Thienes Engineering staff involved in this study include:

Reinhard Stenzel
Brian Weil

DISCUSSION

The project site encompasses approximately 19.95 acres. Proposed improvements to the site include a single commercial/warehouse type building with approximately 419,034 square feet. There are truck dock areas on the westerly and easterly sides of the building. Vehicle parking areas are located on the northerly and southerly portions of the project site. Areas adjacent to the Freeway and Natwar Lane will be landscaped along with smaller landscaped areas throughout the site.

Perris Valley Area Master Drainage Plan

The project site is tabled to Lateral "B-7" as shown on the Perris Valley Area Master Drainage Plan Hydrology Map. The upstream portion of Lateral "B-7" is located in Natwar Lane adjacent to the southerly portion of the project site. Lateral "B-7" continues easterly in Nandina Drive then southerly in Patterson Avenue, ultimately joining Line "B" located in Old Oleander Road (now call Harley Knox Boulevard).

Lateral "B-7" does not include any drainage areas west of the 215 Freeway. It is unclear if portions of the Freeway are tributary to Lateral "B-7". The Master Drainage Plan shows a channel adjacent to the railroad tracks west of the Freeway. This channel, Line "B", conveys flow southerly to Old Oleander Road. None of these described Master Drainage Plan facilities have been constructed at this time. However, Caltrans has constructed a box culvert in Harley Knox Boulevard to Patterson Avenue, then back to Harley Knox Boulevard ultimately discharging to the existing Perris Valley Channel, Line "B" (at Heacock Avenue).

The existing Caltrans box culvert is not designed for the peak flow rates shown on the Perris Valley Area Master Drainage Plan. Based on available information, the Caltrans box culvert has a design peak flow rate of 536 cfs. This is only a portion of the Master Drainage Plan peak flow rate of 2,533 cfs. It seems that the Caltrans box culvert utilizes an upstream detention basin adjacent to the existing sewer treatment plant located on the westerly side of the Freeway north of the prolongation of Nandina Drive. This detention basin does not currently exist.

There is no indication of a connection to the culvert at Patterson Avenue for areas tributary to Lateral "B-7". In addition, the invert elevations of the Caltrans box are not low enough to accommodate an adequately sized Lateral "B-7" storm drain in Patterson Avenue (further described below).

Areas within March Air Reserve Base are not detailed in the Perris Valley Area Master Drainage Plan. However, there is an existing earthen channel that traverses north to south through the Air Reserve Base. This channel intercepts runoff from areas north of the project site as well as flow from the Air Reserve Base. The channel ultimately drains easterly to Perris Valley Storm Channel, Line "B" at Heacock Avenue. Both the Air Reserve Base channel and the Caltrans box culvert discharge at the same location.

See Appendix "A" for portions of the Perris Valley Area Master Drainage Plan and Catrans box culvert plans.

Existing Condition

Under existing conditions, the site is a vacant lot covered in natural grasses and sparse vegetation. Runoff from the site generally drains from west to east toward Natwar Lane. The 100-year peak flow rate (from the project site only) currently draining to Natwar Lane (nodes 110-112 and 120-121) is approximately 15.0 cfs. Runoff from the northerly portion of the site that drains to the prolongation of Natwar Lane (nodes 100-101) is approximately 9.0 cfs.

The total 100-year peak flow rate from the project site under existing conditions is approximately 24.0 cfs (direct sum of the individual drainage areas).

There is an existing double 6' x 3' culvert under the Freeway that discharges offsite flow into the project site. This discharge appears to have created a natural drainage course easterly through the project site. There is an existing trash rack and 24" storm drain at Natwar Lane that appears to convey runoff easterly under the street. While the project site currently accepts offsite flows, these flows were not considered with the existing condition hydrology. This was done to establish an existing 100-year peak flow rate from the site only, for comparisons with the proposed peak flow rates. The runoff currently tributary from under the Freeway will be conveyed through the project site with a separate public storm drain adequately sized for the offsite runoff.

See Appendix "B" for existing condition hydrology calculations and Appendix "C" for an existing condition hydrology map.

Offsite Hydrology

As previously mentioned, there are offsite flows tributary to the project site and are conveyed via an existing double 6' x 3' reinforced concrete box under the Freeway. The amount of runoff tributary to this location is unclear. The Master Plan of Drainage for the Perris Valley Area shows an ultimate channel adjacent to the Freeway that diverts flows southerly past the existing culvert. However, this system does not exist at this time.

There are two 36" corrugated metal pipes that currently convey runoff under the existing railroad tracks near the Caltrans double box culvert. A recent hydrology study prepared for the Riverside County Transportation Commission (RCTC) indicates a drainage area tributary to the two 36" pipes. From the report, it appears that the 100-year peak flow rate at this location (mile post 12.1) is 179.2 cfs. However, a detailed hydraulic analysis of the two pipes indicate a capacity of about 106 cfs. It is not clear whether the remaining peak flow rate tops over the Freeway or continues southerly adjacent to the Railroad

tracks. Conservatively, further analysis of downstream facilities considers the 179.2 cfs at the Caltrans box culvert.

Adding peak flow rates from areas between the Railroad tracks and the Freeway and portions of the Freeway and median yields a 100-year peak flow rate of 196.7 cfs. These peak flow rates and analysis are in a separate report titled "Offsite Hydrology Calculations for 215 Freeway and Natwar", also prepared by Thienes Engineering, Inc.

This flow continues through the project site via an existing natural drainage course to the previously mentioned 24" storm drain under Natwar Lane. Based on available aerial topography, it appears that flows continue through an existing site east of Natwar Lane then across Western Way.

The existing 24" storm drain at Natwar Lane is not adequately sized to convey the tributary existing condition peak flow rate at this location. Excess runoff sheet flows to Natwar Lane where flow either continues easterly through adjacent properties or southerly in the street. The westerly portion of Natwar Lane is not fully improved. The capacity of Natwar Lane is estimated at approximately 30.0 cfs at the southerly portion of the project site. The flow in Natwar Lane continues southerly to Nandina Drive. Nandina Drive slopes easterly to Patterson Avenue. Runoff in excess of Natwar Lane and the existing 24" storm drain sheet flows over the easterly street right-of-way into adjacent properties.

There is another flow path at the northerly portion of Western Way that appears to convey runoff diverted around an existing development on the easterly side of Natwar Lane. Runoff in this flow path continues southeasterly and confluences with the previously mentioned natural drainage course. An existing dirt berm and access road at the westerly property line of the Air Reserve Base prevents runoff from sheet flowing into the Air Reserve Base north of Nandina Drive. This directs runoff southeasterly to the intersection of Nandina Drive and Patterson Avenue. Patterson Avenue is an unimproved dirt road that does not have positive drainage. It appears that flow then drains easterly into March Air Reserve Base to the existing earthen channel.

Runoff from the project site and the offsite areas to the west and east of the project site ultimately drain to the intersection of Nandina Drive and Patterson Avenue.

See Appendix "A" for reference material from the RCTC hydrology report and Appendix "C" for a Drainage Exhibit showing the overall topography and existing drainage patterns.

Proposed Condition Hydrology

Flow from the easterly half of the building, the easterly truck yard and the northeasterly parking lot and drive aisle (nodes 110-131) will drain to catch basins located in the truck yard area. Runoff from the southerly parking lot and drive aisle (nodes 100-101) will drain to a catch basin at the southeasterly portion of the parking lot. A proposed storm drain will convey flows from the southerly parking to the north and confluence with runoff from the easterly truck yard. The easterly storm drain system continues northerly and connects to the proposed public storm drain that conveys offsite flow (at node 133). The 100-year Rational Method peak flow rate for this area is approximately 28.4 cfs.

Runoff from the westerly half of the building, the westerly truck yard, the northwesterly parking lot, and the southwesterly drive aisle (nodes 150-181) will drain to catch basins located in the westerly truck yard. A storm drain will convey runoff northerly to the proposed public storm drain system that will convey offsite flow (at node 183). The 100-year Rational Method peak flow rate for this area is approximately 23.6 cfs.

Stormwater that enters the landscaped areas adjacent to the Freeway (nodes 140-141) will be behind the site screen wall and conveyed to the south via a proposed gutter. A portion of the freeway drains toward the site and runoff will also be collected by the proposed gutter. A wall along the southerly neighbor's westerly property line will block offsite runon and flows will continue southerly, discharging into Nandina Drive. Drainage from the landscape area fronting Natwar Lane and the southeasterly driveway will surface drain directly into the street (nodes 190-191). The 100-year peak flow rate from the project site that will surface drain into the adjacent streets is approximately 3.0 cfs (1.5 cfs + 1.5 cfs).

The total 100-year peak flow rate for proposed conditions is approximately 55.0 cfs (direct sum of the individual areas). This flow rate does not consider onsite detention.

See Appendix "B" for proposed condition hydrology calculations and Appendix "C" for a proposed condition hydrology map.

Proposed Master Plan Storm Drain

The Perris Valley Master Drainage Plan depicts a storm drain system that conveys the project site stormwater south in Natwar Lane, then easterly in Nandina Drive, and continues southerly in Patterson Avenue. It has been established that the Caltrans box culvert has neither the capacity nor the elevation to accommodate this storm drain system. Also, this Master Plan storm drain does not include offsite runoff from the existing culvert under the Freeway. Therefore, an alternative discharge point different from the Master Drainage Plan is necessary.

The Perris Valley MDP Line B storm drain plan by Albert A. Webb Associates (WEBB) shows a storm drain system that convcys stormwater to the southeast, from an existing Caltrans 96" RCP near the March Filed Air Museum, north of the project site. The storm

drain system temporarily discharges into the existing earthen channel northeast of the project. The storm drain will ultimately continue southeasterly with the construction of the Perris Valley Channel Lateral "B" which traverses southeasterly adjacent or onto March Air Reserve Base property, ultimately to an existing channel at Heacock Avenue.

It is unlikely to connect to the Webb designed facility. However, Thienes Engineering, Inc. is working with Riverside County Flood Control and Water Conservation District to connect into Perris Valley Channel Lateral "B" and resize the downstream portion as necessary since this storm drain system is still in preliminary design.

The proposed public storm drain associated with the project site will continue easterly through the project site through the northerly drive aisle then through adjacent sites and connect to the upstream portion of the proposed Perris Valley Channel Lateral "B". Flood Control had tabled this runoff to the storm drain system downstream at Nandina Avenue.

A separate report currently in review with Flood Control shows that this connection can be made with slight modifications to the preliminary storm drain plans.

Hydraulic Calculations

Hydraulic calculations for the proposed public storm drain system from the Freeway to the interim detention basin are provided to properly size this storm drain system as well as ensure that the depth of flow in the existing culvert under the Freeway is not exceeded. A hydraulic model for the existing Freeway culvert was established using the above mentioned peak flow rate to determine a water surface elevation in the existing culvert.

Interim and ultimate condition hydraulic models were established. The interim condition (Phase 1) public storm drain discharges into a temporary detention basin located on the Phase 2 portion of the site. The expected water surface elevation in the basin is used as the hydraulic control for this scenario. In the Phase 1 condition, there will be expected ponding in the truck yards. For preliminary modeling, the proposed condition 100-year peak flow rates are used, even though some detention would be required due to the high water surface elevation. Conservatively, the ponding elevations shown are the hydraulic grade lines for the respective storm drain systems draining each truck yard. Final storm drain design and hydrology for precise grading plans will include detention analysis as necessary.

In the ultimate condition (Phase 2), the proposed public storm drain system will continue easterly and connect to the future Perris Valley Channel, Lateral "B" near the March Air Reserve Base property line. Here, the controlling hydraulic grade line assumes that the box culvert is at soffit condition. Preliminary design of the Flood Control facility shows the hydraulic grade line below soffit condition. In any case, the ultimate condition hydraulic grade line is several feet lower than the interim condition hydraulic grade line.

Both the interim and ultimate hydraulic models include the upstream culvert under the Freeway. Overall, the water surface elevation in each model is the same as the existing model at the upstream portion of the existing culvert under the Freeway. This shows that the proposed storm drain system and interim detention basin do not have an adverse effect at the existing Freeway culvert or Railroad tracks.

See Appendix "C" for hydraulic calculations.

Methodology

Riverside County Rational Method Program, by AES Software, was used for the hydrology calculations. CivilD Software was used for the hydrograph and flood routing calculations. The northerly portion of the site is soil type "B" and the southerly portion is soil type "C" per the Riverside County Hydrology Manual.

See Appendix "A" for reference material from the Hydrology Manual.

Conclusion

The project site will continue to accept offsite runoff from the existing culvert at the 215 Freeway. Interim conditions will drain the offsite and onsite flow easterly to a temporary detention basin located to the east of the project site. Ultimate conditions will convey runoff to the proposed Flood Control located adjacent to March Air Reserve Base. Interim conditions require some onsite detention to be determined with precise grading and storm drain plans. Ultimate condition storm drains can adequately convey 100-year offsite and onsite runoff without any detention.

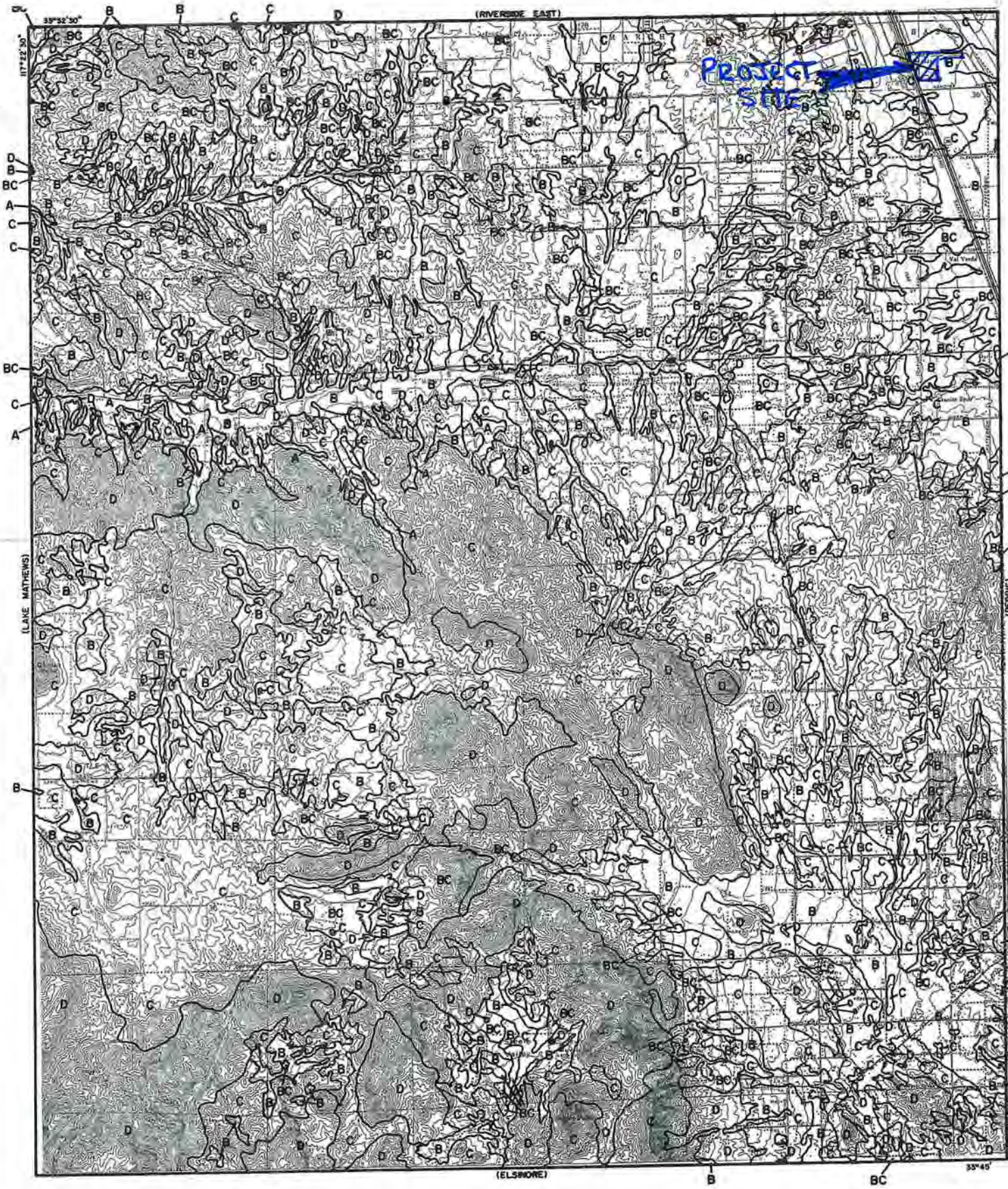
Overall, the proposed improvements provide an alternative to the Perris Valley Area Mater Drainage Plan and do not negatively affect upstream or downstream facilities.

APPENDIX	DESCRIPTION
A	REFERENCE MATERIAL
B	HYDROLOGY CALCULATIONS
C	HYDRAULIC CALCULATIONS
D	HYDROLOGY MAPS

APPENDIX A

REFERENCE MATERIALS

HYDROLOGY MANUAL REFERENCE MATERIAL



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

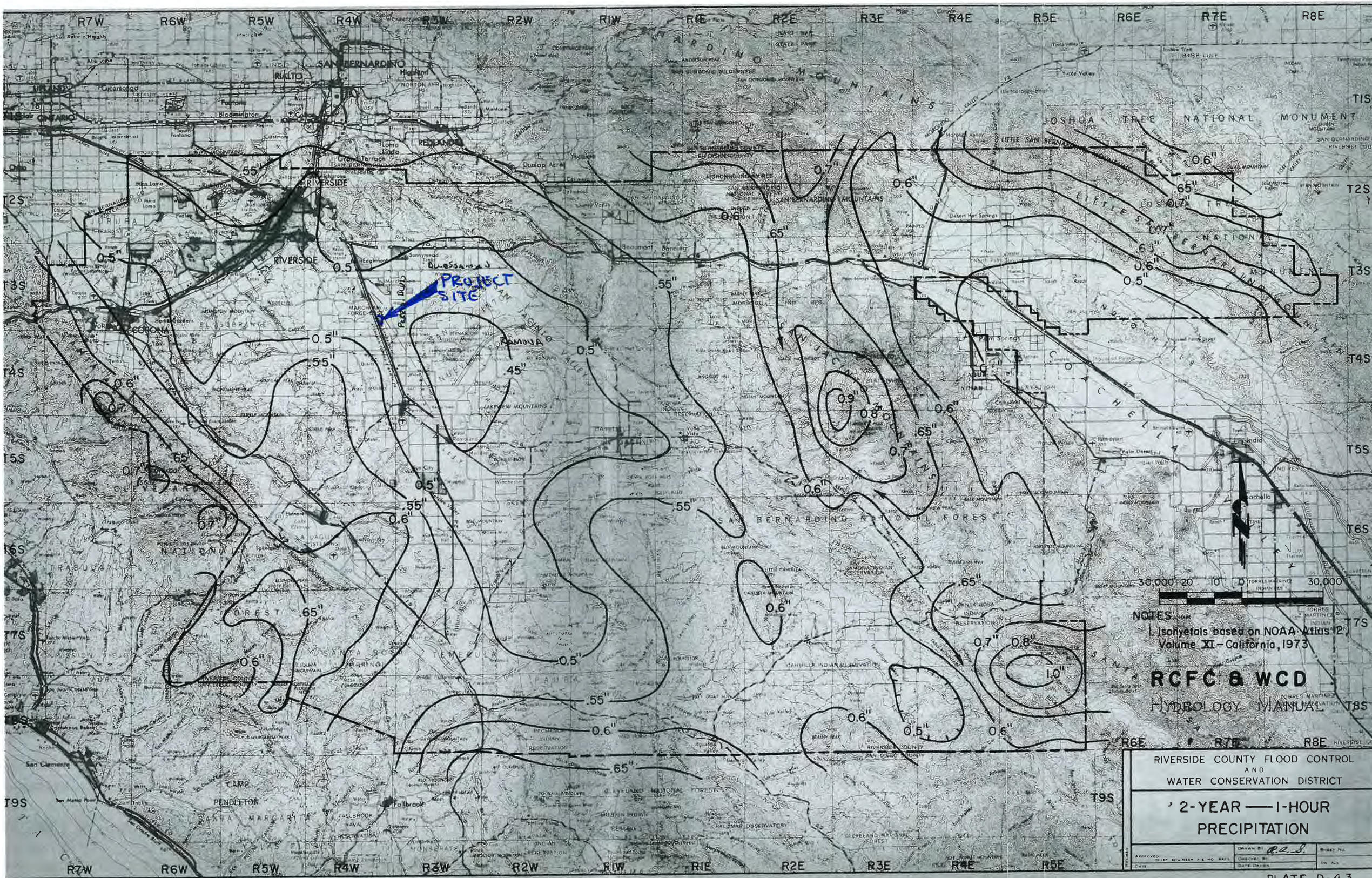
HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR STEELE PEAK

PLATE C-1.29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.55"
0.5"
0.6"
0.7"
0.65"
0.9"
0.8"
1.0"
.45"
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
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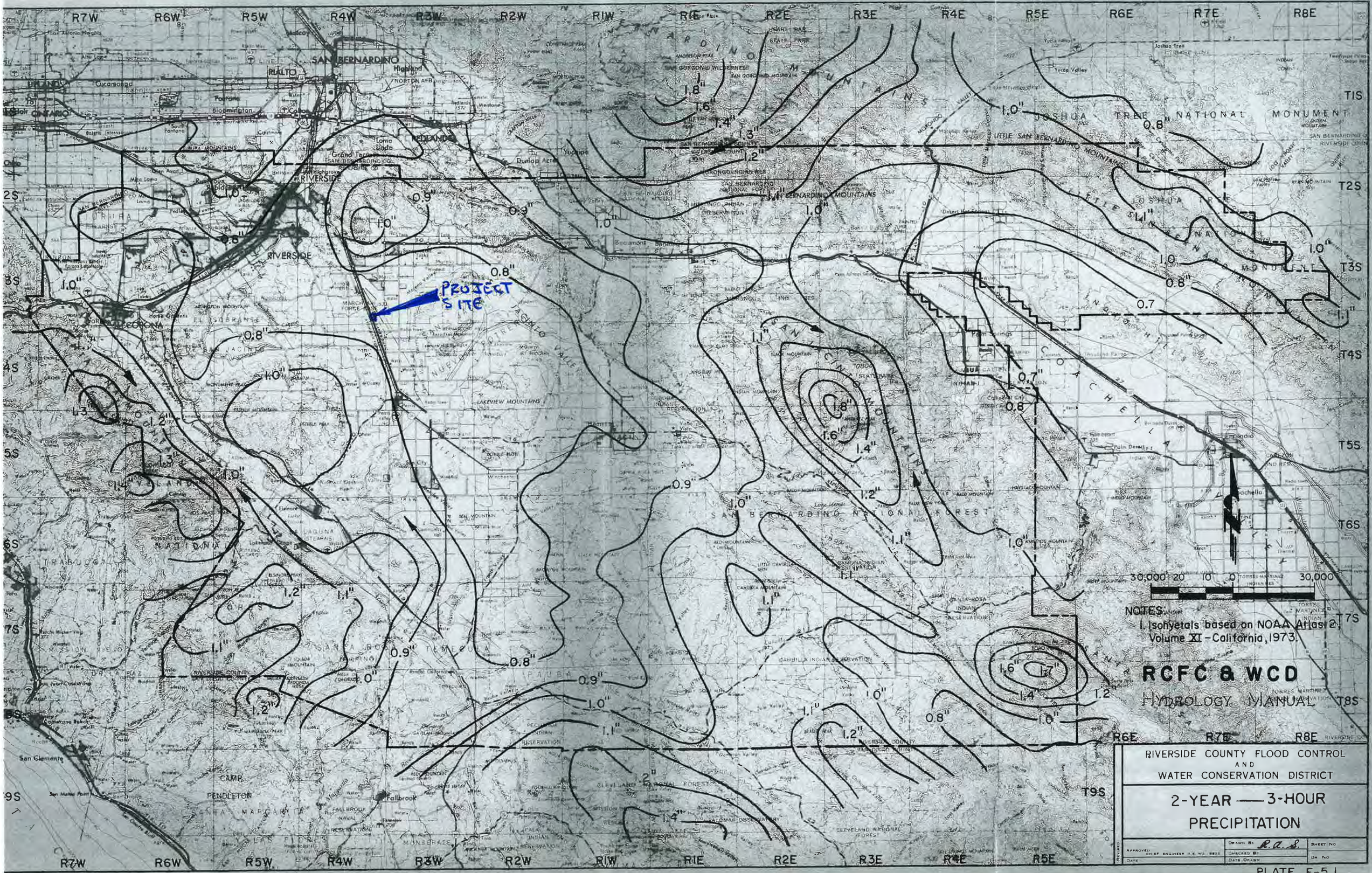
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 1-HOUR PRECIPITATION

PLATE D-4,3



NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973.

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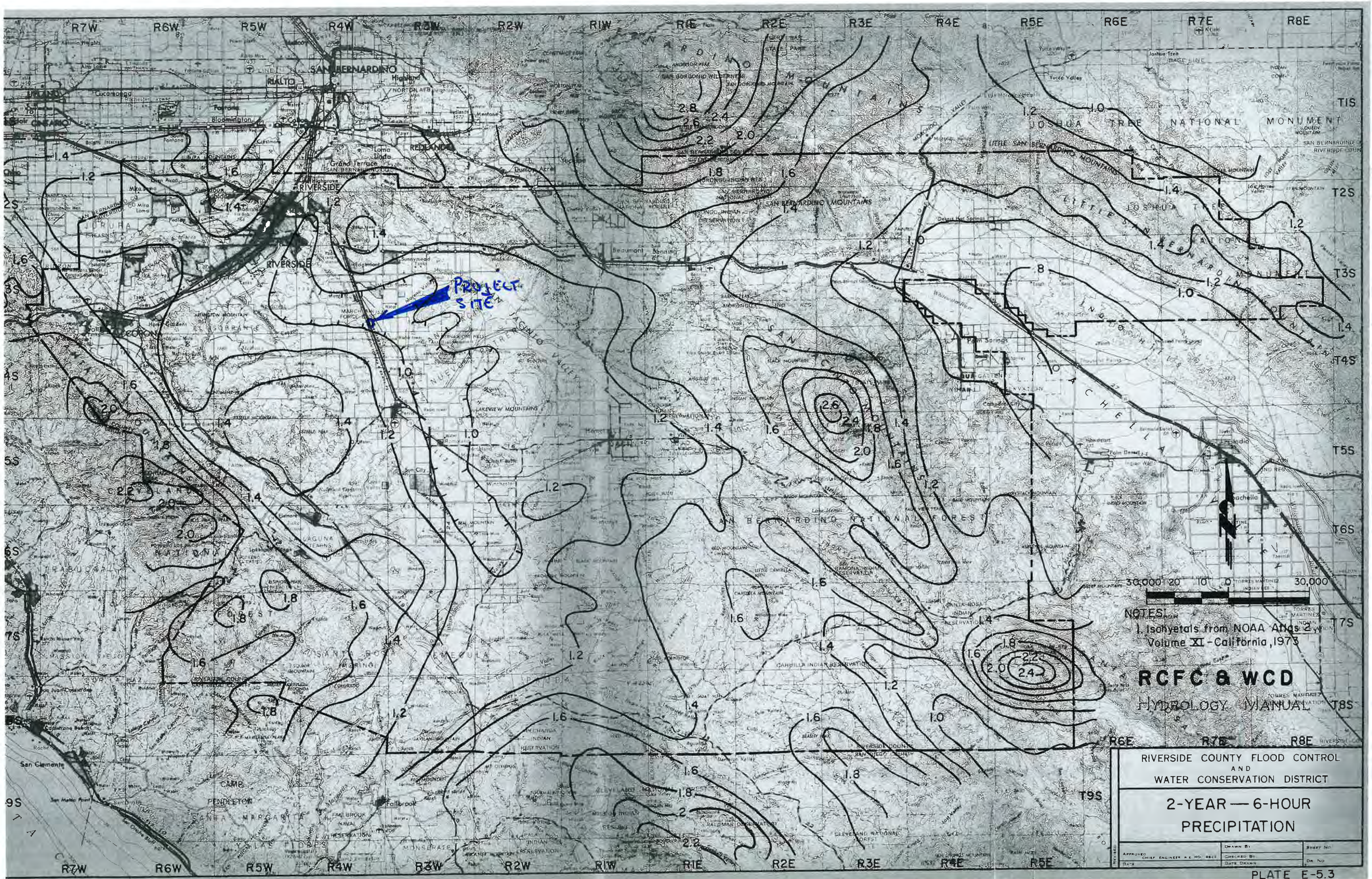
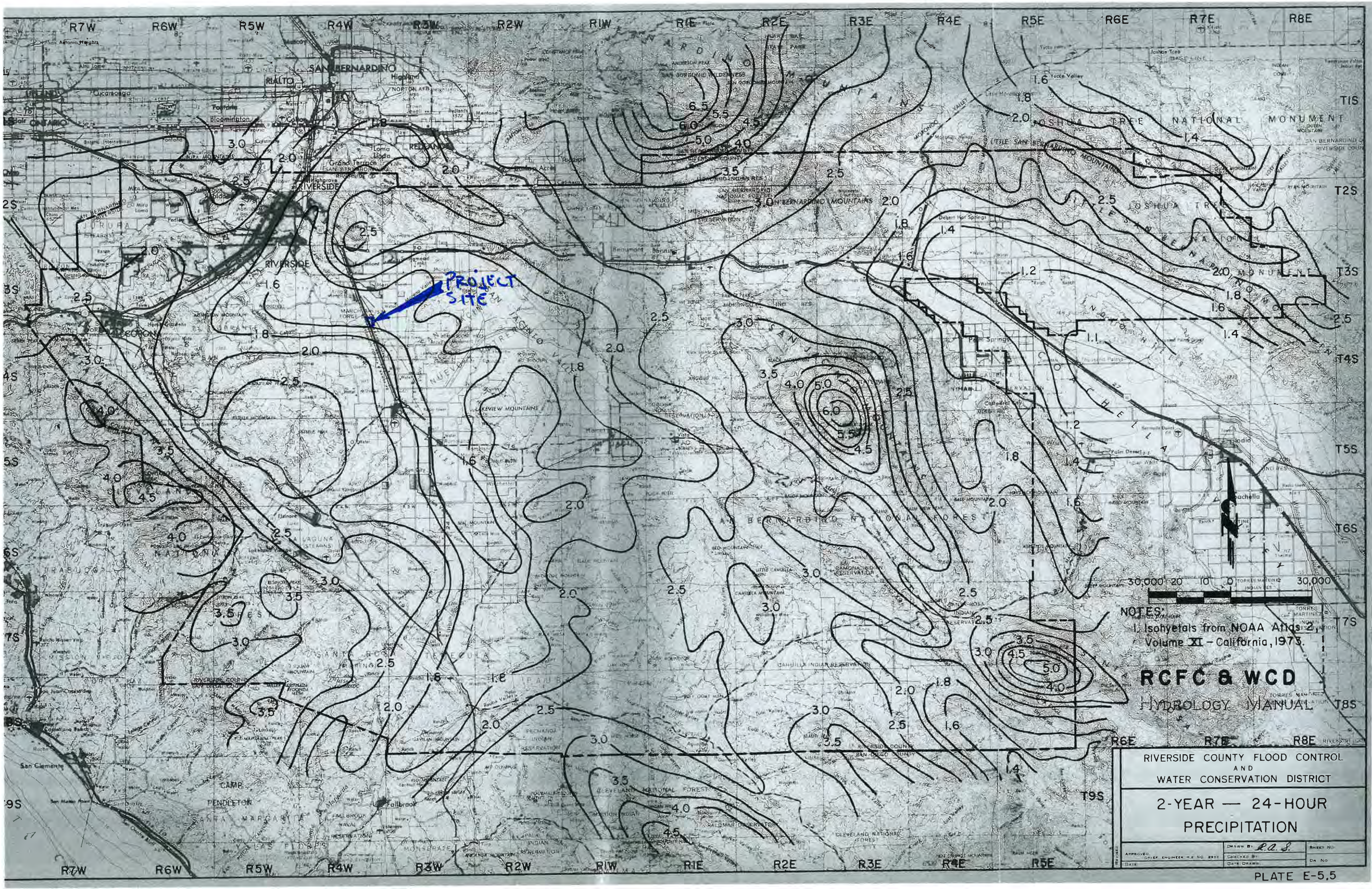
2-YEAR — 3-HOUR PRECIPITATION

APPROVED: CHIEF ENGINEER R.C.F.C. & W.C.D.	DRAWN BY: R.A.S.	SHEET NO
DATE	CHECKED BY:	DR. NO
	DATE DRAWN:	

PLATE E-5.1


PROJECT SITE
NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 6-HOUR PRECIPITATION
PLATE E-5.3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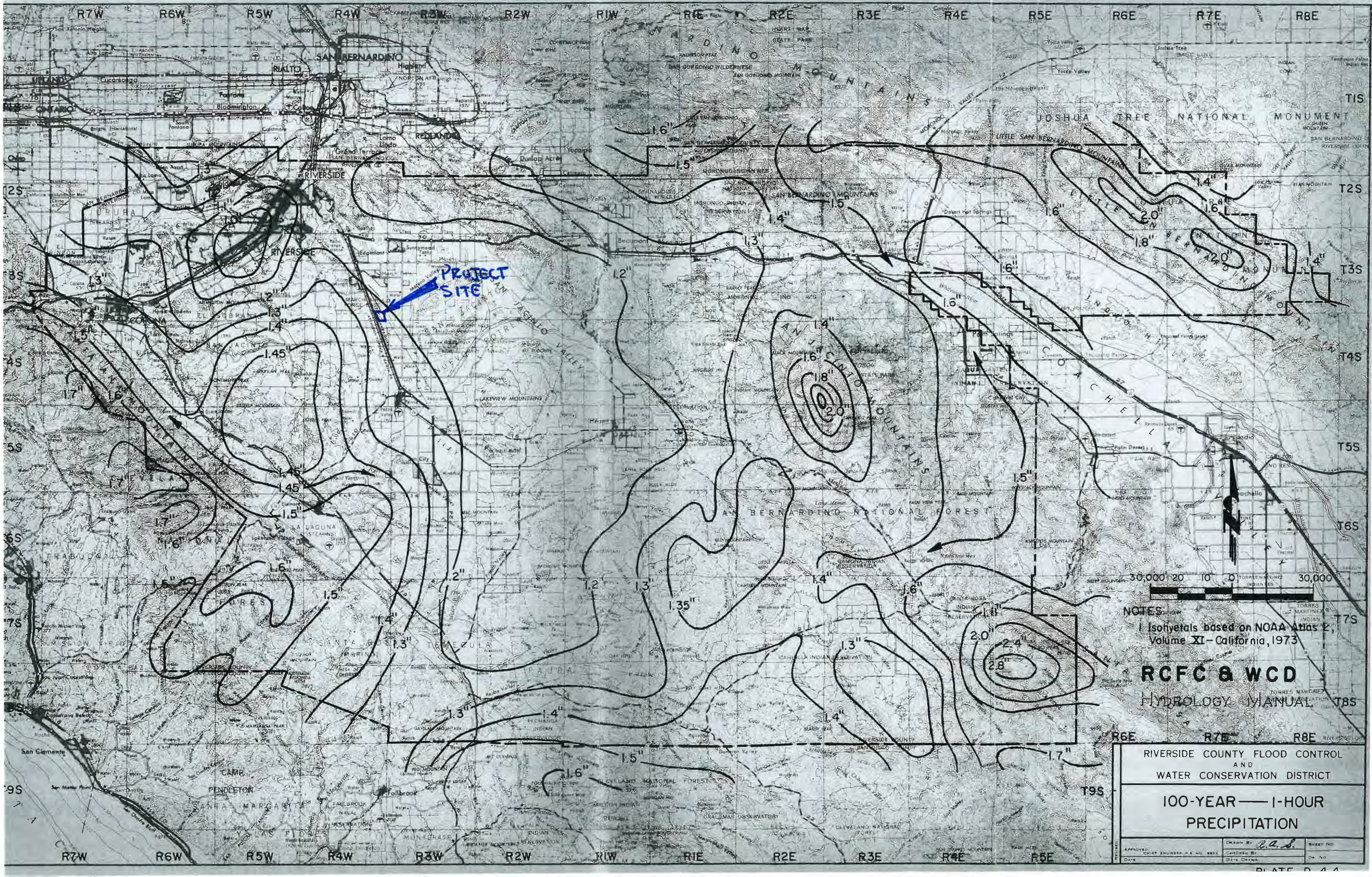
T1S T2S T3S T4S T5S T6S T7S T8S T9S
SAN BERNARDINO
RIALTO
RIVERSIDE
CORONA
JOSHUA TREE NATIONAL MONUMENT
SAN BERNARDINO NATIONAL FOREST
CLEVELAND NATIONAL FOREST
San Clemente
Fallbrook
Palm Springs
Coachella
Indio
30,000 20 10 0 30,000
NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973.
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 24-HOUR PRECIPITATION
PLATE E-5.5


RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
100-YEAR —— 1-HOUR PRECIPITATION
RCFC & WCD
HYDROLOGY MANUAL
NOTES
1 Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
PROJECT SITE
JOSHUA TREE NATIONAL MONUMENT
SAN JACINTO MOUNTAINS
SAN BERNARDINO NATIONAL FOREST
COACHELLA
SAN BERNARDINO
RIVERSIDE
REDLANDS
ONTARIO
LAKEVIEW MOUNTAINS
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
R6E
R7E
R8E
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S


PROJECT SITE
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
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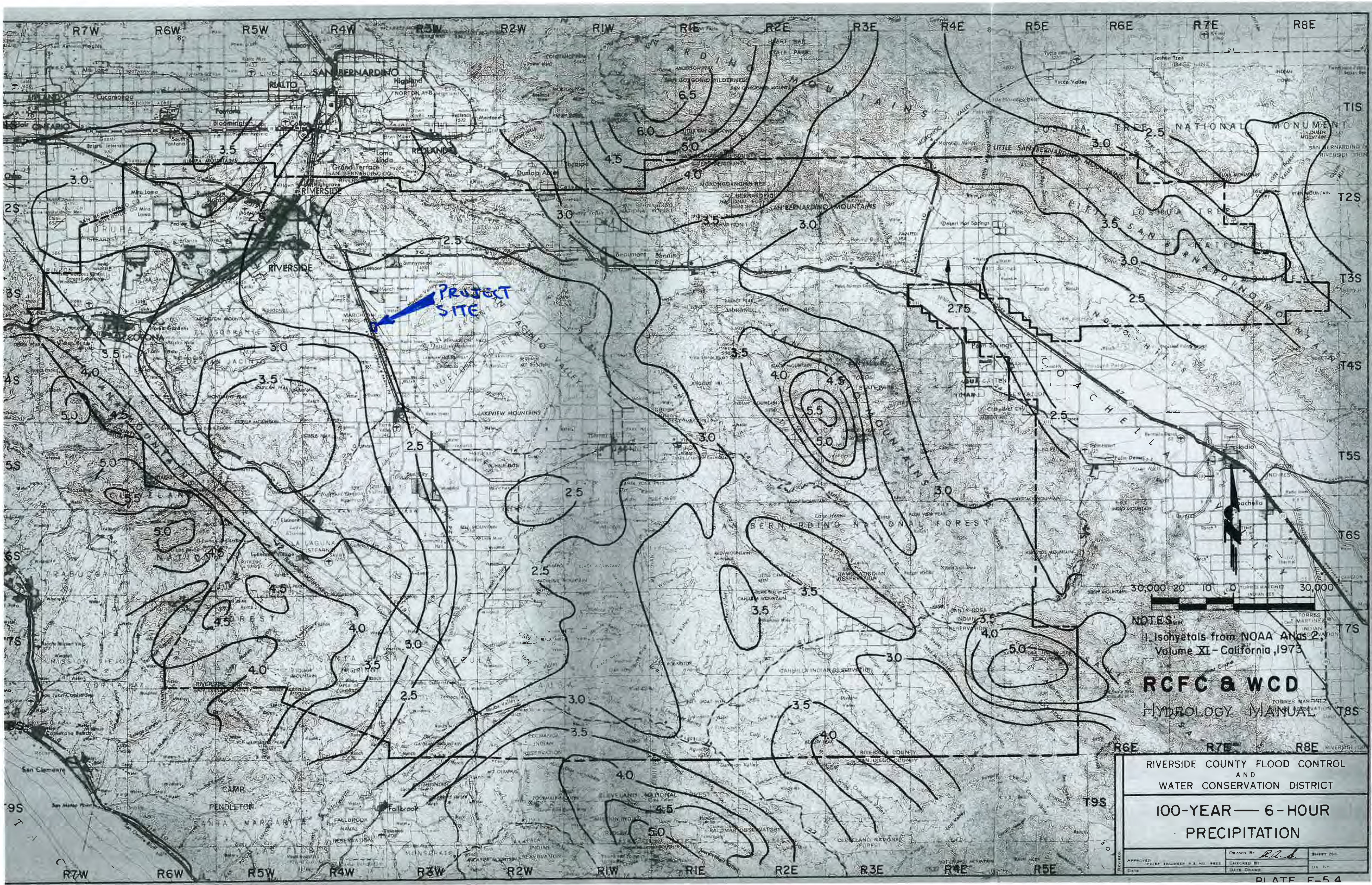
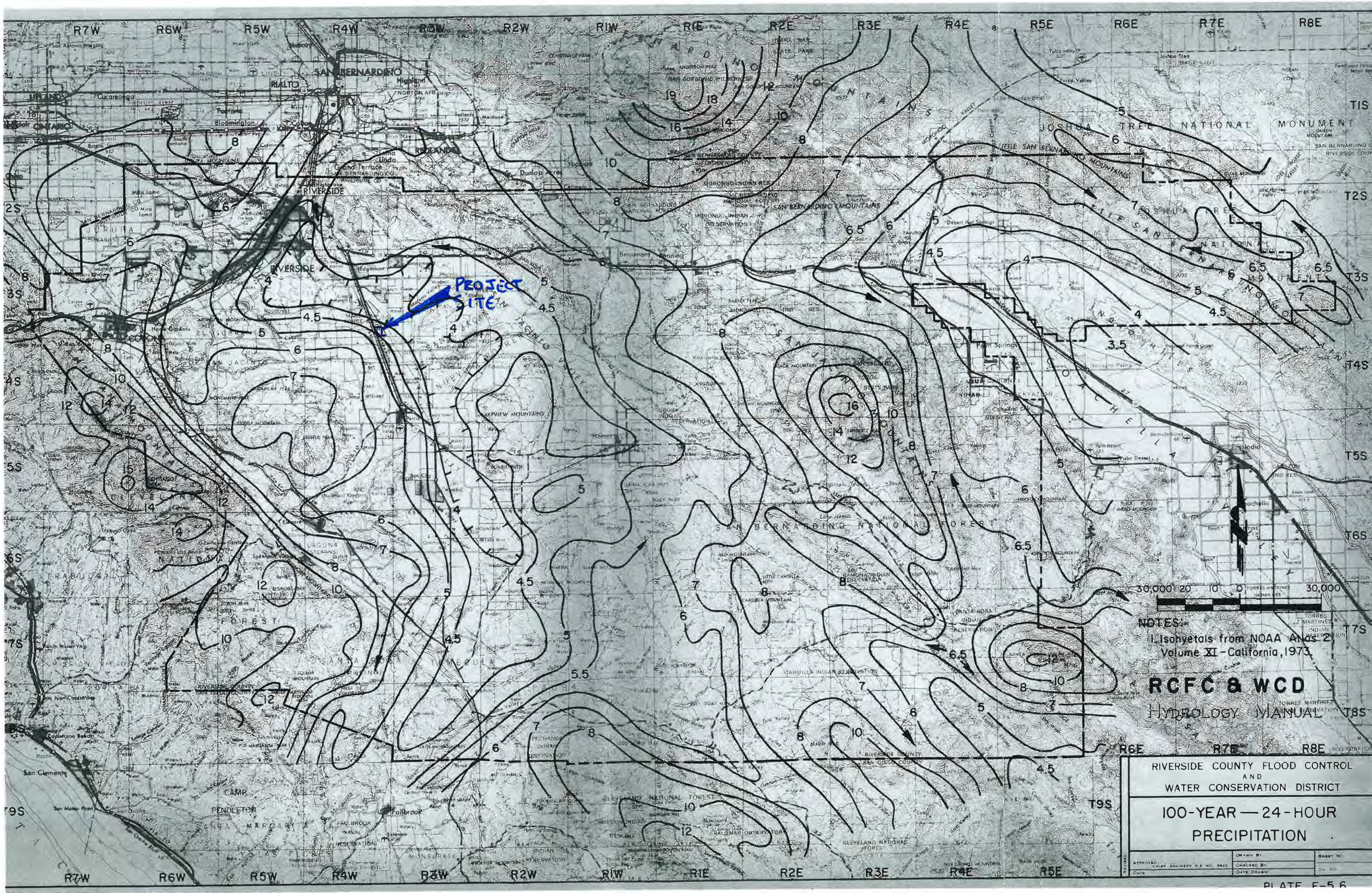
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
100 - YEAR — 3 - HOUR PRECIPITATION
PLATE E-5.2



PROJECT SITE
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
R6E
R7E
R8E
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
SAN BERNARDINO
RIVERSIDE
CORONA
SAN BERNARDINO MOUNTAINS
LITTLE SAN BERNARDINO MOUNTAINS
JOSHUA TREE NATIONAL MONUMENT
SAN JACINTO MOUNTAINS
SAN BERNARDINO NATIONAL FOREST
LAKEVIEW MOUNTAINS
COACHELLA VALLEY
CLEVELAND NATIONAL FOREST
San Clemente
CAMP PENDLETON
Fallbrook
30,000 20 10 0 30,000
NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
100-YEAR — 6-HOUR PRECIPITATION
PLATE E-5.4



NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973.

RCFC & WCD

HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

100-YEAR — 24-HOUR PRECIPITATION

APPROVED: CHIEF ENGINEER R.C.F.C. & W.C.D.	DRAWN BY:	SHEET NO.
DATE	CHECKED BY:	
	DATE DRAWN:	DR. NO.

PLATE E-5.6

RCTC REFERENCE MATERIAL

4.0 HYDRAULIC RESULTS AND DEFICIENCIES

As part of this report, the results of the hydraulic capacities and deficiencies of existing storm drain facilities were evaluated with the use of the software HY-8 (by the Federal Highways Administration, FHWA) per SCRRA design guidelines. HY-8 is a one-dimensional culvert analysis and does not simulate the storage of runoff upstream of the culvert.

Within this investigation, approximately 9 culverts with a tributary area larger than 0.5 sq miles (320Ac) warrant a HEC-RAS study in order to simulate runoff storage and verify the hydraulic grade line at the tracks and delineate the spread along the right of way. From investigation, it was found that these culverts have existing downstream facilities that restrict any upsizing of their hydraulic capacities. If a HEC-RAS study was performed at these locations, the flood plain along the railroad would be delineated; however, further design and coordination would be needed due to downstream restrictions in order to improve capacity. Therefore, no HEC-RAS study was performed for these culverts.

There are currently 50 culverts that cross the proposed track alignment for the Perris Valley Line. Per Metrolink standards, it is required that they be designed for a Q_{100}. The Table 4.1 lists these facilities along with the design Q_{100} and the Q_{pass}.

Table 4.1

#	MP		EXISTING	PROPOSED	Q_{100}	*Q_{cap}	Hydraulic Result
1	MP	0.38	N/A	New 24" CSP	24.5	24.5	Pass
2	MP	0.6	60" CMP	No Work	-	-	Not A Part
3	MP	1.3	3'x2' TWB	To Be Plugged	1.1	-	Not A Part
4	MP	1.4	2-36" RCP	To Be Plugged	1.6	-	Not A Part
5	MP	1.6	36"x24" TWB	1-36" CSP	42.4	42	Pass
6	MP	3.4	48"x51" ORCP	No Work	64	64	Pass
7	MP	3.6	48"x51" ERCP	No Work	322	267	Fail
8	MP	3.9	2-35"x40" ORCPs	No Work	480	196	Fail
9	MP	4.3	30"X33"X34' ORCP	No Work	55	37.4	Fail
10	MP	4.5	36" RCP	No Work	162	88.6	Fail
11	MP	5	42" RCP	Extend in Kind	40	40	Pass
12	MP	5.2	30"X32" ERCP	Extend in Kind	42	42	Pass
13	MP	5.3	2-48"x48" TWBs	2-54" CSPs	343	320	Pass
14	MP	5.8	35"X41" ERCP	1-48" CSP	395	126	Fail
15	MP	6.06	48" CMP	2-36" CSPs	140	151.4	Pass
16	MP	6.11	3-14" SSP CULVERT	No Work	58	58	Pass

17	MP	6.18	36" RCP	No Work	345	27.4	Fail
18	MP	6.2	66" RCP N	No Work	-	-	Not A Part
19	MP	6.5	42" RCP Storm Drain	Raise Ex. Inlet To Grade	-	-	N/A
20	MP	6.6	48"x51" EPC	1-48" RCP	30.8	30.8	Pass
21	MP	6.7	48" RCP Storm Drain	Extend in Kind & Raise Ex. Inlet To Grade	16	16	Pass
22	MP	6.8	60" RCP	No Work	16	16	Pass
23	MP	7.3	3'x6.5' RCB	No Work	29.2	29.2	Pass
24	MP	8	12' X6' RCB	Extend Head Wall	5.5	-	No Study
25	MP	9.7	36"x24" TWB	REPLACE w/ 1-36" CSP	5.5	5.5	Pass
26	MP	9.9	2- 48" CMPs	Extend in Kind	98	98	Pass
27	MP	10.1	2-42" CMPs	Extend in Kind	121	121	Pass
28	MP	11.13	2-48" RCPs	Extend in Kind	272	200.7	Fail
29	MP	11.32	42" RCP	Extend in Kind	272	75.6	Fail
30	MP	11.59	2-40" RCP	Extend in Kind	138	91	Fail
31	MP	12.1	2-36" CMP	Extend in Kind	174	99.4	Fail
32	MP	12.4	2-54" RCP	Extend in Kind	135	135	Pass
33	MP	12.52	2-42" RCP	Extend in Kind	88	88	Pass
34	MP	12.58	2-36" RCP	Extend in Kind	125	110	Pass
35	MP	13.2	24" RCP	Extend in Kind	36	36	Pass
36	MP	13.4	3'x2' TWB to 4'x2' RCB	2-30" CSP	750	38	Fail
37	MP	14.1	13'x4.33' RCP	No Work	-	-	No Study
38	MP	14.2	30" RCP Storm Drain	No Work	-	-	No Study
39	MP	14.5	2-36" RCP	Extend in Kind	130	100.2	Pass
40	MP	14.8	36" CMP	Extend in Kind	741	43.9	Fail
41	MP	14.9	2-14" SSP	2-30" CSPs	9	9	Pass
42	MP	15.3	2-3'x3'TWB to 1-6'x3' RCB	2-42" CSPs	395	168.7	Fail
43	MP	15.8	2-2'x2' TWB to 4'x2' RCB	2-30" CSPs	77.5	64.5	Fail
44	MP	16.16	29"x18" Elliptical CSP	Extend in Kind	59	33	Fail
45	MP	16.2	2-36" CSP	Extend in Kind	41	41	Pass
46	MP	17.1	2-3'x2' TWB to 2-4'x2' RCB	2-42" CSP	0.9	0.9	Pass
47	MP	17.3	2-24"x18" TWB	No Work	-	-	No Study
48	MP	17.5	42"x46" ERCP	No Work	-	-	Not A Part
49	MP	18.1	36"x36" TWB	To be Removed	2.5	-	Pass

***Capacity Criteria Based on SCRRA Design Exception No. 1**

- MP 5.8 and 6.18 - The culverts are located within Box Spring Canyon, an environmentally sensitive area. An increase of runoff would affect the adjacent wash, impacting wildlife significantly. As the track alignment approaches the I-60/215 Freeways, the track drainage is inadequate and the culverts are filled with sediment which indicates high tailwater. The Caltrans facilities convey runoff from the railroad right of way and under the freeway. An increase in capacity in Culverts MP 5.8 and 6.18 would severely impact the Caltrans facilities. Grades in the area downstream from the culverts are relatively flat and sedimentation will continue post construction. Currently, plans have been developed to extend the culverts and add headwalls and an access road as part of the track rehab.

- MP 11.13 - The culvert conveys runoff from an existing golf course and cemetery to the east in which retention ponds control the runoff to the culvert. There is not enough as-built information to accurately model the retention ponds. The culvert capacity cannot be increase due to the downstream restrictions imposed by the I-215 freeway. *Caltrans has requested that the design of the culverts in this area maintain their current capacities as to not increase the runoff to Caltrans' culverts along the I-215 Freeway.* Plans for the existing double 48" reinforced concrete pipe culvert are to extend the culvert and add a headwall downstream.

- MP 11.32 - There is inadequate as-built information for the tributary area upstream for storm drain or private detention basins. The existing culvert size will not be increased due to the request from Caltrans to maintain the existing conveyance. The plans for the existing single 42"reinforced concrete pipe culvert are merely to extend the culvert and add a headwall downstream.

- MP 11.59 - There is inadequate as-built information for the tributary area upstream for storm drain or any private detention basins. The existing culvert size will remain the same because of the request from Caltrans to maintain the existing conveyance. Plans for the existing double 38"x24 elliptical reinforced concrete pipe culvert are to extend the culvert and add a headwall downstream.

- MP 12.1- There is inadequate as-built information for the tributary area upstream for storm drain or the various private detention basins. There currently exists a detention basin owned by RCFCD just north of the culvert. According to RCFCD, the existing basin has an outlet pipe that is plugged, But in the future when the County's Master Drainage Plan is built out east of the Freeway, the plugged outlet pipe will be opened and

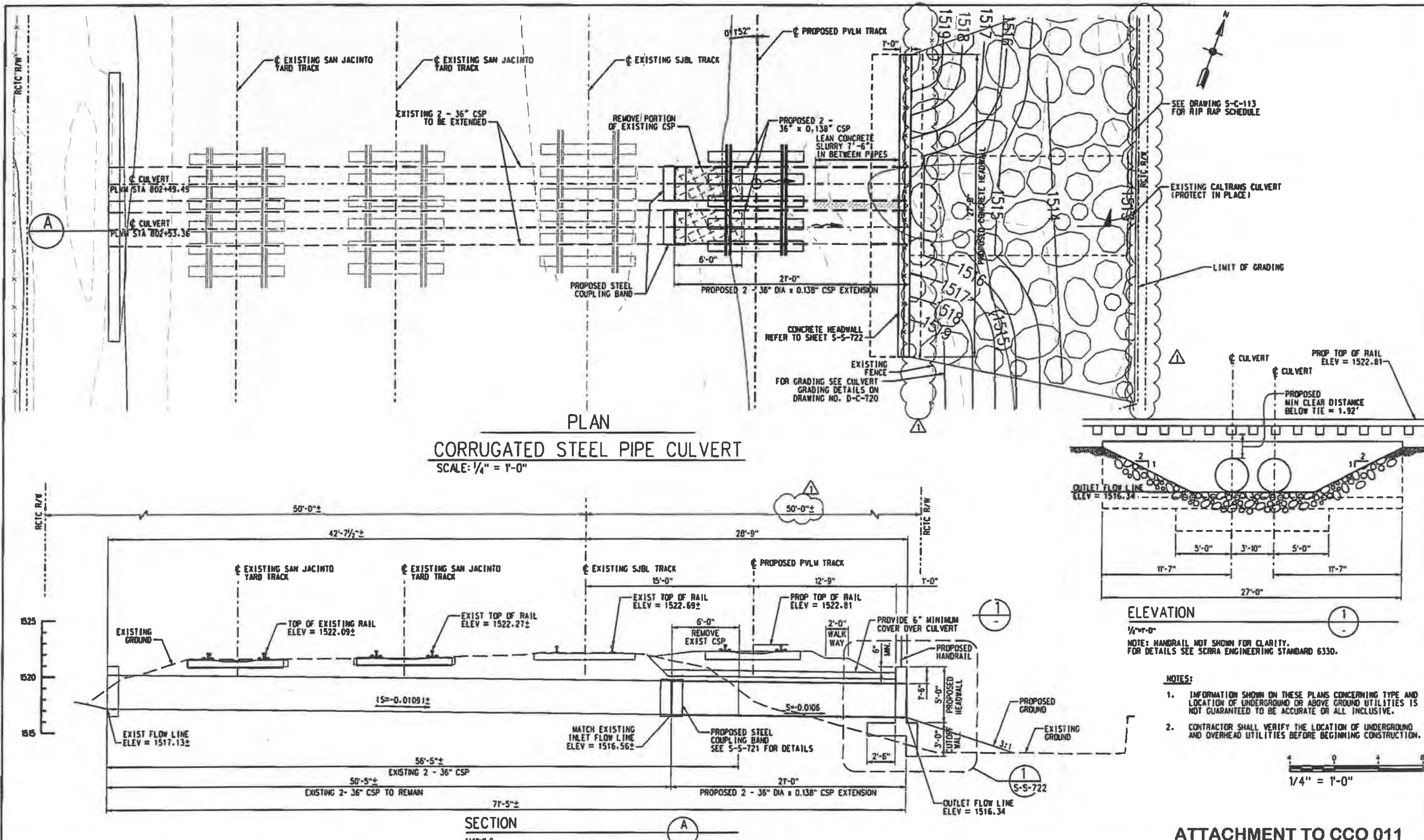
conveyed to the railroad culvert to be conveyed through the Caltrans culvert and on to the County's drainage network. RCFCD has requested that we increase the size of the culvert to accommodate the future drainage plans and plug the culvert until then. The increase in size to Culvert MP 12.1, requested by RCFCD, would contravene the request by Caltrans in limiting the conveyance from the existing track culverts. Therefore, there are no plans to increase the size of the existing double 36" Corrugated Metal Pipe culvert, but the culvert will be extended and a headwall added to the downstream end.

- MP 13.4- The proposed culvert was sized to match the existing capacity of the existing timber wood box. The culvert size will not be increased to maintain the current conveyance as requested by Caltrans.

- MP 14.8 - There is inadequate as-built and topography information for the tributary area upstream for storm drain or the existing private detention basins that attenuate the peak flow to the railroad right-of-way. Caltrans has indicated their concern if the culvert capacities were to be increased and a second track constructed adjacent to the freeway. The conveyance area between the RCTC right of way and the freeway would be reduced and an increase in conveyance could possibly cause flooding of the freeway travel lanes. In adhering to Caltrans request, there are no plans to increase the size of the existing single 36" Corrugated Metal Pipe culvert but it will be extended and a headwall added downstream.

- MP 15.3 and 15.8 - The local drainage information was not available to properly model the upstream drainage network for both culverts. A peak flow was calculated for the culverts without any attenuation of that peak from local drainage facilities. The existing culverts are wooden box culverts and will be replaced with reinforced concrete boxes with an increase in length to accommodate the track improvements. The culvert sizes will not be increased to maintain the current conveyance as requested by Caltrans.

- MP 16.16 – The culvert is only being extended on the downstream end. The existing culvert will maintain the existing conveyance. The culvert size will not be increased to maintain the current conveyance as requested by Caltrans.



NOTES:

1. INFORMATION SHOWN ON THESE PLANS CONCERNING TYPE AND LOCATION OF UNDERGROUND OR ABOVE GROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE.
2. CONTRACTOR SHALL VERIFY THE LOCATION OF UNDERGROUND AND OVERHEAD UTILITIES BEFORE BEGINNING CONSTRUCTION.

1/4" = 1'-0"

ATTACHMENT TO CCO 011

REV.	DATE	DESCRIPTION
1	5-19-14	DCN 041 - CALTRANS EASEMENT AND 20' R/W CLARIFICATION
	12-18-12	AS-BID (CONFORMED SET)

DESIGNED BY H. SOLARTE
DRAWN BY H.C. CHANG
CHECKED BY M. GOLJI
APPROVED BY MZ. GHANDEHARI
DATE 5-19-14

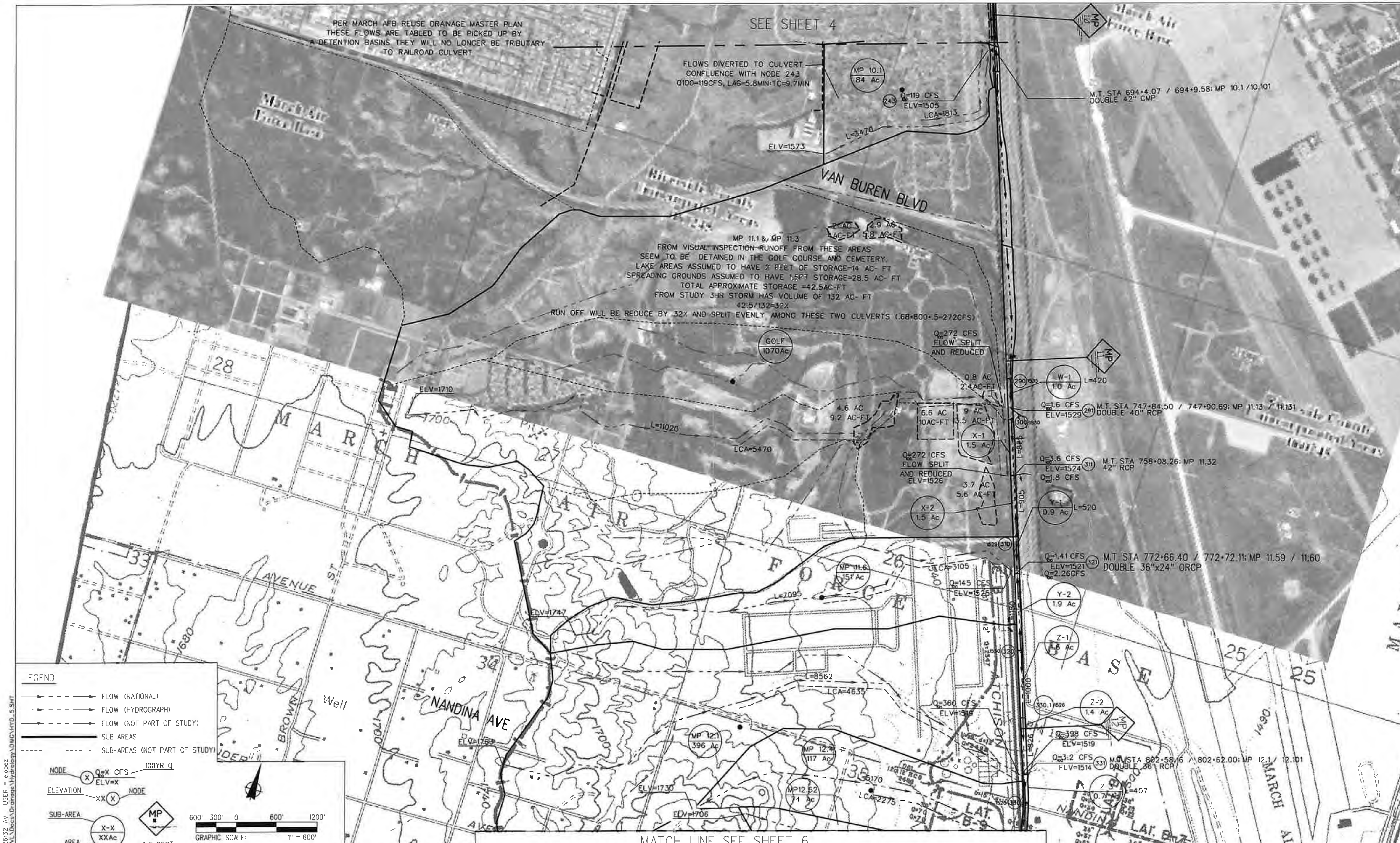
RIVERSIDE COUNTY TRANSPORTATION COMMISSION

STV Incorporated

PATTERSON & ASSOCIATES, INC.

RCTC PERRIS VALLEY LINE
SEGMENT D
CULVERT PLAN AND ELEVATION
PVLM 802+53 (MP 12.1)

CONTRACT NO. 13-33-049-00
DRAWING NO. D S-720
REVISION 1
SHEET NO. 779 OF 2599
SCALE AS SHOWN



SEE SHEET 4
PER MARCH AFB REUSE DRAINAGE MASTER PLAN THESE FLOWS ARE TABLED TO BE PICKED UP BY A DETENTION BASINS THEY WILL NO LONGER BE TRIBUTARY TO RAILROAD CULVERT
FLOWS DIVERTED TO CULVERT CONFLUENCE WITH NODE 243 Q100=119CFS, LAG=5.8MIN:TC=9.7MIN
MP 10.1 84 Ac
Q=119 CFS ELV=1505
LCA=1813
L=3470
ELV=1573
M.T. STA 694+4.07 / 694+9.58: MP 10.1 /10.101 DOUBLE 42" CMP
VAN BUREN BLVD
MP 11.1 & MP 11.3
FROM VISUAL INSPECTION RUNOFF FROM THESE AREAS SEEM TO BE DETAINED IN THE GOLF COURSE AND CEMETERY.
LAKE AREAS ASSUMED TO HAVE 2 FEET OF STORAGE=14 AC- FT
SPREADING GROUNDS ASSUMED TO HAVE 1.5FT STORAGE=28.5 AC- FT
TOTAL APPROXIMATE STORAGE =42.5AC-FT
FROM STUDY 3HR STORM HAS VOLUME OF 132 AC- FT
42.5/132=32%
RUN OFF WILL BE REDUCE BY 32% AND SPLIT EVENLY AMONG THESE TWO CULVERTS (.68*800*.5=272CFS)
Q=272 CFS FLOW SPLIT AND REDUCED
GOLF 1070Ac
0.8 AC 2.4AC-FT
W-1 1.0 Ac
L=420
Q=1.6 CFS ELV=1529
M.T. STA 747+84.50 / 747+90.69: MP 11.13 / 11.131 DOUBLE 40" RCP
ELV=1710
L=11020
LCA=5470
4.6 AC 9.2 AC-FT
6.6 AC 10AC-FT
9 AC 3.5 AC-FT
X-1 1.5 Ac
Q=272 CFS FLOW SPLIT AND REDUCED ELV=1526
Q=3.6 CFS ELV=1524 Q=1.8 CFS
M.T. STA 758+08.26: MP 11.32 42" RCP
3.7 AC 5.6 AC-FT
X-2 1.5 Ac
Y-1 0.9 Ac
L=520
Q=1.41 CFS ELV=1521 Q=2.26CFS
M.T. STA 772+66.40 / 772+72.11: MP 11.59 / 11.60 DOUBLE 36"x24" ORCP
MP 11.6 151 Ac
LCA=3105
Q=145 CFS ELV=1525
L=7095
Y-2 1.9 Ac
ELV=1747
Z-1
L=8562
LCA=4635
Q=360 CFS ELV=1519
Z-2 1.4 Ac
Q=398 CFS ELV=1519
Q=3.2 CFS ELV=1514
M.T. STA 802+58.16 / 802+62.00: MP 12.1 / 12.101 DOUBLE 36" RCP
L=407
MP 12.1 396 Ac
MP 12.4 117 Ac
MP12.52 74 Ac
LCA=2275
ELV=1763
ELV=1730
ELV=1706
NANDINA AVE
AVENUE
MARCH AIR FORCE BASE
LAT. B-9
MATCH LINE SEE SHEET 6
LEGEND
FLOW (RATIONAL)
FLOW (HYDROGRAPH)
FLOW (NOT PART OF STUDY)
SUB-AREAS
SUB-AREAS (NOT PART OF STUDY)
NODE
Q=X CFS ELV=X
100YR Q
ELEVATION
SUB-AREA
AREA
X-X XXAc
MP
MILE POST
600' 300' 0 600' 1200'
GRAPHIC SCALE: 1" = 600'

INFORMATION CONFIDENTIAL: All plans, drawings, specifications, and or information furnished herewith shall remain the property of the Riverside County Transportation Commission and shall be held confidential and shall not be used for any purpose not provided for in agreements with the Riverside County Transportation Commission	INFORMATION CONFIDENTIAL: CURRENT SCRRA CADD DRAFTING STANDARDS, GUIDELINES AND CRITERIA WILL BE FOLLOWED TO THE GREATEST EXTENT PRACTICABLE FOR ENGINEERING DESIGN AND PLAN PREPARATION	DESIGNED BY E. LOPEZ; DRAWN BY R.CARRILLO; CHECKED BY E. LOPEZ; APPROVED BY M. GHANDEHARI; DATE 7-30-08	RIVERSIDE COUNTY TRANSPORTATION COMMISSION

STV Incorporated — 9130 ANAHEIM PLACE, SUITE 210, RANCHO CUCAMONGA, CA 91730-8540

PATTERSON & ASSOCIATES, INC. — 725 TOWN & COUNTRY RD SUITE 300 ORANGE, CA 92868

RCTC PERRIS VALLEY LINE
HYDROLOGY STUDY MAP

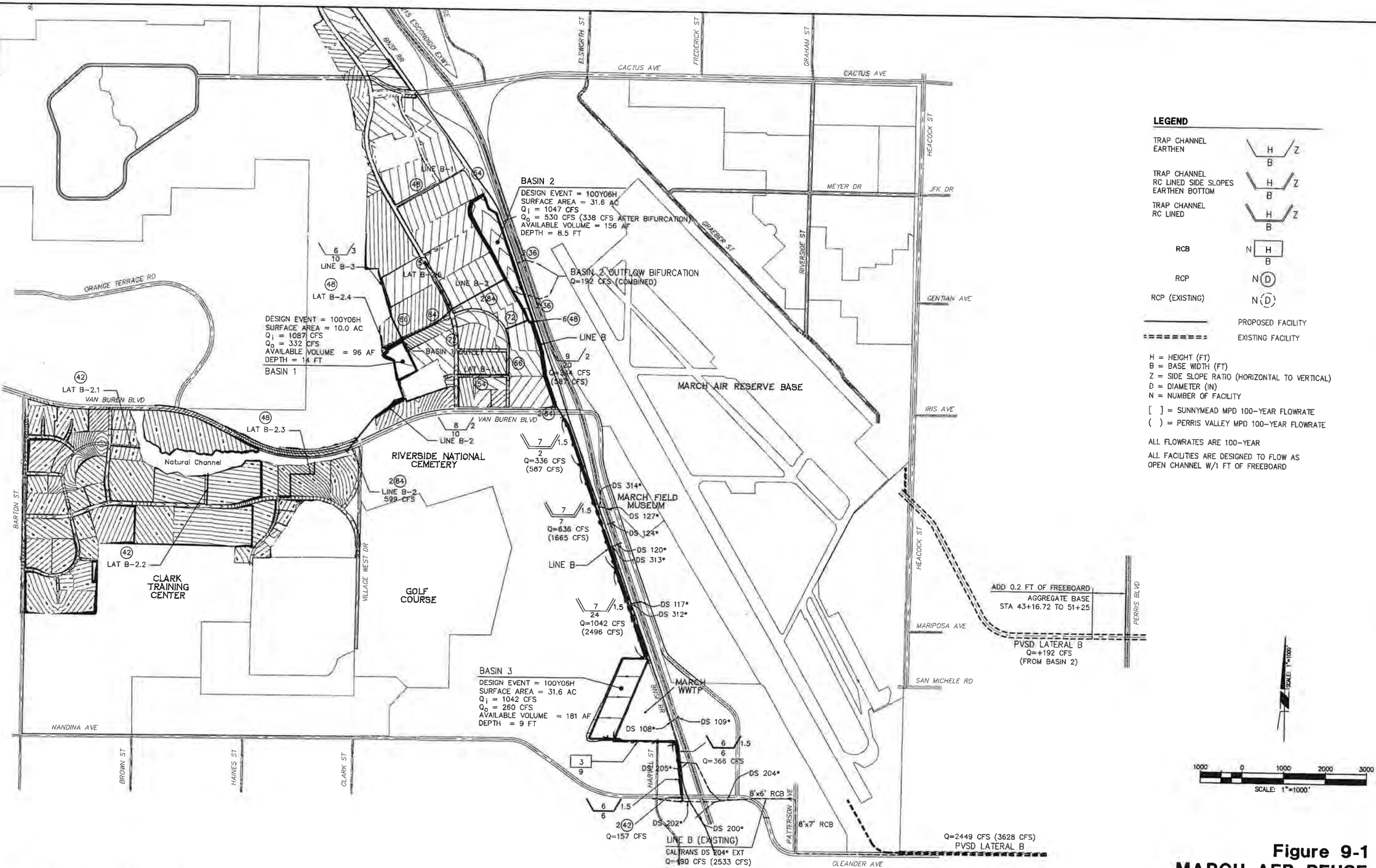
CONTRACT NO.
DRAWING NO.
REVISION | SHEET NO. 5 OF 9
SCALE AS INDICATED

REV. | DATE | BY | SUB. APP.

10/12/2012 10:26:32 AM USER = elopez
J:\Projects\STV\PVL\Docs\Orange\Hydrology\DWG\HYD_5.SHT

909 - 484-0660

CALTRANS REFERENCE MATERIAL



LEGEND

- TRAP CHANNEL EARTHEN — H / B / Z
- TRAP CHANNEL RC LINED SIDE SLOPES EARTHEN BOTTOM — H / B / Z
- TRAP CHANNEL RC LINED — H / B / Z
- RCB — N H / B
- RCP — N (D)
- RCP (EXISTING) — N (D)
- PROPOSED FACILITY
- EXISTING FACILITY

H = HEIGHT (FT)
B = BASE WIDTH (FT)
Z = SIDE SLOPE RATIO (HORIZONTAL TO VERTICAL)
D = DIAMETER (IN)
N = NUMBER OF FACILITY

[ ] = SUNNYMEAD MPD 100-YEAR FLOWRATE
( ) = PERRIS VALLEY MPD 100-YEAR FLOWRATE

ALL FLOWRATES ARE 100-YEAR

ALL FACILITIES ARE DESIGNED TO FLOW AS OPEN CHANNEL W/1 FT OF FREEBOARD

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
14725 ALTON PARKWAY
IRVINE, CALIFORNIA 92618-2027
949.472.3505 ▪ FAX 949.472.8373 ▪ www.RBF.com

Figure 9-1
MARCH AFB REUSE DRAINAGE MASTER PLAN

PROPOSED FACILITIES MAP RECOMMENDED ALTERNATIVE

H:\PDATA\10104245\CADD\STRMWATER\DLV\245FIG9-1.DWG EGC 1/23/08 2:57 pm

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	Riv	215	R52.3	8	23

Caltrans Metric

REGISTERED CIVIL ENGINEER 3-25-03

9-15-03
PLANS APPROVAL DATE

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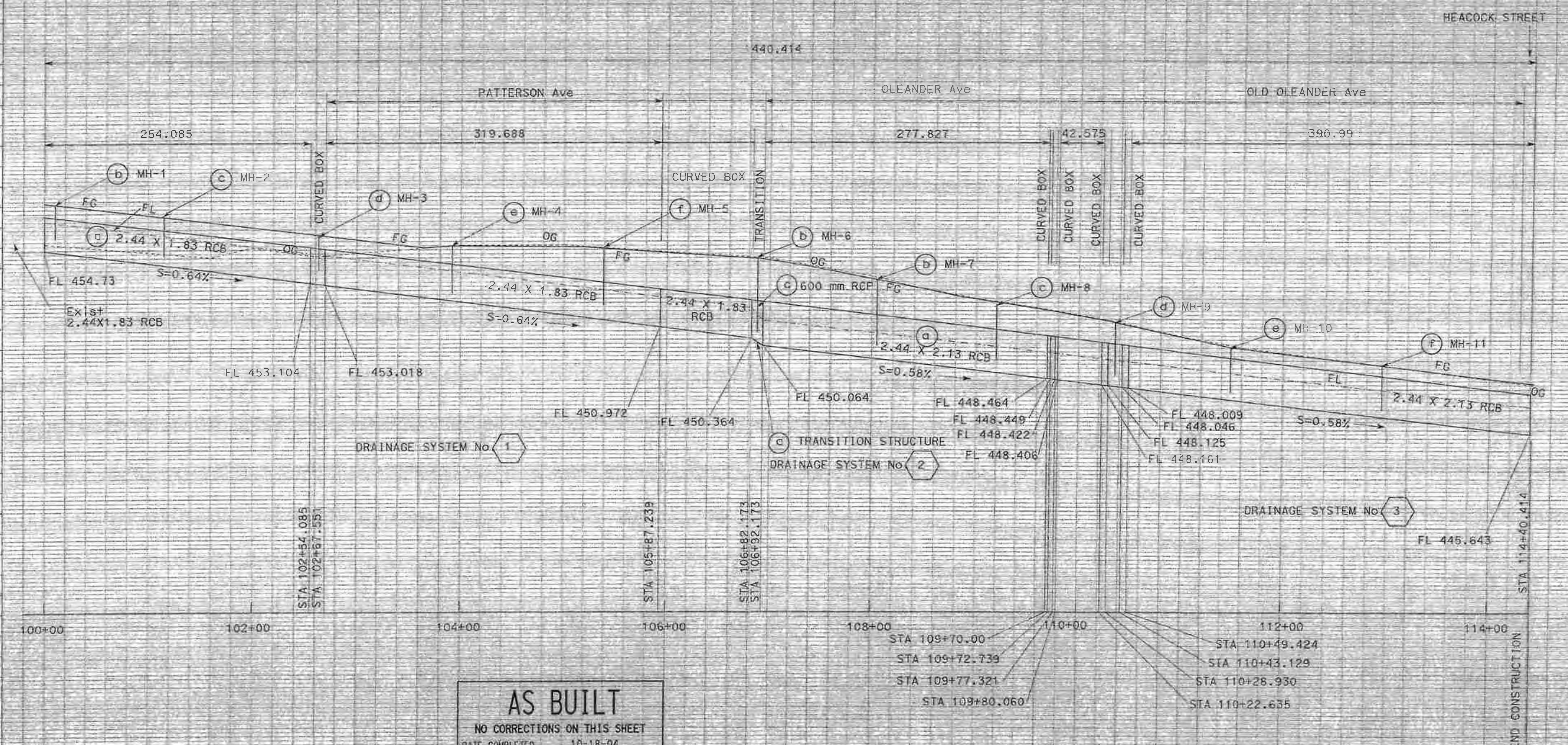
REGISTERED PROFESSIONAL ENGINEER CHRISTOPHER GONZALEZ No. C 63491 Exp. 03-30-06 CIVIL STATE OF CALIFORNIA

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT

PROJECT ENGINEER KIRK BAYLESS

CALCULATED/DESIGNED BY KIRK BAYLESS DATE 8-02 | REVISED BY
CHECKED BY | DATE REVISED



HEACOCK STREET
440.414
PATTERSON Ave
OLEANDER Ave
OLD OLEANDER Ave
254.085
319.688
277.827
42.575
390.99
b MH-1
c MH-2
CURVED BOX
d MH-3
e MH-4
f MH-5
TRANSITION
b MH-6
b MH-7
c MH-8
d MH-9
e MH-10
f MH-11
FG
FL
OG
a 2.44 X 1.83 RCB
S=0.64%
FL 454.73
Exist 2.44X1.83 RCB
FL 453.104
FL 453.018
2.44 X 1.83 RCB
S=0.64%
2.44 X 1.83 RCB
c 600 mm RCP
a 2.44 X 2.13 RCB
S=0.58%
FL 450.972
FL 450.364
FL 450.064
FL 448.464
FL 448.449
FL 448.422
FL 448.406
FL 448.009
FL 448.046
FL 448.125
FL 448.161
2.44 X 2.13 RCB
S=0.58%
c TRANSITION STRUCTURE
DRAINAGE SYSTEM No 1
DRAINAGE SYSTEM No 2
DRAINAGE SYSTEM No 3
FL 445.643
458
456
454
452
450
448
446
444
STA 102+54.085
STA 102+67.551
STA 105+87.239
STA 106+82.173
STA 106+92.173
STA 114+40.414
END CONSTRUCTION
100+00
102+00
104+00
106+00
108+00
110+00
112+00
114+00
STA 109+70.00
STA 109+72.739
STA 109+77.321
STA 109+80.060
STA 110+49.424
STA 110+43.129
STA 110+28.930
STA 110+22.635

AS BUILT
NO CORRECTIONS ON THIS SHEET
DATE COMPLETED 10-18-04
RESIDENT ENGINEER

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DRAINAGE PROFILE

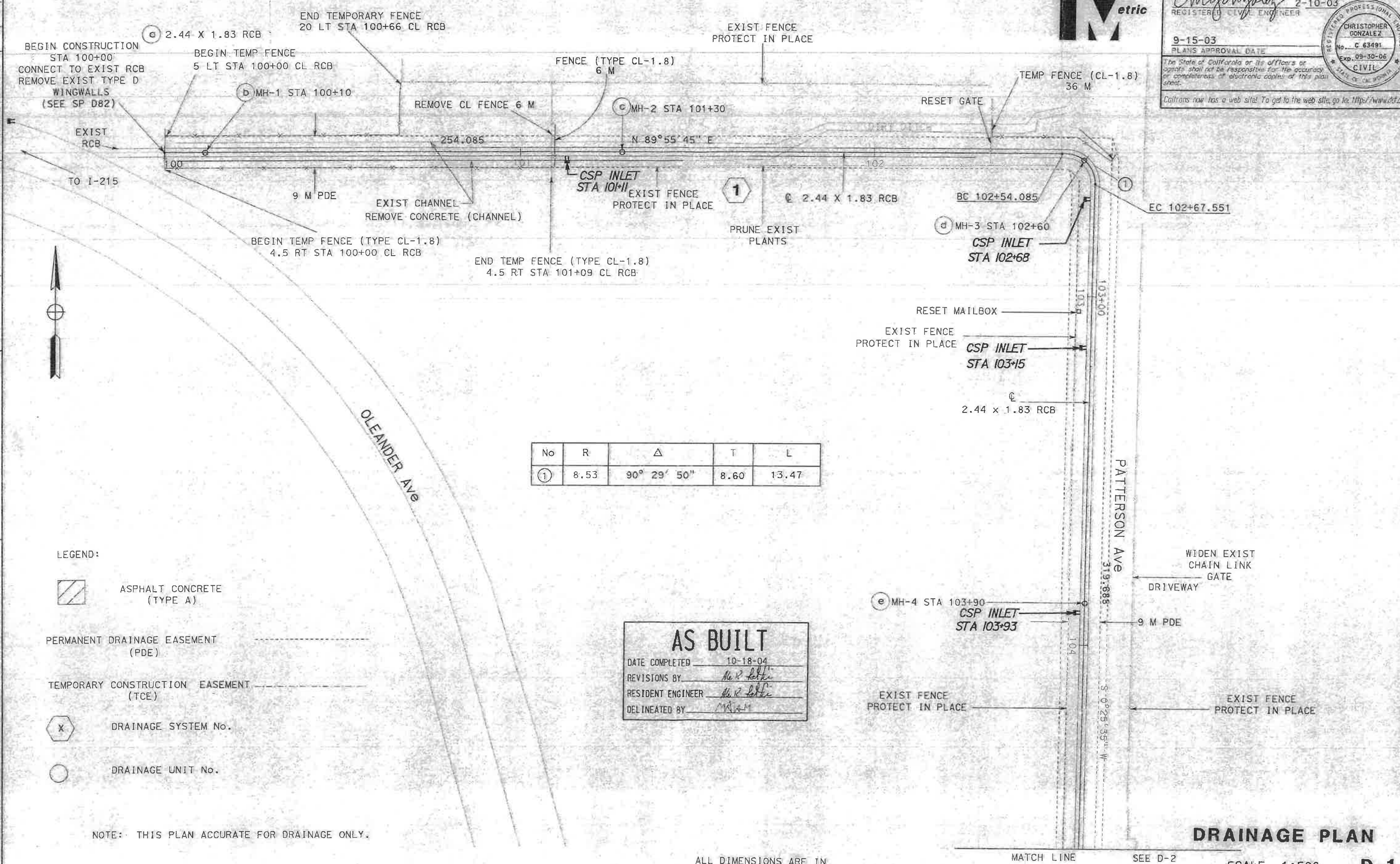
SCALE AS SHOWN

D-4

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS 0 20 40 60 80

CU 08228 | EA 420401

03-25-03



No	R	Δ	T	L
1	8.53	90° 29′ 50″	8.60	13.47

LEGEND:

- ASPHALT CONCRETE (TYPE A)
- PERMANENT DRAINAGE EASEMENT (PDE)
- TEMPORARY CONSTRUCTION EASEMENT (TCE)
- (X) DRAINAGE SYSTEM No.
- ○ DRAINAGE UNIT No.

NOTE: THIS PLAN ACCURATE FOR DRAINAGE ONLY.

AS BUILT
DATE COMPLETED 10-18-04
REVISIONS BY [signature]
RESIDENT ENGINEER [signature]
DELINEATED BY [signature]

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	Riv	215	R52.3	5	23

REGISTERED CIVIL ENGINEER 2-10-03
9-15-03
PLANS APPROVAL DATE
CHRISTOPHER GONZALEZ No. C 63491 Exp. 09-30-06 CIVIL
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STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT
PROJECT ENGINEER K. BAYLESS
CALCULATED/DESIGNED BY KIRK BAYLESS
CHECKED BY
REVISED BY
DATE REVISED 8-02

DRAINAGE PLAN

SCALE 1:500 **D-1**

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

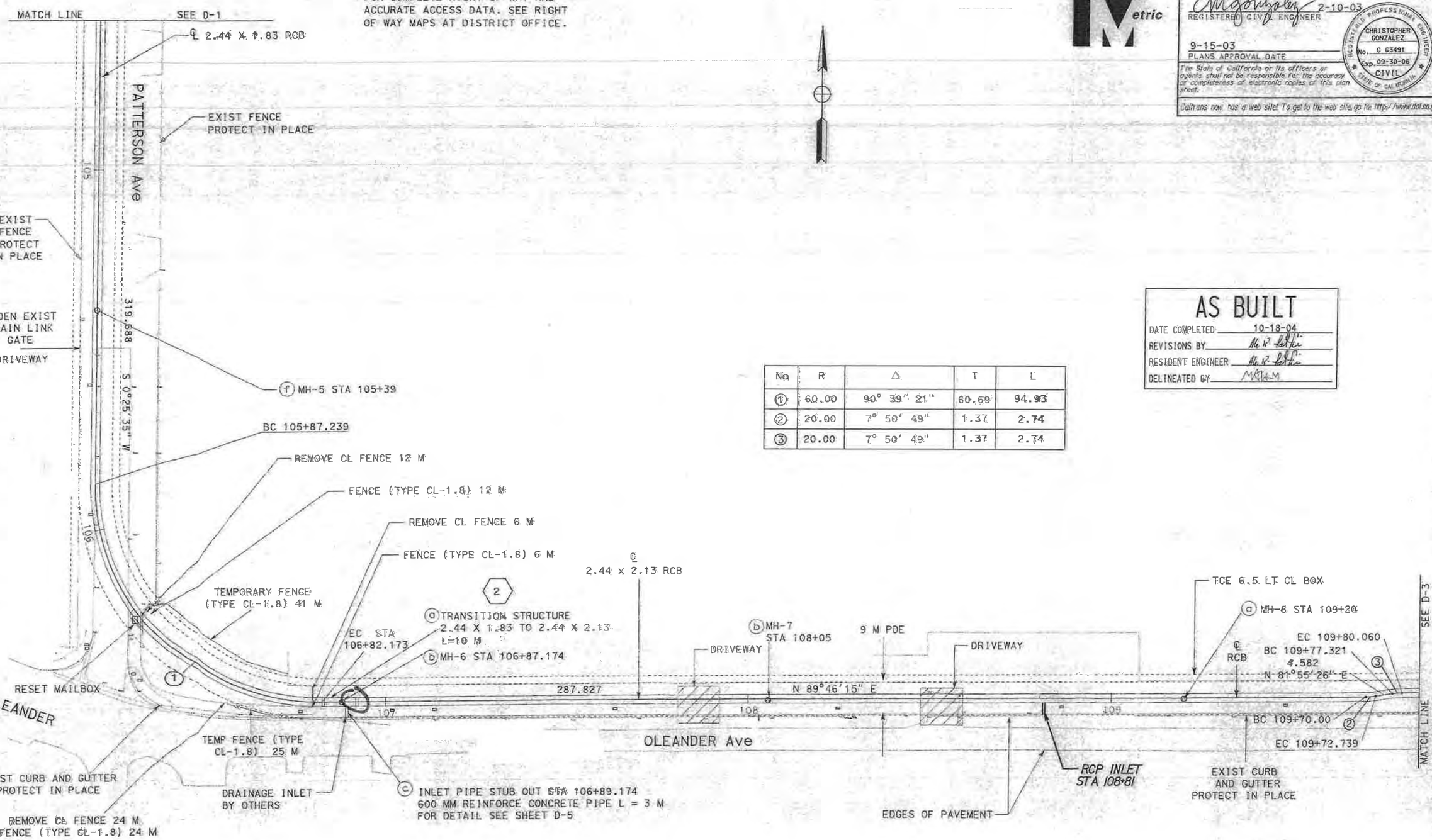
FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS 0 20 40 60 80

USERNAME => sandrien

CU 08228 EA 430401

LAST REVISION 02-10-03 DATE PLOTTED => 20-DEC-2004 TIME PLOTTED => 13:52

NOTE :
FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA. SEE RIGHT OF WAY MAPS AT DISTRICT OFFICE.



No	R	△	T	L
①	60.00	90° 39' 21"	60.69	94.93
②	20.00	7° 50' 49"	1.37	2.74
③	20.00	7° 50' 49"	1.37	2.74

NOTE : THIS PLAN ACCURATE FOR DRAINAGE ONLY.

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DRAINAGE PLAN

SCALE 1:500 **D-2**

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
08	RIV	215	R52.3	6	23

REGISTERED CIVIL ENGINEER — 2-10-03

9-15-03
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — CHRISTOPHER GONZALEZ No. C 63491 Exp. 09-30-06 CIVIL — STATE OF CALIFORNIA

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AS BUILT
DATE COMPLETED: 10-18-04
REVISIONS BY: M. K. Letter
RESIDENT ENGINEER: M. K. Letter
DELINEATED BY: M.K.L.M

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT
PROJECT ENGINEER K. BAYLESS
CALCULATED/DESIGNED BY KIRK BAYLESS
CHECKED BY
DATE REVISED BY
DATE REVISED

LAST REVISION 02-10-03 DATE PLOTTED => 20-DEC-2004 TIME PLOTTED => 13:52

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS 0 20 40 60 80
USERNAME => sandrien
DGN FILE => 842040102.dgn

CU 08228 EA 420401

NOTE :
FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA. SEE RIGHT OF WAY MAPS AT DISTRICT OFFICE.

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	Riv	215	R52.3	7	23

3-25-03
REGISTERED CIVIL ENGINEER

CHRISTOPHER GONZALEZ No. C 63491 Exp. 09-30-06 CIVIL STATE OF CALIFORNIA

9-15-03
PLANS APPROVAL DATE

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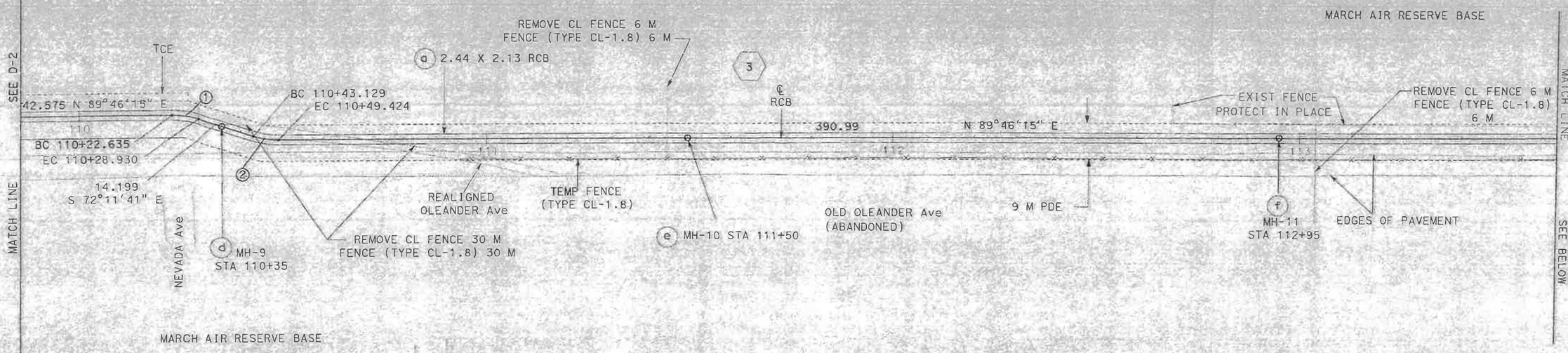

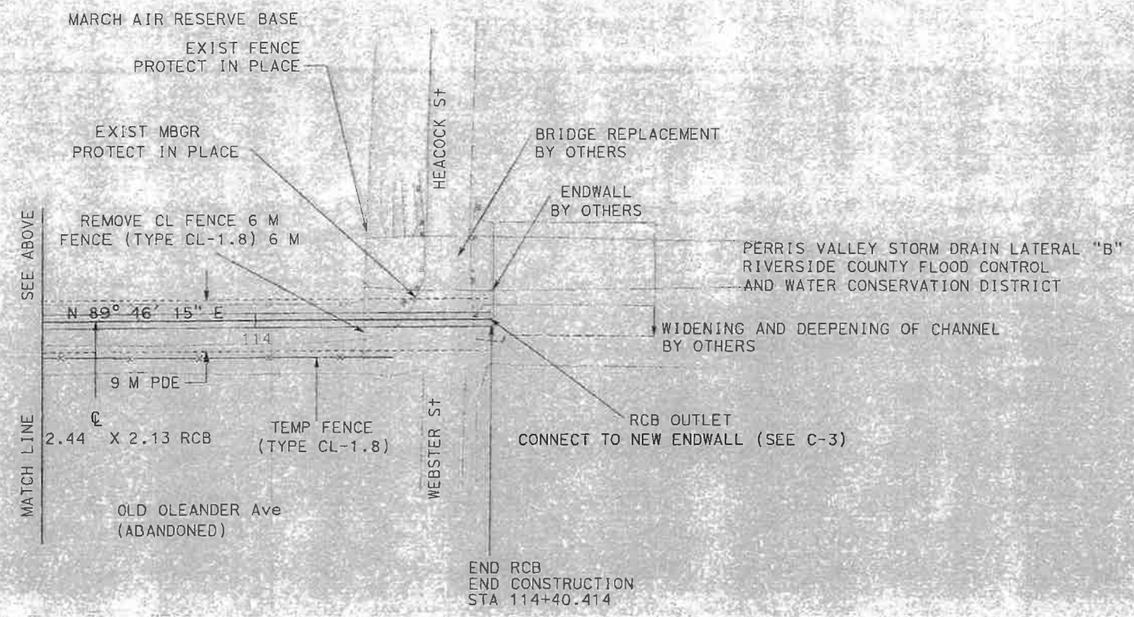

No	R	Δ	T	L
①	20.000	18° 02' 04"	3.17	6.30
②	20.000	18° 02' 04"	3.17	6.30

AS BUILT
NO CORRECTIONS ON THIS SHEET
DATE COMPLETED 10-18-04
RESIDENT ENGINEER

NOTE: THIS PLAN ACCURATE FOR DRAINAGE ONLY.

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DRAINAGE PLAN

SCALE 1:500 **D-3**

AS REVISION 03-25-03 | DATE PLOTTED => 20-DEC-2004 | TIME PLOTTED => 13:52

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT
PROJECT ENGINEER K. BAYLESS
CALCULATED/DESIGNED BY
CHECKED BY
DATE REVISED
DATE REVISED BY

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS 0 20 40 60 80

USERNAME => sondrlen

CU 08228 EA 430401

PERRIS VALLEY AREA MASTER DRAINAGE PLAN

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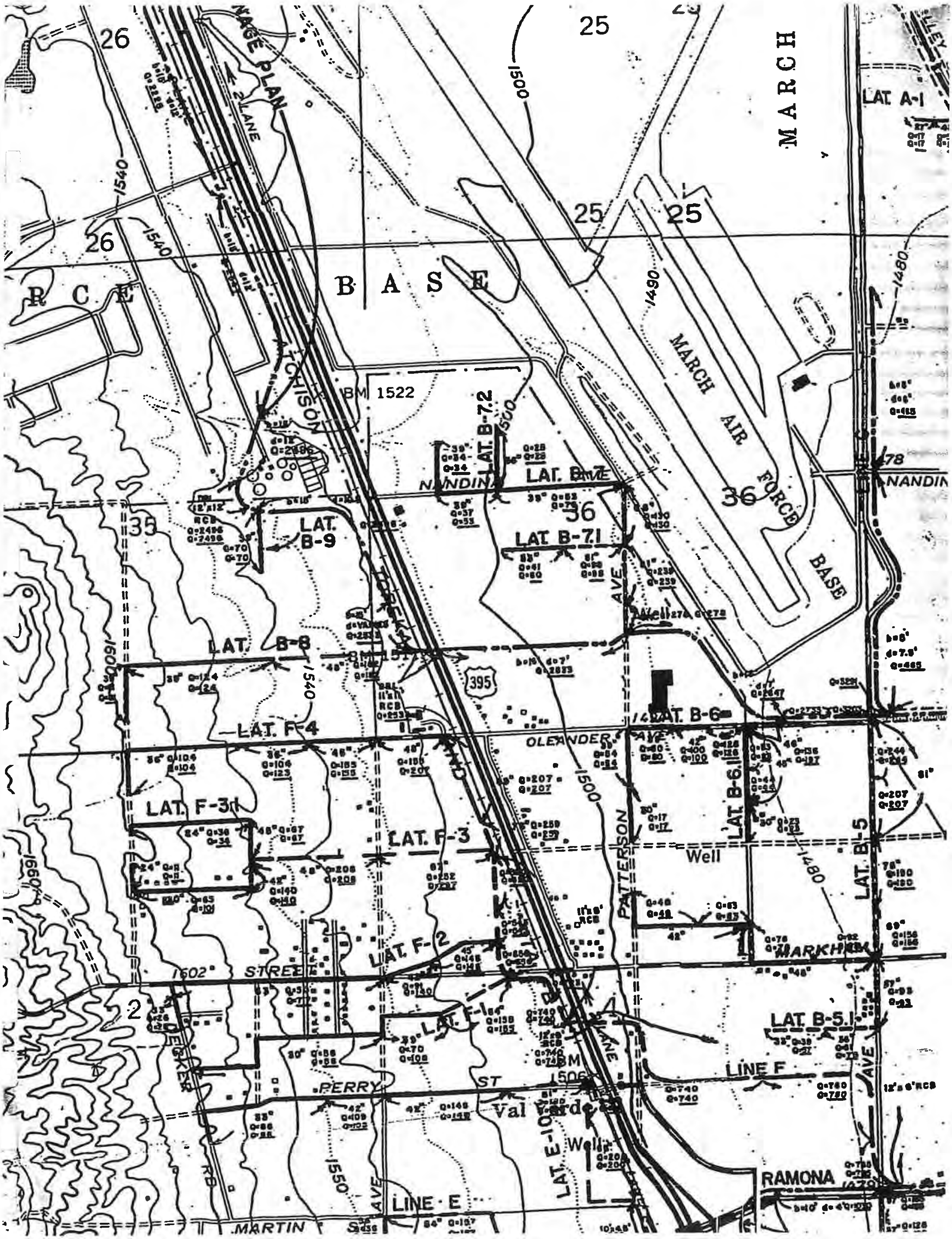
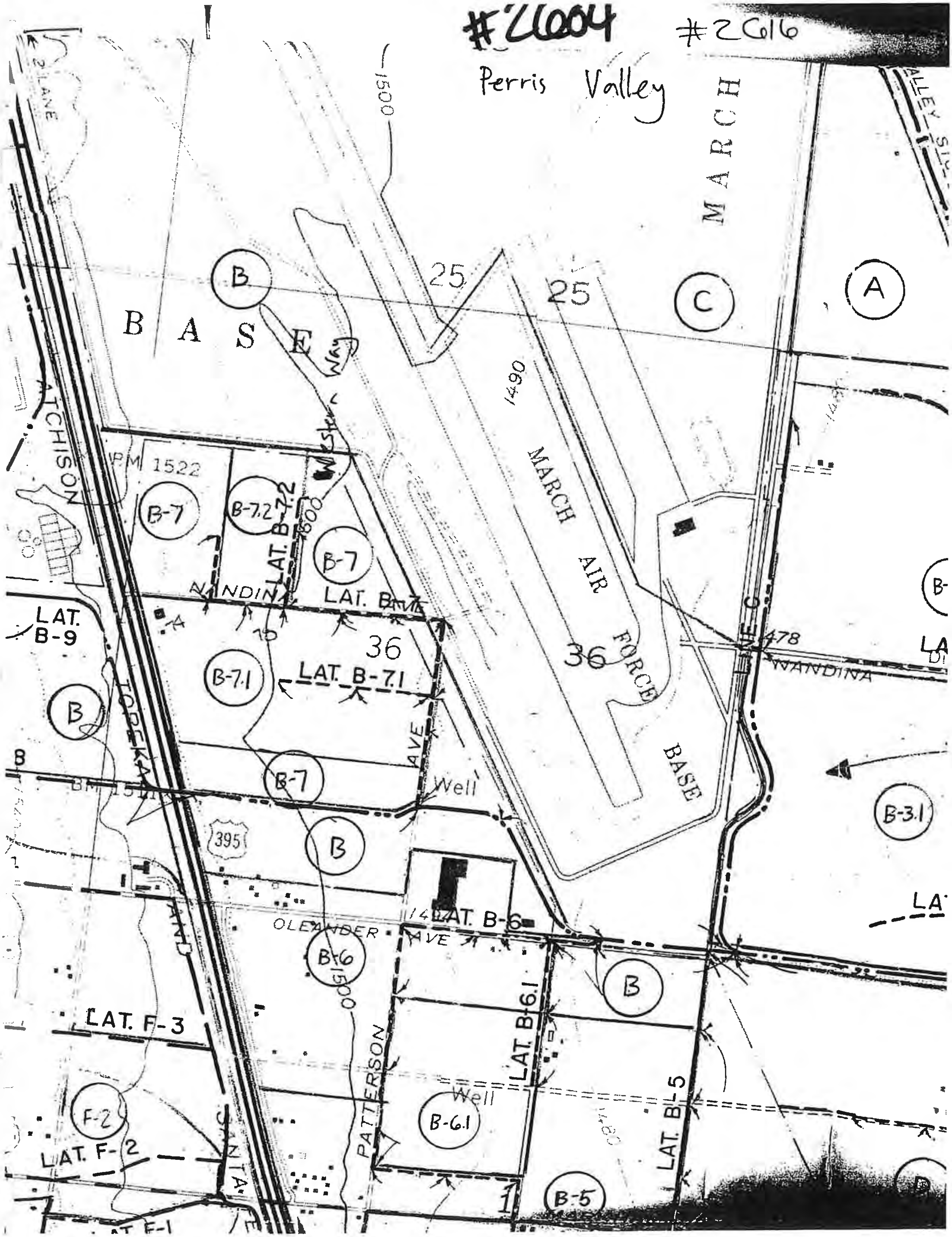


MARCH
BASE
MARCH AIR FORCE BASE
26
25
35
36
2
LAT. A-1
LAT. B-7.2
LAT. B-7
LAT. B-7.1
LAT. B-9
LAT. B-8
LAT. B-6
LAT. B-6.1
LAT. B-5
LAT. B-5.1
LAT. F-4
LAT. F-3.1
LAT. F-3
LAT. F-2
LAT. F-1
LAT. E-10
LINE F
LINE E
NANDINA
OLEANDER AVE
PATTERSON AVE
MARKHAM
PERRY ST
MARTIN ST
RAMONA
STREET
Val Verde
Well
BM 1522
395
1540
1500
1490
1480
1600
1550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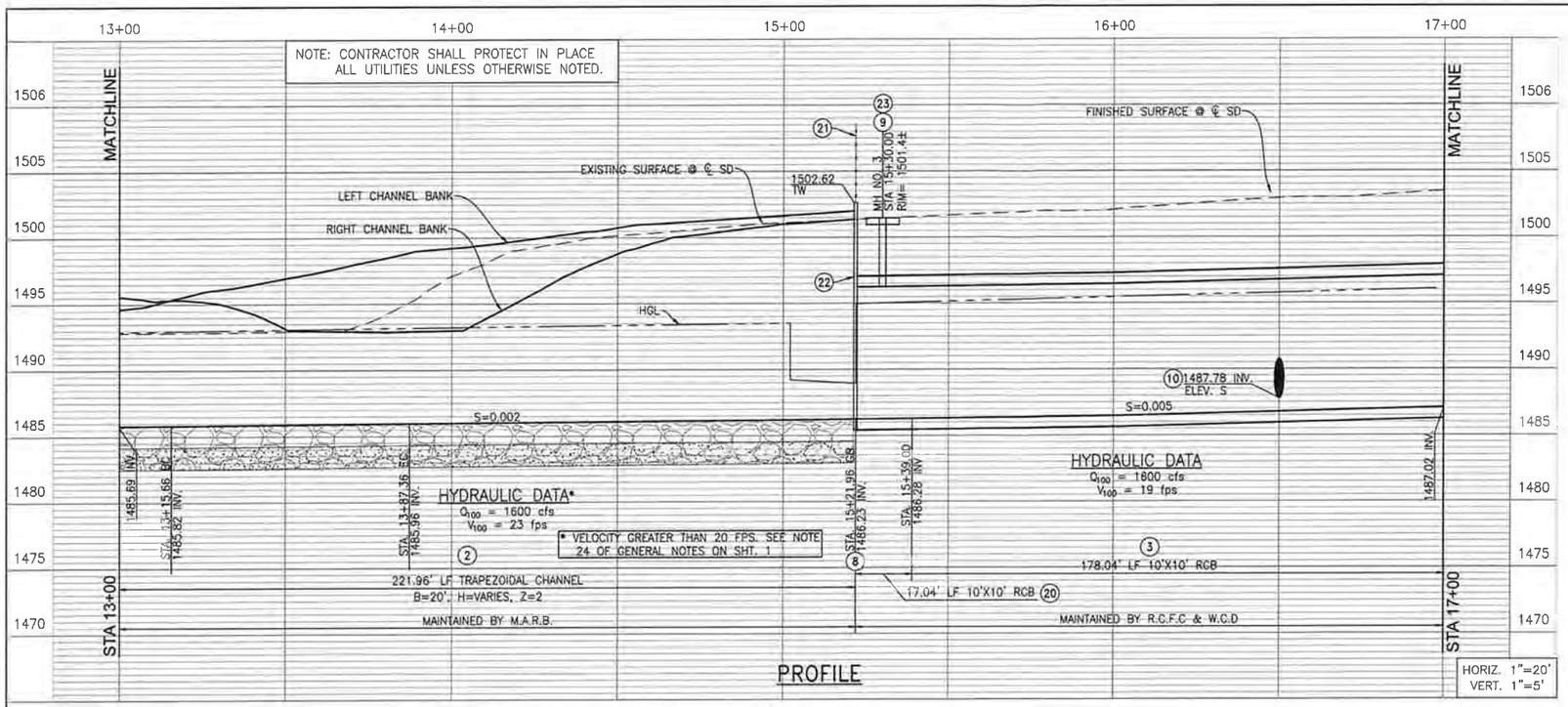
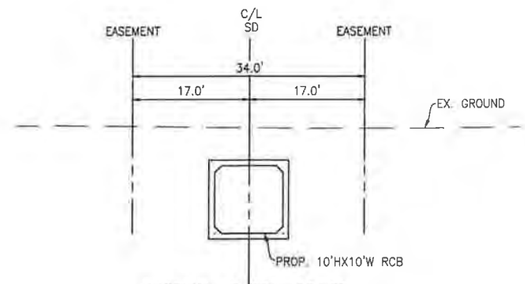
#2616
Perris Valley
MARCH
BASE
B
C
A
25
25
1500
1490
MARCH AIR FORCE BASE
Western Way
ATCHISON
BM 1522
B-7
B-7.2
LAT. B-7.2
1500
B-7
NANDINA AVE
LAT. B-7
LAT. B-9
36
36
B-7.1
LAT. B-7.1
TOPEKA
AVE
B
B-7
Well
395
B
B-3.1
478
NANDINA
LINE C
OLEANDER AVE
LAT. B-6
B-6
1500
B
LAT. B-6.1
LAT. F-3
PATTERSON
Well
B-6.1
LAT. B-5
1480
F-2
LAT. F-2
SANTA FE
B-5
2 LANE

WEBB AND ASSOCIATES STORM DRAIN PLANS



STA. 14+50 NOTE: SEE TYPICAL SECTION ON SHEET 28

TYPICAL FROM 13+00 TO STA 15+21.96

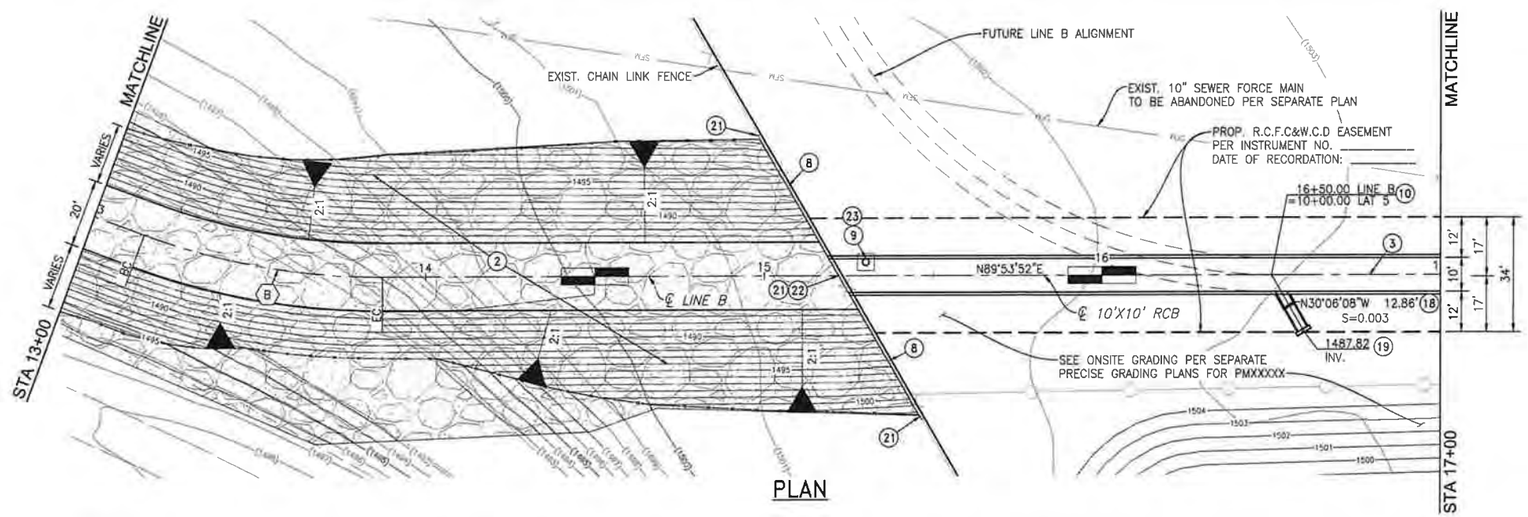


SECTION AT STA. 16+00

TYPICAL FROM STA 15+21.96 TO STA 1700

10' 0 10'

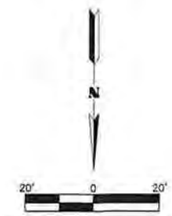
MANHOLE / JUNCTION STRUCTURE DATA					
LATERAL	℄ STATION	WALL STATION	STRUCTURE	A	C
LAT. 5	16+50	10+05.80	JS NO. 1	60'	10.8'



NOTES:

(2) INSTALL 1/4 TON HALF DEPTH GROUTED RIP RAP, T=3.3' LIMITS PER PLAN
(3) INSTALL 10' H X 10' W PRECAST RCB PER STRUCTURAL DETAILS ON SHEET 26
(8) CONSTRUCT HEADWALL PER CALTRANS STD. PLANS NO. D89 & MODIFIED PER SHEET XX
(9) CONSTRUCT MANHOLE NO. 3 PER RCFC&WCD STD. DWG. NO. MH252
(10) CONSTRUCT JUNCTION STRUCTURE NO. 1 PER RCFC&WCD STD. DWG. NO. JS 226
(18) CONSTRUCT 24" DIA. RCP, CLASS IV
(19) CONSTRUCT CONCRETE BULKHEAD PER RCFC&WCD STD. DWG. NO. M816
(20) CONSTRUCT 10' H X10' W CAST-IN-PLACE RCB PER CALTRANS STD. PLAN D-80
(21) REMOVE EXISTING FENCE & REPLACE WITH 6' HIGH (MATCH EXISTING) AIRFORCE SECURITY FENCE WITH SINGLE 45 DEGREE BARBED WIRE ARM (BARBS TOWARD THE CHANNEL) PER UFC 4-022-03 SECURITY FENCE & GATE SPECIFICATIONS & DWG. NO. UFC-702
(22) CONSTRUCT PARAPET PER DETAIL ON SHEET 26
(23) INSTALL 5' X 5' X 0.5' THICK CONCRETE PAD REINFORCED WITH NO. 4 BARS AT 18" EACH WAY.

CURVE DATA	(B)
R	200.00'
Δ	20°32'25"
L	71.70'
T	36.24'
BC	STA. 13+15.66
EC	STA. 13+87.36
PI NORTHING	2261859.723
PI EASTING	6256452.091



APPROVED BY:
ALBERT A. WEBB ASSOCIATES
ENGINEERING CONSULTANTS
3788 McCRAY STREET
RIVERSIDE CA. 92506
PH. (951) 686-1070
FAX (951) 788-1256
ENGINEER, RCE C67239 DATE:

DESIGNED BY: JCC
DRAWN BY: MJS
CONSTR. SET: 2/18/20
CHECKED BY: RSF
PB NUMBER:

Don't Dig...Until You Call:
U.S.A. Toll Free: 1-800-422-4133
for the location of buried utility lines.
Don't disrupt what connects.
TWO WORKING DAYS BEFORE YOU DIG

PERMANENT BENCH MARK
NO PID DX275
SEE SHEET 1 FOR DESCRIPTION
ELEV =1532.7 (NGVD29)
NAVD88 = NGVD29 + 2.46'

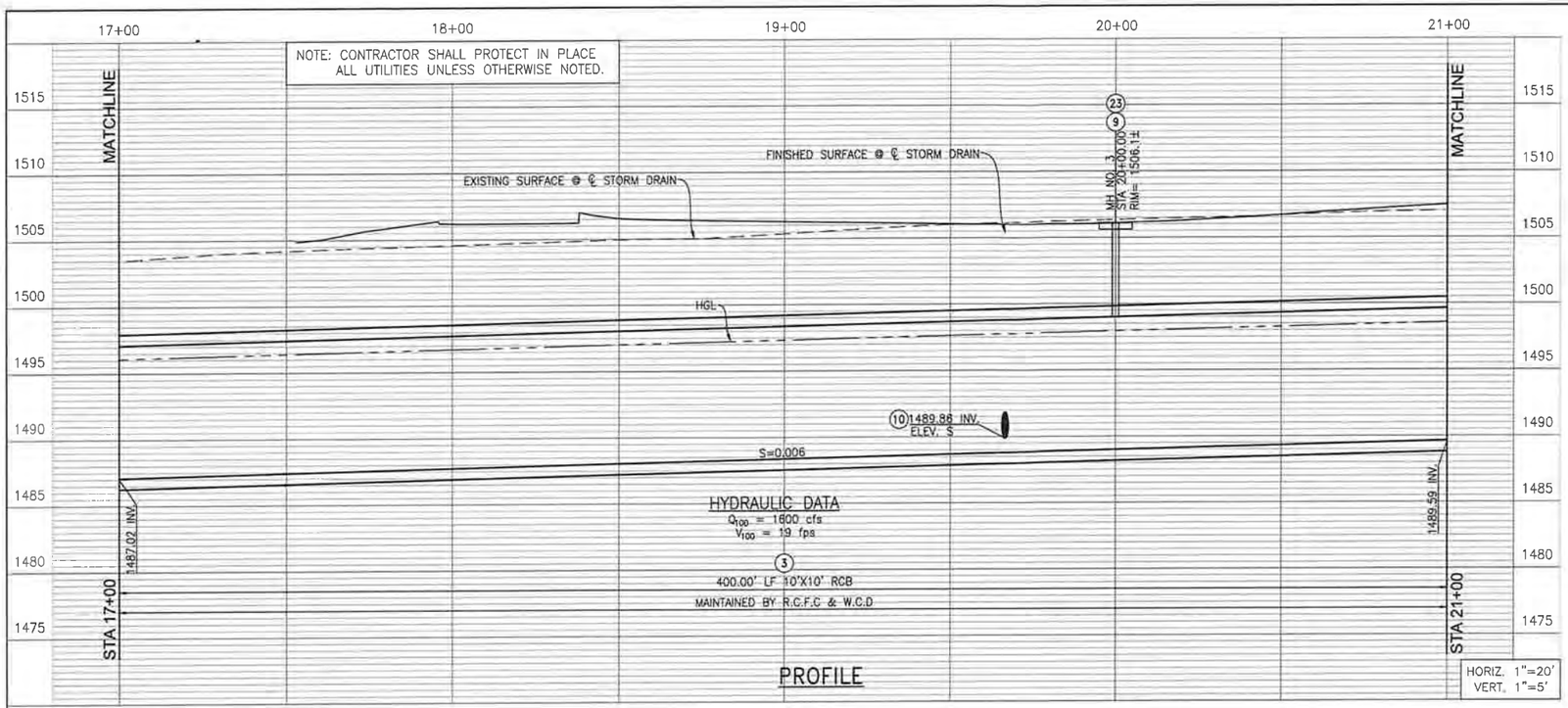
REVISIONS
REF. DESCRIPTION APPR. DATE

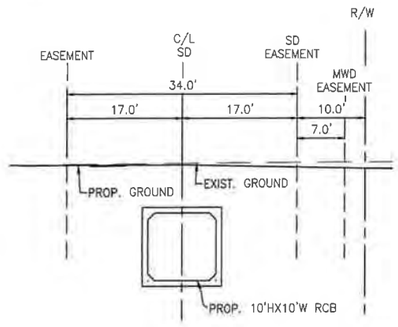
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL BY: DATE:
APPROVED BY: DATE:

PERRIS VALLEY MDP
LINE B
PLAN & PROFILE
STA. 13+00 TO STA. 17+00

PROJECT NO. XX
DRAWING NO. XX
SHEET NO. 3 OF 31

H:\2019\19-0256\DRAWINGS\PLAN SHEETS\19-0256 RCFC-LINE B-SHEET 1-10.DWG 2/18/2020 3:50:11 PM

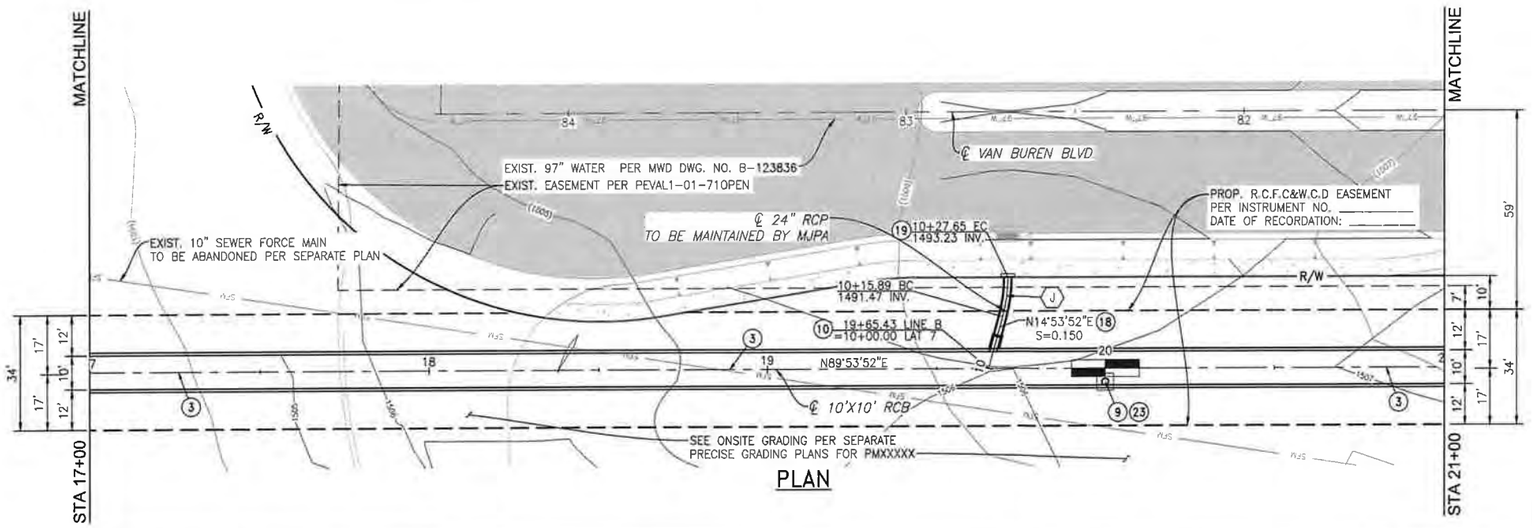




SECTION AT STA. 20+00

TYPICAL FROM STA 17+00 TO STA 21+00

10' 0 10'



MANHOLE / JUNCTION STRUCTURE DATA					
LATERAL	℄ STATION	WALL STATION	STRUCTURE	A	C
LAT 7	19+65.43	10+05.18	JS NO. 1	75°	10.2'

NOTES:

(3) INSTALL 10' H X 10' W PRECAST RCB PER STRUCTURAL DETAILS ON SHEET 26
(9) CONSTRUCT MANHOLE NO. 3 PER RCFC&WCD STD. DWG. NO. MH252
(10) CONSTRUCT JUNCTION STRUCTURE NO. 1 PER RCFC&WCD STD. DWG. NO. JS 226
(18) CONSTRUCT 24" DIA. RCP, CLASS IV
(19) CONSTRUCT CONCRETE BULKHEAD PER RCFC&WCD STD. DWG. NO. M816
(23) INSTALL 5' X 5' X 0.5' THICK CONCRETE PAD REINFORCED WITH NO. 4 BARS AT 18" EACH WAY.

N

20' 0 20'

CURVE DATA	(J)
R	45.00'
Δ	15°00'00"
L	11.78'
T	5.92'
BC	STA. 10+15.89
EC	STA. 10+27.68
PI NORTHING	2261837.540
PI EASTING	6255832.177

APPROVED BY:

ALBERT A. WEBB ASSOCIATES

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3788 McCRAY STREET
RIVERSIDE, CA. 92506
PH. (951) 686-1070
FAX (951) 788-1256

ENGINEER, RCE C67239 DATE:

DESIGNED BY: JCC
DRAWN BY: MJS
CONSTR SET: 2/18/20
CHECKED BY: RSF
PB NUMBER:

Don't Dig...Until You Call:
U.S.A. Toll Free: 1-800-422-4133
for the location of buried utility lines.
Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

PERMANENT BENCH MARK
NO. PID DX275
SEE SHEET 1 FOR DESCRIPTION

ELEV. =1532.7 (NGVD29)
NAVD88 = NGVD29 + 2.46'

REVISIONS			
REF	DESCRIPTION	APP'R.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL BY: _____ DATE: _____

APPROVED BY: _____ DATE: _____

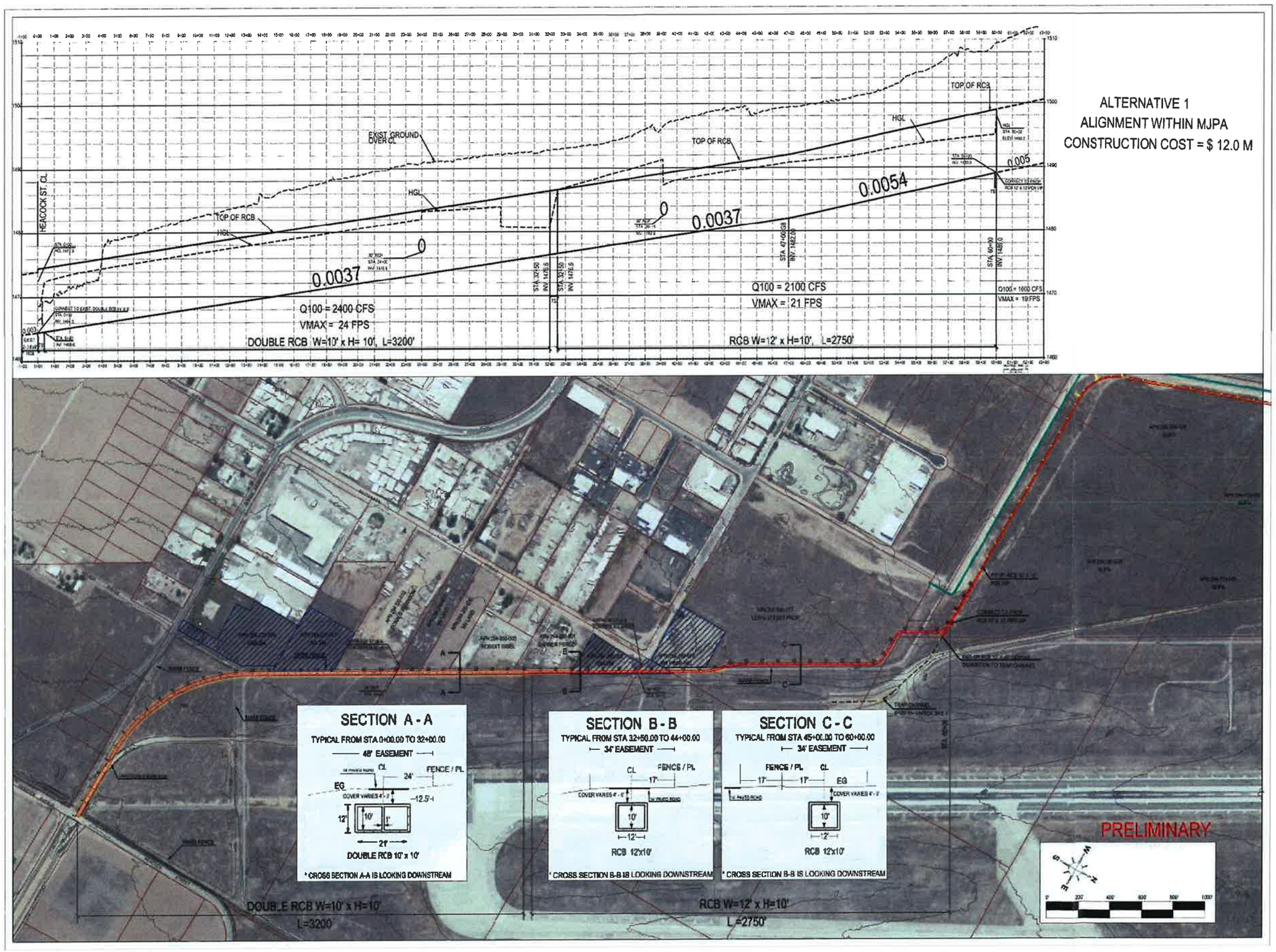
PERRIS VALLEY MDP
LINE B
PLAN & PROFILE
STA. 17+00 TO STA. 21+00

PROJECT NO. XX
DRAWING NO. XX
SHEET NO. 4 OF 31

H:\2019\19-0256\DRAWINGS\PLAN SHEETS\19-0256 RCFC-LINE B-SHEET 1-10.DWG 2/18/2020 3:50:11 PM

RIVERSIDE COUNTY FLOOD CONTROL

PRELIMINARY STORM DRAIN PLAN



ALTERNATIVE 1
ALIGNMENT WITHIN MJPA
CONSTRUCTION COST = $ 12.0 M

APPENDIX B

HYDROLOGY CALCULATIONS

EXISTING CONDITION

```
**************************************************************************
        RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
      RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                  (RCFC&WCD)  1978 HYDROLOGY MANUAL
       (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                  (Rational Tabling Version 23.0)
            Release Date: 07/01/2016  License ID 1435

                    Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* FIRST MARCH LOGISTICS BUILDING 1                                       *
* EXISTING CONDITION 100-YEAR                                            *
* NODES 100-101                                                          *
 **************************************************************************

  FILE NAME: W:\3788\E100.DAT
  TIME/DATE OF STUDY: 12:00 03/03/2021
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  2-YEAR, 1-HOUR PRECIPITATION(INCH) =  0.470
  100-YEAR, 1-HOUR PRECIPITATION(INCH) =  1.250
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.250
  SLOPE OF INTENSITY DURATION CURVE = 0.5000
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
        FOR ALL DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)      (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================   ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1026.40
  UPSTREAM ELEVATION(FEET) =   1520.99
  DOWNSTREAM ELEVATION(FEET) =   1508.27
  ELEVATION DIFFERENCE(FEET) =     12.72
  TC = 0.709*[( 1026.40**3)/(    12.72)]**.2 =   27.339
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.852
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5748
  SOIL CLASSIFICATION IS "B"
  SUBAREA RUNOFF(CFS) =      9.63
  TOTAL AREA(ACRES) =      9.05   TOTAL RUNOFF(CFS) =      9.63
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        9.1  TC(MIN.) =     27.34
  PEAK FLOW RATE(CFS)   =       9.63
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
              Release Date: 07/01/2016  License ID 1435

                        Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* FIRST MARCH LOGISTICS BUILDING 1                                      *
* EXISTING CONDITION 100-YEAR                                           *
* NODES 110-112                                                         *
 *************************************************************************

  FILE NAME: W:\3788\E110.DAT
  TIME/DATE OF STUDY: 15:20 01/21/2021
-------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
-------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  2-YEAR, 1-HOUR PRECIPITATION(INCH) =  0.470
  100-YEAR, 1-HOUR PRECIPITATION(INCH) =  1.250
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.250
  SLOPE OF INTENSITY DURATION CURVE = 0.5000
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
        FOR ALL DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================   ======  =====  ====  =====  ======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
-------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=========================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   849.01
  UPSTREAM ELEVATION(FEET) =   1518.45
  DOWNSTREAM ELEVATION(FEET) =   1505.78
  ELEVATION DIFFERENCE(FEET) =     12.67
  TC = 0.709*[(  849.01**3)/(    12.67)]**.2 =   24.417
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.959
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6893
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      6.08
  TOTAL AREA(ACRES) =      4.50   TOTAL RUNOFF(CFS) =      6.08

**************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    111.00 IS CODE =  81
-------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.959
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5865
  SOIL CLASSIFICATION IS "B"
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.23
  TOTAL AREA(ACRES) =       4.7   TOTAL RUNOFF(CFS) =       6.31
  TC(MIN.) =   24.42

**************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  52
-------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
=========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1505.78  DOWNSTREAM(FEET) =   1503.67
  CHANNEL LENGTH THRU SUBAREA(FEET) =   208.25   CHANNEL SLOPE =  0.0101
  CHANNEL FLOW THRU SUBAREA(CFS) =       6.31
  FLOW VELOCITY(FEET/SEC) =   2.24 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.55   Tc(MIN.) =   25.96
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =    1057.26 FEET.

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

```
================================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.900
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6843
 SOIL CLASSIFICATION IS "C"
 SUBAREA AREA(ACRES) =    2.40   SUBAREA RUNOFF(CFS) =    3.12
 TOTAL AREA(ACRES) =       7.1   TOTAL RUNOFF(CFS) =      9.43
 TC(MIN.) =   25.96

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.900
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5802
 SOIL CLASSIFICATION IS "B"
 SUBAREA AREA(ACRES) =    1.50   SUBAREA RUNOFF(CFS) =    1.65
 TOTAL AREA(ACRES) =       8.6   TOTAL RUNOFF(CFS) =     11.08
 TC(MIN.) =   25.96
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        8.6  TC(MIN.) =     25.96
 PEAK FLOW RATE(CFS)   =      11.08
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
              Release Date: 07/01/2016  License ID 1435

                        Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* FIRST MARCH LOGISTICS BUILDING 1                                      *
* EXISTING CONDITION 100-YEAR                                           *
* NODES 120-121                                                         *
 ************************************************************************

  FILE NAME: W:\3788\E120.DAT
  TIME/DATE OF STUDY: 15:24 01/21/2021
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  2-YEAR, 1-HOUR PRECIPITATION(INCH) =  0.470
  100-YEAR, 1-HOUR PRECIPITATION(INCH) =  1.250
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.250
  SLOPE OF INTENSITY DURATION CURVE = 0.5000
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
        FOR ALL DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)      (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   668.15
  UPSTREAM ELEVATION(FEET) =   1514.02
  DOWNSTREAM ELEVATION(FEET) =   1506.61
  ELEVATION DIFFERENCE(FEET) =      7.41
  TC = 0.709*[(  668.15**3)/(     7.41)]**.2 =   23.542
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.996
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6922
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      3.94
  TOTAL AREA(ACRES) =      2.85   TOTAL RUNOFF(CFS) =      3.94
========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        2.8  TC(MIN.) =     23.54
  PEAK FLOW RATE(CFS)    =       3.94
========================================================================
========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

PROPOSED CONDITION

```
************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
               Release Date: 07/01/2016  License ID 1435

                        Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* FIRST MARCH LOGISTICS BUILDING 1                                      *
* PROPOSED CONDITION 100-YEAR                                           *
* NODES 100-133                                                         *
 ************************************************************************

  FILE NAME: W:\3788\P100.DAT
  TIME/DATE OF STUDY: 10:51 07/28/2021
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  2-YEAR, 1-HOUR PRECIPITATION(INCH) =  0.470
  100-YEAR, 1-HOUR PRECIPITATION(INCH) =  1.250
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.250
  SLOPE OF INTENSITY DURATION CURVE = 0.5000
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
        FOR ALL DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================   ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   523.00
  UPSTREAM ELEVATION(FEET) =   1513.62
  DOWNSTREAM ELEVATION(FEET) =   1509.34
  ELEVATION DIFFERENCE(FEET) =      4.28
  TC = 0.303*[(  523.00**3)/(     4.28)]**.2 =    9.692
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.110
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8855
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      4.41
  TOTAL AREA(ACRES) =      1.60   TOTAL RUNOFF(CFS) =      4.41

************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    112.00 IS CODE =  31
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1506.01  DOWNSTREAM(FEET) =  1504.20
  FLOW LENGTH(FEET) =   361.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.46
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.41
  PIPE TRAVEL TIME(MIN.) =   1.35    Tc(MIN.) =   11.04
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =     884.00 FEET.

************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =   1
------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.04
  RAINFALL INTENSITY(INCH/HR) =   2.91
  TOTAL STREAM AREA(ACRES) =     1.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.41

************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
```

```
------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   238.00
 UPSTREAM ELEVATION(FEET) =   1510.80
 DOWNSTREAM ELEVATION(FEET) =   1508.59
 ELEVATION DIFFERENCE(FEET) =      2.21
 TC = 0.303*[(  238.00**3)/(     2.21)]**.2 =    6.897
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.687
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8874
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =      8.51
 TOTAL AREA(ACRES) =      2.60   TOTAL RUNOFF(CFS) =      8.51

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1504.59  DOWNSTREAM(FEET) =  1504.28
 FLOW LENGTH(FEET) =     9.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.06
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.51
 PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    6.91
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =     247.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.91
 RAINFALL INTENSITY(INCH/HR) =   3.68
 TOTAL STREAM AREA(ACRES) =     2.60
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.51

 ** CONFLUENCE DATA **
 STREAM      RUNOFF       Tc       INTENSITY      AREA
 NUMBER       (CFS)     (MIN.)    (INCH/HOUR)    (ACRE)
     1         4.41    11.04         2.914         1.60
     2         8.51     6.91         3.683         2.60

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

 ** PEAK FLOW RATE TABLE **
 STREAM      RUNOFF       Tc       INTENSITY
 NUMBER       (CFS)     (MIN.)    (INCH/HOUR)
     1        11.26     6.91         3.683
     2        11.14    11.04         2.914

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      11.26   Tc(MIN.) =    6.91
 TOTAL AREA(ACRES) =        4.2
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =     884.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1504.20  DOWNSTREAM(FEET) =  1503.46
 FLOW LENGTH(FEET) =   145.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.65
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      11.26
 PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =    7.34
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    122.00 =    1029.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.34
 RAINFALL INTENSITY(INCH/HR) =   3.57
 TOTAL STREAM AREA(ACRES) =     4.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.26

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   152.00
 UPSTREAM ELEVATION(FEET) =   1510.40
 DOWNSTREAM ELEVATION(FEET) =   1508.59
 ELEVATION DIFFERENCE(FEET) =      1.81
 TC = 0.303*[(  152.00**3)/(     1.81)]**.2 =    5.485
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.134
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8818
 SOIL CLASSIFICATION IS "B"
 SUBAREA RUNOFF(CFS) =      1.82
 TOTAL AREA(ACRES) =      0.50   TOTAL RUNOFF(CFS) =      1.82

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    121.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.134
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8886
 SOIL CLASSIFICATION IS "C"
 SUBAREA AREA(ACRES) =    1.05   SUBAREA RUNOFF(CFS) =    3.86
 TOTAL AREA(ACRES) =       1.5   TOTAL RUNOFF(CFS) =      5.68
 TC(MIN.) =    5.48

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1504.59  DOWNSTREAM(FEET) =  1503.82
 FLOW LENGTH(FEET) =     7.00   MANNING'S N =  0.012
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.51
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.68
 PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    5.49
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =     159.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    5.49
 RAINFALL INTENSITY(INCH/HR) =   4.13
 TOTAL STREAM AREA(ACRES) =     1.55
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.68

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc       INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)    (INCH/HOUR)    (ACRE)
     1       11.26     7.34         3.574          4.20
     1       11.14    11.47         2.859          4.20
     2        5.68     5.49         4.132          1.55

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF       Tc       INTENSITY
 NUMBER      (CFS)     (MIN.)    (INCH/HOUR)
     1       14.11     5.49        4.132
     2       16.18     7.34        3.574
     3       15.07    11.47        2.859

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      16.18   Tc(MIN.) =    7.34
 TOTAL AREA(ACRES) =        5.8
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    122.00 =    1029.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1503.46  DOWNSTREAM(FEET) =  1501.91
 FLOW LENGTH(FEET) =   310.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.12
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      16.18
 PIPE TRAVEL TIME(MIN.) =   0.84    Tc(MIN.) =    8.18
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    132.00 =    1339.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.18
 RAINFALL INTENSITY(INCH/HR) =   3.38
 TOTAL STREAM AREA(ACRES) =     5.75
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     16.18
```

```
****************************************************************************
 FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE = 21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   506.00
 UPSTREAM ELEVATION(FEET) =   1513.12
 DOWNSTREAM ELEVATION(FEET) =   1508.16
 ELEVATION DIFFERENCE(FEET) =      4.96
 TC = 0.303*[(  506.00**3)/(     4.96)]**.2 =    9.225
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.188
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8777
 SOIL CLASSIFICATION IS "B"
 SUBAREA RUNOFF(CFS) =     13.15
 TOTAL AREA(ACRES) =      4.70   TOTAL RUNOFF(CFS) =     13.15

****************************************************************************
 FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1504.16  DOWNSTREAM(FEET) =  1502.85
 FLOW LENGTH(FEET) =     4.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  28.77
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      13.15
 PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    9.23
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    132.00 =     510.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.23
 RAINFALL INTENSITY(INCH/HR) =   3.19
 TOTAL STREAM AREA(ACRES) =     4.70
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.15

 ** CONFLUENCE DATA **
 STREAM      RUNOFF        Tc       INTENSITY      AREA
 NUMBER       (CFS)      (MIN.)    (INCH/HOUR)    (ACRE)
     1        14.11      6.35         3.842          5.75
     1        16.18      8.18         3.385          5.75
     1        15.07     12.32         2.759          5.75
     2        13.15      9.23         3.187          4.70

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

 ** PEAK FLOW RATE TABLE **
 STREAM      RUNOFF       Tc       INTENSITY
 NUMBER       (CFS)     (MIN.)    (INCH/HOUR)
     1        23.16      6.35        3.842
     2        27.84      8.18        3.385
     3        28.39      9.23        3.187
     4        26.45     12.32        2.759

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      28.39   Tc(MIN.) =    9.23
 TOTAL AREA(ACRES) =       10.4
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    132.00 =    1339.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1501.91  DOWNSTREAM(FEET) =  1499.53
 FLOW LENGTH(FEET) =   250.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.07
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      28.39
 PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =    9.69
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    133.00 =    1589.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       10.4  TC(MIN.) =      9.69
 PEAK FLOW RATE(CFS)    =      28.39
 *** PEAK FLOW RATE TABLE ***
        Q(CFS)    Tc(MIN.)
 1       23.16       6.84
 2       27.84       8.64
 3       28.39       9.69
 4       26.45      12.78
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
              Release Date: 07/01/2016  License ID 1435

                        Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* FIRST MARCH LOGISTICS BUILDING 1                                       *
* PROPOSED CONDITION 100-YEAR                                            *
* NODES 140-141                                                          *
 **************************************************************************

  FILE NAME: W:\3788\P140.DAT
  TIME/DATE OF STUDY: 16:24 02/12/2021
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  2-YEAR, 1-HOUR PRECIPITATION(INCH) =  0.470
  100-YEAR, 1-HOUR PRECIPITATION(INCH) =  1.250
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.250
  SLOPE OF INTENSITY DURATION CURVE = 0.5000
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
        FOR ALL DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)      (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  ================   =======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   832.19
  UPSTREAM ELEVATION(FEET) =   1518.53
  DOWNSTREAM ELEVATION(FEET) =   1513.20
  ELEVATION DIFFERENCE(FEET) =      5.33
  TC = 0.303*[(  832.19**3)/(     5.33)]**.2 =   12.257
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.766
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8840
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.22
  TOTAL AREA(ACRES) =      0.50   TOTAL RUNOFF(CFS) =      1.22

**************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    141.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.766
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8753
  SOIL CLASSIFICATION IS "B"
  SUBAREA AREA(ACRES) =    0.10   SUBAREA RUNOFF(CFS) =    0.24
  TOTAL AREA(ACRES) =       0.6   TOTAL RUNOFF(CFS) =      1.46
  TC(MIN.) =   12.26
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =         0.6  TC(MIN.) =     12.26
  PEAK FLOW RATE(CFS)   =        1.46
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1435

                        Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* FIRST MARCH LOGISTICS BUILDING 1                                      *
* PROPOSED CONDITION 100-YEAR                                           *
* NODES 150-183                                                         *
 ************************************************************************

  FILE NAME: W:\3788\P150.DAT
  TIME/DATE OF STUDY: 12:19 02/12/2021
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  2-YEAR, 1-HOUR PRECIPITATION(INCH) =  0.470
  100-YEAR, 1-HOUR PRECIPITATION(INCH) =  1.250
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.250
  SLOPE OF INTENSITY DURATION CURVE = 0.5000
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
        FOR ALL DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)      (FT)    SIDE / SIDE/ WAY    (FT)    (FT)   (FT)   (FT)    (n)
===  =====  =========  ================  ======  =====  ======  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    151.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   444.00
  UPSTREAM ELEVATION(FEET) =   1513.62
  DOWNSTREAM ELEVATION(FEET) =   1509.72
  ELEVATION DIFFERENCE(FEET) =      3.90
  TC = 0.303*[(  444.00**3)/(     3.90)]**.2 =    8.950
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.237
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8859
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =     10.04
  TOTAL AREA(ACRES) =      3.50   TOTAL RUNOFF(CFS) =     10.04

************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    151.00 IS CODE =  81
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.237
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8780
  SOIL CLASSIFICATION IS "B"
  SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =     0.43
  TOTAL AREA(ACRES) =        3.7   TOTAL RUNOFF(CFS) =      10.46
  TC(MIN.) =    8.95

************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    162.00 IS CODE =  31
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1505.72  DOWNSTREAM(FEET) =  1504.90
  FLOW LENGTH(FEET) =   165.31   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.53
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.46
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =    9.45
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    162.00 =     609.31 FEET.

************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =   1
```

```
------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
========================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.45
 RAINFALL INTENSITY(INCH/HR) =   3.15
 TOTAL STREAM AREA(ACRES) =     3.65
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.46

************************************************************************
 FLOW PROCESS FROM NODE    160.00 TO NODE    161.00 IS CODE =  21
------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   178.76
 UPSTREAM ELEVATION(FEET) =   1513.23
 DOWNSTREAM ELEVATION(FEET) =   1509.72
 ELEVATION DIFFERENCE(FEET) =      3.51
 TC = 0.303*[(  178.76**3)/(     3.51)]**.2 =    5.295
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.208
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8821
 SOIL CLASSIFICATION IS "B"
 SUBAREA RUNOFF(CFS) =      3.90
 TOTAL AREA(ACRES) =      1.05   TOTAL RUNOFF(CFS) =      3.90

************************************************************************
 FLOW PROCESS FROM NODE    161.00 TO NODE    161.00 IS CODE =  81
------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.208
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8888
 SOIL CLASSIFICATION IS "C"
 SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =    0.56
 TOTAL AREA(ACRES) =       1.2   TOTAL RUNOFF(CFS) =      4.46
 TC(MIN.) =    5.30

************************************************************************
 FLOW PROCESS FROM NODE    161.00 TO NODE    162.00 IS CODE =  31
------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1505.72  DOWNSTREAM(FEET) =  1505.20
 FLOW LENGTH(FEET) =    17.12   MANNING'S N =  0.012
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.97
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =  1
 PIPE-FLOW(CFS) =       4.46
 PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    5.33
 LONGEST FLOWPATH FROM NODE    160.00 TO NODE    162.00 =     195.88 FEET.

************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =   1
------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
========================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    5.33
 RAINFALL INTENSITY(INCH/HR) =   4.20
 TOTAL STREAM AREA(ACRES) =     1.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.46

 ** CONFLUENCE DATA **
 STREAM      RUNOFF        Tc       INTENSITY       AREA
 NUMBER       (CFS)      (MIN.)    (INCH/HOUR)     (ACRE)
     1        10.46      9.45         3.150          3.65
     2         4.46      5.33         4.195          1.20

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

 ** PEAK FLOW RATE TABLE **
 STREAM      RUNOFF       Tc       INTENSITY
 NUMBER       (CFS)     (MIN.)    (INCH/HOUR)
     1        10.36      5.33        4.195
     2        13.81      9.45        3.150

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       13.81   Tc(MIN.) =    9.45
 TOTAL AREA(ACRES) =        4.8
 LONGEST FLOWPATH FROM NODE    150.00 TO NODE    162.00 =     609.31 FEET.

************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    172.00 IS CODE =  31
------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1504.88  DOWNSTREAM(FEET) =  1504.11
 FLOW LENGTH(FEET) =   152.32   MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.02
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
```

```
 PIPE-FLOW(CFS) =       13.81
 PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =    9.87
 LONGEST FLOWPATH FROM NODE    150.00 TO NODE    172.00 =     761.63 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    172.00 TO NODE    172.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.87
 RAINFALL INTENSITY(INCH/HR) =   3.08
 TOTAL STREAM AREA(ACRES) =     4.85
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.81

****************************************************************************
 FLOW PROCESS FROM NODE    170.00 TO NODE    171.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   223.85
 UPSTREAM ELEVATION(FEET) =   1514.60
 DOWNSTREAM ELEVATION(FEET) =   1509.72
 ELEVATION DIFFERENCE(FEET) =      4.88
 TC = 0.303*[(  223.85**3)/(     4.88)]**.2 =    5.674
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.065
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8816
 SOIL CLASSIFICATION IS "B"
 SUBAREA RUNOFF(CFS) =      6.09
 TOTAL AREA(ACRES) =      1.70   TOTAL RUNOFF(CFS) =      6.09

****************************************************************************
 FLOW PROCESS FROM NODE    171.00 TO NODE    172.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1505.72  DOWNSTREAM(FEET) =  1504.46
 FLOW LENGTH(FEET) =    18.18   MANNING'S N =  0.012
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.26
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =  1
 PIPE-FLOW(CFS) =       6.09
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.70
 LONGEST FLOWPATH FROM NODE    170.00 TO NODE    172.00 =     242.03 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    172.00 TO NODE    172.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    5.70
 RAINFALL INTENSITY(INCH/HR) =   4.06
 TOTAL STREAM AREA(ACRES) =     1.70
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.09

 ** CONFLUENCE DATA **
 STREAM      RUNOFF        Tc       INTENSITY       AREA
 NUMBER       (CFS)      (MIN.)    (INCH/HOUR)     (ACRE)
     1        10.36      5.78         4.026          4.85
     1        13.81      9.87         3.082          4.85
     2         6.09      5.70         4.057          1.70

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

 ** PEAK FLOW RATE TABLE **
 STREAM      RUNOFF       Tc       INTENSITY
 NUMBER       (CFS)     (MIN.)    (INCH/HOUR)
     1        16.30      5.70        4.057
     2        16.40      5.78        4.026
     3        18.44      9.87        3.082

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      18.44   Tc(MIN.) =    9.87
 TOTAL AREA(ACRES) =       6.6
 LONGEST FLOWPATH FROM NODE    150.00 TO NODE    172.00 =     761.63 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    172.00 TO NODE    182.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1504.11  DOWNSTREAM(FEET) =  1503.38
 FLOW LENGTH(FEET) =   146.68   MANNING'S N =  0.012
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.45
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =  1
 PIPE-FLOW(CFS) =      18.44
 PIPE TRAVEL TIME(MIN.) =   0.38    Tc(MIN.) =   10.25
 LONGEST FLOWPATH FROM NODE    150.00 TO NODE    182.00 =     908.31 FEET.
```

```
****************************************************************************
 FLOW PROCESS FROM NODE    182.00 TO NODE    182.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.25
 RAINFALL INTENSITY(INCH/HR) =   3.02
 TOTAL STREAM AREA(ACRES) =     6.55
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     18.44

****************************************************************************
 FLOW PROCESS FROM NODE    180.00 TO NODE    181.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   491.81
 UPSTREAM ELEVATION(FEET) =   1513.12
 DOWNSTREAM ELEVATION(FEET) =   1509.72
 ELEVATION DIFFERENCE(FEET) =      3.40
 TC = 0.303*[(  491.81**3)/(     3.40)]**.2 =    9.781
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.096
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8772
 SOIL CLASSIFICATION IS "B"
 SUBAREA RUNOFF(CFS) =      5.30
 TOTAL AREA(ACRES) =      1.95   TOTAL RUNOFF(CFS) =      5.30

****************************************************************************
 FLOW PROCESS FROM NODE    181.00 TO NODE    182.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1505.72  DOWNSTREAM(FEET) =  1504.10
 FLOW LENGTH(FEET) =    17.12   MANNING'S N =  0.012
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.41
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.30
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =     9.80
 LONGEST FLOWPATH FROM NODE    180.00 TO NODE    182.00 =     508.93 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    182.00 TO NODE    182.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.80
 RAINFALL INTENSITY(INCH/HR) =   3.09
 TOTAL STREAM AREA(ACRES) =     1.95
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.30

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       16.30     6.10        3.921         6.55
     1       16.40     6.18        3.894         6.55
     1       18.44    10.25        3.025         6.55
     2        5.30     9.80        3.093         1.95

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF       Tc      INTENSITY
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
     1       19.59     6.10        3.921
     2       19.74     6.18        3.894
     3       22.93     9.80        3.093
     4       23.62    10.25        3.025

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      23.62   Tc(MIN.) =   10.25
 TOTAL AREA(ACRES) =        8.5
 LONGEST FLOWPATH FROM NODE    150.00 TO NODE    182.00 =     908.31 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    182.00 TO NODE    183.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1503.36  DOWNSTREAM(FEET) =  1500.45
 FLOW LENGTH(FEET) =    38.70   MANNING'S N =  0.012
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  19.02
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      23.62
 PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   10.28
 LONGEST FLOWPATH FROM NODE    150.00 TO NODE    183.00 =     947.01 FEET.
============================================================================
 END OF STUDY SUMMARY:
```

```
 TOTAL AREA(ACRES)      =        8.5  TC(MIN.) =     10.28
 PEAK FLOW RATE(CFS)    =      23.62
 *** PEAK FLOW RATE TABLE ***
        Q(CFS)    Tc(MIN.)
 1       19.59        6.13
 2       19.74        6.22
 3       22.93        9.83
 4       23.62       10.28
================================================================================
================================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
     (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
               Release Date: 07/01/2016  License ID 1435

                         Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* FIRST MARCH LOGISTICS BUILDING 1                                       *
* PROPOSED CONDITION 100-YEAR                                            *
* NODES 190-191                                                          *
 **************************************************************************

  FILE NAME: W:\3788\P190.DAT
  TIME/DATE OF STUDY: 12:20 02/12/2021
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  2-YEAR, 1-HOUR PRECIPITATION(INCH) =  0.470
  100-YEAR, 1-HOUR PRECIPITATION(INCH) =  1.250
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.250
  SLOPE OF INTENSITY DURATION CURVE = 0.5000
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
        FOR ALL DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    191.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    79.50
  UPSTREAM ELEVATION(FEET) =   1510.46
  DOWNSTREAM ELEVATION(FEET) =   1506.97
  ELEVATION DIFFERENCE(FEET) =      3.49
  TC = 0.303*[(   79.50**3)/(     3.49)]**.2 =    3.260
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.330
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8891
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.35
  TOTAL AREA(ACRES) =      0.35   TOTAL RUNOFF(CFS) =      1.35

**************************************************************************
  FLOW PROCESS FROM NODE    191.00 TO NODE    191.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.330
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8825
  SOIL CLASSIFICATION IS "B"
  SUBAREA AREA(ACRES) =    0.05   SUBAREA RUNOFF(CFS) =     0.19
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.54
  TC(MIN.) =    5.00
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        0.4  TC(MIN.) =       5.00
  PEAK FLOW RATE(CFS)    =       1.54
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX C

HYDRAULIC CALCULATIONS

PHASE I (INTERIM CONDITION)

DATE: 11/ 1/2021
TIME: 7:11

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	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	3	1	1.00	4.00	13.00	0.00	0.00	0.00										
CD	2	3	1	1.00	3.00	13.00	0.00	0.00	0.00										
CD	12	4			1.00														
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														
CD	66	4			5.50														
CD	72	4			6.00														
CD	78	4			6.50														
CD	84	4			7.00														
CD	90	4			7.50														
CD	96	4			8.00														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

NATWAR - PERRIS

HEADING LINE NO 2 IS -

LINE A - PHASE 1 Public.

HEADING LINE NO 3 IS -

HYDRAULIC ANALYSIS - 100-YEAR

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1199.10	1490.71	84	1507.90

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1216.77	1491.60	84	0.013	0.00	45.00	0.00	0

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1275.92	1494.56	84	0.013	0.00	0.00	0.00	0

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1293.59	1495.44	84	0.013	0.00	45.00	0.00	0

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1298.25	1495.45	84	0.013	0.00	0.00	0.00	1

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1546.70	1496.20	84	0.013	0.00	0.00	0.00	0

ELEMENT NO 7 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1551.37	1496.21	84	0.013	0.00	0.00	0.00	1

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1777.68	1496.89	84	0.013	0.00	0.00	0.00	0

ELEMENT NO 9 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1782.34	1496.90	84	0.013	0.00	0.00	0.00	1

ELEMENT NO 10 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1882.81	1497.21	84	0.013	0.00	0.00	0.00	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
	1882.81	1497.21	84	30	0	0.013	28.4	0.0	1499.49	0.00	90.00	0.00

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 12 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2052.93	1497.72	84	0.013	0.00	0.00	0.00	0

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 13 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2057.60	1497.73	84	0.013	0.00	0.00	0.00	1

ELEMENT NO 14 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2306.04	1498.48	84	0.013	0.00	0.00	0.00	0

ELEMENT NO 15 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2311.46	1498.49	84	0.013	0.00	0.00	0.00	1

ELEMENT NO 16 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2525.32	1499.13	84	0.013	0.00	0.00	0.00	0

ELEMENT NO 17 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2560.66	1499.24	84	0.013	0.00	89.98	0.00	0

ELEMENT NO 18 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	2575.66	1499.28	1	24	0	0.014	23.6	0.0	1500.45	0.00	45.00	0.00

ELEMENT NO 19 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2875.66	1500.18	1	0.014	0.00	0.00	0.00	1

ELEMENT NO 20 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3175.66	1501.08	1	0.014	0.00	0.00	0.00	1

ELEMENT NO 21 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3234.77	1502.74	1	0.014	0.00	0.00	0.00	0

ELEMENT NO 22 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3242.35	1502.95	1	0.014	0.00	19.45	0.00	0

ELEMENT NO 23 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3302.86	1504.65	1	0.014	0.00	0.00	0.00	1

ELEMENT NO 24 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3330.71	1506.97	1	0.014	0.00	70.92	0.00	0

F 0 5 1 5 P PAGE NO 4

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 25 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3354.72	1508.96	1	0.014	0.00	0.00	0.00	0

ELEMENT NO 26 IS A TRANSITION

U/S DATA	STATION	INVERT	SECT	N
	3356.00	1509.01	2	0.014

ELEMENT NO 27 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3449.50	1509.12	2	0.014	0.00	0.00	0.00	0

ELEMENT NO 28 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	3449.50	1509.12	2	24	24	0.014	2.8	1.2	1509.47	1509.47	90.00	90.00

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 29 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3543.00	1509.23	2	0.014	0.00	0.00	0.00	0

ELEMENT NO 30 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT	W S ELEV
	3543.00	1509.23	2	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: THIENES ENGINEERING F0515P PAGE 1

WATER SURFACE PROFILE LISTING

NATWAR - PERRIS
LINE A - PHASE 1
HYDRAULIC ANALYSIS - 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1199.10	1490.71	17.190	1507.900	248.7	6.46	0.648	1508.548	0.00	4.134	7.00	0.00	0.00	0	0.00
17.67	0.05037					.001516	0.03		1.973			0.00		
1216.77	1491.60	16.418	1508.018	248.7	6.46	0.648	1508.666	0.00	4.134	7.00	0.00	0.00	0	0.00
59.15	0.05004					.001516	0.09		1.976			0.00		
1275.92	1494.56	13.548	1508.108	248.7	6.46	0.648	1508.756	0.00	4.134	7.00	0.00	0.00	0	0.00

17.67	0.04980					.001516	0.03			1.979			0.00		
1293.59	1495.44	12.787	1508.227	248.7	6.46	0.648	1508.875	0.00	4.134		7.00	0.00	0.00	0	0.00
4.66	0.00215					.001516	0.01			4.914			0.00		
1298.25	1495.45	12.816	1508.266	248.7	6.46	0.648	1508.914	0.00	4.134		7.00	0.00	0.00	0	0.00
248.45	0.00302					.001516	0.38			4.351			0.00		
1546.70	1496.20	12.443	1508.643	248.7	6.46	0.648	1509.291	0.00	4.134		7.00	0.00	0.00	0	0.00
4.67	0.00214					.001516	0.01			4.918			0.00		
1551.37	1496.21	12.472	1508.682	248.7	6.46	0.648	1509.330	0.00	4.134		7.00	0.00	0.00	0	0.00
226.31	0.00300					.001516	0.34			4.357			0.00		
1777.68	1496.89	12.135	1509.025	248.7	6.46	0.648	1509.673	0.00	4.134		7.00	0.00	0.00	0	0.00
4.66	0.00215					.001516	0.01			4.914			0.00		
1782.34	1496.90	12.165	1509.065	248.7	6.46	0.648	1509.713	0.00	4.134		7.00	0.00	0.00	0	0.00
100.47	0.00309					.001516	0.15			4.319			0.00		
1882.81	1497.21	12.007	1509.217	248.7	6.46	0.648	1509.865	0.00	4.134		7.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.001352	0.00						0.00		
1882.81	1497.21	12.286	1509.496	220.3	5.72	0.509	1510.005	0.00	3.880		7.00	0.00	0.00	0	0.00
170.12	0.00300					.001189	0.20			4.029			0.00		

WATER SURFACE PROFILE LISTING

NATWAR - PERRIS
LINE A - PHASE 1
HYDRAULIC ANALYSIS - 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
2052.93	1497.72	11.979	1509.699	220.3	5.72	0.509	1510.208	0.00	3.880		7.00	0.00	0.00	0	0.00
4.67	0.00214					.001189	0.01			4.503			0.00		
2057.60	1497.73	12.000	1509.730	220.3	5.72	0.509	1510.239	0.00	3.880		7.00	0.00	0.00	0	0.00
248.44	0.00302					.001189	0.30			4.020			0.00		
2306.04	1498.48	11.545	1510.025	220.3	5.72	0.509	1510.534	0.00	3.880		7.00	0.00	0.00	0	0.00
5.42	0.00185					.001189	0.01			4.748			0.00		
2311.46	1498.49	11.567	1510.057	220.3	5.72	0.509	1510.566	0.00	3.880		7.00	0.00	0.00	0	0.00
213.86	0.00299					.001189	0.25			4.031			0.00		
2525.32	1499.13	11.181	1510.311	220.3	5.72	0.509	1510.820	0.00	3.880		7.00	0.00	0.00	0	0.00
35.34	0.00311					.001189	0.04			3.981			0.00		
2560.66	1499.24	11.215	1510.455	220.3	5.72	0.509	1510.964	0.00	3.880		7.00	0.00	0.00	0	0.00
JUNCT STR	0.00267					.001295	0.02						0.00		
2575.66	1499.28	11.426	1510.706	196.7	4.14	0.266	1510.972	0.00	2.029		4.00	13.00	0.00	1	1.00
300.00	0.00300					.001210	0.36			2.347			0.00		
2875.66	1500.18	10.903	1511.083	196.7	4.14	0.266	1511.349	0.00	2.029		4.00	13.00	0.00	1	1.00
300.00	0.00300					.001210	0.36			2.347			0.00		
3175.66	1501.08	10.379	1511.459	196.7	4.14	0.266	1511.725	0.00	2.029		4.00	13.00	0.00	1	1.00
59.11	0.02808					.001210	0.07			1.076			0.00		
3234.77	1502.74	8.791	1511.531	196.7	4.14	0.266	1511.797	0.00	2.029		4.00	13.00	0.00	1	1.00
7.58	0.02770					.001210	0.01			1.081			0.00		
3242.35	1502.95	8.615	1511.565	196.7	4.14	0.266	1511.831	0.00	2.029		4.00	13.00	0.00	1	1.00
60.51	0.02809					.001210	0.07			1.076			0.00		

WATER SURFACE PROFILE LISTING

NATWAR - PERRIS
LINE A - PHASE 1
HYDRAULIC ANALYSIS - 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR

L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
3302.86	1504.65	7.001	1511.651	196.7	4.14	0.266	1511.917	0.00	2.029		4.00	13.00	0.00	1	1.00
27.85	0.08330					.001210	0.03			0.751			0.00		
3330.71	1506.97	4.762	1511.732	196.7	4.14	0.266	1511.998	0.00	2.029		4.00	13.00	0.00	1	1.00
9.33	0.08288					.001210	0.01			0.753			0.00		
3340.04	1507.74	4.000	1511.744	196.7	4.14	0.266	1512.010	0.00	2.029		4.00	13.00	0.00	1	1.00
1.95	0.08288					.000787	0.00			0.753			0.00		
3341.99	1507.90	3.813	1511.718	196.7	4.30	0.287	1512.005	0.00	2.029		4.00	13.00	0.00	1	1.00
1.82	0.08288					.000876	0.00			0.753			0.00		
3343.81	1508.06	3.635	1511.690	196.7	4.51	0.316	1512.006	0.00	2.029		4.00	13.00	0.00	1	1.00
1.68	0.08288					.000991	0.00			0.753			0.00		
3345.49	1508.19	3.466	1511.661	196.7	4.73	0.347	1512.008	0.00	2.029		4.00	13.00	0.00	1	1.00
1.54	0.08288					.001123	0.00			0.753			0.00		
3347.03	1508.32	3.305	1511.628	196.7	4.96	0.382	1512.010	0.00	2.029		4.00	13.00	0.00	1	1.00
1.42	0.08288					.001274	0.00			0.753			0.00		
3348.45	1508.44	3.151	1511.591	196.7	5.20	0.420	1512.011	0.00	2.029		4.00	13.00	0.00	1	1.00
1.29	0.08288					.001445	0.00			0.753			0.00		
3349.74	1508.55	3.005	1511.552	196.7	5.46	0.462	1512.014	0.00	2.029		4.00	13.00	0.00	1	1.00
1.15	0.08288					.001641	0.00			0.753			0.00		
3350.89	1508.64	2.865	1511.507	196.7	5.72	0.508	1512.015	0.00	2.029		4.00	13.00	0.00	1	1.00
1.02	0.08288					.001865	0.00			0.753			0.00		
3351.91	1508.73	2.731	1511.458	196.7	6.00	0.559	1512.017	0.00	2.029		4.00	13.00	0.00	1	1.00
0.88	0.08288					.002122	0.00			0.753			0.00		

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
3352.79	1508.80	2.604	1511.404	196.7	6.29	0.615	1512.019	0.00	2.029		4.00	13.00	0.00	1	1.00
0.74	0.08288					.002414	0.00			0.753			0.00		
3353.53	1508.86	2.483	1511.344	196.7	6.60	0.677	1512.021	0.00	2.029		4.00	13.00	0.00	1	1.00
0.60	0.08288					.002750	0.00			0.753			0.00		
3354.13	1508.91	2.368	1511.279	196.7	6.92	0.744	1512.023	0.00	2.029		4.00	13.00	0.00	1	1.00
0.45	0.08288					.003134	0.00			0.753			0.00		
3354.58	1508.95	2.257	1511.205	196.7	7.26	0.819	1512.024	0.00	2.029		4.00	13.00	0.00	1	1.00
0.14	0.08288					.003436	0.00			0.753			0.00		
3354.72	1508.96	2.212	1511.172	196.7	7.41	0.853	1512.025	0.00	2.029		4.00	13.00	0.00	1	1.00
TRANS STR	0.03906					.003887	0.00						0.00		
3356.00	1509.01	2.071	1511.081	196.7	7.91	0.973	1512.054	0.00	2.029		3.00	13.00	0.00	1	1.00
4.52	0.00118					.003978	0.02			3.000			0.00		
3360.52	1509.02	2.172	1511.187	196.7	7.55	0.884	1512.071	0.00	2.029		3.00	13.00	0.00	1	1.00
11.09	0.00118					.003485	0.04			3.000			0.00		
3371.61	1509.03	2.278	1511.306	196.7	7.20	0.804	1512.110	0.00	2.029		3.00	13.00	0.00	1	1.00
20.27	0.00118					.003056	0.06			3.000			0.00		
3391.88	1509.05	2.389	1511.441	196.7	6.86	0.731	1512.172	0.00	2.029		3.00	13.00	0.00	1	1.00
33.33	0.00118					.002681	0.09			3.000			0.00		
3425.21	1509.09	2.506	1511.597	196.7	6.54	0.664	1512.261	0.00	2.029		3.00	13.00	0.00	1	1.00
24.29	0.00118					.002426	0.06			3.000			0.00		

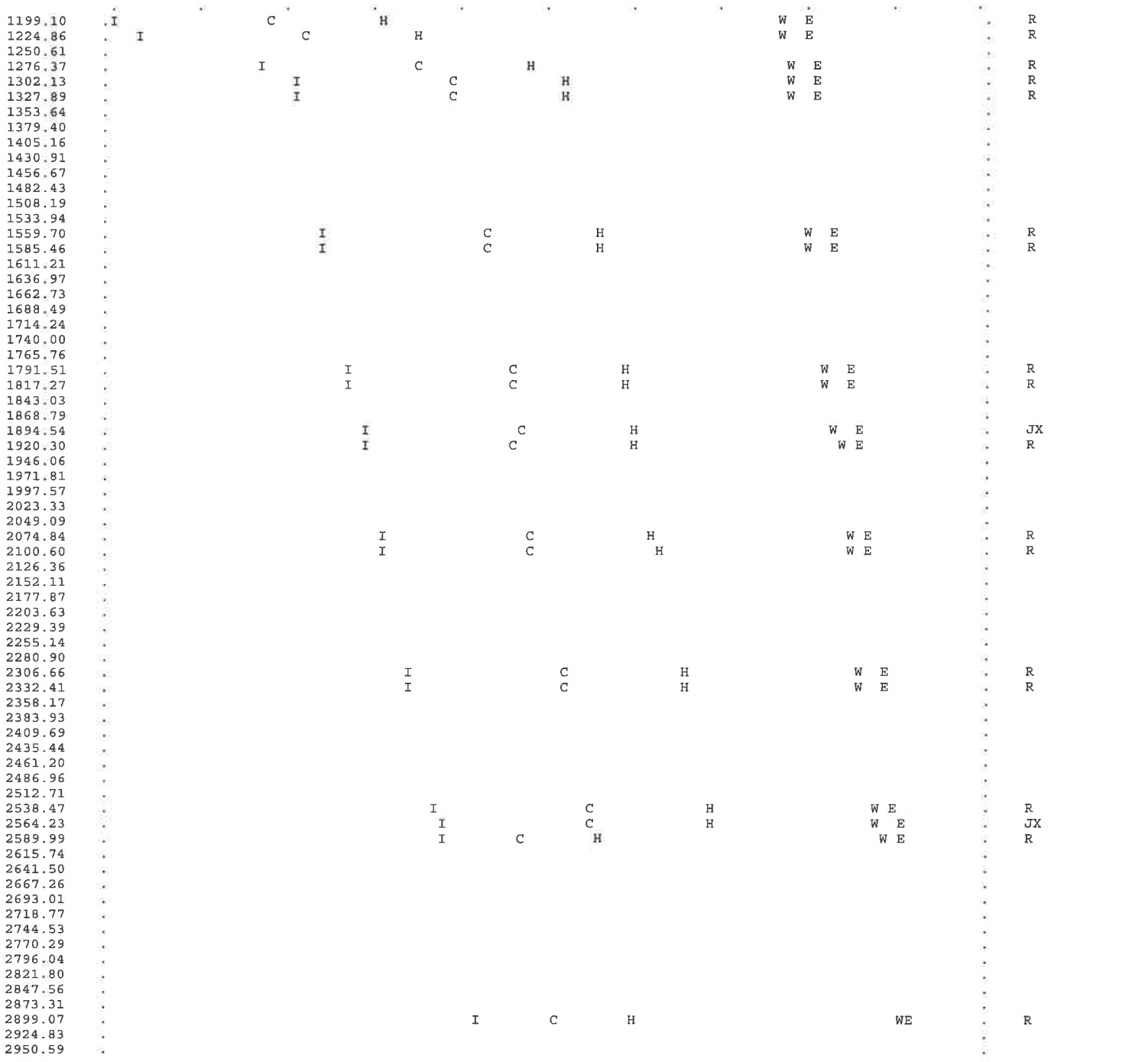
3449.50	1509.12	2.568	1511.688	196.7	6.38	0.633	1512.321	0.00	2.029		3.00	13.00	0.00	1	1.00
JUNCT STR	0.00000					.002197	0.00						0.00		

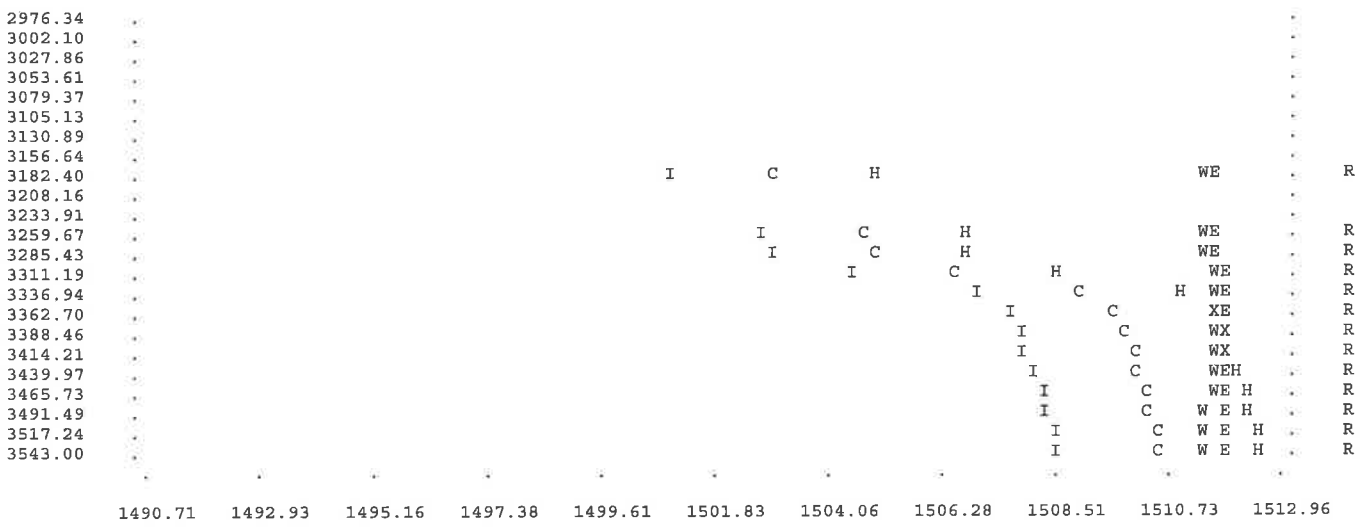
WATER SURFACE PROFILE LISTING

NATWAR - PERRIS
LINE A - PHASE 1
HYDRAULIC ANALYSIS - 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
3449.50	1509.12	2.658	1511.778	192.7	6.04	0.567	1512.345	0.00	2.001		3.00	13.00	0.00	1	1.00
93.50	0.00118					.001936	0.18			3.000			0.00		
3543.00	1509.23	2.777	1512.007	192.7	5.78	0.519	1512.526	0.00	2.001		3.00	13.00	0.00	1	1.00

NATWAR - PERRIS
LINE A - PHASE 1
HYDRAULIC ANALYSIS - 100-YEAR





N O T E S

1. GLOSSARY
   - I = INVERT ELEVATION
   - C = CRITICAL DEPTH
   - W = WATER SURFACE ELEVATION
   - H = HEIGHT OF CHANNEL
   - E = ENERGY GRADE LINE
   - X = CURVES CROSSING OVER
   - B = BRIDGE ENTRANCE OR EXIT
   - Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

DATE: 11/ 2/2021
TIME: 8:36

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	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	10	4			0.83														
CD	12	4			1.00														
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

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WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

FIRST MARCH LOGISTICS

HEADING LINE NO 2 IS -

LINE "A" ONSITE

HEADING LINE NO 3 IS -

100-YR

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *
U/S DATA STATION INVERT SECT W S ELEV
1003.50 1499.53 36 1509.36

ELEMENT NO 2 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1076.16 1501.03 36 0.012 0.00 0.00 0.00 0

ELEMENT NO 3 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1080.16 1501.05 36 0.012 0.00 0.00 0.00 1

ELEMENT NO 4 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1086.41 1501.08 36 0.012 0.00 0.00 0.00 0

ELEMENT NO 5 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1090.41 1501.10 36 0.012 0.00 0.00 0.00 1

ELEMENT NO 6 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1253.69 1501.91 36 0.012 0.00 0.00 0.00 0

ELEMENT NO 7 IS A SYSTEM HEADWORKS * *
U/S DATA STATION INVERT SECT W S ELEV
1253.69 1501.91 36 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: THIENES ENGINEERING F0515P PAGE 1
WATER SURFACE PROFILE LISTING

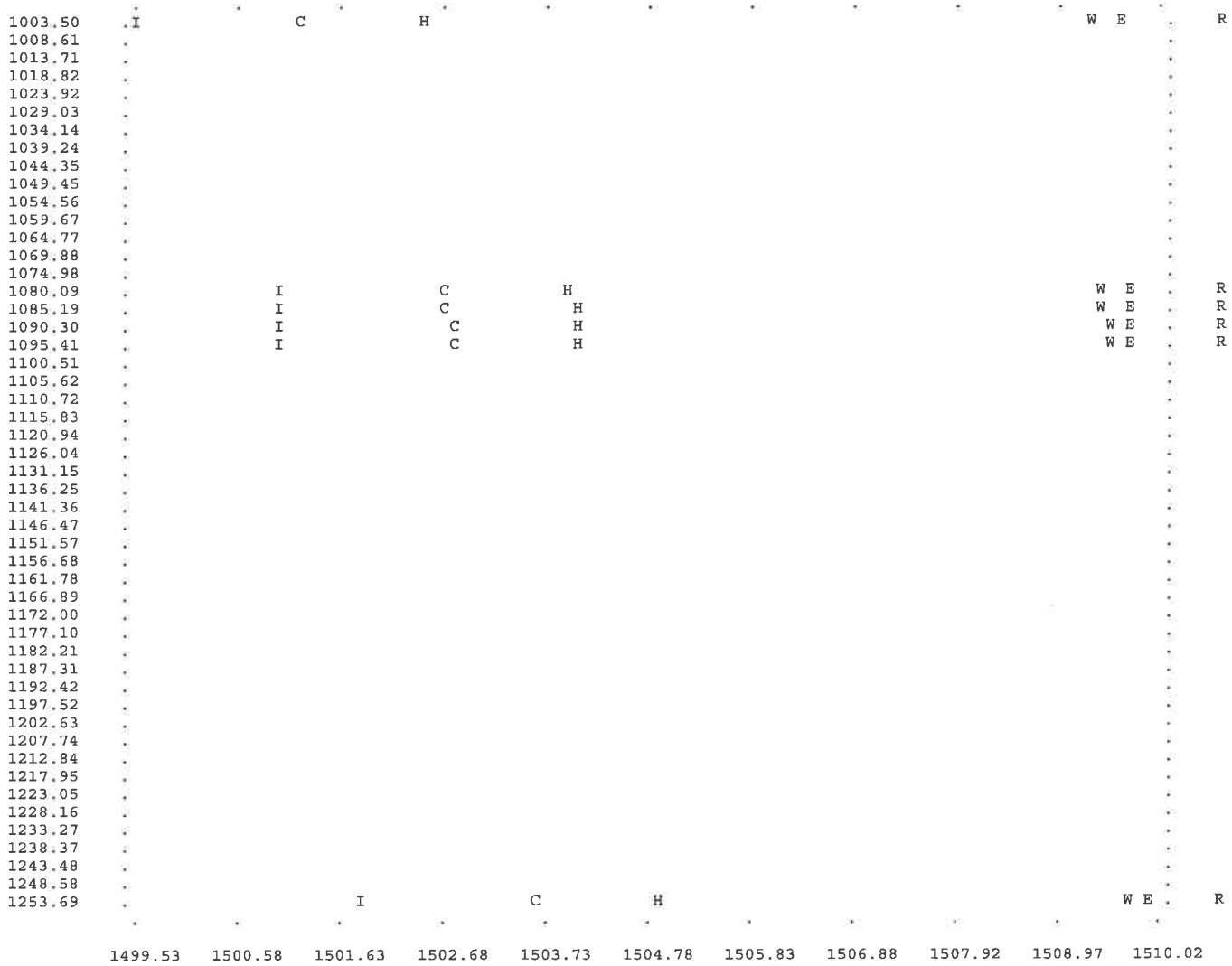
FIRST MARCH LOGISTICS
LINE "A"
100-YR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1003.50	1499.53	9.830	1509.360	28.4	4.02	0.251	1509.611	0.00	1.724	3.00	0.00	0.00	0	0.00
72.66	0.02064					.001545	0.11		1.071			0.00		
1076.16	1501.03	8.442	1509.472	28.4	4.02	0.251	1509.723	0.00	1.724	3.00	0.00	0.00	0	0.00
4.00	0.00500					.001545	0.01		1.597			0.00		
1080.16	1501.05	8.441	1509.491	28.4	4.02	0.251	1509.742	0.00	1.724	3.00	0.00	0.00	0	0.00
6.25	0.00480					.001545	0.01		1.617			0.00		
1086.41	1501.08	8.421	1509.501	28.4	4.02	0.251	1509.752	0.00	1.724	3.00	0.00	0.00	0	0.00
4.00	0.00500					.001545	0.01		1.597			0.00		
1090.41	1501.10	8.419	1509.519	28.4	4.02	0.251	1509.770	0.00	1.724	3.00	0.00	0.00	0	0.00
163.28	0.00496					.001545	0.25		1.601			0.00		

1253.69	1501.91	7.862	1509.772	28.4	4.02	0.251	1510.023	0.00	1.724	3.00	0.00	0.00	0

0.00□

FIRST MARCH LOGISTICS
LINE "A"
100-YR



N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

DATE: 11/ 2/2021
TIME: 8:17

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	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	10	4			0.83														
CD	12	4			1.00														
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

FIRST MARCH LOGISTICS

HEADING LINE NO 2 IS -

LINE "B"

HEADING LINE NO 3 IS -

100-YR

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1012.55	1500.71	36	1510.58

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1015.76	1501.00	36	0.012	0.00	0.00	45.00	0

ELEMENT NO 3 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1038.70	1502.97	36	0.012	0.00	0.00	0.00	0

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
	1042.78	1503.38	36	18	0	0.012	5.2	0.0	1503.33	0.00	45.00	0.00

ELEMENT NO 5 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1189.38	1504.11	36	0.012	0.00	0.00	0.00	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
	1189.38	1504.11	36	18	0	0.012	4.6	0.0	1504.46	0.00	45.00	0.00

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 7 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1341.70	1504.88	36	0.012	0.00	0.00	0.00	0

ELEMENT NO 8 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1345.70	1504.90	30	18	0	0.012	3.3	0.0	1504.98	0.00	45.00	0.00

ELEMENT NO 9 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1483.07	1505.58	30	0.012	0.00	0.00	0.00	0

ELEMENT NO 10 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1500.74	1505.67	30	0.012	22.50	45.00	0.00	0

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 11 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1511.01	1505.72	30	0.012	0.00	0.00	0.00	0

ELEMENT NO 12 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1511.01	1505.72	30	0.00

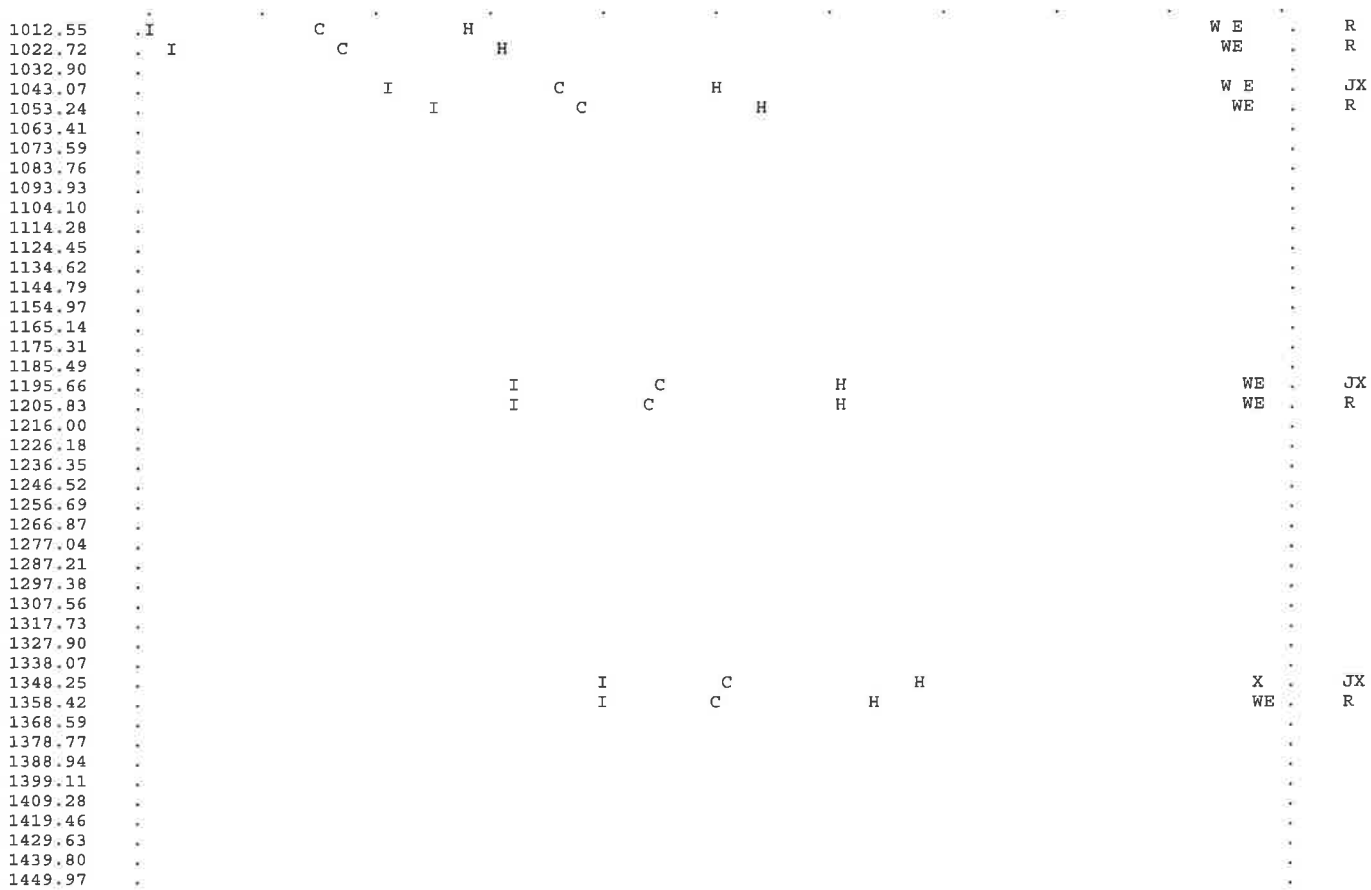
NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: THIENES ENGINEERING F0515P PAGE 1
WATER SURFACE PROFILE LISTING

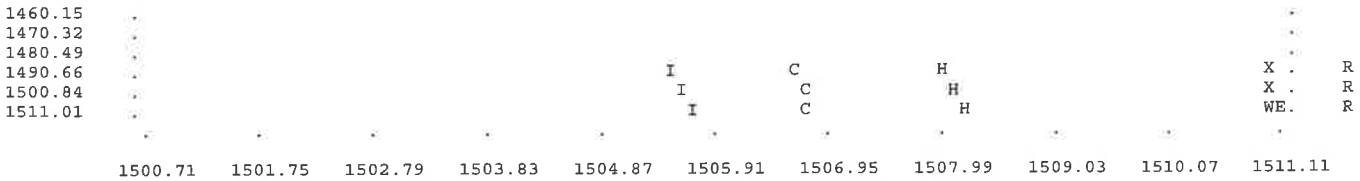
FIRST MARCH LOGISTICS
LINE "B"
100-YR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1012.55	1500.71	9.870	1510.580	23.6	3.34	0.173	1510.753	0.00	1.565		3.00	0.00	0.00	0	0.00
3.21	0.09034					.001067	0.00			0.670			0.00		
1015.76	1501.00	9.609	1510.609	23.6	3.34	0.173	1510.782	0.00	1.565		3.00	0.00	0.00	0	0.00
22.94	0.08588					.001067	0.02			0.674			0.00		
1038.70	1502.97	7.664	1510.634	23.6	3.34	0.173	1510.807	0.00	1.565		3.00	0.00	0.00	0	0.00
JUNCT STR	0.10049					.000857	0.00						0.00		
1042.78	1503.38	7.345	1510.725	18.4	2.60	0.105	1510.830	0.00	1.374		3.00	0.00	0.00	0	0.00
146.60	0.00498					.000648	0.09			1.245			0.00		
1189.38	1504.11	6.710	1510.820	18.4	2.60	0.105	1510.925	0.00	1.374		3.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.000507	0.00						0.00		
1189.38	1504.11	6.765	1510.875	13.8	1.95	0.059	1510.934	0.00	1.183		3.00	0.00	0.00	0	0.00
152.32	0.00505					.000365	0.06			1.061			0.00		
1341.70	1504.88	6.051	1510.931	13.8	1.95	0.059	1510.990	0.00	1.183		3.00	0.00	0.00	0	0.00
JUNCT STR	0.00500					.000461	0.00						0.00		
1345.70	1504.90	6.033	1510.933	10.5	2.14	0.071	1511.004	0.00	1.084		2.50	0.00	0.00	0	0.00
137.37	0.00495					.000558	0.08			1.000			0.00		
1483.07	1505.58	5.430	1511.010	10.5	2.14	0.071	1511.081	0.00	1.084		2.50	0.00	0.00	0	0.00
17.67	0.00509					.000558	0.01			0.990			0.00		
1500.74	1505.67	5.360	1511.030	10.5	2.14	0.071	1511.101	0.00	1.084		2.50	0.00	0.00	0	0.00
10.27	0.00487					.000558	0.01			1.001			0.00		
1511.01	1505.72	5.316	1511.036	10.5	2.14	0.071	1511.107	0.00	1.084		2.50	0.00	0.00	0	

0.00□

FIRST MARCH LOGISTICS
LINE "B"
100-YR





N O T E S

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2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

DATE: 11/ 3/2021
TIME: 8:56

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	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	18	4			1.50														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

PUBLIC STORM DRAIN

HEADING LINE NO 2 IS -

IN WESTERN WAY

HEADING LINE NO 3 IS -

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	4395.74	1491.41	18	1496.00

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	4695.92	1492.91	18	0.013	0.00	0.00	0.00	0

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	4699.92	1492.93	18	0.013	0.00	0.00	0.00	1

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	5000.10	1494.43	18	0.013	0.00	0.00	0.00	0

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	5004.10	1494.45	18	0.013	0.00	0.00	0.00	1

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	5280.73	1495.83	18	0.013	0.00	0.00	0.00	0

ELEMENT NO 7 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	5304.29	1495.95	18	0.013	22.50	60.00	0.00	0

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	5308.29	1495.97	18	0.013	0.00	0.00	0.00	1

ELEMENT NO 9 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	5419.72	1496.53	18	0.013	0.00	0.00	0.00	0

ELEMENT NO 10 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	5419.72	1496.53	18	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: THIENES ENGINEERING F0515P PAGE 1
WATER SURFACE PROFILE LISTING

PUBLIC STORM DRAIN
IN WESTERN WAY

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
4395.74	1491.41	4.590	1496.000	1.8	1.02	0.016	1496.016	0.00	0.505	1.50	0.00	0.00	0	0.00
300.18	0.00500					.000294	0.09		0.500			0.00		
4695.92	1492.91	3.178	1496.088	1.8	1.02	0.016	1496.104	0.00	0.505	1.50	0.00	0.00	0	0.00
4.00	0.00500					.000294	0.00		0.500			0.00		
4699.92	1492.93	3.160	1496.090	1.8	1.02	0.016	1496.106	0.00	0.505	1.50	0.00	0.00	0	0.00
300.18	0.00500					.000294	0.09		0.500			0.00		
5000.10	1494.43	1.748	1496.178	1.8	1.02	0.016	1496.194	0.00	0.505	1.50	0.00	0.00	0	0.00
4.00	0.00500					.000294	0.00		0.500			0.00		

5004.10	1494.45	1.730	1496.180	1.8	1.02	0.016	1496.196	0.00	0.505		1.50	0.00	0.00	0	0.00
49.04	0.00499					.000290	0.01			0.500			0.00		
5053.14	1494.69	1.500	1496.195	1.8	1.02	0.016	1496.211	0.00	0.505		1.50	0.00	0.00	0	0.00
29.10	0.00499					.000272	0.01			0.500			0.00		
5082.24	1494.84	1.360	1496.200	1.8	1.07	0.018	1496.218	0.00	0.505		1.50	0.00	0.00	0	0.00
16.56	0.00499					.000266	0.00			0.500			0.00		
5098.80	1494.92	1.280	1496.202	1.8	1.12	0.020	1496.222	0.00	0.505		1.50	0.00	0.00	0	0.00
13.84	0.00499					.000288	0.00			0.500			0.00		
5112.64	1494.99	1.213	1496.205	1.8	1.17	0.021	1496.226	0.00	0.505		1.50	0.00	0.00	0	0.00
11.96	0.00499					.000317	0.00			0.500			0.00		
5124.60	1495.05	1.155	1496.206	1.8	1.23	0.024	1496.230	0.00	0.505		1.50	0.00	0.00	0	0.00
10.91	0.00499					.000352	0.00			0.500			0.00		
5135.51	1495.11	1.102	1496.208	1.8	1.29	0.026	1496.234	0.00	0.505		1.50	0.00	0.00	0	0.00
9.88	0.00499					.000392	0.00			0.500			0.00		

PUBLIC STORM DRAIN
IN WESTERN WAY

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
5145.39	1495.15	1.054	1496.209	1.8	1.36	0.029	1496.238	0.00	0.505		1.50	0.00	0.00	0	0.00
9.05	0.00499					.000440	0.00			0.500			0.00		
5154.44	1495.20	1.010	1496.210	1.8	1.42	0.031	1496.241	0.00	0.505		1.50	0.00	0.00	0	0.00
8.64	0.00499					.000494	0.00			0.500			0.00		
5163.08	1495.24	0.968	1496.211	1.8	1.49	0.035	1496.246	0.00	0.505		1.50	0.00	0.00	0	0.00
8.02	0.00499					.000556	0.00			0.500			0.00		
5171.10	1495.28	0.929	1496.212	1.8	1.56	0.038	1496.250	0.00	0.505		1.50	0.00	0.00	0	0.00
7.38	0.00499					.000627	0.00			0.500			0.00		
5178.48	1495.32	0.893	1496.213	1.8	1.64	0.042	1496.255	0.00	0.505		1.50	0.00	0.00	0	0.00
7.20	0.00499					.000708	0.01			0.500			0.00		
5185.68	1495.36	0.858	1496.214	1.8	1.72	0.046	1496.260	0.00	0.505		1.50	0.00	0.00	0	0.00
6.55	0.00499					.000802	0.01			0.500			0.00		
5192.23	1495.39	0.826	1496.215	1.8	1.81	0.051	1496.266	0.00	0.505		1.50	0.00	0.00	0	0.00
6.36	0.00499					.000909	0.01			0.500			0.00		
5198.59	1495.42	0.795	1496.215	1.8	1.89	0.056	1496.271	0.00	0.505		1.50	0.00	0.00	0	0.00
6.17	0.00499					.001031	0.01			0.500			0.00		
5204.76	1495.45	0.765	1496.216	1.8	1.98	0.061	1496.277	0.00	0.505		1.50	0.00	0.00	0	0.00
5.73	0.00499					.001170	0.01			0.500			0.00		
5210.49	1495.48	0.737	1496.217	1.8	2.08	0.067	1496.284	0.00	0.505		1.50	0.00	0.00	0	0.00
5.54	0.00499					.001329	0.01			0.500			0.00		
5216.03	1495.51	0.710	1496.217	1.8	2.18	0.074	1496.291	0.00	0.505		1.50	0.00	0.00	0	0.00
5.34	0.00499					.001510	0.01			0.500			0.00		

PUBLIC STORM DRAIN
IN WESTERN WAY

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
5221.37	1495.53	0.684	1496.218	1.8	2.29	0.081	1496.299	0.00	0.505		1.50	0.00	0.00	0	0.00
4.85	0.00499					.001718	0.01			0.500			0.00		

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
5226.22	1495.56	0.660	1496.218	1.8	2.40	0.090	1496.308	0.00	0.505		1.50	0.00	0.00	0	0.00
4.96	0.00499					.001954	0.01			0.500			0.00		
5231.18	1495.58	0.636	1496.219	1.8	2.52	0.098	1496.317	0.00	0.505		1.50	0.00	0.00	0	0.00
4.39	0.00499					.002225	0.01			0.500			0.00		
5235.57	1495.61	0.614	1496.219	1.8	2.64	0.108	1496.327	0.00	0.505		1.50	0.00	0.00	0	0.00
4.55	0.00499					.002535	0.01			0.500			0.00		
5240.12	1495.63	0.592	1496.220	1.8	2.77	0.119	1496.339	0.00	0.505		1.50	0.00	0.00	0	0.00
3.85	0.00499					.002889	0.01			0.500			0.00		
5243.97	1495.65	0.572	1496.219	1.8	2.91	0.131	1496.350	0.00	0.505		1.50	0.00	0.00	0	0.00
4.06	0.00499					.003295	0.01			0.500			0.00		
5248.03	1495.67	0.552	1496.219	1.8	3.05	0.144	1496.363	0.00	0.505		1.50	0.00	0.00	0	0.00
3.71	0.00499					.003757	0.01			0.500			0.00		
5251.74	1495.68	0.533	1496.218	1.8	3.20	0.159	1496.377	0.00	0.505		1.50	0.00	0.00	0	0.00
4.44	0.00499					.004302	0.02			0.500			0.00		
5256.18	1495.71	0.514	1496.221	1.8	3.36	0.175	1496.396	0.00	0.505		1.50	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
5256.18	1495.71	0.500	1496.207	1.8	3.49	0.189	1496.396	0.00	0.505		1.50	0.00	0.00	0	0.00
24.55	0.00499					.005109	0.13			0.500			0.00		
5280.73	1495.83	0.500	1496.330	1.8	3.49	0.189	1496.519	0.00	0.505		1.50	0.00	0.00	0	0.00
23.56	0.00509					.005109	0.12			0.500			0.00		

□

WATER SURFACE PROFILE LISTING

PUBLIC STORM DRAIN
IN WESTERN WAY

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
5304.29	1495.95	0.500	1496.450	1.8	3.49	0.189	1496.639	0.00	0.505		1.50	0.00	0.00	0	0.00
4.00	0.00500					.005109	0.02			0.500			0.00		
5308.29	1495.97	0.500	1496.470	1.8	3.49	0.189	1496.659	0.00	0.505		1.50	0.00	0.00	0	0.00
98.87	0.00503					.005109	0.51			0.500			0.00		
5407.16	1496.47	0.500	1496.967	1.8	3.49	0.189	1497.156	0.00	0.505		1.50	0.00	0.00	0	0.00
12.56	0.00503					.005014	0.06			0.500			0.00		
5419.72	1496.53	0.505	1497.035	1.8	3.44	0.184	1497.219	0.00	0.505		1.50	0.00	0.00	0	0.00□

PUBLIC STORM DRAIN
IN WESTERN WAY

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              .   .   .   .   .   .   .   .   .   .   .   .
  4395.74   .I     C         H                             X                        .   R
  4409.77   .                                                                       .
  4423.79   .                                                                       .
  4437.82   .                                                                       .
  4451.85   .                                                                       .
  4465.88   .                                                                       .
  4479.90   .                                                                       .
  4493.93   .                                                                       .
  4507.96   .                                                                       .
  4521.98   .                                                                       .
  4536.01   .                                                                       .
  4550.04   .                                                                       .
  4564.07   .                                                                       .
  4578.09   .                                                                       .
  4592.12   .                                                                       .
  4606.15   .                                                                       .
  4620.17   .                                                                       .
  4634.20   .                                                                       .
  4648.23   .                                                                       .
  4662.26   .                                                                       .
  4676.28   .                                                                       .
  4690.31   .                                                                       .
  4704.34   .             I     C          H               X                        .   R
  4718.36   .             I     C          H               X                        .   R
  4732.39   .                                                                       .
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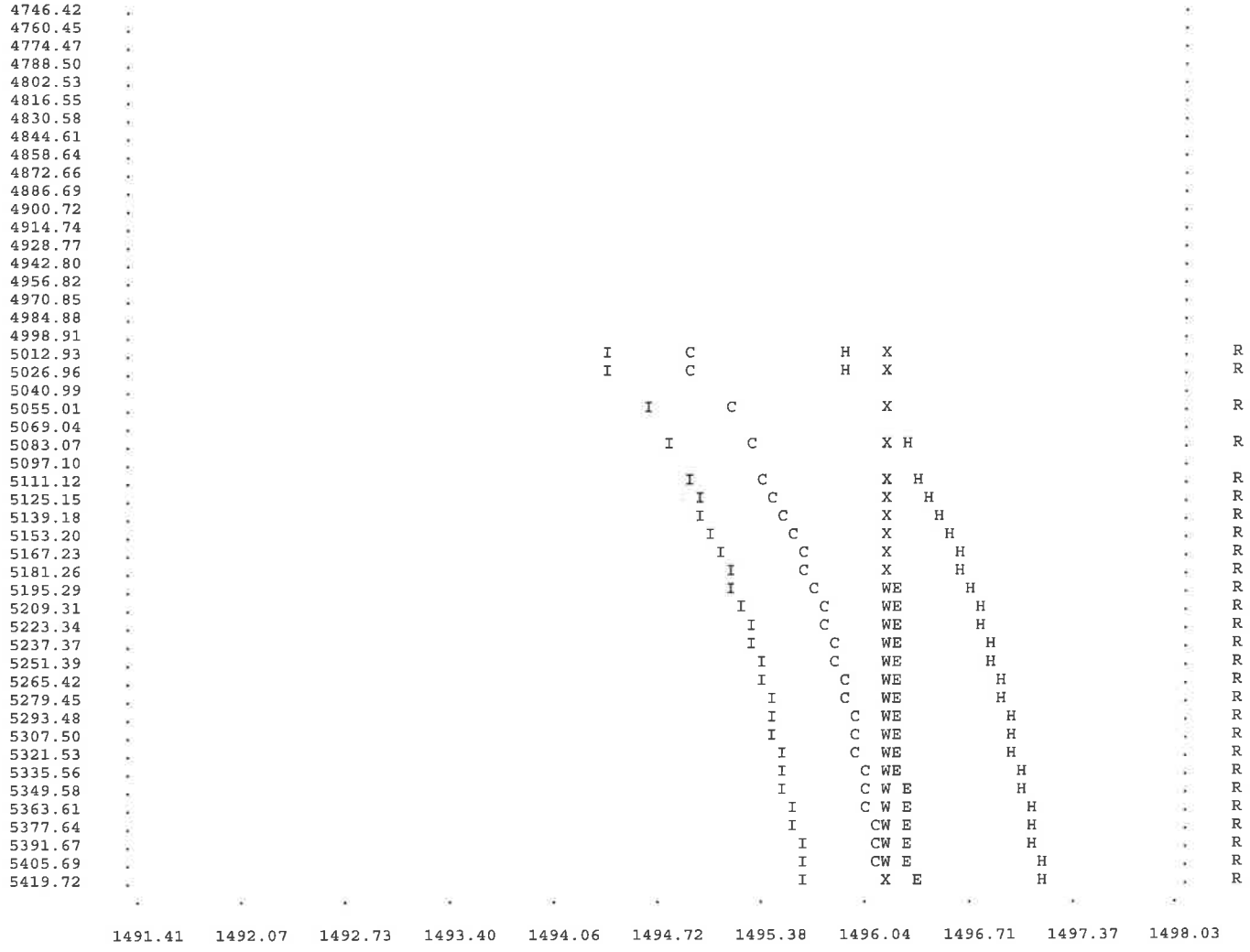

N O T E S

1. GLOSSARY
   - I = INVERT ELEVATION
   - C = CRITICAL DEPTH
   - W = WATER SURFACE ELEVATION
   - H = HEIGHT OF CHANNEL
   - E = ENERGY GRADE LINE
   - X = CURVES CROSSING OVER
   - B = BRIDGE ENTRANCE OR EXIT
   - Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

PHASE 2 (ULTIMATE CONDITION)

DATE: 11/ 1/2021
TIME: 8:48

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	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	3	1	1.00	4.00	13.00	0.00	0.00	0.00										
CD	2	3	1	1.00	3.00	13.00	0.00	0.00	0.00										
CD	12	4			1.00														
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														
CD	66	4			5.50														
CD	72	4			6.00														
CD	78	4			6.50														
CD	84	4			7.00														
CD	90	4			7.50														
CD	96	4			8.00														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

NATWAR - PERRIS

HEADING LINE NO 2 IS - Public

LINE A - PHASE 2

HEADING LINE NO 3 IS -

HYDRAULIC ANALYSIS - 100-YEAR

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	797.84	1487.43	84	1495.80

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	993.16	1494.39	84	0.013	0.00	0.00	0.00	0

ELEMENT NO 3 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	997.82	1494.55	84	0.013	0.00	0.00	0.00	1

ELEMENT NO 4 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1206.51	1495.18	84	0.013	0.00	0.00	0.00	0

ELEMENT NO 5 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1206.51	1495.18	84	24	0	0.013	18.8	0.0	1496.55	0.00	90.00	0.00

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 6 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1293.59	1495.44	84	0.013	0.00	0.00	0.00	0

ELEMENT NO 7 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1298.25	1495.45	84	0.013	0.00	0.00	0.00	1

ELEMENT NO 8 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1546.70	1496.20	84	0.013	0.00	0.00	0.00	0

ELEMENT NO 9 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1551.37	1496.21	84	0.013	0.00	0.00	0.00	1

ELEMENT NO 10 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1777.68	1496.89	84	0.013	0.00	0.00	0.00	0

ELEMENT NO 11 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1782.34	1496.90	84	0.013	0.00	0.00	0.00	1

ELEMENT NO 12 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1882.81	1497.21	84	0.013	0.00	0.00	0.00	0

WATER SURFACE PROFILE - ELEMENT CARD LISTING

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
	1882.81	1497.21	84	30	0	0.013	28.4	0.0	1499.49	0.00	90.00	0.00

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 14 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2052.93	1497.72	84	0.013	0.00	0.00	0.00	0

ELEMENT NO 15 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2057.60	1497.73	84	0.013	0.00	0.00	0.00	1

ELEMENT NO 16 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2306.04	1498.48	84	0.013	0.00	0.00	0.00	0

ELEMENT NO 17 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2311.46	1498.49	84	0.013	0.00	0.00	0.00	1

ELEMENT NO 18 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2525.32	1499.13	84	0.013	0.00	0.00	0.00	0

ELEMENT NO 19 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2560.66	1499.24	84	0.013	0.00	89.98	0.00	0

ELEMENT NO 20 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	2575.66	1499.28	1	24	0	0.014	23.6	0.0	1500.45	0.00	45.00	0.00

ELEMENT NO 21 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2875.66	1500.18	1	0.014	0.00	0.00	0.00	1

ELEMENT NO 22 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3175.66	1501.08	1	0.014	0.00	0.00	0.00	1

ELEMENT NO 23 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3234.77	1502.74	1	0.014	0.00	0.00	0.00	0□

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PAGE NO 4

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 24 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3242.35	1502.95	1	0.014	0.00	19.45	0.00	0

ELEMENT NO 25 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3302.86	1504.65	1	0.014	0.00	0.00	0.00	1

ELEMENT NO 26 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3330.71	1506.97	1	0.014	0.00	70.92	0.00	0

ELEMENT NO 27 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3354.72	1508.96	1	0.014	0.00	0.00	0.00	0

ELEMENT NO 28 IS A TRANSITION

U/S DATA	STATION	INVERT	SECT	N
	3356.00	1509.01	2	0.014

ELEMENT NO 29 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3449.50	1509.12	2	0.014	0.00	0.00	0.00	0

ELEMENT NO 30 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	3449.50	1509.12	2	24	24	0.014	2.8	1.2	1509.47	1509.47	90.00	90.00

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 31 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3543.00	1509.23	2	0.014	0.00	0.00	0.00	0

ELEMENT NO 32 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT	W S ELEV
	3543.00	1509.23	2	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC □
LICENSEE: THIENES ENGINEERING F0515P PAGE 1

WATER SURFACE PROFILE LISTING

NATWAR - PERRIS
LINE A - PHASE 1
HYDRAULIC ANALYSIS - 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO				SF AVE	HF		NORM DEPTH				ZR		

797.84	1487.43	8.370	1495.800	267.5	6.95	0.750	1496.550	0.00	4.294		7.00	0.00	0.00	0	0.00
40.44	0.03563					.001744	0.07			2.240			0.00		
838.28	1488.87	7.000	1495.871	267.5	6.95	0.750	1496.621	0.00	4.294		7.00	0.00	0.00	0	0.00
3.41	0.03563					.001658	0.01			2.240			0.00		
841.69	1488.99	6.877	1495.869	267.5	6.98	0.756	1496.625	0.00	4.294		7.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
841.69	1488.99	2.556	1491.548	267.5	21.04	6.872	1498.420	0.00	4.294		7.00	0.00	0.00	0	0.00
27.75	0.03563					.020562	0.57			2.240			0.00		
869.44	1489.98	2.628	1492.609	267.5	20.26	6.373	1498.982	0.00	4.294		7.00	0.00	0.00	0	0.00
27.94	0.03563					.018300	0.51			2.240			0.00		
897.38	1490.98	2.723	1493.700	267.5	19.32	5.794	1499.494	0.00	4.294		7.00	0.00	0.00	0	0.00
21.90	0.03563					.016056	0.35			2.240			0.00		
919.28	1491.76	2.821	1494.578	267.5	18.42	5.267	1499.845	0.00	4.294		7.00	0.00	0.00	0	0.00
17.44	0.03563					.014091	0.25			2.240			0.00		
936.72	1492.38	2.924	1495.303	267.5	17.56	4.788	1500.091	0.00	4.294		7.00	0.00	0.00	0	0.00
14.08	0.03563					.012375	0.17			2.240			0.00		
950.80	1492.88	3.032	1495.912	267.5	16.74	4.353	1500.265	0.00	4.294		7.00	0.00	0.00	0	0.00
11.45	0.03563					.010872	0.12			2.240			0.00		
962.25	1493.29	3.144	1496.433	267.5	15.96	3.957	1500.390	0.00	4.294		7.00	0.00	0.00	0	0.00
9.31	0.03563					.009556	0.09			2.240			0.00		
971.56	1493.62	3.261	1496.881	267.5	15.22	3.597	1500.478	0.00	4.294		7.00	0.00	0.00	0	0.00
7.50	0.03563					.008405	0.06			2.240			0.00		

NATWAR - PERRIS
LINE A - PHASE 1
HYDRAULIC ANALYSIS - 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
979.06	1493.89	3.384	1497.271	267.5	14.51	3.271	1500.542	0.00	4.294		7.00	0.00	0.00	0	0.00
5.99	0.03563					.007397	0.04			2.240			0.00		
985.05	1494.10	3.512	1497.613	267.5	13.84	2.973	1500.586	0.00	4.294		7.00	0.00	0.00	0	0.00
4.65	0.03563					.006514	0.03			2.240			0.00		
989.70	1494.27	3.647	1497.914	267.5	13.19	2.703	1500.617	0.00	4.294		7.00	0.00	0.00	0	0.00
3.46	0.03563					.005742	0.02			2.240			0.00		
993.16	1494.39	3.789	1498.179	267.5	12.58	2.457	1500.636	0.00	4.294		7.00	0.00	0.00	0	0.00
0.53	0.03433					.005321	0.00			2.262			0.00		
993.69	1494.41	3.815	1498.223	267.5	12.47	2.415	1500.638	0.00	4.294		7.00	0.00	0.00	0	0.00
2.33	0.03433					.004953	0.01			2.262			0.00		
996.02	1494.49	3.966	1498.454	267.5	11.89	2.196	1500.650	0.00	4.294		7.00	0.00	0.00	0	0.00
1.39	0.03433					.004376	0.01			2.262			0.00		
997.41	1494.54	4.124	1498.660	267.5	11.34	1.996	1500.656	0.00	4.294		7.00	0.00	0.00	0	0.00
0.41	0.03433					.003869	0.00			2.262			0.00		
997.82	1494.55	4.294	1498.844	267.5	10.81	1.814	1500.658	0.00	4.294		7.00	0.00	0.00	0	0.00
32.50	0.00302					.003426	0.11			4.574			0.00		
1030.32	1494.65	4.472	1499.120	267.5	10.30	1.649	1500.769	0.00	4.294		7.00	0.00	0.00	0	0.00
176.19	0.00302					.003122	0.55			4.574			0.00		
1206.51	1495.18	4.572	1499.752	267.5	10.05	1.567	1501.319	0.00	4.294		7.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.002385	0.00						0.00		
1206.51	1495.18	5.348	1500.528	248.7	7.88	0.965	1501.493	0.00	4.134		7.00	0.00	0.00	0	0.00

87.08	0.00299					.001814	0.16			4.367			0.00			

□

WATER SURFACE PROFILE LISTING

NATWAR - PERRIS
LINE A - PHASE 1
HYDRAULIC ANALYSIS - 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1293.59	1495.44	5.181	1500.621	248.7	8.14	1.030	1501.651	0.00	4.134		7.00	0.00	0.00	0	0.00
4.66	0.00215					.001881	0.01			4.914			0.00		
1298.25	1495.45	5.179	1500.629	248.7	8.15	1.030	1501.659	0.00	4.134		7.00	0.00	0.00	0	0.00
121.04	0.00302					.001992	0.24			4.351			0.00		
1419.29	1495.82	4.952	1500.767	248.7	8.54	1.133	1501.900	0.00	4.134		7.00	0.00	0.00	0	0.00
122.66	0.00302					.002231	0.27			4.351			0.00		
1541.95	1496.19	4.742	1500.928	248.7	8.96	1.247	1502.175	0.00	4.134		7.00	0.00	0.00	0	0.00
4.75	0.00302					.002365	0.01			4.351			0.00		
1546.70	1496.20	4.735	1500.935	248.7	8.98	1.252	1502.187	0.00	4.134		7.00	0.00	0.00	0	0.00
4.67	0.00214					.002368	0.01			4.918			0.00		
1551.37	1496.21	4.737	1500.947	248.7	8.97	1.250	1502.197	0.00	4.134		7.00	0.00	0.00	0	0.00
143.17	0.00300					.002514	0.36			4.357			0.00		
1694.54	1496.64	4.542	1501.182	248.7	9.41	1.375	1502.557	0.00	4.134		7.00	0.00	0.00	0	0.00
83.14	0.00300					.002732	0.23			4.357			0.00		
1777.68	1496.89	4.461	1501.351	248.7	9.61	1.433	1502.784	0.00	4.134		7.00	0.00	0.00	0	0.00
4.66	0.00215					.002792	0.01			4.914			0.00		
1782.34	1496.90	4.473	1501.373	248.7	9.58	1.424	1502.797	0.00	4.134		7.00	0.00	0.00	0	0.00
100.47	0.00309					.002870	0.29			4.319			0.00		
1882.81	1497.21	4.380	1501.590	248.7	9.82	1.496	1503.086	0.00	4.134		7.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.002158	0.00						0.00		
1882.81	1497.21	5.370	1502.580	220.3	6.95	0.751	1503.331	0.00	3.880		7.00	0.00	0.00	0	0.00
107.69	0.00300					.001436	0.15			4.029			0.00		

□

WATER SURFACE PROFILE LISTING

NATWAR - PERRIS
LINE A - PHASE 1
HYDRAULIC ANALYSIS - 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1990.50	1497.53	5.127	1502.660	220.3	7.29	0.826	1503.486	0.00	3.880		7.00	0.00	0.00	0	0.00
62.43	0.00300					.001566	0.10			4.029			0.00		
2052.93	1497.72	4.988	1502.708	220.3	7.51	0.876	1503.584	0.00	3.880		7.00	0.00	0.00	0	0.00
4.67	0.00214					.001622	0.01			4.503			0.00		
2057.60	1497.73	4.984	1502.714	220.3	7.52	0.877	1503.591	0.00	3.880		7.00	0.00	0.00	0	0.00
95.81	0.00302					.001722	0.16			4.020			0.00		
2153.41	1498.02	4.772	1502.791	220.3	7.88	0.965	1503.756	0.00	3.880		7.00	0.00	0.00	0	0.00
93.49	0.00302					.001933	0.18			4.020			0.00		
2246.90	1498.30	4.574	1502.876	220.3	8.27	1.061	1503.937	0.00	3.880		7.00	0.00	0.00	0	0.00
59.14	0.00302					.002128	0.13			4.020			0.00		
2306.04	1498.48	4.455	1502.935	220.3	8.52	1.128	1504.063	0.00	3.880		7.00	0.00	0.00	0	0.00
5.42	0.00185					.002205	0.01			4.748			0.00		
2311.46	1498.49	4.460	1502.950	220.3	8.51	1.125	1504.075	0.00	3.880		7.00	0.00	0.00	0	0.00
100.43	0.00299					.002343	0.24			4.031			0.00		
2411.89	1498.79	4.282	1503.073	220.3	8.93	1.238	1504.311	0.00	3.880		7.00	0.00	0.00	0	0.00

113.43	0.00299					.002632	0.30			4.031			0.00			
2525.32	1499.13	4.128	1503.258	220.3	9.33	1.352	1504.610	0.00	3.880		7.00	0.00	0.00	0	0.00	
35.34	0.00311					.002834	0.10			3.981			0.00			
2560.66	1499.24	4.077	1503.317	220.3	9.47	1.393	1504.710	0.00	3.880		7.00	0.00	0.00	0	0.00	
JUNCT STR	0.00267					.002280	0.03						0.00			
2575.66	1499.28	5.197	1504.477	196.7	4.14	0.266	1504.743	0.00	2.029		4.00	13.00	0.00	1	1.00	
300.00	0.00300					.001210	0.36			2.347			0.00			

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WATER SURFACE PROFILE LISTING

NATWAR - PERRIS
LINE A - PHASE 1
HYDRAULIC ANALYSIS - 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
2875.66	1500.18	4.674	1504.854	196.7	4.14	0.266	1505.120	0.00	2.029		4.00	13.00	0.00	1	1.00
300.00	0.00300					.001210	0.36			2.347			0.00		
3175.66	1501.08	4.150	1505.230	196.7	4.14	0.266	1505.496	0.00	2.029		4.00	13.00	0.00	1	1.00
5.59	0.02808					.001210	0.01			1.076			0.00		
3181.25	1501.24	4.000	1505.237	196.7	4.14	0.266	1505.503	0.00	2.029		4.00	13.00	0.00	1	1.00
5.86	0.02808					.000787	0.00			1.076			0.00		
3187.11	1501.40	3.813	1505.215	196.7	4.30	0.287	1505.502	0.00	2.029		4.00	13.00	0.00	1	1.00
5.47	0.02808					.000876	0.00			1.076			0.00		
3192.58	1501.56	3.635	1505.190	196.7	4.51	0.316	1505.506	0.00	2.029		4.00	13.00	0.00	1	1.00
2.88	0.02808					.000963	0.00			1.076			0.00		
3195.46	1501.64	3.542	1505.178	196.7	4.63	0.333	1505.511	0.00	2.029		4.00	13.00	0.00	1	1.00
HYDRAULIC JUMP													0.00		
3195.46	1501.64	1.029	1502.665	196.7	15.92	3.937	1506.602	0.00	2.029		4.00	13.00	0.00	1	1.00
39.31	0.02808					.033304	1.31			1.076			0.00		
3234.77	1502.74	1.005	1503.745	196.7	16.32	4.134	1507.879	0.00	2.029		4.00	13.00	0.00	1	1.00
7.58	0.02770					.034916	0.26			1.081			0.00		
3242.35	1502.95	0.997	1503.947	196.7	16.44	4.197	1508.144	0.00	2.029		4.00	13.00	0.00	1	1.00
32.84	0.02809					.037575	1.23			1.076			0.00		
3275.19	1503.87	0.958	1504.831	196.7	17.11	4.548	1509.379	0.00	2.029		4.00	13.00	0.00	1	1.00
27.67	0.02809					.042919	1.19			1.076			0.00		
3302.86	1504.65	0.913	1505.563	196.7	17.95	5.002	1510.565	0.00	2.029		4.00	13.00	0.00	1	1.00
6.52	0.08330					.044073	0.29			0.751			0.00		

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WATER SURFACE PROFILE LISTING

NATWAR - PERRIS
LINE A - PHASE 1
HYDRAULIC ANALYSIS - 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
3309.38	1505.19	0.940	1506.133	196.7	17.44	4.721	1510.854	0.00	2.029		4.00	13.00	0.00	1	1.00
8.72	0.08330					.039331	0.34			0.751			0.00		
3318.10	1505.92	0.986	1506.906	196.7	16.62	4.291	1511.197	0.00	2.029		4.00	13.00	0.00	1	1.00
6.95	0.08330					.034085	0.24			0.751			0.00		
3325.05	1506.50	1.034	1507.532	196.7	15.85	3.902	1511.434	0.00	2.029		4.00	13.00	0.00	1	1.00
5.66	0.08330					.029556	0.17			0.751			0.00		
3330.71	1506.97	1.085	1508.055	196.7	15.11	3.547	1511.602	0.00	2.029		4.00	13.00	0.00	1	1.00
1.58	0.08288					.026871	0.04			0.753			0.00		

3332.29	1507.10	1.101	1508.202	196.7	14.89	3.444	1511.646	0.00	2.029		4.00	13.00	0.00	1	1.00
4.44	0.08288					.024552	0.11			0.753			0.00		
3336.73	1507.47	1.154	1508.623	196.7	14.20	3.132	1511.755	0.00	2.029		4.00	13.00	0.00	1	1.00
3.71	0.08288					.021319	0.08			0.753			0.00		
3340.44	1507.78	1.211	1508.988	196.7	13.54	2.847	1511.835	0.00	2.029		4.00	13.00	0.00	1	1.00
3.10	0.08288					.018522	0.06			0.753			0.00		
3343.54	1508.03	1.270	1509.304	196.7	12.91	2.588	1511.892	0.00	2.029		4.00	13.00	0.00	1	1.00
2.60	0.08288					.016102	0.04			0.753			0.00		
3346.14	1508.25	1.332	1509.581	196.7	12.31	2.353	1511.934	0.00	2.029		4.00	13.00	0.00	1	1.00
2.16	0.08288					.014009	0.03			0.753			0.00		
3348.30	1508.43	1.397	1509.825	196.7	11.74	2.139	1511.964	0.00	2.029		4.00	13.00	0.00	1	1.00
1.79	0.08288					.012195	0.02			0.753			0.00		
3350.09	1508.58	1.465	1510.041	196.7	11.19	1.944	1511.985	0.00	2.029		4.00	13.00	0.00	1	1.00
1.45	0.08288					.010622	0.02			0.753			0.00		

WATER SURFACE PROFILE LISTING

NATWAR - PERRIS
LINE A - PHASE 1
HYDRAULIC ANALYSIS - 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
3351.54	1508.70	1.536	1510.233	196.7	10.67	1.768	1512.001	0.00	2.029		4.00	13.00	0.00	1	1.00
1.17	0.08288					.009259	0.01			0.753			0.00		
3352.71	1508.79	1.611	1510.404	196.7	10.17	1.607	1512.011	0.00	2.029		4.00	13.00	0.00	1	1.00
0.90	0.08288					.008077	0.01			0.753			0.00		
3353.61	1508.87	1.690	1510.558	196.7	9.70	1.461	1512.019	0.00	2.029		4.00	13.00	0.00	1	1.00
0.66	0.08288					.007050	0.00			0.753			0.00		
3354.27	1508.92	1.772	1510.695	196.7	9.25	1.328	1512.023	0.00	2.029		4.00	13.00	0.00	1	1.00
0.45	0.08288					.006157	0.00			0.753			0.00		
3354.72	1508.96	1.859	1510.819	196.7	8.82	1.207	1512.026	0.00	2.029		4.00	13.00	0.00	1	1.00
TRANS STR	0.03906					.005120	0.01						0.00		
3356.00	1509.01	2.029	1511.039	196.7	8.08	1.013	1512.052	0.00	2.029		3.00	13.00	0.00	1	1.00
2.27	0.00118					.004211	0.01			3.000			0.00		
3358.27	1509.01	2.128	1511.141	196.7	7.70	0.921	1512.062	0.00	2.029		3.00	13.00	0.00	1	1.00
8.01	0.00118					.003689	0.03			3.000			0.00		
3366.28	1509.02	2.232	1511.254	196.7	7.34	0.838	1512.092	0.00	2.029		3.00	13.00	0.00	1	1.00
15.94	0.00118					.003233	0.05			3.000			0.00		
3382.22	1509.04	2.341	1511.382	196.7	7.00	0.761	1512.143	0.00	2.029		3.00	13.00	0.00	1	1.00
27.12	0.00118					.002836	0.08			3.000			0.00		
3409.34	1509.07	2.455	1511.528	196.7	6.68	0.692	1512.220	0.00	2.029		3.00	13.00	0.00	1	1.00
40.16	0.00118					.002498	0.10			3.000			0.00		
3449.50	1509.12	2.568	1511.688	196.7	6.38	0.633	1512.321	0.00	2.029		3.00	13.00	0.00	1	1.00
JUNCT STR	0.00000					.002198	0.00						0.00		

WATER SURFACE PROFILE LISTING

NATWAR - PERRIS
LINE A - PHASE 1
HYDRAULIC ANALYSIS - 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
3449.50	1509.12	2.658	1511.778	192.7	6.04	0.567	1512.345	0.00	2.001		3.00	13.00	0.00	1	1.00
93.50	0.00118					.001936	0.18			3.000			0.00		

```
  3543.00  1509.23    2.777  1512.007     192.7     5.78    0.519  1512.526    0.00     2.001              3.00   13.00  0.00   1
1.00□

                          NATWAR - PERRIS
                          LINE A - PHASE 1
                          HYDRAULIC ANALYSIS - 100-YEAR


                .         .         .         .         .         .         .          .         .         .         .
     797.84    .I               C          H    W  E                                                                 .    R
     815.33    .                                                                                                     .
     832.81    .                                                                                                     .
     850.30    .     I                C          X  E                                                                .    R
     867.78    .      I               C          X  E                                                                .    R
     885.27    .      I         W     C          H         E                                                         .    R
     902.75    .         I          W     C          H       E                                                       .    R
     920.24    .             I          W     C          H     E                                                     .    R
     937.72    .                I          W     C          H   E                                                    .    R
     955.21    .                   I          W     C         H  E                                                   .    R
     972.69    .                     I           W    C         H E                                                  .    R
     990.18    .                      I            W   C          X                                                  .    R
    1007.66    .                        I            W   C         X                                                 .    R
    1025.15    .                         I            W   C        EH                                                .    R
    1042.63    .                          I            W  C        E H                                               .    R
    1060.12    .                          I              W C       E  H                                              .    R
    1077.60    .                           I              W C      E  H                                              .    R
    1095.09    .                           I              W C      E  H                                              .    R
    1112.57    .                           I               WC      E   H                                             .    R
    1130.06    .                           I               WC      E   H                                             .    R
    1147.54    .                           I                X      E   H                                             .    R
    1165.03    .                            I                X      E  H                                             .    R
    1182.51    .                                                                                                     .
    1200.00    .                                                                                                     .
    1217.48    .                              I                CW     E  H                                           .    JX
    1234.97    .                              I               C    W   E H                                           .    R
    1252.45    .                                                                                                     .
    1269.94    .                                                                                                     .
    1287.42    .                                                                                                     .
    1304.91    .                               I               C   W   E  H                                          .    R
    1322.39    .                               I               C   W   E  H                                          .    R
    1339.88    .                                                                                                     .
    1357.36    .                                                                                                     .
    1374.85    .                                                                                                     .
    1392.33    .                                                                                                     .
    1409.82    .                                                                                                     .
    1427.30    .                                I                C  W   E   H                                        .    R
    1444.79    .                                                                                                     .
    1462.27    .                                                                                                     .
    1479.76    .                                                                                                     .
    1497.24    .                                                                                                     .
    1514.73    .                                                                                                     .
    1532.21    .                                                                                                     .
    1549.70    .                                  I               C W    E   H                                       .    R
    1567.18    .                                  I               C W    E   H                                       .    R
    1584.67    .                                  I               C W    E   H                                       .    R
    1602.15    .                                                                                                     .
    1619.64    .                                                                                                     .
    1637.12    .                                                                                                     .
    1654.61    .                                                                                                     .
    1672.09    .                                                                                                     .
    1689.58    .                                                                                                     .
    1707.06    .                                    I                CW    E   H                                     .    R
    1724.55    .                                                                                                     .
    1742.04    .                                                                                                     .
    1759.52    .                                                                                                     .
    1777.01    .                                                                                                     .
    1794.49    .                                     I                CW    E   H                                    .    R
    1811.98    .                                     I                CW    E   H                                    .    R
    1829.46    .                                                                                                     .
    1846.95    .                                                                                                     .
    1864.43    .                                                                                                     .
    1881.92    .                                                                                                     .
    1899.40    .                                      I                CW    E   H                                   .    JX
    1916.89    .                                      I              C     W  E  H                                   .    R
    1934.37    .                                                                                                     .
    1951.86    .                                                                                                     .
    1969.34    .                                                                                                     .
    1986.83    .                                                                                                     .
    2004.31    .                                       I              C    W  E   H                                  .    R
    2021.80    .                                                                                                     .
    2039.28    .                                                                                                     .
    2056.77    .                                        I              C   W   E   H                                 .    R
    2074.25    .                                        I              C   W   E   H                                 .    R
    2091.74    .                                                                                                     .
    2109.22    .                                                                                                     .
    2126.71    .                                                                                                     .
    2144.19    .                                                                                                     .
    2161.68    .                                         I              C   W  E    H                                .    R
    2179.16    .                                                                                                     .
    2196.65    .                                                                                                     .
    2214.13    .                                                                                                     .
    2231.62    .                                                                                                     .
    2249.10    .                                          I              C  W   E    H                               .    R
    2266.59    .                                                                                                     .
    2284.07    .                                                                                                     .
    2301.56    .                                                                                                     .
    2319.04    .                                           I              C W    E    H                              .    R
    2336.53    .                                           I              C W    E    H                              .    R
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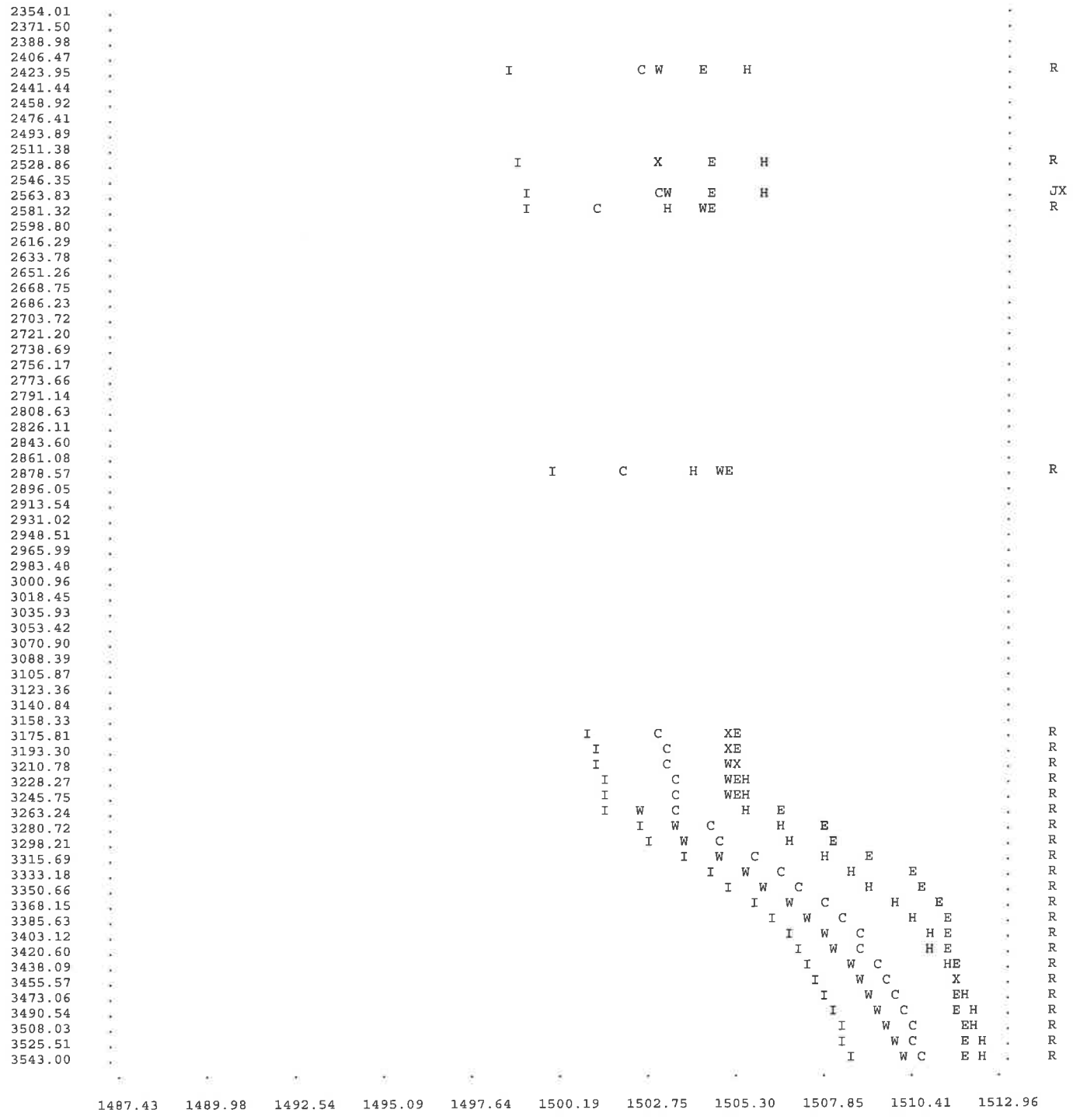


N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

DATE: 11/ 2/2021
TIME: 8:40

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	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	10	4			0.83														
CD	12	4			1.00														
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

FIRST MARCH LOGISTICS

HEADING LINE NO 2 IS -

LINE "A" ONSITE

HEADING LINE NO 3 IS -

100-YEAR

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1003.50	1499.53	36	1502.09

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1076.16	1501.03	36	0.012	0.00	0.00	0.00	0

ELEMENT NO 3 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1080.16	1501.05	36	0.012	0.00	0.00	0.00	1

ELEMENT NO 4 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1086.41	1501.08	36	0.012	0.00	0.00	0.00	0

ELEMENT NO 5 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1090.41	1501.10	36	0.012	0.00	0.00	0.00	1

ELEMENT NO 6 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1253.69	1501.91	36	0.012	0.00	0.00	0.00	0

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
	1253.69	1501.91	36	18	0	0.012	12.2	0.0	1502.85	0.00	90.00	0.00

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 8 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1397.85	1502.63	36	0.012	0.00	0.00	0.00	0

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

ELEMENT NO 9 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1401.85	1502.65	24	0.012	0.00	0.00	0.00	1

ELEMENT NO 10 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1563.63	1503.46	24	0.012	0.00	0.00	0.00	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
	1563.63	1503.46	24	18	0	0.012	4.9	0.0	1503.82	0.00	90.00	0.00

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 12 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1709.05	1504.19	24	0.012	0.00	0.00	0.00	0

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
	1711.77	1504.20	18	18	0	0.012	6.9	0.0	1504.28	0.00	45.00	0.00

ELEMENT NO 14 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1743.82	1504.36	18	0.012	0.00	0.00	0.00	0

ELEMENT NO 15 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1761.49	1504.45	18	0.012	22.50	45.00	0.00	0

ELEMENT NO 16 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1987.42	1505.58	18	0.012	0.00	0.00	0.00	0

ELEMENT NO 17 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1991.42	1505.60	18	0.012	0.00	0.00	0.00	1

ELEMENT NO 18 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2026.76	1505.78	18	0.012	22.50	90.00	0.00	0

ELEMENT NO 19 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2072.45	1506.01	18	0.012	0.00	0.00	0.00	0

ELEMENT NO 20 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT	W S ELEV
	2072.45	1506.01	18	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC □

WATER SURFACE PROFILE LISTING

FIRST MARCH LOGISTICS
LINE "A"
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1003.50	1499.53	2.560	1502.090	28.4	4.42	0.303	1502.393	0.00	1.724	3.00	0.00	0.00	0	0.00
3.45	0.02064					.001484	0.01		1.071			0.00		
1006.95	1499.60	2.480	1502.081	28.4	4.55	0.321	1502.402	0.00	1.724	3.00	0.00	0.00	0	0.00
HYDRAULIC JUMP												0.00		
1006.95	1499.60	1.167	1500.768	28.4	11.17	1.937	1502.705	0.00	1.724	3.00	0.00	0.00	0	0.00
15.14	0.02064					.014443	0.22		1.071			0.00		
1022.09	1499.91	1.194	1501.108	28.4	10.81	1.816	1502.924	0.00	1.724	3.00	0.00	0.00	0	0.00
15.78	0.02064					.012965	0.20		1.071			0.00		
1037.87	1500.24	1.238	1501.478	28.4	10.31	1.651	1503.129	0.00	1.724	3.00	0.00	0.00	0	0.00
11.36	0.02064					.011384	0.13		1.071			0.00		
1049.23	1500.47	1.283	1501.757	28.4	9.83	1.502	1503.259	0.00	1.724	3.00	0.00	0.00	0	0.00
8.31	0.02064					.010000	0.08		1.071			0.00		
1057.54	1500.65	1.331	1501.977	28.4	9.38	1.365	1503.342	0.00	1.724	3.00	0.00	0.00	0	0.00
6.34	0.02064					.008789	0.06		1.071			0.00		
1063.88	1500.78	1.380	1502.156	28.4	8.94	1.241	1503.397	0.00	1.724	3.00	0.00	0.00	0	0.00
4.71	0.02064					.007727	0.04		1.071			0.00		
1068.59	1500.87	1.432	1502.306	28.4	8.52	1.128	1503.434	0.00	1.724	3.00	0.00	0.00	0	0.00
3.50	0.02064					.006799	0.02		1.071			0.00		
1072.09	1500.95	1.486	1502.432	28.4	8.13	1.025	1503.457	0.00	1.724	3.00	0.00	0.00	0	0.00
2.47	0.02064					.005987	0.01		1.071			0.00		
1074.56	1501.00	1.543	1502.540	28.4	7.75	0.932	1503.472	0.00	1.724	3.00	0.00	0.00	0	0.00
1.60	0.02064					.005276	0.01		1.071			0.00		

□

WATER SURFACE PROFILE LISTING

FIRST MARCH LOGISTICS
LINE "A"
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1076.16	1501.03	1.603	1502.633	28.4	7.39	0.848	1503.481	0.00	1.724	3.00	0.00	0.00	0	0.00

4.00	0.00500					.004941	0.02			1.597			0.00		
1080.16	1501.05	1.604	1502.654	28.4	7.38	0.847	1503.501	0.00	1.724		3.00	0.00	0.00	0	0.00
6.25	0.00480					.004953	0.03			1.617			0.00		
1086.41	1501.08	1.601	1502.681	28.4	7.40	0.851	1503.532	0.00	1.724		3.00	0.00	0.00	0	0.00
4.00	0.00500					.004969	0.02			1.597			0.00		
1090.41	1501.10	1.601	1502.701	28.4	7.40	0.851	1503.552	0.00	1.724		3.00	0.00	0.00	0	0.00
102.83	0.00496					.004969	0.51			1.601			0.00		
1193.24	1501.61	1.601	1503.211	28.4	7.40	0.851	1504.062	0.00	1.724		3.00	0.00	0.00	0	0.00
53.96	0.00496					.004704	0.25			1.601			0.00		
1247.20	1501.88	1.657	1503.535	28.4	7.09	0.781	1504.316	0.00	1.724		3.00	0.00	0.00	0	0.00
6.49	0.00496					.004176	0.03			1.601			0.00		
1253.69	1501.91	1.724	1503.634	28.4	6.76	0.709	1504.343	0.00	1.724		3.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.002187	0.00						0.00		
1253.69	1501.91	2.602	1504.512	16.2	2.49	0.096	1504.608	0.00	1.286		3.00	0.00	0.00	0	0.00
28.95	0.00499					.000481	0.01			1.160			0.00		
1282.64	1502.06	2.462	1504.517	16.2	2.61	0.106	1504.623	0.00	1.286		3.00	0.00	0.00	0	0.00
24.49	0.00499					.000527	0.01			1.160			0.00		
1307.13	1502.18	2.342	1504.519	16.2	2.74	0.116	1504.635	0.00	1.286		3.00	0.00	0.00	0	0.00
21.86	0.00499					.000584	0.01			1.160			0.00		
1328.99	1502.29	2.234	1504.520	16.2	2.87	0.128	1504.648	0.00	1.286		3.00	0.00	0.00	0	0.00
19.85	0.00499					.000651	0.01			1.160			0.00		

WATER SURFACE PROFILE LISTING

FIRST MARCH LOGISTICS
LINE "A"
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1348.84	1502.38	2.135	1504.520	16.2	3.01	0.141	1504.661	0.00	1.286		3.00	0.00	0.00	0	0.00
18.03	0.00499					.000728	0.01			1.160			0.00		
1366.87	1502.47	2.044	1504.519	16.2	3.16	0.155	1504.674	0.00	1.286		3.00	0.00	0.00	0	0.00
16.41	0.00499					.000817	0.01			1.160			0.00		
1383.28	1502.56	1.960	1504.517	16.2	3.31	0.170	1504.687	0.00	1.286		3.00	0.00	0.00	0	0.00
14.57	0.00499					.000918	0.01			1.160			0.00		
1397.85	1502.63	1.885	1504.515	16.2	5.28	0.433	1504.948	0.00	1.451		2.00	0.00	0.00	0	0.00
4.00	0.00500					.003776	0.02			1.530			0.00		
1401.85	1502.65	1.878	1504.528	16.2	5.29	0.434	1504.962	0.00	1.451		2.00	0.00	0.00	0	0.00
70.42	0.00501					.003861	0.27			1.530			0.00		
1472.27	1503.00	1.754	1504.757	16.2	5.55	0.478	1505.235	0.00	1.451		2.00	0.00	0.00	0	0.00
54.06	0.00501					.004115	0.22			1.530			0.00		
1526.33	1503.27	1.658	1504.931	16.2	5.82	0.526	1505.457	0.00	1.451		2.00	0.00	0.00	0	0.00
37.30	0.00501					.004424	0.16			1.530			0.00		
1563.63	1503.46	1.602	1505.062	16.2	6.01	0.560	1505.622	0.00	1.451		2.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.003345	0.00						0.00		
1563.63	1503.46	2.204	1505.664	11.3	3.60	0.201	1505.865	0.00	1.206		2.00	0.00	0.00	0	0.00
70.65	0.00502					.002106	0.15			1.173			0.00		
1634.28	1503.82	2.000	1505.815	11.3	3.60	0.201	1506.016	0.00	1.206		2.00	0.00	0.00	0	0.00
54.08	0.00502					.001973	0.11			1.173			0.00		
1688.36	1504.09	1.814	1505.900	11.3	3.77	0.221	1506.121	0.00	1.206		2.00	0.00	0.00	0	0.00
20.69	0.00502					.001903	0.04			1.173			0.00		

WATER SURFACE PROFILE LISTING

FIRST MARCH LOGISTICS
LINE "A"
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1709.05	1504.19	1.734	1505.924	11.3	3.90	0.237	1506.161	0.00	1.206		2.00	0.00	0.00	0	0.00
JUNCT STR	0.00368					.001721	0.00						0.00		
1711.77	1504.20	1.917	1506.117	4.4	2.49	0.096	1506.213	0.00	0.805		1.50	0.00	0.00	0	0.00
32.05	0.00499					.001495	0.05			0.790			0.00		
1743.82	1504.36	1.805	1506.165	4.4	2.49	0.096	1506.261	0.00	0.805		1.50	0.00	0.00	0	0.00
17.67	0.00509					.001495	0.03			0.790			0.00		
1761.49	1504.45	1.755	1506.205	4.4	2.49	0.096	1506.301	0.00	0.805		1.50	0.00	0.00	0	0.00
72.75	0.00500					.001478	0.11			0.790			0.00		
1834.24	1504.81	1.500	1506.314	4.4	2.49	0.096	1506.410	0.00	0.805		1.50	0.00	0.00	0	0.00
35.74	0.00500					.001384	0.05			0.790			0.00		
1869.98	1504.99	1.360	1506.353	4.4	2.61	0.106	1506.459	0.00	0.805		1.50	0.00	0.00	0	0.00
19.02	0.00500					.001353	0.03			0.790			0.00		
1889.00	1505.09	1.280	1506.368	4.4	2.74	0.117	1506.485	0.00	0.805		1.50	0.00	0.00	0	0.00
15.65	0.00500					.001465	0.02			0.790			0.00		
1904.65	1505.17	1.213	1506.379	4.4	2.87	0.128	1506.507	0.00	0.805		1.50	0.00	0.00	0	0.00
13.33	0.00500					.001612	0.02			0.790			0.00		
1917.98	1505.23	1.155	1506.388	4.4	3.01	0.141	1506.529	0.00	0.805		1.50	0.00	0.00	0	0.00
12.11	0.00500					.001789	0.02			0.790			0.00		
1930.09	1505.29	1.102	1506.395	4.4	3.16	0.155	1506.550	0.00	0.805		1.50	0.00	0.00	0	0.00
10.81	0.00500					.001995	0.02			0.790			0.00		
1940.90	1505.35	1.054	1506.401	4.4	3.31	0.170	1506.571	0.00	0.805		1.50	0.00	0.00	0	0.00
9.74	0.00500					.002236	0.02			0.790			0.00		

WATER SURFACE PROFILE LISTING

FIRST MARCH LOGISTICS
LINE "A"
100-YEAR

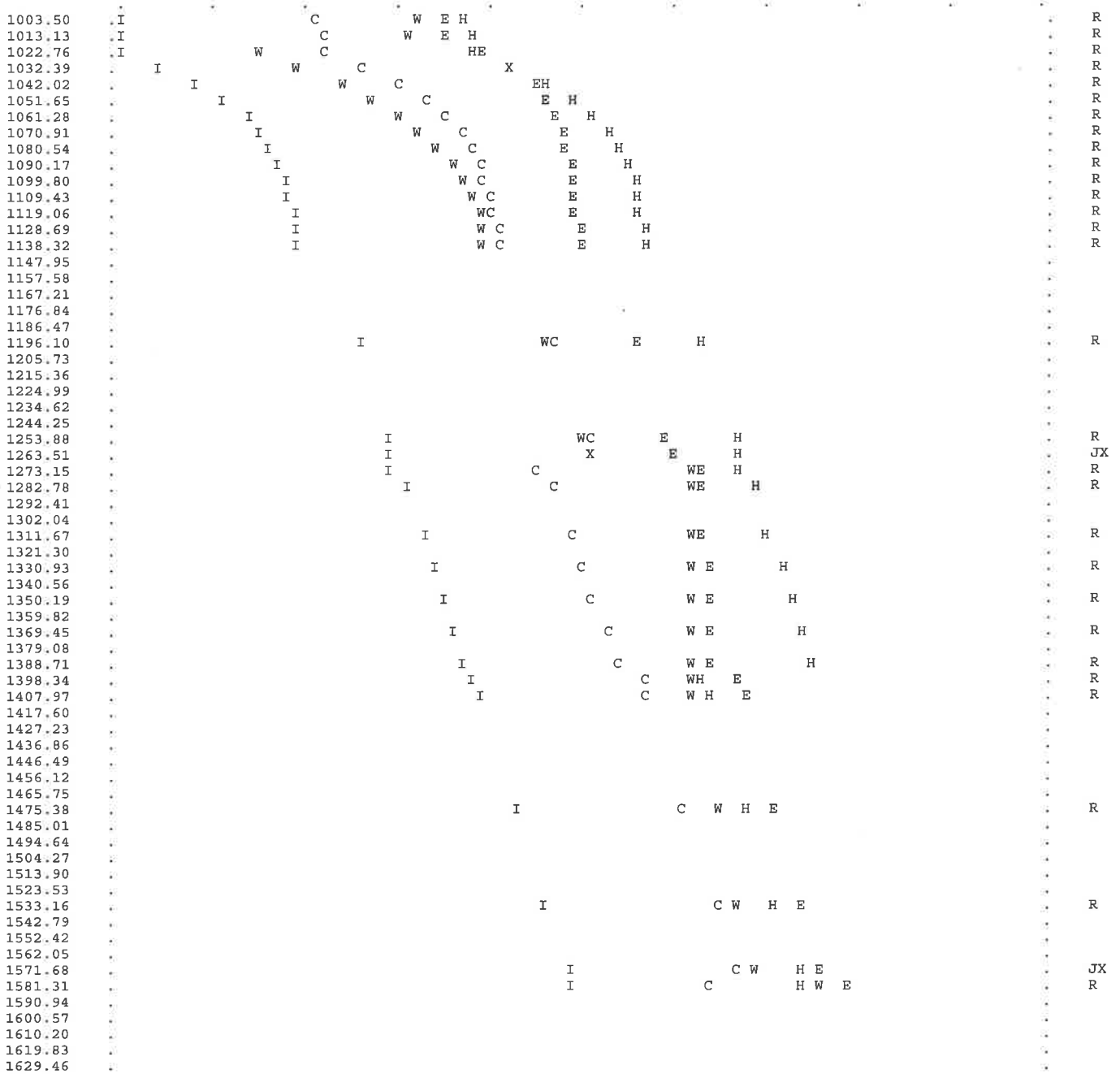
STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1950.64	1505.40	1.010	1506.406	4.4	3.48	0.188	1506.594	0.00	0.805		1.50	0.00	0.00	0	0.00
9.34	0.00500					.002513	0.02			0.790			0.00		
1959.98	1505.44	0.968	1506.411	4.4	3.65	0.206	1506.617	0.00	0.805		1.50	0.00	0.00	0	0.00
8.45	0.00500					.002829	0.02			0.790			0.00		
1968.43	1505.48	0.929	1506.414	4.4	3.82	0.227	1506.641	0.00	0.805		1.50	0.00	0.00	0	0.00
7.35	0.00500					.003193	0.02			0.790			0.00		
1975.78	1505.52	0.893	1506.415	4.4	4.01	0.250	1506.665	0.00	0.805		1.50	0.00	0.00	0	0.00
7.20	0.00500					.003609	0.03			0.790			0.00		
1982.98	1505.56	0.858	1506.416	4.4	4.21	0.275	1506.691	0.00	0.805		1.50	0.00	0.00	0	0.00
4.44	0.00500					.004021	0.02			0.790			0.00		
1987.42	1505.58	0.834	1506.414	4.4	4.36	0.295	1506.709	0.00	0.805		1.50	0.00	0.00	0	0.00
3.56	0.00500					.004467	0.02			0.790			0.00		
1990.98	1505.60	0.805	1506.403	4.4	4.55	0.322	1506.725	0.00	0.805		1.50	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1990.98	1505.60	0.790	1506.388	4.4	4.66	0.337	1506.725	0.00	0.805		1.50	0.00	0.00	0	0.00
0.44	0.00500					.005023	0.00			0.790			0.00		

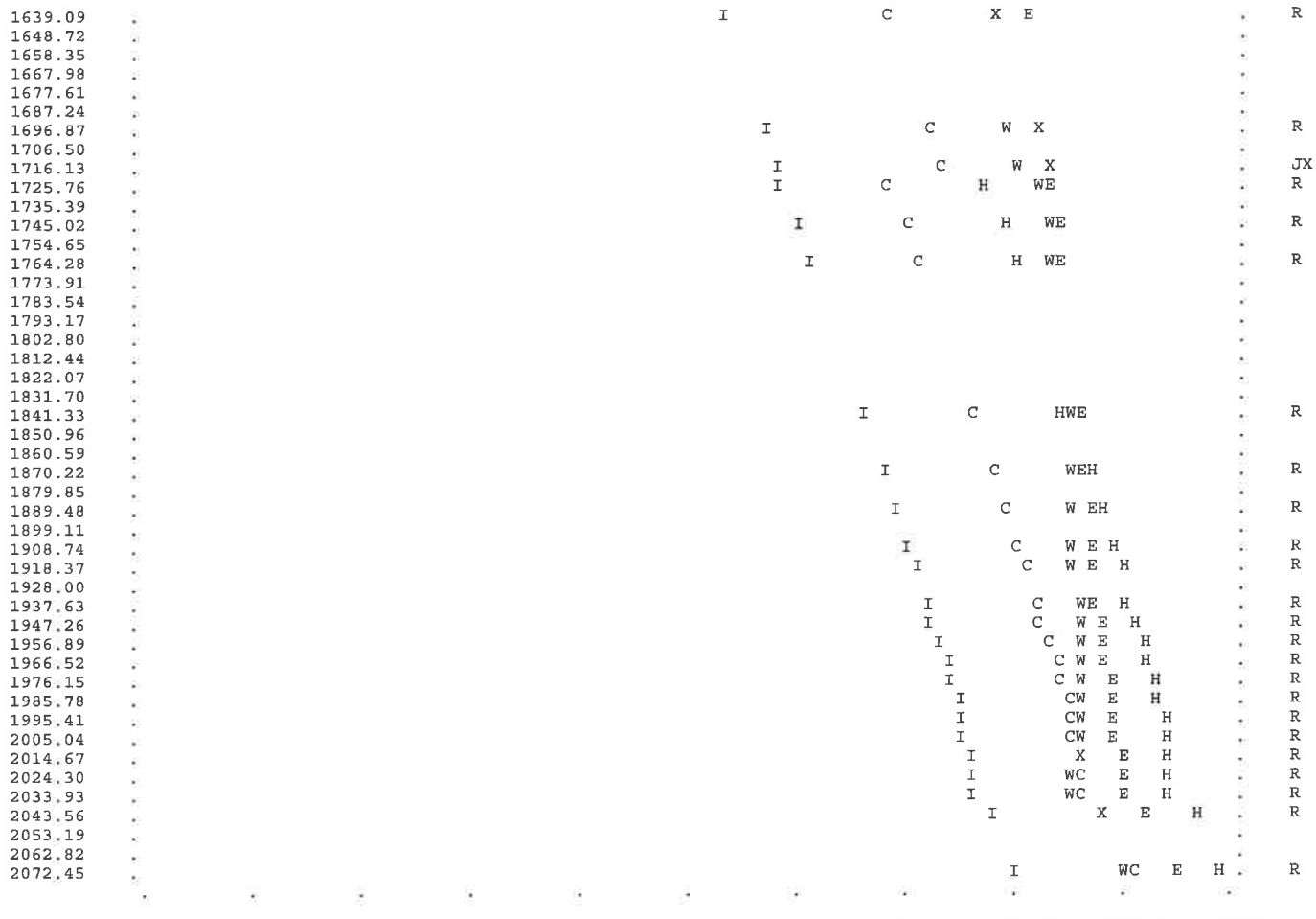
1991.42	1505.60	0.790	1506.390	4.4	4.66	0.337	1506.727	0.00	0.805		1.50	0.00	0.00	0	0.00
35.34	0.00509					.005023	0.18			0.790			0.00		
2026.76	1505.78	0.790	1506.570	4.4	4.66	0.337	1506.907	0.00	0.805		1.50	0.00	0.00	0	0.00
42.30	0.00503					.005023	0.21			0.790			0.00		
2069.06	1505.99	0.790	1506.783	4.4	4.66	0.337	1507.120	0.00	0.805		1.50	0.00	0.00	0	0.00
3.39	0.00503					.004872	0.02			0.790			0.00		

FIRST MARCH LOGISTICS
LINE "A"
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
2072.45	1506.01	0.805	1506.815	4.4	4.55	0.322	1507.137	0.00	0.805	1.50	0.00	0.00	0	
0.00														

FIRST MARCH LOGISTICS
LINE "A"
100-YEAR





N O T E S

1. GLOSSARY
   - I = INVERT ELEVATION
   - C = CRITICAL DEPTH
   - W = WATER SURFACE ELEVATION
   - H = HEIGHT OF CHANNEL
   - E = ENERGY GRADE LINE
   - X = CURVES CROSSING OVER
   - B = BRIDGE ENTRANCE OR EXIT
   - Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

DATE: 11/ 2/2021
TIME: 8: 6

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	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	10	4			0.83														
CD	12	4			1.00														
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

FIRST MARCH LOGISTICS

HEADING LINE NO 2 IS -

LINE "B"

HEADING LINE NO 3 IS -

100-YR

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1012.55	1500.71	36	1503.90

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1015.76	1501.00	36	0.012	0.00	0.00	45.00	0

ELEMENT NO 3 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1038.70	1502.97	36	0.012	0.00	0.00	0.00	0

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
	1042.78	1503.38	36	18	0	0.012	5.2	0.0	1503.33	0.00	45.00	0.00

ELEMENT NO 5 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1189.38	1504.11	36	0.012	0.00	0.00	0.00	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
	1189.38	1504.11	36	18	0	0.012	4.6	0.0	1504.46	0.00	45.00	0.00

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 7 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1341.70	1504.88	36	0.012	0.00	0.00	0.00	0

ELEMENT NO 8 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1345.70	1504.90	30	18	0	0.012	3.3	0.0	1504.98	0.00	45.00	0.00

ELEMENT NO 9 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1483.07	1505.58	30	0.012	0.00	0.00	0.00	0

ELEMENT NO 10 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1500.74	1505.67	30	0.012	22.50	45.00	0.00	0

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 11 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1511.01	1505.72	30	0.012	0.00	0.00	0.00	0

ELEMENT NO 12 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1511.01	1505.72	30	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: THIENES ENGINEERING F0515P PAGE 1
WATER SURFACE PROFILE LISTING

FIRST MARCH LOGISTICS
LINE "B"
100-YR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1012.55	1500.71	3.190	1503.900	23.6	3.34	0.173	1504.073	0.00	1.565		3.00	0.00	0.00	0	0.00
2.42	0.09034					.001058	0.00			0.670			0.00		
1014.97	1500.93	3.000	1503.928	23.6	3.34	0.173	1504.101	0.00	1.565		3.00	0.00	0.00	0	0.00
0.79	0.09034					.000999	0.00			0.670			0.00		
1015.76	1501.00	2.926	1503.926	23.6	3.36	0.175	1504.101	0.00	1.565		3.00	0.00	0.00	0	0.00
2.49	0.08588					.000944	0.00			0.674			0.00		
1018.25	1501.21	2.697	1503.911	23.6	3.52	0.193	1504.104	0.00	1.565		3.00	0.00	0.00	0	0.00
1.62	0.08588					.000975	0.00			0.674			0.00		
1019.87	1501.35	2.540	1503.893	23.6	3.70	0.212	1504.105	0.00	1.565		3.00	0.00	0.00	0	0.00
0.10	0.08588					.001013	0.00			0.674			0.00		
1019.97	1501.36	2.531	1503.892	23.6	3.71	0.214	1504.106	0.00	1.565		3.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1019.97	1501.36	0.914	1502.275	23.6	12.95	2.605	1504.880	0.00	1.565		3.00	0.00	0.00	0	0.00
2.98	0.08588					.024554	0.07			0.674			0.00		
1022.95	1501.62	0.946	1502.563	23.6	12.34	2.366	1504.929	0.00	1.565		3.00	0.00	0.00	0	0.00
2.83	0.08588					.021479	0.06			0.674			0.00		
1025.78	1501.86	0.979	1502.839	23.6	11.77	2.151	1504.990	0.00	1.565		3.00	0.00	0.00	0	0.00
2.39	0.08588					.018815	0.04			0.674			0.00		
1028.17	1502.07	1.014	1503.080	23.6	11.22	1.956	1505.036	0.00	1.565		3.00	0.00	0.00	0	0.00
2.04	0.08588					.016490	0.03			0.674			0.00		
1030.21	1502.24	1.050	1503.291	23.6	10.70	1.777	1505.068	0.00	1.565		3.00	0.00	0.00	0	0.00
1.75	0.08588					.014450	0.03			0.674			0.00		

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1031.96	1502.39	1.087	1503.478	23.6	10.20	1.615	1505.093	0.00	1.565		3.00	0.00	0.00	0	0.00
1.47	0.08588					.012667	0.02			0.674			0.00		
1033.43	1502.52	1.126	1503.643	23.6	9.72	1.468	1505.111	0.00	1.565		3.00	0.00	0.00	0	0.00
1.24	0.08588					.011112	0.01			0.674			0.00		
1034.67	1502.62	1.167	1503.791	23.6	9.27	1.335	1505.126	0.00	1.565		3.00	0.00	0.00	0	0.00
1.04	0.08588					.009750	0.01			0.674			0.00		
1035.71	1502.71	1.209	1503.922	23.6	8.84	1.214	1505.136	0.00	1.565		3.00	0.00	0.00	0	0.00
0.86	0.08588					.008556	0.01			0.674			0.00		
1036.57	1502.79	1.253	1504.040	23.6	8.43	1.103	1505.143	0.00	1.565		3.00	0.00	0.00	0	0.00
0.68	0.08588					.007515	0.01			0.674			0.00		
1037.25	1502.85	1.300	1504.145	23.6	8.04	1.003	1505.148	0.00	1.565		3.00	0.00	0.00	0	0.00
0.54	0.08588					.006605	0.00			0.674			0.00		
1037.79	1502.89	1.348	1504.240	23.6	7.66	0.912	1505.152	0.00	1.565		3.00	0.00	0.00	0	0.00
0.41	0.08588					.005805	0.00			0.674			0.00		
1038.20	1502.93	1.398	1504.325	23.6	7.31	0.829	1505.154	0.00	1.565		3.00	0.00	0.00	0	0.00
0.28	0.08588					.005106	0.00			0.674			0.00		
1038.48	1502.95	1.451	1504.402	23.6	6.97	0.754	1505.156	0.00	1.565		3.00	0.00	0.00	0	0.00
0.17	0.08588					.004494	0.00			0.674			0.00		
1038.65	1502.96	1.506	1504.471	23.6	6.64	0.685	1505.156	0.00	1.565		3.00	0.00	0.00	0	0.00

0.05	0.08588					.003954	0.00			0.674			0.00			
1038.70	1502.97	1.565	1504.535	23.6	6.33	0.622	1505.157	0.00	1.565		3.00	0.00	0.00	0	0.00	
JUNCT STR	0.10049					.002986	0.01						0.00			

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1042.78	1503.38	1.560	1504.940	18.4	4.95	0.381	1505.321	0.00	1.374		3.00	0.00	0.00	0	0.00
6.63	0.00498					.002427	0.02			1.245			0.00		
1049.41	1503.41	1.502	1504.915	18.4	5.20	0.420	1505.335	0.00	1.374		3.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1049.41	1503.41	1.245	1504.658	18.4	6.64	0.684	1505.342	0.00	1.374		3.00	0.00	0.00	0	0.00
57.74	0.00498					.004994	0.29			1.245			0.00		
1107.15	1503.70	1.245	1504.946	18.4	6.64	0.684	1505.630	0.00	1.374		3.00	0.00	0.00	0	0.00
63.85	0.00498					.004776	0.30			1.245			0.00		
1171.00	1504.02	1.276	1505.294	18.4	6.42	0.640	1505.934	0.00	1.374		3.00	0.00	0.00	0	0.00
15.95	0.00498					.004281	0.07			1.245			0.00		
1186.95	1504.10	1.323	1505.421	18.4	6.12	0.581	1506.002	0.00	1.374		3.00	0.00	0.00	0	0.00
2.43	0.00498					.003758	0.01			1.245			0.00		
1189.38	1504.11	1.374	1505.484	18.4	5.83	0.527	1506.011	0.00	1.374		3.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.002145	0.00						0.00		
1189.38	1504.11	1.823	1505.933	13.8	3.07	0.146	1506.079	0.00	1.183		3.00	0.00	0.00	0	0.00
13.39	0.00505					.000828	0.01			1.061			0.00		
1202.77	1504.18	1.752	1505.930	13.8	3.22	0.161	1506.091	0.00	1.183		3.00	0.00	0.00	0	0.00
12.60	0.00505					.000935	0.01			1.061			0.00		
1215.37	1504.24	1.684	1505.925	13.8	3.38	0.177	1506.102	0.00	1.183		3.00	0.00	0.00	0	0.00
11.34	0.00505					.001060	0.01			1.061			0.00		
1226.71	1504.30	1.621	1505.920	13.8	3.54	0.195	1506.115	0.00	1.183		3.00	0.00	0.00	0	0.00
10.77	0.00505					.001201	0.01			1.061			0.00		

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1237.48	1504.35	1.560	1505.913	13.8	3.71	0.214	1506.127	0.00	1.183		3.00	0.00	0.00	0	0.00
9.64	0.00505					.001362	0.01			1.061			0.00		
1247.12	1504.40	1.503	1505.905	13.8	3.90	0.236	1506.141	0.00	1.183		3.00	0.00	0.00	0	0.00
8.97	0.00505					.001547	0.01			1.061			0.00		
1256.09	1504.45	1.448	1505.895	13.8	4.09	0.259	1506.154	0.00	1.183		3.00	0.00	0.00	0	0.00
8.22	0.00505					.001759	0.01			1.061			0.00		
1264.31	1504.49	1.395	1505.884	13.8	4.28	0.285	1506.169	0.00	1.183		3.00	0.00	0.00	0	0.00
7.03	0.00505					.001999	0.01			1.061			0.00		
1271.34	1504.52	1.345	1505.869	13.8	4.49	0.314	1506.183	0.00	1.183		3.00	0.00	0.00	0	0.00
4.42	0.00505					.002276	0.01			1.061			0.00		
1275.76	1504.55	1.297	1505.843	13.8	4.71	0.345	1506.188	0.00	1.183		3.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		

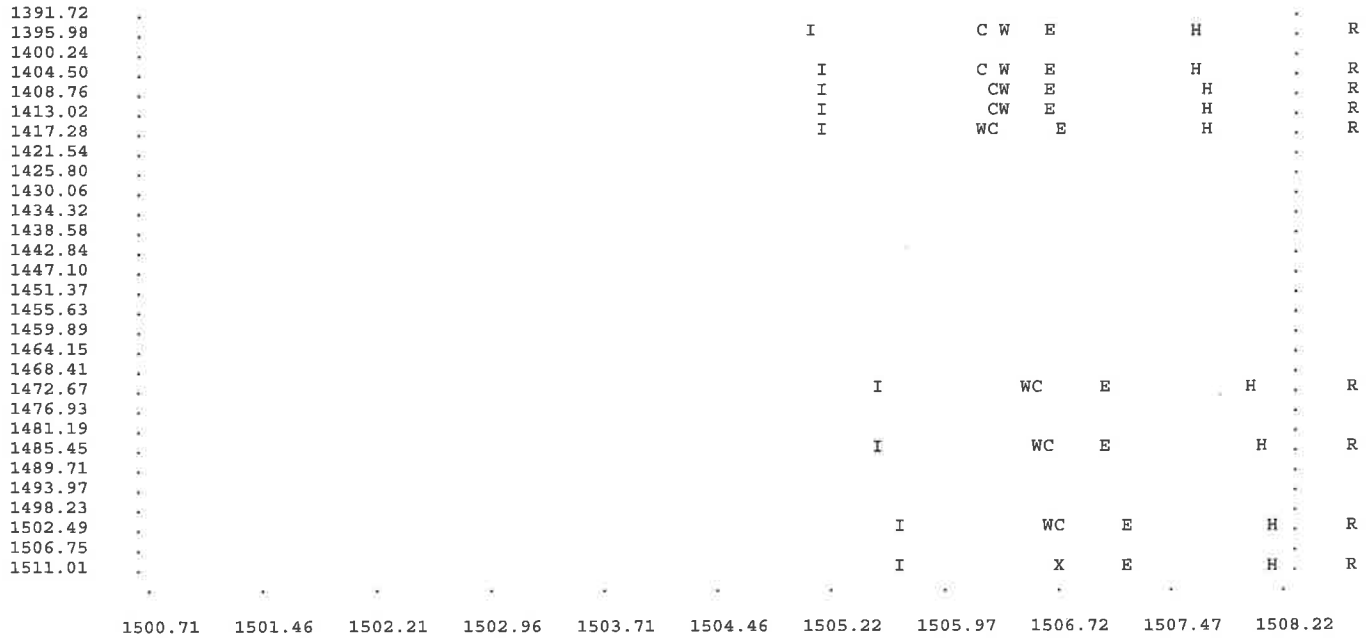
1275.76	1504.55	1.062	1505.608	13.8	6.16	0.590	1506.198	0.00	1.183		3.00	0.00	0.00	0	0.00
7.51	0.00505					.005043	0.04			1.061			0.00		
1283.27	1504.59	1.063	1505.648	13.8	6.15	0.588	1506.236	0.00	1.183		3.00	0.00	0.00	0	0.00
46.36	0.00505					.004722	0.22			1.061			0.00		
1329.63	1504.82	1.101	1505.920	13.8	5.87	0.535	1506.455	0.00	1.183		3.00	0.00	0.00	0	0.00
10.48	0.00505					.004140	0.04			1.061			0.00		
1340.11	1504.87	1.140	1506.012	13.8	5.59	0.486	1506.498	0.00	1.183		3.00	0.00	0.00	0	0.00
1.59	0.00505					.003626	0.01			1.061			0.00		
1341.70	1504.88	1.183	1506.063	13.8	5.33	0.441	1506.504	0.00	1.183		3.00	0.00	0.00	0	0.00
JUNCT STR	0.00500					.002266	0.01						0.00		

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1345.70	1504.90	1.538	1506.438	10.5	3.32	0.171	1506.609	0.00	1.084		2.50	0.00	0.00	0	0.00
11.63	0.00495					.001222	0.01			1.000			0.00		
1357.33	1504.96	1.477	1506.435	10.5	3.48	0.188	1506.623	0.00	1.084		2.50	0.00	0.00	0	0.00
10.72	0.00495					.001381	0.01			1.000			0.00		
1368.05	1505.01	1.420	1506.431	10.5	3.65	0.207	1506.638	0.00	1.084		2.50	0.00	0.00	0	0.00
9.84	0.00495					.001563	0.02			1.000			0.00		
1377.89	1505.06	1.366	1506.425	10.5	3.83	0.227	1506.652	0.00	1.084		2.50	0.00	0.00	0	0.00
8.90	0.00495					.001772	0.02			1.000			0.00		
1386.79	1505.10	1.315	1506.418	10.5	4.01	0.250	1506.668	0.00	1.084		2.50	0.00	0.00	0	0.00
8.17	0.00495					.002009	0.02			1.000			0.00		
1394.96	1505.14	1.266	1506.410	10.5	4.21	0.275	1506.685	0.00	1.084		2.50	0.00	0.00	0	0.00
7.30	0.00495					.002280	0.02			1.000			0.00		
1402.26	1505.18	1.219	1506.399	10.5	4.41	0.302	1506.701	0.00	1.084		2.50	0.00	0.00	0	0.00
5.84	0.00495					.002591	0.02			1.000			0.00		
1408.10	1505.21	1.175	1506.384	10.5	4.63	0.333	1506.717	0.00	1.084		2.50	0.00	0.00	0	0.00
0.23	0.00495					.002948	0.00			1.000			0.00		
1408.33	1505.21	1.133	1506.343	10.5	4.86	0.366	1506.709	0.00	1.084		2.50	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1408.33	1505.21	1.000	1506.210	10.5	5.73	0.509	1506.719	0.00	1.084		2.50	0.00	0.00	0	0.00
64.29	0.00495					.004917	0.32			1.000			0.00		
1472.62	1505.53	1.000	1506.528	10.5	5.73	0.509	1507.037	0.00	1.084		2.50	0.00	0.00	0	0.00
10.45	0.00495					.004905	0.05			1.000			0.00		

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1483.07	1505.58	1.001	1506.581	10.5	5.72	0.507	1507.088	0.00	1.084		2.50	0.00	0.00	0	0.00
17.67	0.00509					.004699	0.08			0.990			0.00		
1500.74	1505.67	1.024	1506.694	10.5	5.55	0.478	1507.172	0.00	1.084		2.50	0.00	0.00	0	0.00
7.78	0.00487					.004349	0.03			1.001			0.00		
1508.52	1505.71	1.044	1506.752	10.5	5.40	0.453	1507.205	0.00	1.084		2.50	0.00	0.00	0	0.00
2.49	0.00487					.003933	0.01			1.001			0.00		

1511.01 1505.72 1.084 1506.804 10.5 5.14 0.411 1507.215 0.00 1.084 2.50 0.00 0.00 0
0.00□

FIRST MARCH LOGISTICS
LINE "B"
100-YR

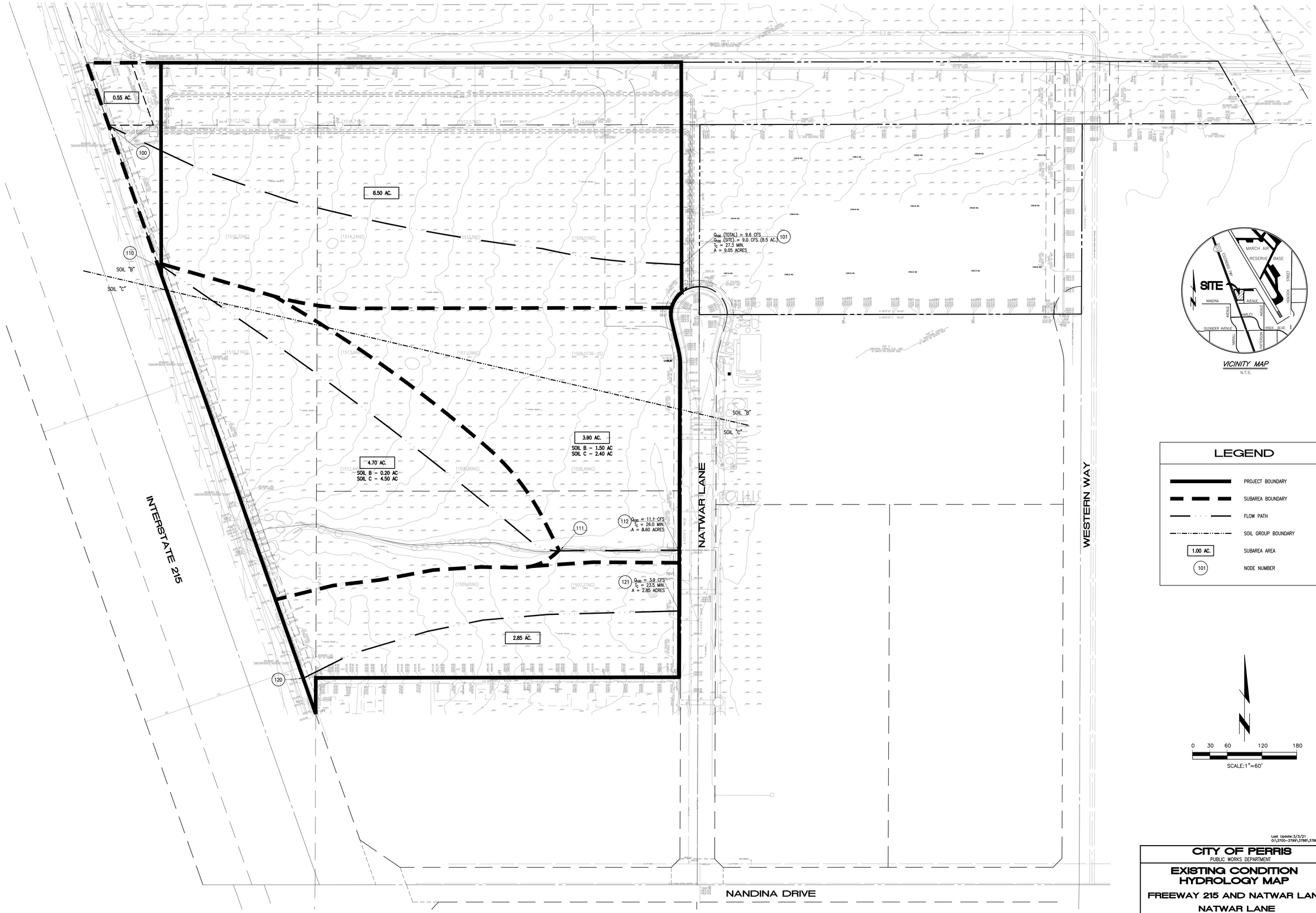


N O T E S

1. GLOSSARY
   - I = INVERT ELEVATION
   - C = CRITICAL DEPTH
   - W = WATER SURFACE ELEVATION
   - H = HEIGHT OF CHANNEL
   - E = ENERGY GRADE LINE
   - X = CURVES CROSSING OVER
   - B = BRIDGE ENTRANCE OR EXIT
   - Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

APPENDIX D

HYDROLOGY MAPS



VICINITY MAP
N.T.S.

LEGEND

- PROJECT BOUNDARY
- SUBAREA BOUNDARY
- FLOW PATH
- SOIL GROUP BOUNDARY
- 1.00 AC. — SUBAREA AREA
- (101) — NODE NUMBER

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

Last Update: 3/3/21
O:\3700-3799\3788\3788hyd-ex.dwg

CITY OF PERRIS
PUBLIC WORKS DEPARTMENT

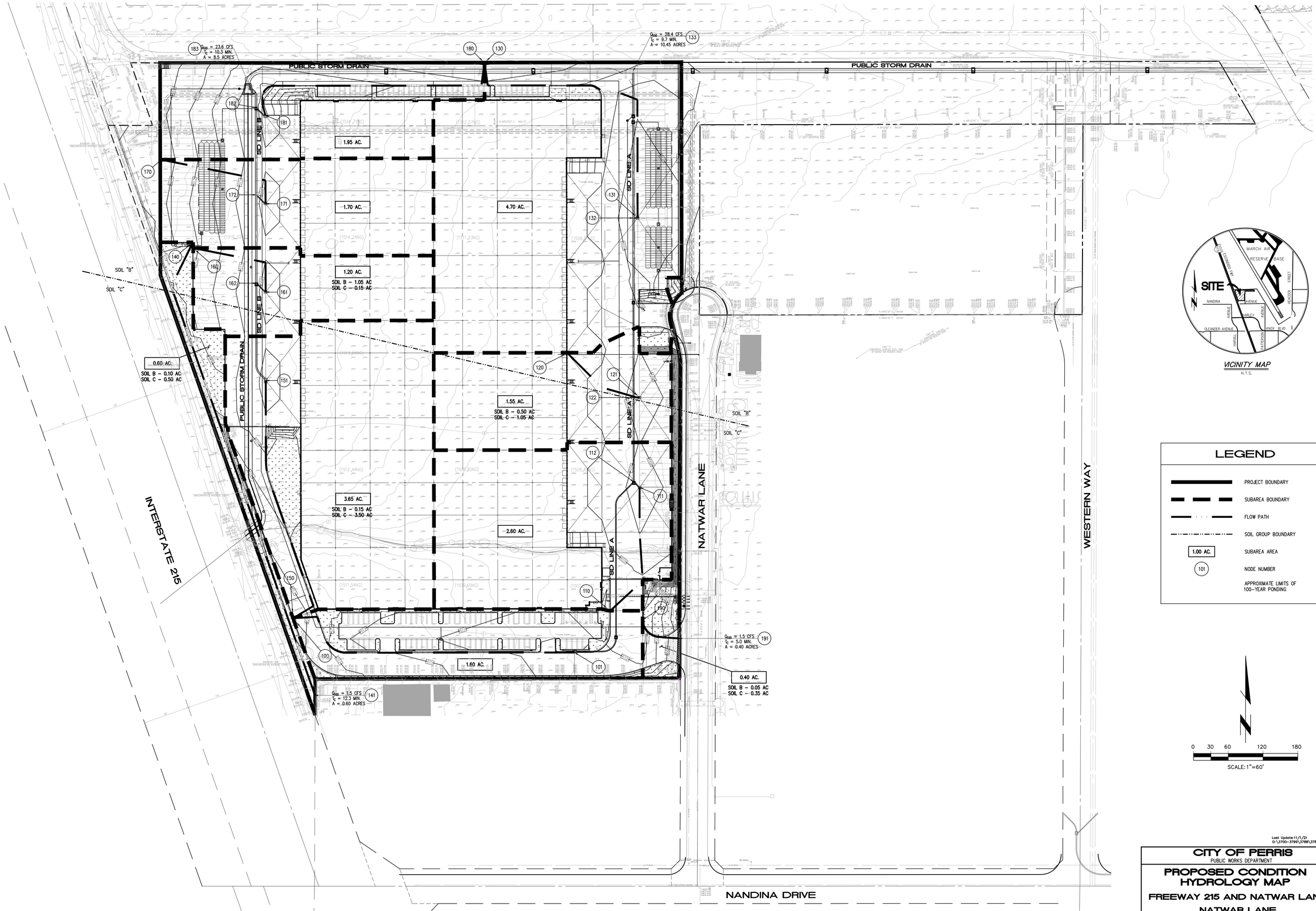
EXISTING CONDITION HYDROLOGY MAP
FREEWAY 215 AND NATWAR LANE
NATWAR LANE

3788/1 OF 1 SHEET

PREPARED FOR:
FIRST INDUSTRY REALTY TRUST, INC.
898 N. PACIFIC COAST HIGHWAY STE. 175
EL SEGUNDO, CA 90245
PHONE: (310) 321-3813
EMAIL: MPIOLI@FIRSTINDUSTRIAL.COM

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 _____
Approved by _____ Date _____
Public Works Director _____ R.C.E. XXXXX
Sheet 1 of 1 Sheets



LEGEND

- PROJECT BOUNDARY
- SUBAREA BOUNDARY
- FLOW PATH
- SOIL GROUP BOUNDARY
- 1.00 AC. — SUBAREA AREA
- 101 — NODE NUMBER
- APPROXIMATE LIMITS OF 100-YEAR PONDING

0 30 60 120 180

SCALE: 1"=60'

Last Update:11/1/21
O:\3700-3799\3788\3788hyd.dwg

CITY OF PERRIS
PUBLIC WORKS DEPARTMENT

PROPOSED CONDITION HYDROLOGY MAP
FREEWAY 215 AND NATWAR LANE
NATWAR LANE

3788/1 OF 1 SHEET

PREPARED FOR:
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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 _____

Approved by _____ Date _____
Public Works Director R.C.E. XXXXX

Sheet 1 of 1 Sheets