

**PRELIMINARY HYDROLOGY  
AND HYDRAULIC CALCULATIONS**

FOR

**EAST END AVENUE INDUSTRIAL BUILDING  
NORTHWEST AND NORTHEAST CORNER OF COUNTY ROAD  
AND EAST END AVENUE  
CHINO, CA 91710**

PREPARED FOR

**ALERE PROPERTY GROUP LLC  
100 BAYVIEW CIRCLE, SUITE 300  
NEWPORT BEACH, CA 92660  
P. (949) 509-5000**

AUGUST 19, 2019  
REVISED NOVEMBER 12, 2019  
REVISED JANUARY 15, 2020  
REVISED FEBRUARY 27, 2020  
REVISED APRIL 14, 2020

JOB NO. 3712

PREPARED BY

**THIENES ENGINEERING  
14349 FIRESTONE BLVD.  
LA MIRADA, CALIFORNIA 90638  
P. (714) 521-4811**

# PRELIMINARY HYDROLOGY AND HYDRAULIC CALCULATIONS

FOR

**EAST END AVENUE INDUSTRIAL BUILDING  
NORTHWEST AND NORTHEAST CORNER OF COUNTY ROAD  
AND EAST END AVENUE**

PREPARED UNDER  
THE SUPERVISION OF



  
REINHARD STENZEL      DATE: 4/14/20  
R.C.E. 56155  
EXP. 12/31/2020

## INTRODUCTION

### PROJECT LOCATION

The project site is located at the northwest corner of East County Road and East End Avenue in the city of Chino, California. The site is bounded by railroad tracks along the north property line, San Antonio Channel along the west property line, County Road along the South property line, and the same railroad tracks along the east property line. East End Avenue runs north and south through the property. Please see Figure 1 for vicinity map.

### STUDY PURPOSE

The purpose of this study is to determine the 100-year peak flow rate from the site that will drain to the existing channel in County Road.

### PROJECT STAFF

Thienes Engineering staff involved in this study include:

Reinhard Stenzel  
Brian Weil  
Matthew Cruz



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**"VICINITY MAP"**  
 FOR  
**OMP COUNTY RD. AND EAST END AVE.**

Google Earth



## DISCUSSION

The proposed project site consists of a larger lot on the westerly side of East End Avenue (approximately 12.0 acres) and a smaller lot on the easterly side of East End Avenue (approximately 0.9 acres). The larger, westerly lot will have Building One, 212,251 square feet, Building Two, 24,942 square feet, and Building Three, 15,340 square feet. The smaller, easterly lot will have Building Four which is 15,252 square feet. Other improvements include vehicle parking located throughout the site and a truck yard on the westerly side of the site. The remainder of the site will be reserved for landscaping.

### Existing Facilities

There is an existing San Bernardino County Flood Control District (S.B.C.F.C.D.) facility (San Antonio Creek) adjacent to the westerly portion of the larger lot. There is another S.B.C.F.C.D. channel, Chino Storm Drain, on the southerly side of the smaller lot that continues westerly on the south side of County Road. There is also an existing 24" city of Chino storm drain in East End Avenue.

From the City of Chino's Master Plan of Drainage, the project site is located within Area 14 of the Chino Storm Drain system. The Chino Storm Drain system is the previously described channel located on the southerly side of County Road. The Master Plan of Drainage describes that this facility will be adequate to serve future drainage needs assuming other upstream relief drains are constructed. It is unknown if all of these improvements have been completed. Therefore, runoff from the project site tributary to this Channel will be limited to existing conditions, such that there will be no adverse effects on the existing facilities.

See Appendix "A" for reference storm drain plans and portions of the city's Master Plan of Drainage.

### FEMA Flood Zones

The project site is located in FIRM 06071C8615H, effective August 28, 2008. Flood hazard zones were downloaded, in CAD format, from the FEMA data base via Geo HEC-RAS program. From the FIRM, the majority of the project site is within FEMA Flood Zone X, unshaded. Zone X, unshaded is defined as "areas of minimal flood hazard".

It appears that less than 5 feet of the southerly portion of the project site is within FEMA Flood Zone A, shaded. Flood Zone A, shaded, is defined as "special flood hazard areas subject to inundation by the 1% annual chance flood, without base flood elevations".

Only landscaped areas and driveways are within Flood Zone A, shaded. While Flood Zone A, shaded does not give base flood elevations, it is clear that this zone is shown near the ultimate street right-of-way. The lowest elevation of the building is over 3 feet above the street elevations.

See Appendix "A" for portions of FIRM 06071C8615H.

### Existing Condition

The northern portion of the larger lot is currently undeveloped with native grasses and vegetation. Subarea A drains southwesterly towards San Antonio Creek Channel at a gentle grade of approximately 1.5%. There is no existing inlet or storm drain connection to the Channel at this location. There is, however an existing flapgated connection to the Channel approximately 180' south of the railroad tracks north of the project site, but no inlet within the site. The 100-year peak flow rate from subarea is approximately 11.5 cfs.

Subarea B also drains southwesterly. Subarea B discharges to County Road. The north portion of the subarea is undeveloped with native grasses, the southern portion is developed as four single family homes with large yard which appear to be used for commercial operations. Subarea B has a gentle slope of approximately 1.2% towards County Road. The 100-year peak flow rate from subarea is approximately 17.8 cfs. These flows continue westerly in County Road. It does not appear that the northerly half of County Road can adequately convey the entire 100-year peak flow rate without topping the crown of the street. Any flow that tops the crown sheet flows Chino Storm Drain located on the southerly side of County Road. Flow conveyed on the northerly side of County Road ultimately drains to San Antonio Creek Channel.

Subarea C drains southerly towards County Road. The majority of the site is undeveloped with native grasses. The southern portion of the subarea is developed with a residential home with a large lot used as a commercial operation, similar to Subarea C. The subarea has an average slope of 0.9% towards County Road. The 100-year peak flow rate from subarea is approximately 11.8 cfs. Based on recent survey and aerial topography, County Road does not have a significant crown at this location as evident by only one catch basin located on the southerly side of the street. Runoff sheet flows to this catch basin then to Chino Storm Drain via an existing storm drain connection.

The smaller lot to the east, subarea D, is currently undeveloped with native grasses and vegetation. Approximately one third of subarea D drains easterly towards the railroad. The 100-year peak flow rate from subarea is approximately 0.8 cfs. The majority of the subarea drains westerly towards the existing catch basin in East End Avenue. The 100-year peak flow rate from subarea is approximately 1.5 cfs

The total 100-year peak flow at this project is approximately 43.4 cfs (11.5 cfs + 17.8 cfs + 11.8 cfs + 1.5 cfs + 0.8 cfs).

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

## Proposed Condition

The proposed condition will be developed as four warehouse type buildings with associated truck yards, vehicle parking, drive aisle, and scattered landscape. Proposed condition drainage patterns will maintain existing drainage to the maximum extent practicable. Even though the City's Master Plan of Drainage has tabled the entire site southerly to the Chino Storm Drain Channel, a majority of the site will be tabled to the existing connection at San Antonio Creek Channel. In general, the majority of the westerly side of the site, which is made up of Buildings 1, 2, and 3 will all drain to San Antonio Creek Channel with the remaining portion to the Chino Storm Drain Channel. The east side of the site which is made up of Building 4 will also drain to the southerly channel along County Road via the existing storm drain in East End Avenue.

Runoff from the easterly half of Building 1, Buildings 2 and 3 and the parking area between these buildings (Nodes 100-112) drain to catch basin located in the vehicle parking lot. A storm drain, Line "B", will convey this flow westerly around Building 1. Runoff from the westerly half of Building 1, the truck yard area, the northerly parking area and a portion of offsite flow from the railroad (nodes 120-152) will also drain to this storm drain (confluence at Node 153). The storm drain continues westerly ultimately connecting to an existing 30" stub at San Antonio Creek Channel. The 100-year peak flow rate at the Channel is approximately 44.9 cfs, undetained.

Runoff from the easterly vehicle parking located east of Buildings 2 and 3 as well as the drive aisle between these buildings will drain to catch basins in the parking area (Nodes 300-303). Flows are conveyed southerly via onsite storm drain Line "C". The 100-year peak flow rate from this portion of the project site is approximately 4.4 cfs. Line "C" continues westerly where runoff from the adjacent streets (Nodes 310-313) are added. The storm drain connects to the back of an existing catch basin on the southerly side of County Road and ultimately drains to Chino Storm Drain Channel. The total 100-year peak flow rate at this location is approximately 7.5 cfs. This is less than the existing condition 100-year peak flow rate currently draining to the existing catch basin (11.8 cfs).

Flow from the landscaped area and a portion of the proposed driveways fronting County Road (Nodes 90-91) will sheet flow to the street. The 100-year peak flow rate for this area is approximately 2.3 cfs.

Flow from the easterly Building 4 site will be collected in catch basins located in the parking areas. A proposed storm drain will convey this flow to the existing 24" storm drain in East End Avenue. The 100-year peak flow rate for this area is approximately 4.2 cfs.

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

## Detention

Runoff tributary to the Chino Storm Drain Channel has been reduced to less than existing conditions. A portion of the site currently drains to the channel and the City of Chino's Master Plan of Drainage has tabled the entire site to the Channel. Therefore, detention will not be required for the easterly parking areas at Buildings 2 and 3.

San Antonio Creek Channel does not appear to have any deficiencies or peak flow limitations. However, some detention is still utilized in the westerly truck yard area. A small area hydrograph was established for areas tributary to the truck yard (Nodes 120-142). The time of concentration and peak flow rate are from the Rational Method calculations. Discharge rates are based on the hydraulic capacity of the downstream storm drain system.

Flood routing analysis shows that approximately 5.8 cfs can discharge from the truck yard area with the remaining volume (0.178 acre-feet) to be stored at a depth of approximately 1.00' (water surface elevation 763.60). The entire truck yard area is fenced off from the public. There are nine vehicle parking areas adjacent to the trailer parking stalls. A few of these parking areas are within the anticipated 100-year ponding. However, the maximum depth in the parking is no more than 0.38'. There is a secondary outlet located at the driveway immediately south of the ponding area such that flow can discharge to the street at elevation 763.80.

With onsite detention, the 100-year peak flow rate to San Antonio Creek Channel is approximately 31.4 cfs.

The easterly lot will have a 100-year peak flow rate of approximately 4.2 cfs tributary to the existing 24" RCP downstream at East End Avenue. There is no detention proposed at this location.

Please refer to appendix "C" for detention calculations.

## Hydraulics

Hydraulics calculations are based on preliminary storm drain plan and profiles. The plans for San Antonio Creek do not indicate a water surface elevation in the channel. The effective FRIM shows the flows are contained in the channel, but base flood elevations are not provided. The channel is 30' wide and 12' high at the point of the existing connection. The hydraulic grade line for the onsite storm drain system is assumed to be 2.0' lower than the top of channel (2.0' freeboard).

The hydraulic control for the storm drain system serving the easterly parking area of Buildings 2 and 3 use the flowline in the street near the existing catch basin. At this location, flow can sheet flow southerly directly into the Channel. This is also very close to the limits of the flood zone shown on the effective FIRM at this location. Note that the FIRM does not indicate base flood elevations at this location.

## Methodology

Hydrology calculations were computed using Advanced Engineering Software's (AES) Rational Method Hydrology computer program for San Bernardino County. Hydrographs and detention calculations were computed using AES software's small area unit hydrograph program. WSPG was used for the hydraulic calculations. The soil type is "B" per the San Bernardino Hydrology Manual. Please see Appendix "A" for reference materials.

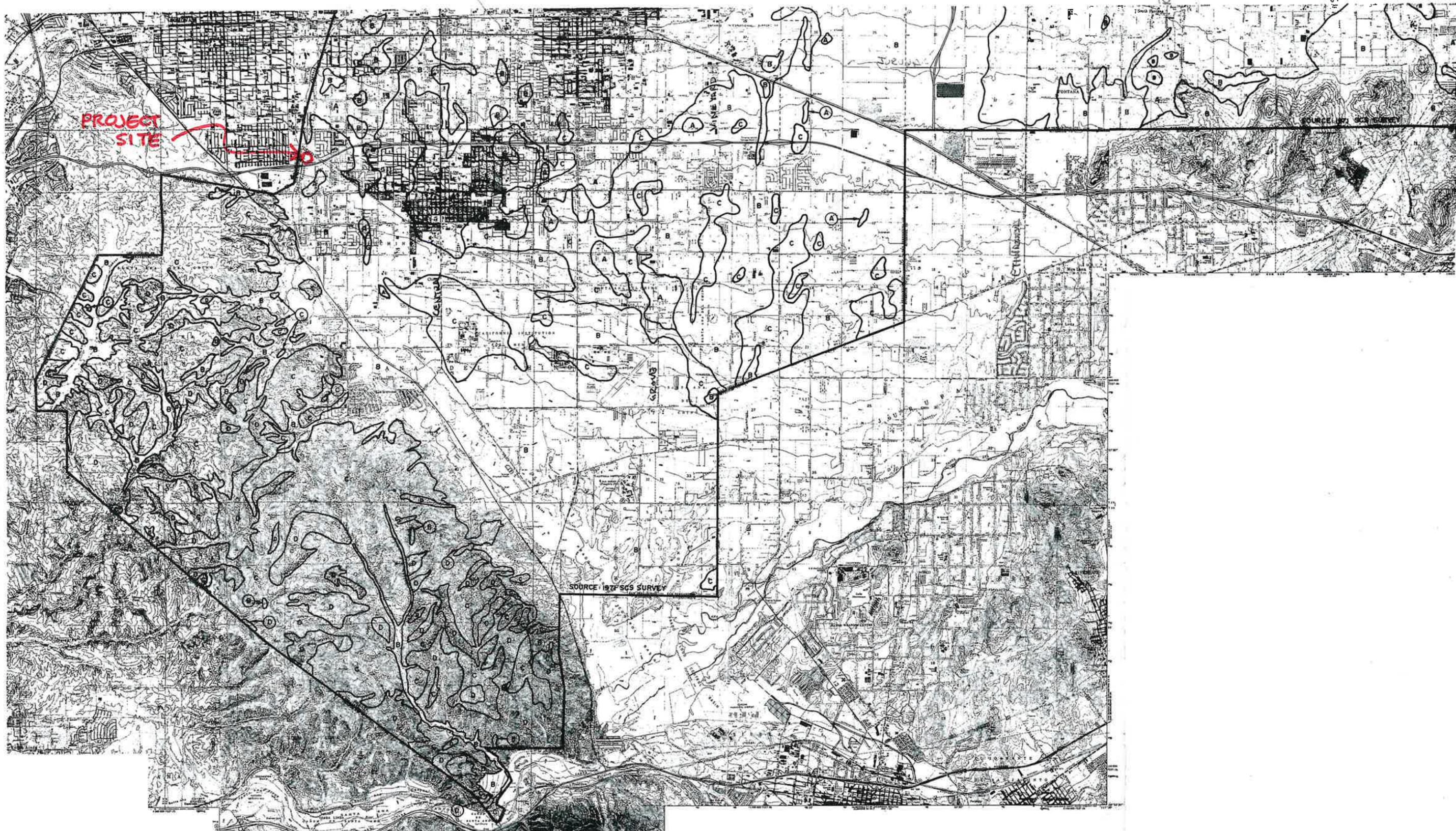
**APPENDIX**

**DESCRIPTION**

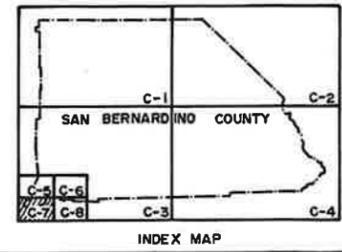
<b>A</b>	<b>REFERENCE MATERIALS</b>
<b>B</b>	<b>HYDROLOGY CALCULATIONS</b> <b>EXISTING CONDITION</b> <b>PROPOSED CONDITION</b>
<b>C</b>	<b>DETENTION CALCULATIONS</b>
<b>D</b>	<b>HYDRAULIC CALCULATIONS</b>
<b>E</b>	<b>HYDROLOGY MAP</b>

## **APPENDIX A**

### **REFERENCE MATERIALS**



**SAN BERNARDINO COUNTY**  
**HYDROLOGY MANUAL**



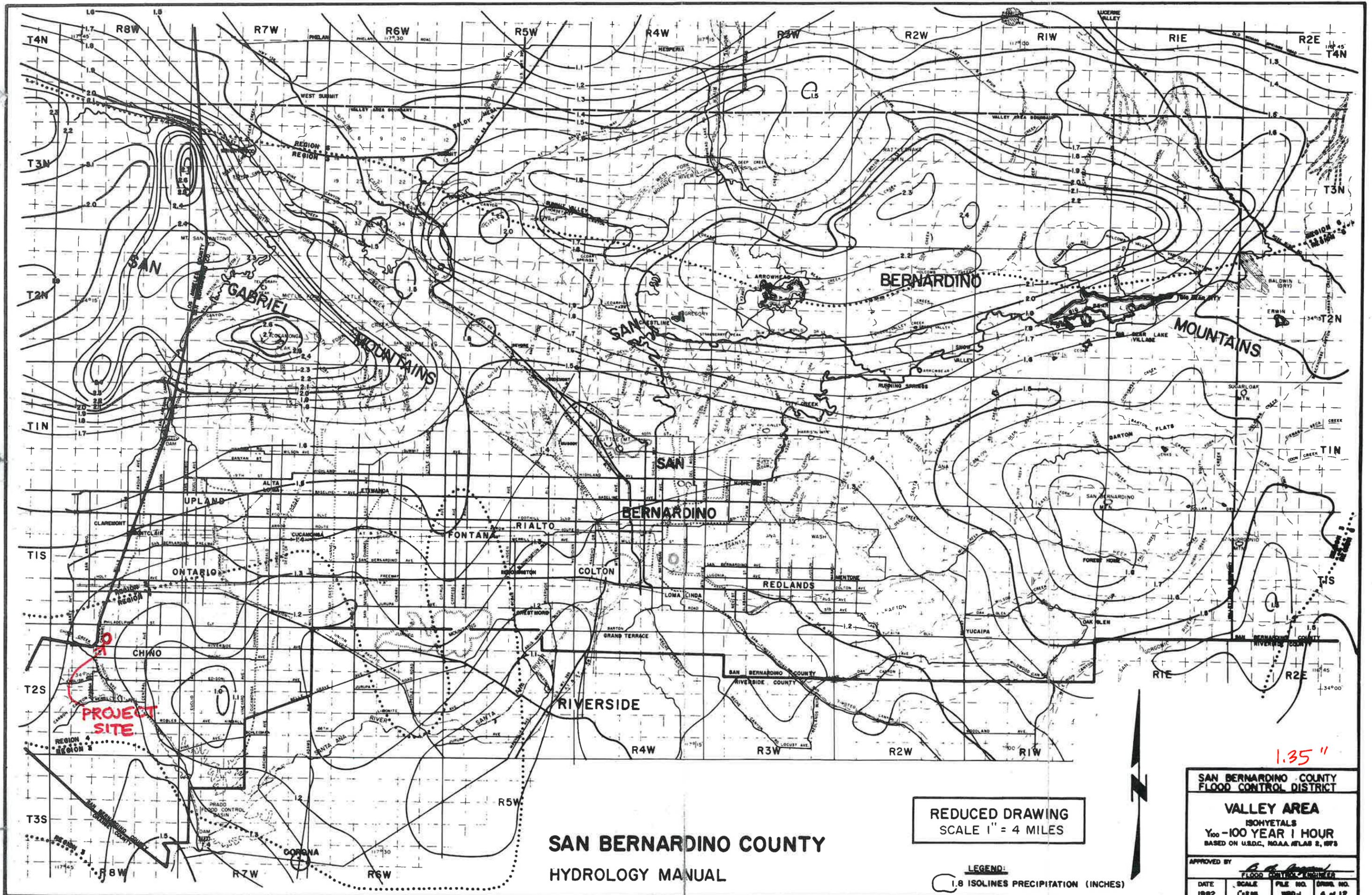
- LEGEND
- SOIL GROUP BOUNDARY
  - A SOIL GROUP DESIGNATION
  - BOUNDARY OF INDICATED SOURCE

SCALE REDUCED BY 1/2

SCALE 1:48,000

*SOIL "B"*

**HYDROLOGIC SOILS GROUP MAP**  
**FOR**  
**SOUTHWEST-C AREA**



**SAN BERNARDINO COUNTY  
HYDROLOGY MANUAL**

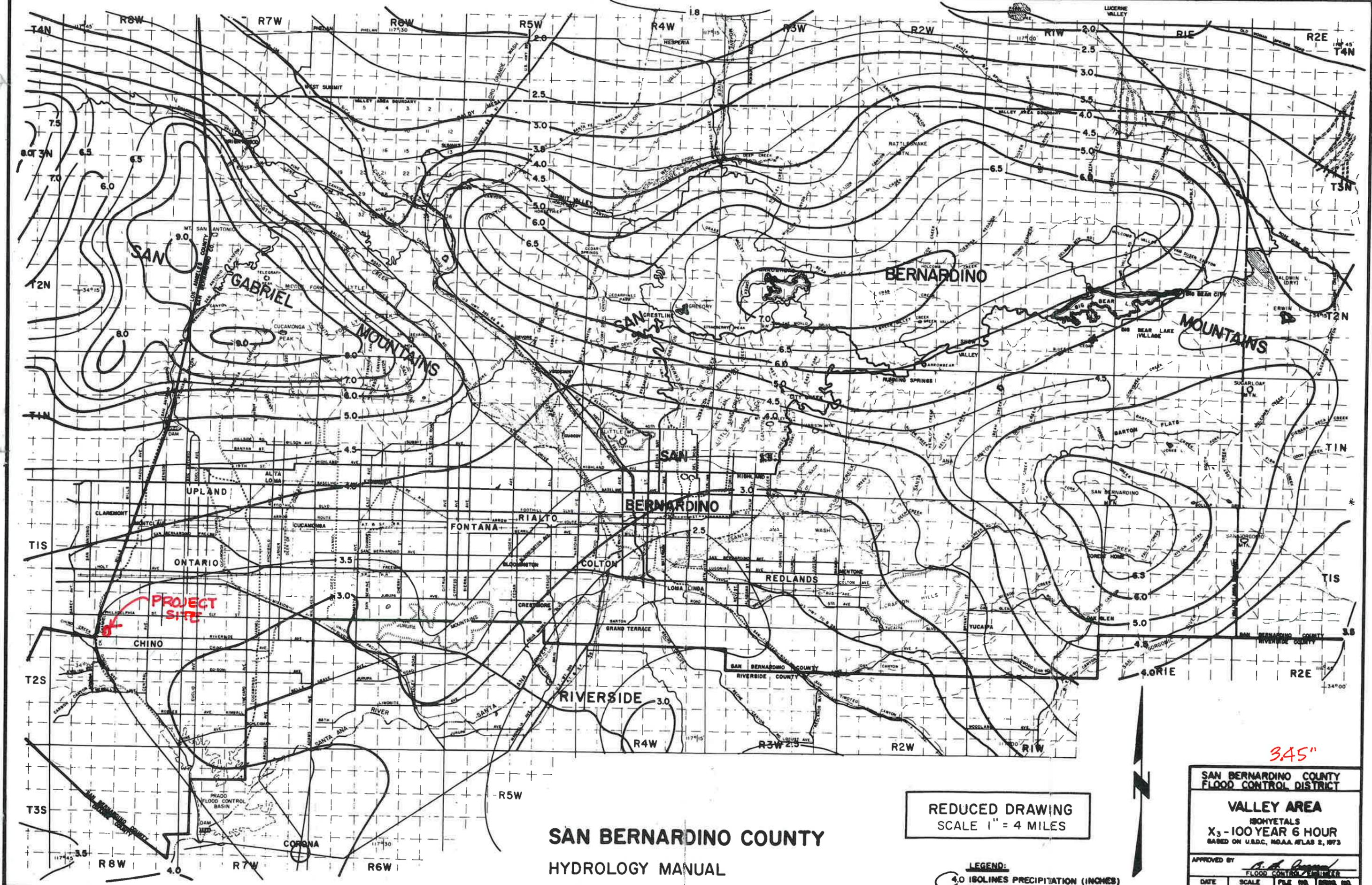
**REDUCED DRAWING  
SCALE 1" = 4 MILES**

**LEGEND:**  
○ 1.8 ISOLINES PRECIPITATION (INCHES)



1.35"

<b>SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT</b>			
<b>VALLEY AREA</b>			
ISOHYETALS			
Y <sub>100</sub> - 100 YEAR 1 HOUR			
BASED ON U.S.D.C. NOAA ATLAS 2, 1973			
APPROVED BY			
DATE	SCALE	FILE NO.	DRAW. NO.
1982	1"=2 MI.	WRD-1	4 of 12



**SAN BERNARDINO COUNTY  
HYDROLOGY MANUAL**

REDUCED DRAWING  
SCALE 1" = 4 MILES

LEGEND:  
4.0 ISOLINES PRECIPITATION (INCHES)

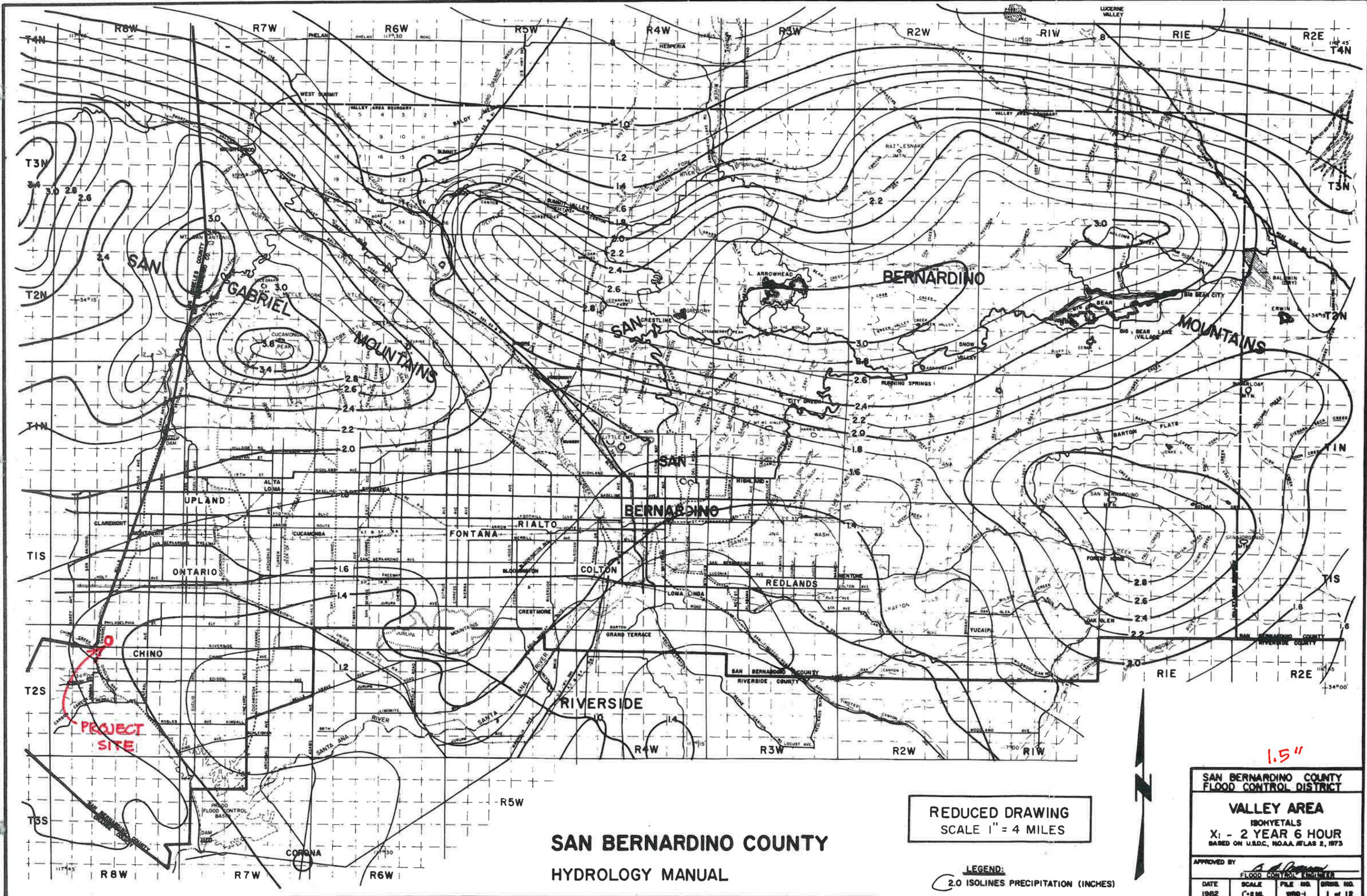
3.45"

**SAN BERNARDINO COUNTY  
FLOOD CONTROL DISTRICT**

**VALLEY AREA**  
ISOHYETALS  
X<sub>3</sub>-100 YEAR 6 HOUR  
BASED ON U.S.D.C. NOAA ATLAS 2, 1973

APPROVED BY: *[Signature]*  
FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRAW. NO.
1982	1"=2 MI.	WRD-1	8 of 12



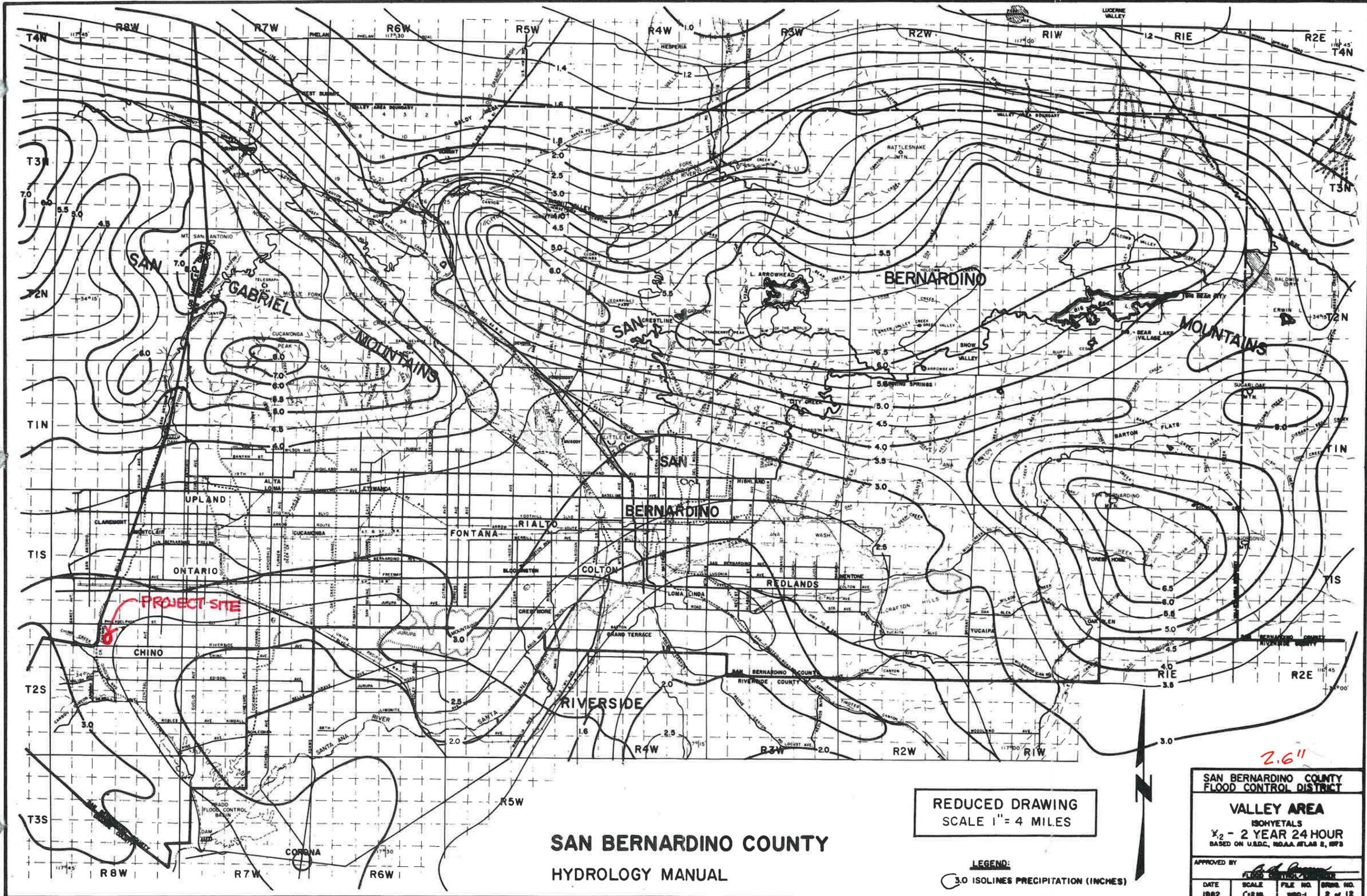
**SAN BERNARDINO COUNTY  
HYDROLOGY MANUAL**

**REDUCED DRAWING  
SCALE 1" = 4 MILES**

**LEGEND:**  
2.0 ISOLINES PRECIPITATION (INCHES)

1.5"

<b>SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT</b>			
<b>VALLEY AREA</b>			
ISOHYETALS			
X <sub>1</sub> - 2 YEAR 6 HOUR			
BASED ON U.S.D.C. NOAA ATLAS 2, 1973			
APPROVED BY <i>[Signature]</i>			
DATE	SCALE	FILE NO.	DRAW. NO.
1982	1" = 4 MI.	WB-1	1 of 12



**SAN BERNARDINO COUNTY  
HYDROLOGY MANUAL**

**REDUCED DRAWING  
SCALE 1" = 4 MILES**

**LEGEND:**  
3.0 ISOLINES PRECIPITATION (INCHES)

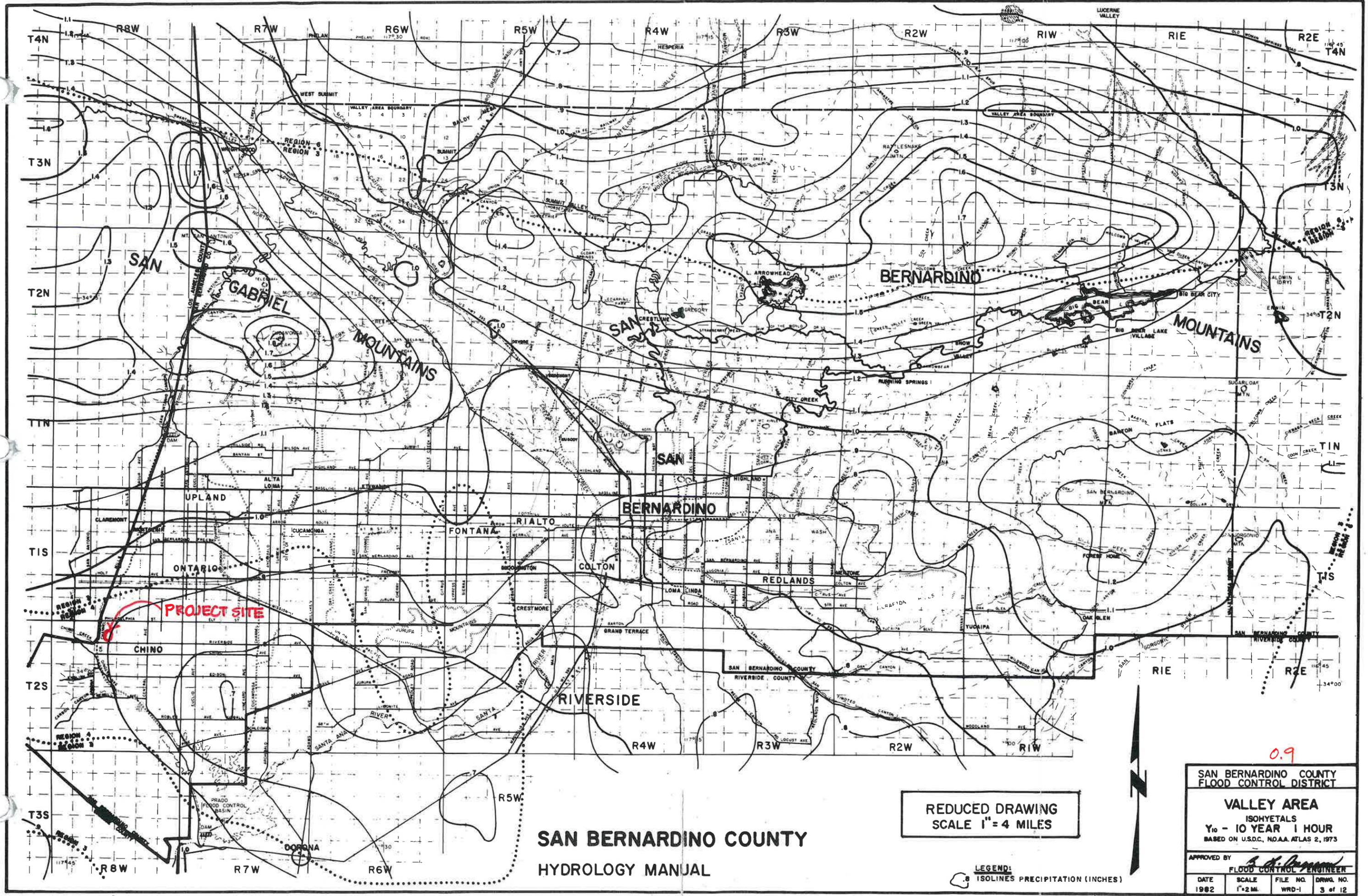
2.6"

**SAN BERNARDINO COUNTY  
FLOOD CONTROL DISTRICT**

**VALLEY AREA**  
ISOHYETALS  
X<sub>2</sub> - 2 YEAR 24 HOUR  
BASED ON U.S.D.C. NOAA ATLAS 2, 1973

APPROVED BY: *[Signature]*

DATE	SCALE	FILE NO.	DRAW. NO.
1982	1"=4 MI.	WRD-1	2 of 12



**SAN BERNARDINO COUNTY  
HYDROLOGY MANUAL**

**REDUCED DRAWING  
SCALE 1" = 4 MILES**

**LEGEND:**  
ISOLINES PRECIPITATION (INCHES)

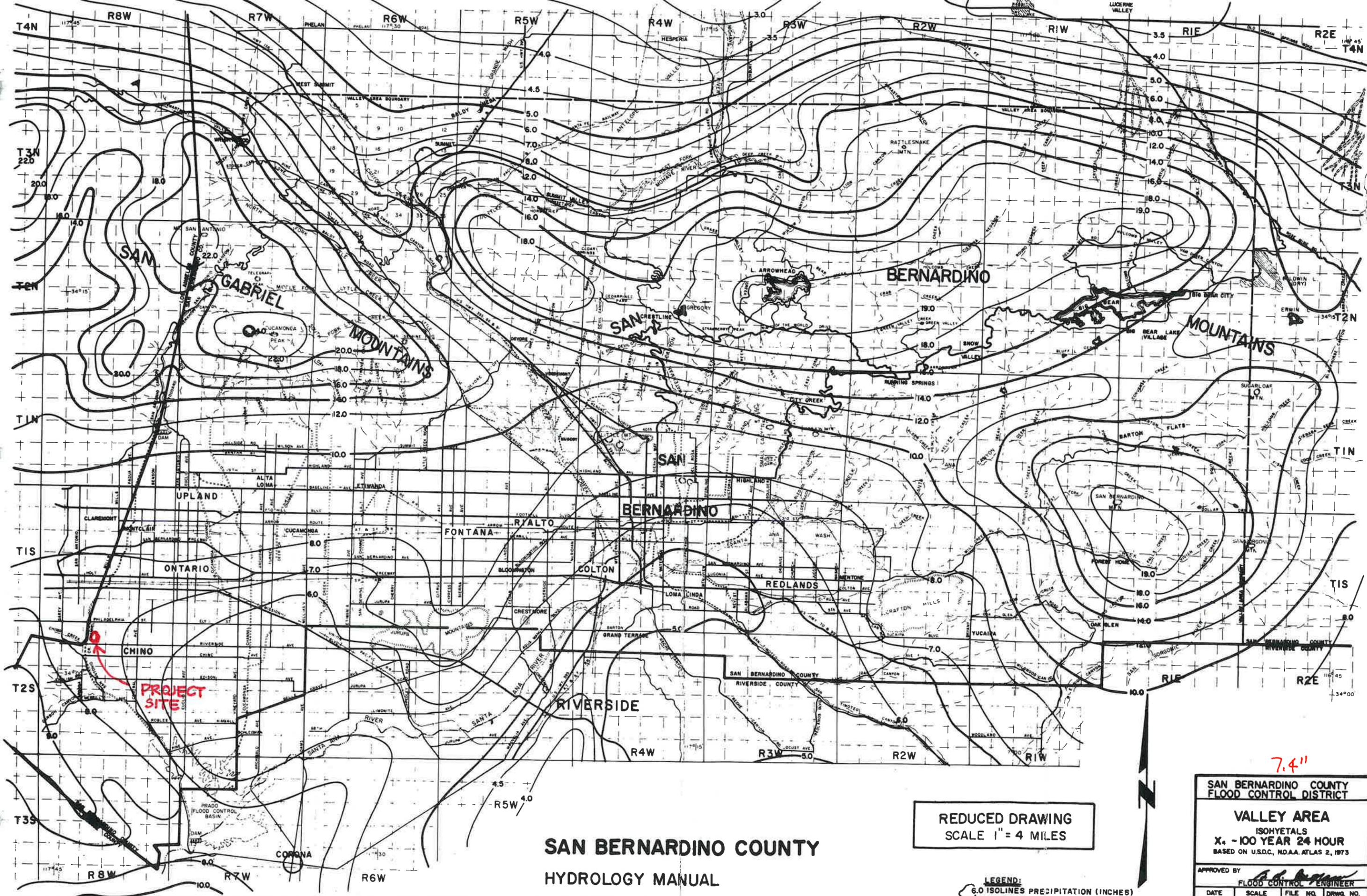
**SAN BERNARDINO COUNTY  
FLOOD CONTROL DISTRICT**

**VALLEY AREA**  
ISOHYETALS  
Y<sub>10</sub> - 10 YEAR 1 HOUR  
BASED ON U.S.D.C. NO. AA ATLAS 2, 1973

APPROVED BY *[Signature]*  
FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1" = 2 MI.	WRD-1	3 of 12

0.9



**SAN BERNARDINO COUNTY  
HYDROLOGY MANUAL**

**REDUCED DRAWING  
SCALE 1" = 4 MILES**

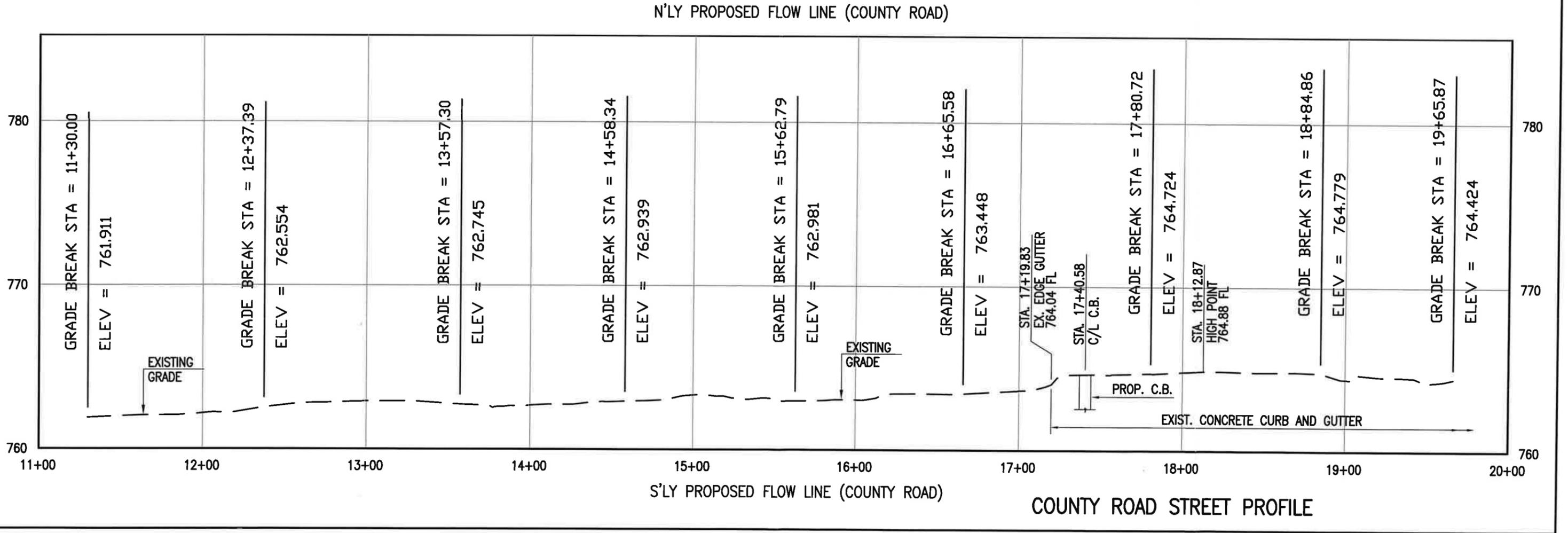
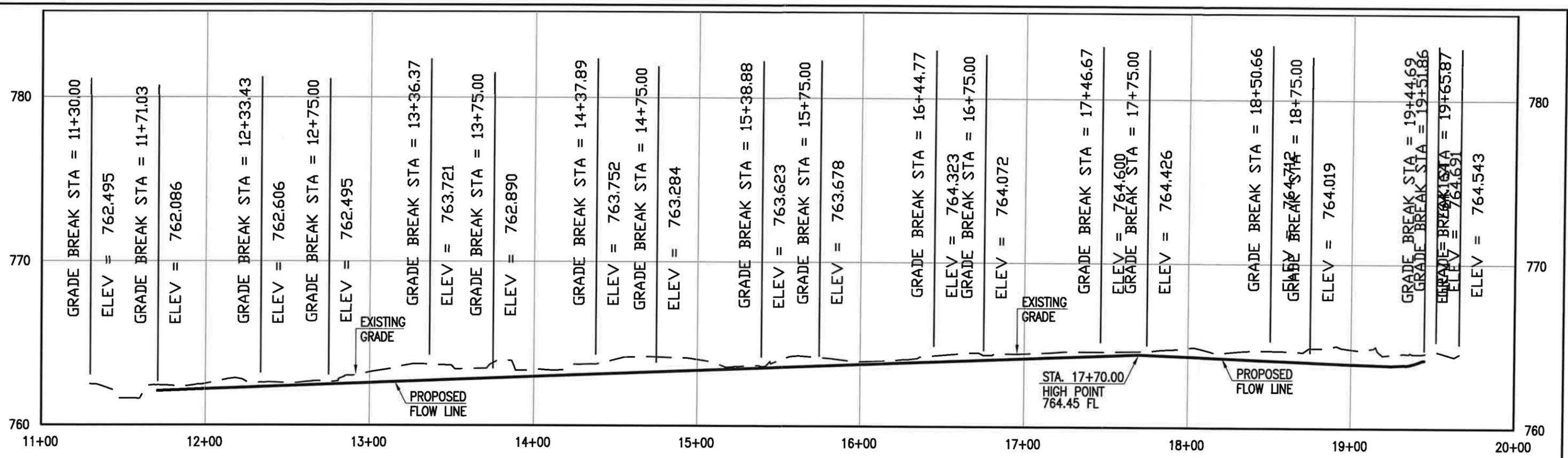
**LEGEND:**  
6.0 ISOLINES PRECIPITATION (INCHES)

**SAN BERNARDINO COUNTY  
FLOOD CONTROL DISTRICT**

**VALLEY AREA  
ISOHYETALS  
X<sub>4</sub> - 100 YEAR 24 HOUR  
BASED ON U.S.D.C. NOAA ATLAS 2, 1973**

APPROVED BY <i>[Signature]</i>			
FLOOD CONTROL ENGINEER			
DATE	SCALE	FILE NO.	DRWG. NO.
1982	1"=2MI.	WRD-1	6 of 12

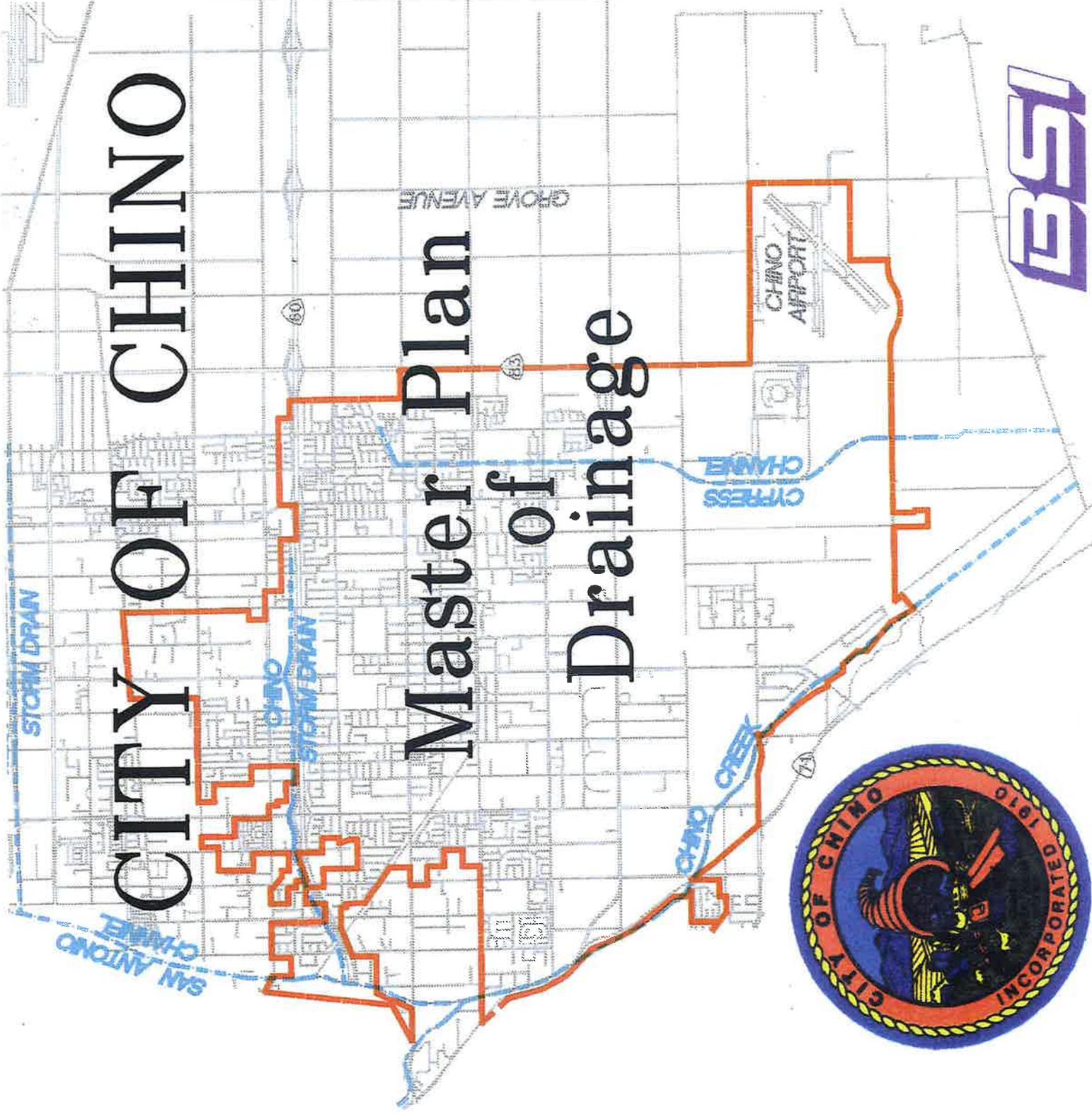
7.4"



COUNTY ROAD STREET PROFILE

# CITY OF CHINO

## Master Plan Drainage



A storm drain along Phillips Boulevard from Oaks Avenue to San Antonio Channel (System 28) has been planned to intercept runoff from approximately 2.3 square miles area north of Phillips Boulevard. Another storm drain along Francis Avenue (System 19) has been planned to provide relief to Chino Storm Drain by intercepting runoff from the area between Phillips Boulevard and Francis Avenue and diverting the flow westerly to discharge into Chino Storm Drain downstream of Norton Avenue. Upon construction of the storm drain improvements recommended for System 19 and System 28, the existing capacity of Chino Storm Drain would become adequate to serve the future needs.

Drainage area 14, and 16 through 27, totaling approximately 2,050 acres, lying to the south of Francis Avenue and extending from Magnolia Avenue to San Antonio Channel, will be tributary to System 11. The existing storm drain along Central Avenue at the intersection of Phillips Boulevard is to be diverted to System 28 and the section between Francis Avenue and Phillips is planned to be diverted into System 19.

#### SYSTEM 12

As shown in Figure VI-3, System 12 has an area of 24 acres bounded by Southern Pacific Railroad, San Antonio Channel and Philadelphia Street. A 27-inch storm drain has been planned to drain this area into San Antonio Channel.

#### SYSTEM 13

As shown in Figure VI-4, System 13 is comprised of an area of 25 acres lying to the west of San Antonio Channel and north of Chino Storm Drain. Runoff from this area presently flows across County Road at Mills Avenue. A storm drain along County Road from Mills Avenue, under the Southern Pacific Railroad tracks, to the San Antonio Channel has been planned to relieve flooding in this area.

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**MASTER PLAN OF DRAINAGE**  
**CITY OF CHINO**

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**FINAL REPORT**

**NOVEMBER, 1993**

**MASTER PLAN OF DRAINAGE  
CITY OF CHINO, CALIFORNIA**

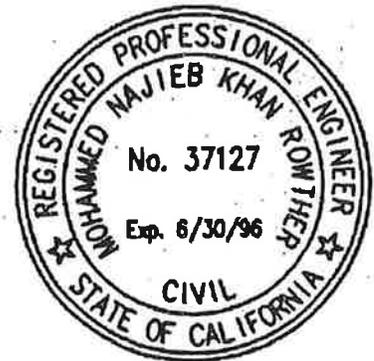
Prepared for:

**CITY OF CHINO  
PUBLIC WORKS DEPARTMENT  
13220 Central Avenue  
Chino, California 91710**

Prepared by:

**BSI Consultants, Inc.  
2001 East First Street  
Santa Ana, California 92705  
(714) 568-7300**

Under the supervision of:



*Mohammed Rowther*

Mohammed N.K. Rowther

*November 18, 1993*

Date

Drainage areas tributary to each system have been identified with numbers that coincide with the system numbers. The drainage areas have been sub-divided into subareas, each tributary to a concentration node. Storm drains planned in a system have been identified by Line Numbers.

This section presents the following:

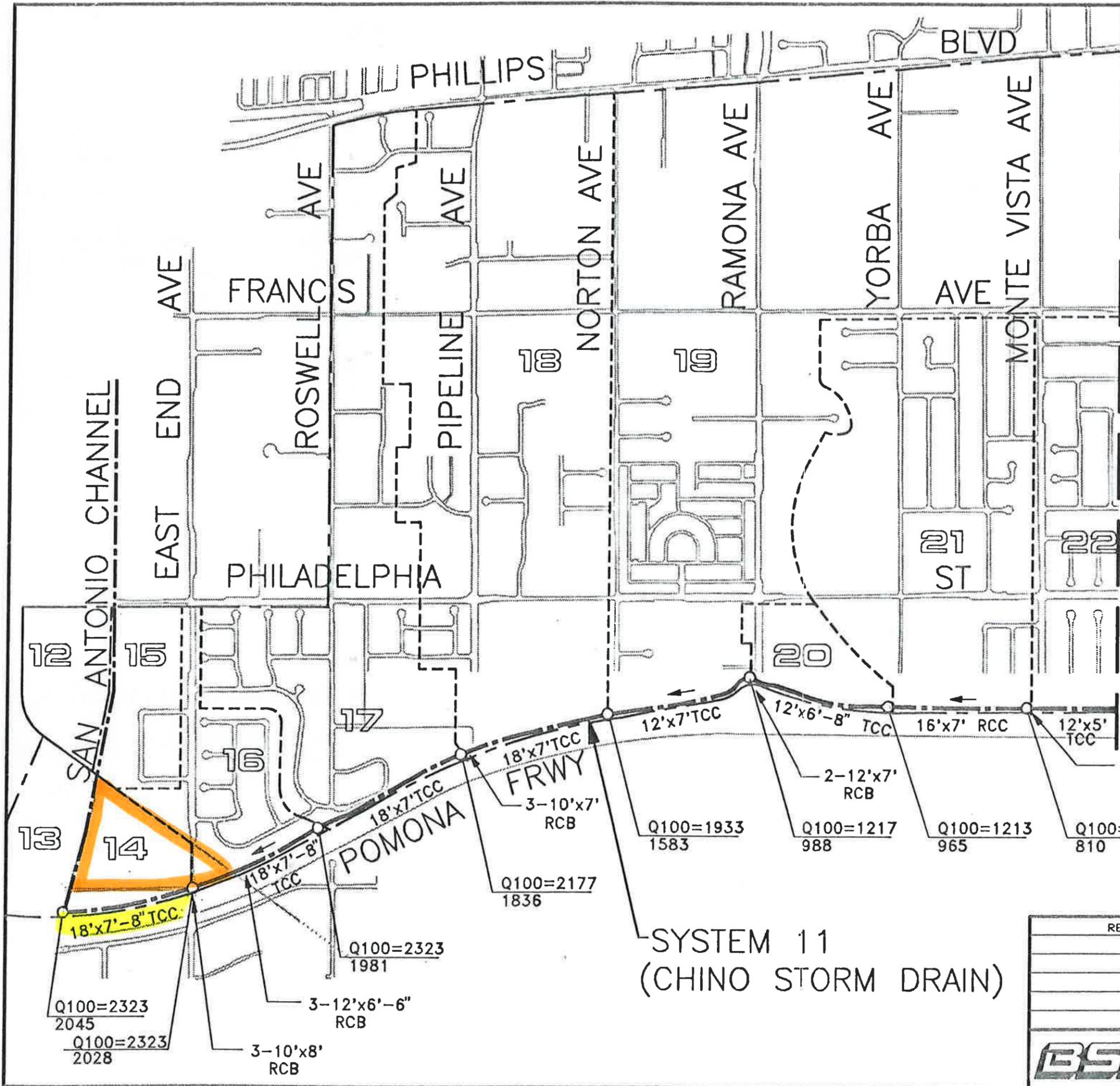
- a brief description of the drainage systems and basis of cost estimates.
- 1000-scale System Maps showing peak flow rates at concentration nodes, and existing and planned facilities;
- a detailed breakdown of preliminary cost estimates for each of the planned storm drain system.

## **VI.2 SYSTEM DESCRIPTIONS**

### **SYSTEM 11 (CHINO STORM DRAIN)**

Chino Storm Drain presently owned and operated by SBCFCD was built by Caltrans. As shown in Figure VI-1 and Figure VI-2, it runs along the north side of the Pomona Freeway (Route 60) from Benson Avenue to San Antonio Channel. It is a trapezoidal concrete channel with reinforced concrete box culverts at street crossings. A reinforced concrete box conduit extends the drain from Benson Avenue to Oaks Avenue. The present drainage area tributary to the Chino Storm Drain extends from San Antonio Channel to Magnolia Avenue in the east-west direction and from State Street to the Pomona Freeway in the north-south direction. The 100-year storm runoff from this approximately 5.5 square mile area exceeds the existing capacity of Chino Storm Drain.

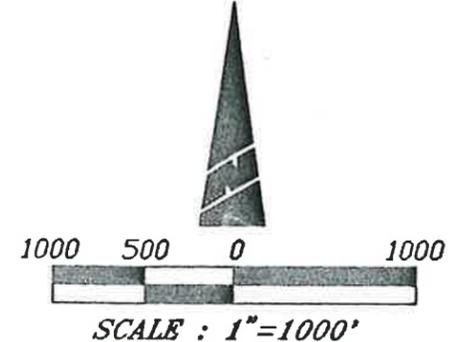
In order to reduce the 100-year storm runoff tributary to Chino Storm Drain to the channel's present capacity, two parallel relief drain systems have been planned.



**LEGEND**

- SYSTEM AREA NUMBER
- SYSTEM AREA BOUNDARY
- SUBAREA BOUNDARY
- PROPOSED STORM DRAIN-ADJOINING SYSTEM
- PROPOSED STORM DRAIN-THIS SYSTEM
- EXISTING CLOSED CONDUIT
- EXISTING CONCRETE CHANNEL
- EXISTING EARTHEN CHANNEL
- TOTAL FLOW FOR YEAR STORM (25) IN CUBIC FEET PER SECOND
- TOTAL AREA TRIBUTARY TO NODE IN ACRES
- LINE NUMBER
- VACATED STREET
- REINFORCED CONCRETE PIPE SIZE
- CAST-IN-PLACE PIPE
- CORRUGATED METAL PIPE
- REINFORCED CONCRETE BOX
- TRAPEZOIDAL CONCRETE CHANNEL
- RECTANGULAR CONCRETE CHANNEL
- EXISTING LIFT STATION

MATCH LINE  
SEE FIGURE VI-2



SYSTEM 11  
(CHINO STORM DRAIN)

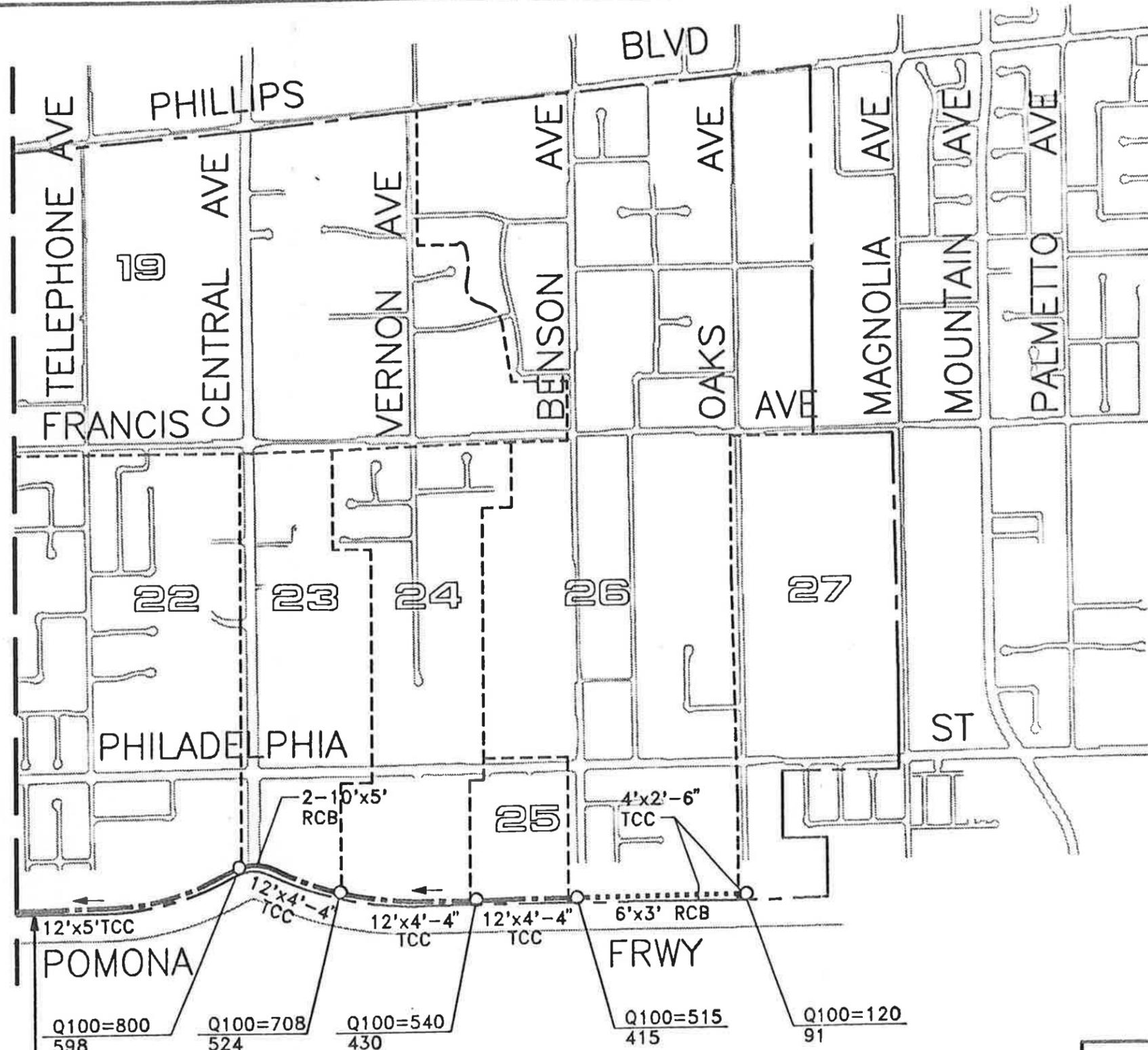
REVISIONS	

**CITY OF CHINO**  
**MASTER PLAN OF DRAINAGE**  
**SYSTEM 11**  
**(CHINO STORM DRAIN)**

**BSI** BSI Consultants, Inc.  
200 E. First Street  
Santa Ana, CA 92705  
(714) 569-7300

FIGURE VI-1

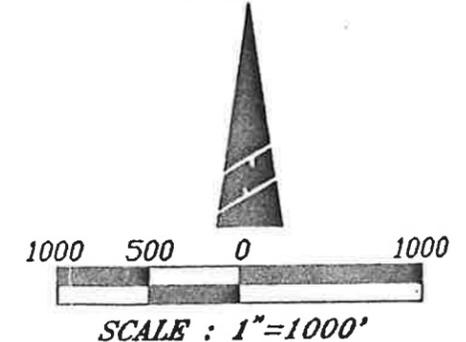
MATCH LINE SEE FIGURE VI-1



SYSTEM 11  
(CHINO STORM DRAIN)

LEGEND

- 10 SYSTEM AREA NUMBER
- SYSTEM AREA BOUNDARY
- - - SUBAREA BOUNDARY
- - - - PROPOSED STORM DRAIN-ADJOINING SYSTEM
- PROPOSED STORM DRAIN-THIS SYSTEM
- ..... EXISTING CLOSED CONDUIT
- - - - EXISTING CONCRETE CHANNEL
- ..... EXISTING EARTHEN CHANNEL
- Q 25=150 TOTAL FLOW FOR YEAR STORM (25) IN CUBIC FEET PER SECOND
- 125 TOTAL AREA TRIBUTARY TO NODE IN ACRES
- 49-2 LINE NUMBER
- YORK VACATED STREET
- 24" REINFORCED CONCRETE PIPE SIZE
- CIPP CAST-IN-PLACE PIPE
- CMF CORRUGATED METAL PIPE
- RCB REINFORCED CONCRETE BOX
- TCC TRAPEZOIDAL CONCRETE CHANNEL
- RCC RECTANGULAR CONCRETE CHANNEL
- ⊠ EXISTING LIFT STATION



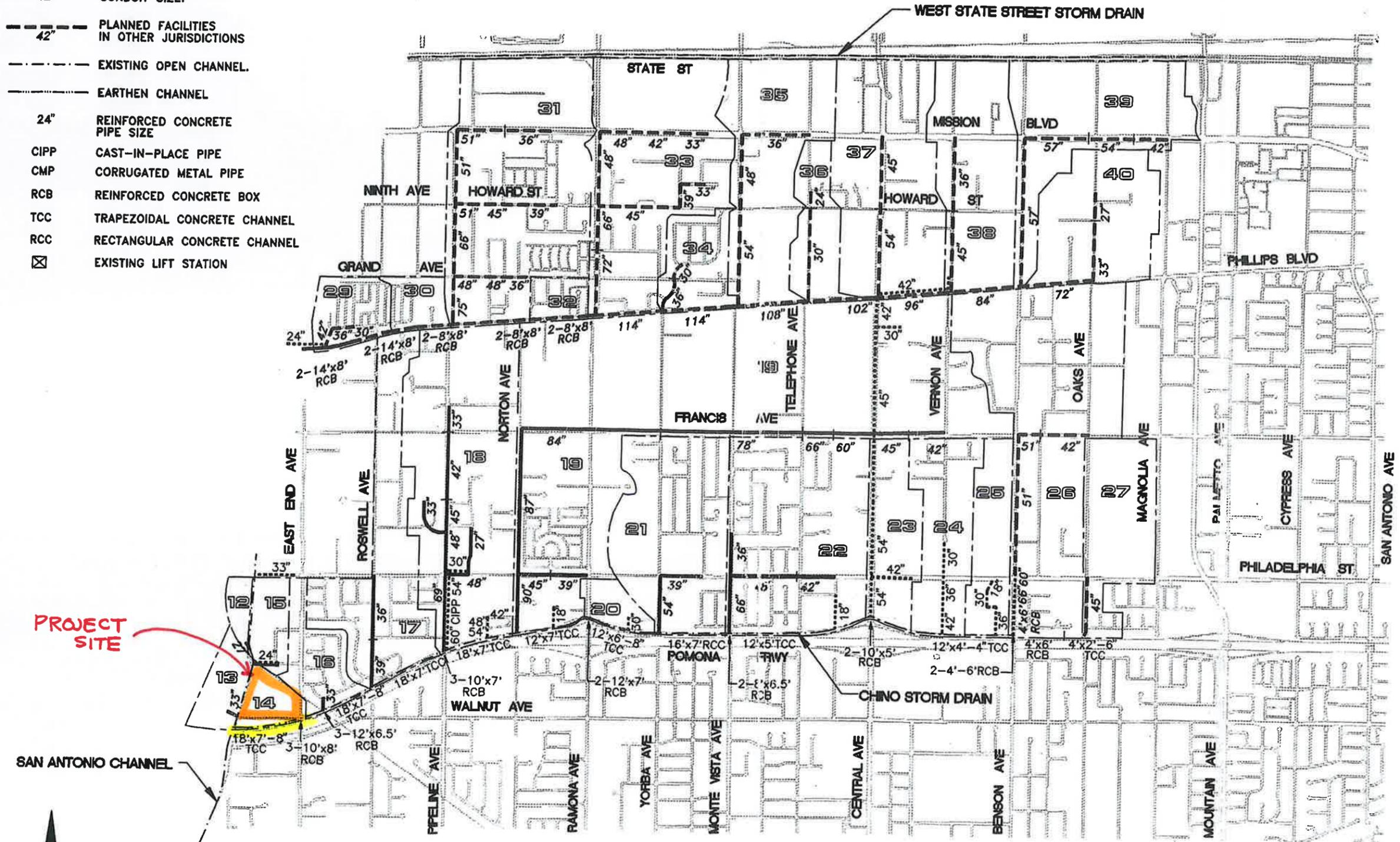
REVISIONS

CITY OF CHINO  
 MASTER PLAN OF DRAINAGE  
**SYSTEM 11**  
 (CHINO STORM DRAIN)  
 FIGURE VI-2

**BSI** BSI Consultants, Inc.  
 2001 E. First Street  
 Santa Ana, CA 92703  
 (714) 568-7300

**LEGEND**

- 31** SYSTEM AREA NUMBER
- SYSTEM AREA BOUNDARY
- ..... EXISTING STORM DRAIN CONDUIT SIZE.
- 60" PLANNED FACILITIES CONDUIT SIZE.
- 42" PLANNED FACILITIES CONDUIT SIZE.
- 42" PLANNED FACILITIES IN OTHER JURISDICTIONS
- EXISTING OPEN CHANNEL.
- EARTHEN CHANNEL
- 24" REINFORCED CONCRETE PIPE SIZE
- CIPP CAST-IN-PLACE PIPE
- CMP CORRUGATED METAL PIPE
- RCB REINFORCED CONCRETE BOX
- TCC TRAPEZOIDAL CONCRETE CHANNEL
- RCC RECTANGULAR CONCRETE CHANNEL
- ☒ EXISTING LIFT STATION



Description	Date/Initial

FIGURE II-1

7733.00 11-18-99 MFC/RT/NEW 04

# SAN BERNARDINO COUNTY DEPARTMENT OF TRANSPORTATION / FLOOD CONTROL



## PLANS FOR CONSTRUCTION ON CHINO STORM DRAIN SAN ANTONIO CHANNEL TO CENTRAL AVENUE CHINO, CALIFORNIA

W.O. F00867

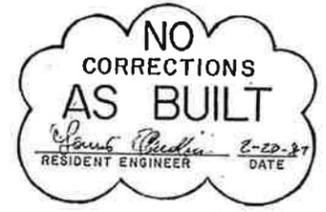
INDEX OF SHEETS

SHEET NO.	TITLE
1	TITLE SHEET
2	CONCRETE RAMP DETAILS & 36" DIA. DRAIN HOLES
3	SIDE DRAIN INLETS
4	LEVEE SUBDRAIN SYSTEM PLAN
5	CONCRETE RAMP DETAILS



PROJECT LOCATION MAP

NO SCALE



SAN BERNARDINO COUNTY  
APPROVED BY: B. P. Ingram 2/20/84  
COUNTY ROAD COMMISSIONER RCE 18748 DATE  
FLOOD CONTROL ENGINEER

FILE NO.

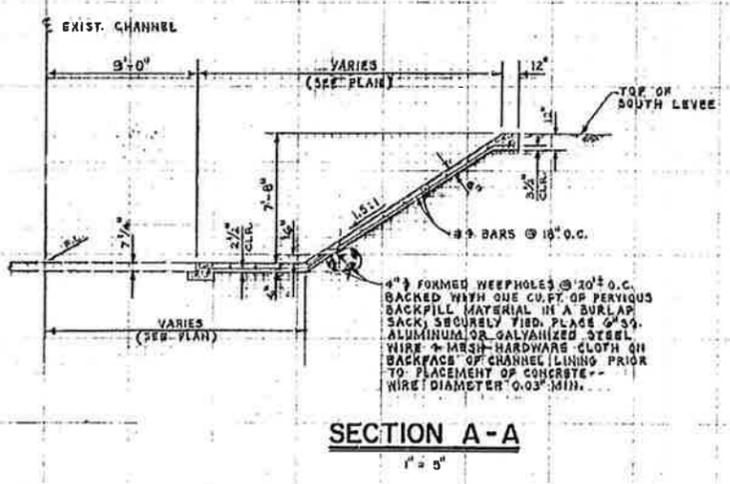
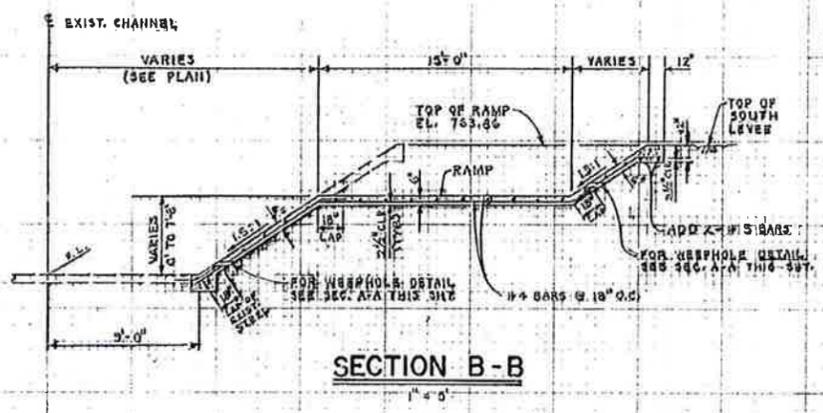
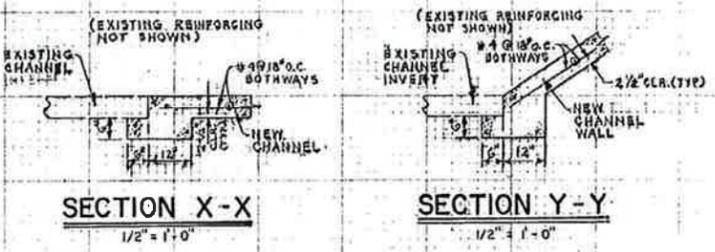
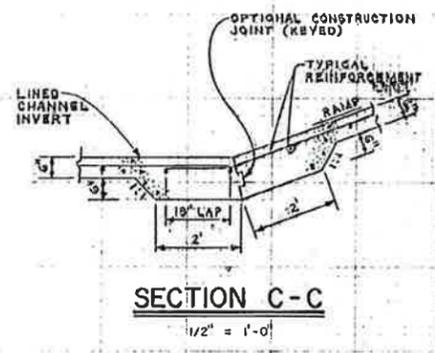
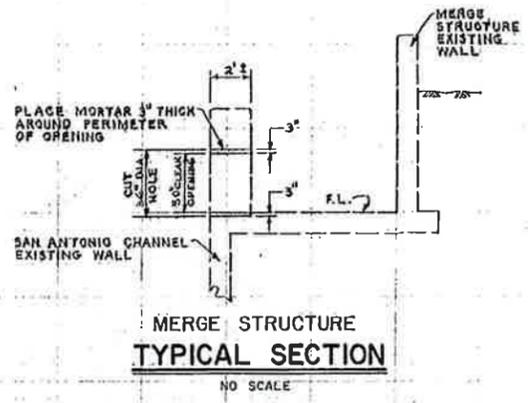
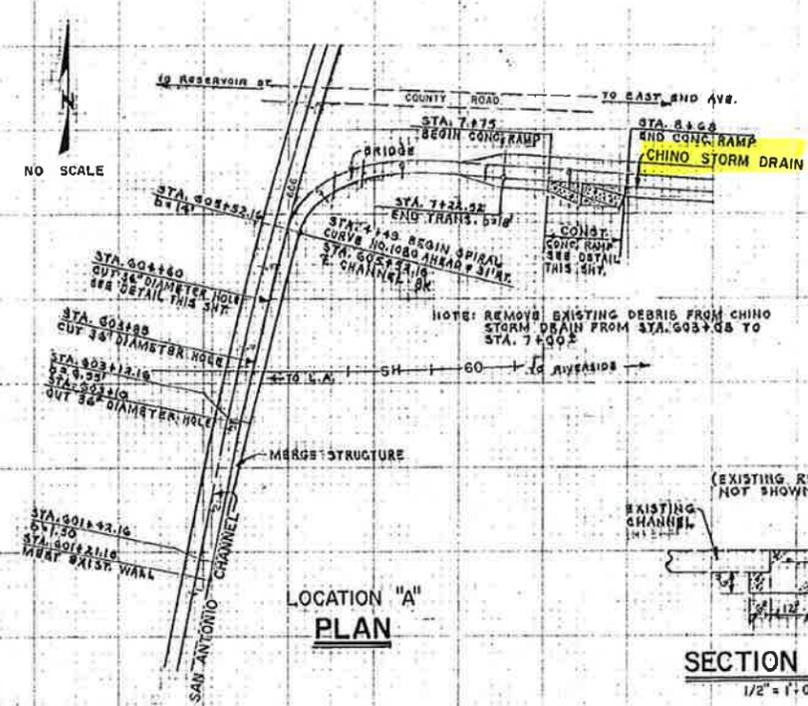
FILE NO.

COUNTY OF SAN BERNARDINO  
DEPARTMENT OF  
TRANSPORTATION / FLOOD CONTROL

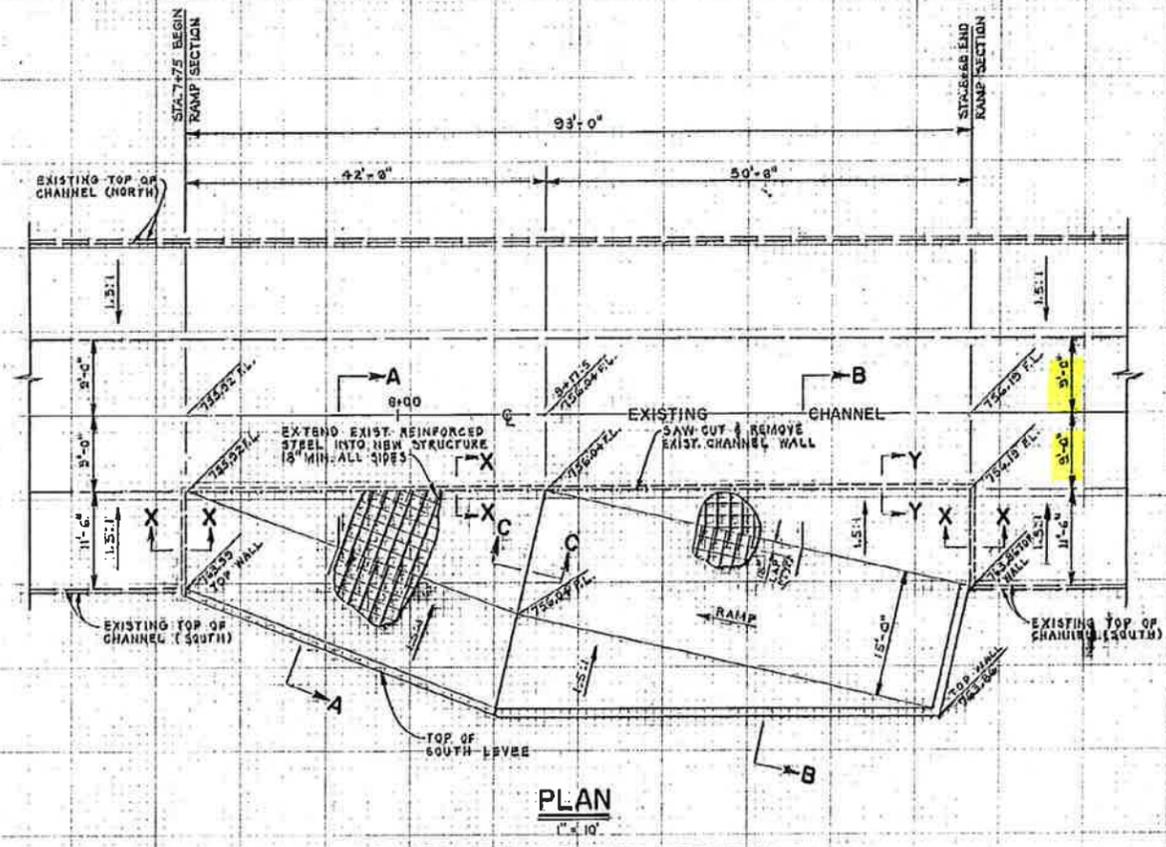
**CHINO STORM DRAIN**  
SAN ANTONIO CHANNEL TO CENTRAL AVENUE  
CHINO, CALIFORNIA

WO NO. F00867 FIELD BOOK REF.  
SUBMITTED BY: *Paul A. Palumbo* DATE: *2/16/84*  
RECOMMENDED / APPROVED BY: *B.P. Quinn* DATE: *2/16/84*  
*Paul A. Palumbo* DATE: *2/16/84* ASSIST. FLOOD CONTROL ENGR.  
*B.P. Quinn* DATE: *2/16/84* FLOOD CONTROL ENGINEER

**CONCRETE RAMP DETAILS**  
**8" 36" DIA. DRAIN HOLES**



- RAMP GENERAL NOTES:**
- 1) SAW-CUT TRANSVERSE WEAKENED PLANE JOINTS IN THE INVERT AND SIDE WALLS SHALL BE CONSTRUCTED AT 20" O.C. JOINTS SHALL BE 1/4" MAXIMUM IN WIDTH AND TO A DEPTH OF WITHIN 1/2" OF THE REINFORCEMENT.
  - 2) THE REINFORCEMENT MATERIALS SHALL BE SUPPORTED IN BOTH DIRECTIONS AT 4" MAXIMUM SPACING OR AS DIRECTED BY THE ENGINEER.



**NO CORRECTIONS AS BUILT**  
*Paul A. Palumbo* DATE: *2-20-87*  
RESIDENT ENGINEER

NO.	DATE	REVISIONS

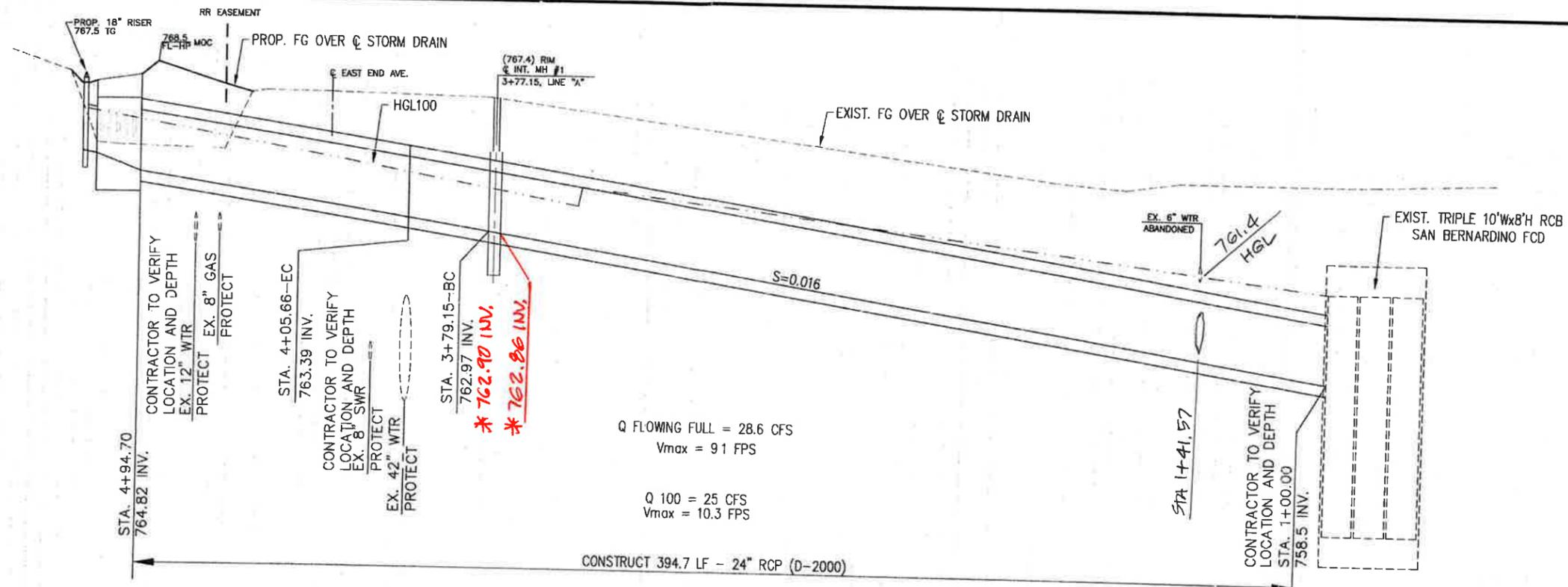
FILE NO. 1-120-4/2-5  
DESIGNED BY: *G.L.A.*  
DRAWN BY: *G.L.A.*

765

765

755

755



CONSTRUCT 394.7 LF - 24" RCP (D-2000)

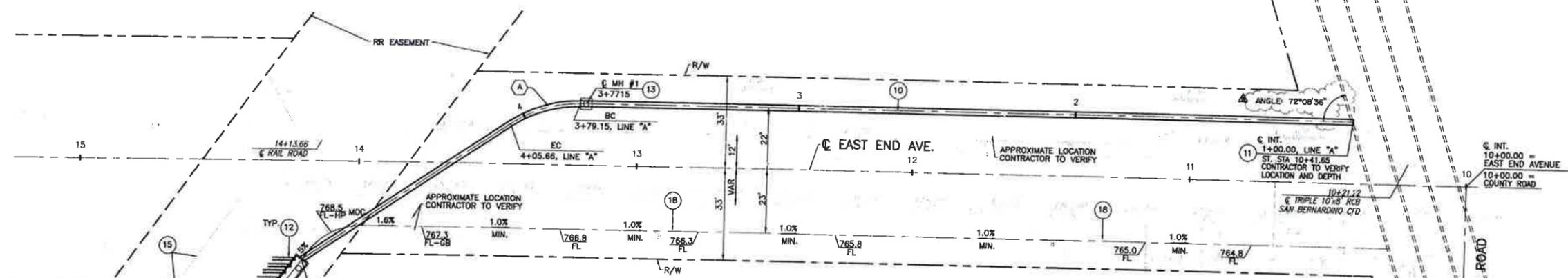
Q FLOWING FULL = 28.6 CFS  
Vmax = 91 FPS

Q 100 = 25 CFS  
Vmax = 10.3 FPS

PROFILE SCALE  
HORIZ: 1" = 20'  
VERT: 1" = 2'

\* SURVEYED ELEVATION

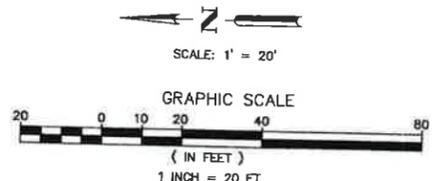
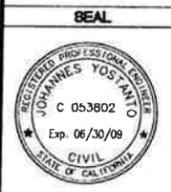
NOTE: ALL FACILITIES AND IMPROVEMENTS WITHIN DISTRICT RIGHT-OF-WAY SHALL BE PROTECTED IN PLACE OR REPLACE IN KIND.



CONSTRUCTION NOTES

- 10 - CONSTRUCT 24" RCP (2000-D), CASE 3 BEDDING & BACKFILL PER LACDPW STD. DWG. 3080-2
- 11 - CONSTRUCT PIPE CONNECTION TO EXIST. RCE PER SBCFCD SP. 127 A, SEE SHEET 3
- 12 - CONSTRUCT AND EXTEND TO MATCH EXISTING 12" STEEL PIPE (FULL WELDED JOINT)
- 13 - CONSTRUCT MODIFY JUNCTION STRUCTURE II PER CITY STD. 370
- 14 - CONSTRUCT CONCRETE APRON PER DETAIL ON SHEET 3
- 15 - CONSTRUCT #4 REBAR @ 4" O.C. TRASH RACK UPSTREAM OF CULVERTS OPENING
- 16 - CONSTRUCT 18" RISER PER MODIFIED CITY STD. 355, ADD 4-1" DIA. PERFORATED HOLES BETWEEN FLOWLINE AND RISER RIM, SEE SHEET 3 FOR DETAIL
- 17 - CONSTRUCT MODIFIED CATCH BASIN II PER CITY STD. 340, OMIT CURB OPENING, USE REINFORCEMENT AND DIMENSION FOR V=8', SEE SHEET 3 FOR DETAIL
- 18 - BACKFILL EXIST. DITCH AND CREATE SHOULDER SWALE TO DRAIN

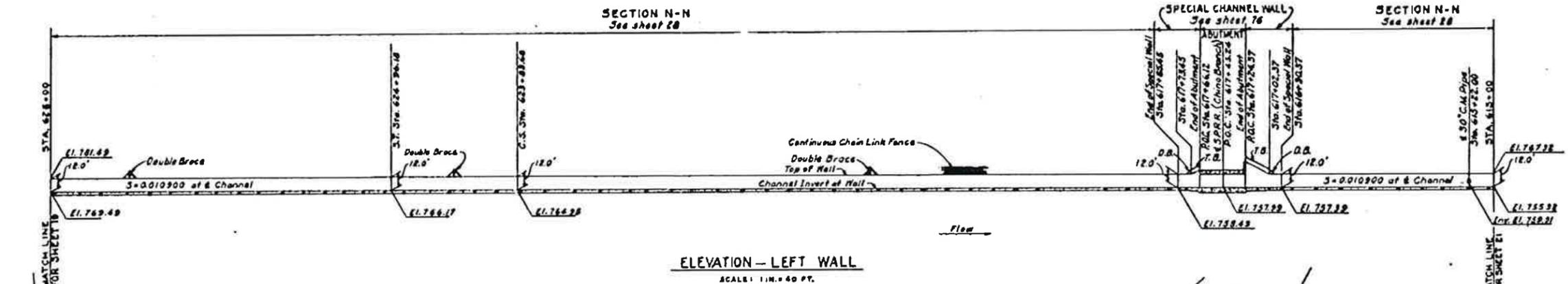
Curve / Line Data				
CURVE	RADIUS	LENGTH	TANGENT	DELTA/BEARING
A	22.50'	26.51'	13.65'	33°45'11"



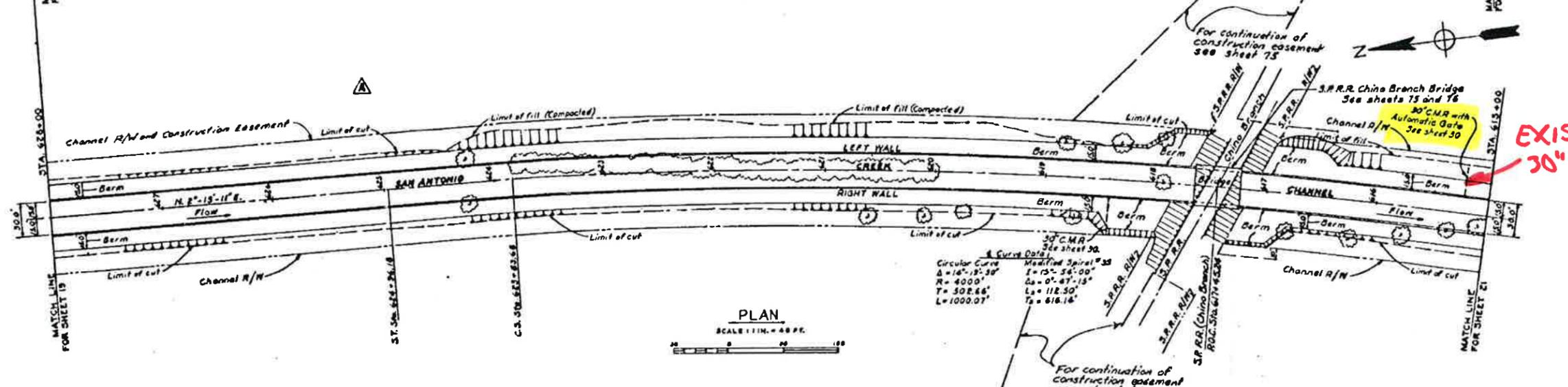
<b>PREPARED BY</b> J. YOSTANTO P.E. ADDRESS: 20316 VIA MANRESA YORBA LINDA, CA 92887 TELEPHONE: (714) 693-7707 FAX: (714) 693-7707 C. 053802 8/30/09 SIGNATURE RCE DATE		<b>REVISIONS</b> 1. UNIVERSITY OF PROP. STORM DRAIN WAS ON... 2. ADDED ANGLE... 3. RECORD DRAWING / NO CHANGE MADE BY: J.Y. DATE: 1/23/08 APPROVED BY: A.D. DATE: 1/23/08		<b>BENCH MARK DATA</b> NO. BM 125-37, ELEV. 784.8375 FT LOCATION: (2007 DATUM) A 2-1/2" BRASS DISC STAMPED "125/37" LOCATED IN TOP OF CURB, 5' WEST OF THE BOR OF THE SW CURB RETURN, AND BEING 61' WEST AND 18' SOUTH OF THE CENTERLINE INT. OF EAST END AVE. AND COUNTY ROAD.		<b>REFERENCE DRAWINGS</b> WATER: [ ] SEWER: [ ] FIRE: [ ] PLANNING: [ ] TRAFFIC: [ ] SERVICES: [ ]		<b>REVIEWED BY STAFF</b> JY DATE: [ ] CITY ENGINEERS STAFF: [ ] DESIGNED: [ ] CHECKED: [ ] RECOMMENDED: [ ]		<b>APPROVED BY:</b> JAMES A. HILL CITY ENGINEER DATE: 1/23/08	
---	--	--	--	--	--	--	--	--	--	--	--

**CITY OF CHINO ENGINEERING DIVISION**  
**STORM DRAIN IMPROVEMENT PLAN AND PROFILE**  
**EAST END AVENUE**  
**COUNTY ROAD TO THE RAIL ROAD**

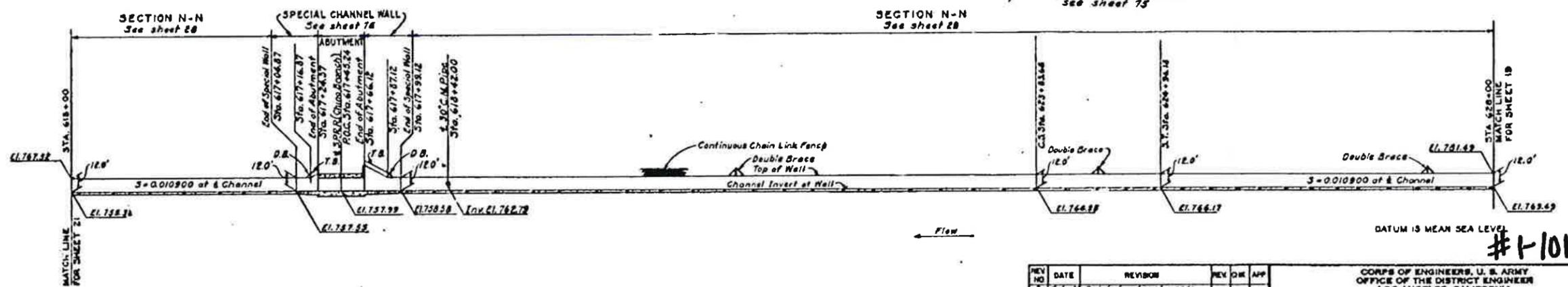
PROJECT NO. C.I.P.  
 SHEET 2 OF 3  
 DRAWING NO. AA4352A



ELEVATION - LEFT WALL  
SCALE: 1 IN. = 40 FT.



PLAN  
SCALE: 1 IN. = 40 FT.



ELEVATION - RIGHT WALL  
SCALE: 1 IN. = 40 FT.

REFERENCE DRAWINGS  
For reference drawings and  
General notes See sheets 10 and 28

RECORD DRAWING - AS CONSTRUCTED  
CONV. No. 58-121 REV. A DATE 2/16/61 BY H. G. COOPER  
CONV. No. REV. DATE BY

REV. NO.	DATE	REVISION	REV. OR APP.
1	10/10/59	DESIGNED ORIGINAL DESIGN	DESIGNED
2		REVISIONS	
3			
4			
5			
6			
7			
8			
9			
10			

CORPS OF ENGINEERS, U. S. ARMY  
 OFFICE OF THE DISTRICT ENGINEER  
 LOS ANGELES, CALIFORNIA  
 SANTA ANA RIVER BASIN, CALIFORNIA  
**SAN ANTONIO AND CHINO CREEKS IMPROVEMENT**  
 SAN ANTONIO CREEK CHANNEL  
 HOLT AVENUE TO CHINO AVENUE  
 DETAIL PLAN NO. 11  
 STA. 628+00 TO STA. 615+00

HARRISON & WOOLLEY  
 CONSULTING ENGINEERS  
 200 N. WYTH STREET SANTA ANA, CALIFORNIA  
 ARCHITECT - ENGINEER

SCALE AS SHOWN  
 TO ACCOMPANY SPECIFICATIONS  
 CIVILS - 85-47

DATE OCTOBER 1959  
 FILE NO. 15 G. 2833  
 283/20 REV. A

#101-13

DATUM IS MEAN SEA LEVEL

## **APPENDIX B**

### **HYDROLOGY CALCULATIONS**

**HYDROLOGY  
EXISTING CONDITION**

\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
(c) Copyright 1983-99 Advanced Engineering Software (aes)  
Ver. 8.0 Release Date: 01/01/99 License ID 1435

Analysis prepared by:

THIENES ENGINEERING  
16800 VALLEY VIEW AVENUE  
LA MIRADA CA 90638  
PH: (714) 521-4811 FAX: (714) 521-4173

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* EXISTING CONDITION \*  
\* NODE 100-101 \*  
\* TEI JN 3712 \*  
\*\*\*\*\*

FILE NAME: C:\XDRIVE\3712\EX100.DAT  
TIME/DATE OF STUDY: 16:47 01/15/2020

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--\*TIME-OF-CONCENTRATION MODEL\*--

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  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000  
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.3500

\*ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD\*

\*\*\*\*\*  
FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

=====  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<  
=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 674.00  
ELEVATION DATA: UPSTREAM (FEET) = 770.30 DOWNSTREAM (FEET) = 759.90

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$   
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 9.477  
\* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 4.085  
SUBAREA Tc AND LOSS RATE DATA (AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
NATURAL FAIR COVER						
"OPEN BRUSH"	B	3.10	0.31	1.00	84	22.01
COMMERCIAL	B	0.25	0.45	0.10	76	9.48

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.31  
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.93  
SUBAREA RUNOFF (CFS) = 11.45  
TOTAL AREA (ACRES) = 3.35 PEAK FLOW RATE (CFS) = 11.45

=====  
END OF STUDY SUMMARY:  
TOTAL AREA (ACRES) = 3.35 TC (MIN.) = 9.48  
EFFECTIVE AREA (ACRES) = 3.35 AREA-AVERAGED Fm (INCH/HR) = 0.29  
AREA-AVERAGED Fp (INCH/HR) = 0.31 AREA-AVERAGED Ap = 0.93  
PEAK FLOW RATE (CFS) = 11.45  
=====

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
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Analysis prepared by:

THIENES ENGINEERING  
 16800 VALLEY VIEW AVENUE  
 LA MIRADA CA 90638  
 PH: (714) 521-4811 FAX: (714) 521-4173

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

\* EXISTING CONDITION \*  
 \* NODE 110-111 \*  
 \* TEI JN 3712 \*  
 \*\*\*\*\*

FILE NAME: C:\XDRIVE\3712\EX110.DAT  
 TIME/DATE OF STUDY: 16:50 01/15/2020

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--\*TIME-OF-CONCENTRATION MODEL\*--

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  
 \*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000  
 USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.3500

\*ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD\*

\*\*\*\*\*

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 734.00  
 ELEVATION DATA: UPSTREAM (FEET) = 771.20 DOWNSTREAM (FEET) = 761.95

Tc = K \* [(LENGTH\*\* 3.00) / (ELEVATION CHANGE)] \*\* 0.20

SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.211

\* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.906

SUBAREA Tc AND LOSS RATE DATA (AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
NATURAL FAIR COVER						
"OPEN BRUSH"	B	2.00	0.31	1.00	84	23.71
COMMERCIAL	B	3.20	0.45	0.10	76	10.21
COMMERCIAL	B	0.05	0.45	0.10	76	10.21

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.44

SUBAREA RUNOFF (CFS) = 17.77

TOTAL AREA (ACRES) = 5.25 PEAK FLOW RATE (CFS) = 17.77

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 5.25 TC (MIN.) = 10.21  
 EFFECTIVE AREA (ACRES) = 5.25 AREA-AVERAGED Fm (INCH/HR) = 0.15  
 AREA-AVERAGED Fp (INCH/HR) = 0.33 AREA-AVERAGED Ap = 0.44  
 PEAK FLOW RATE (CFS) = 17.77

=====

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
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 Ver. 8.0 Release Date: 01/01/99 License ID 1435

Analysis prepared by:

THIENES ENGINEERING  
 16800 VALLEY VIEW AVENUE  
 LA MIRADA CA 90638  
 PH: (714) 521-4811 FAX: (714) 521-4173

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

\* EXISTING CONDITION \*  
 \* NODE 200-201 \*  
 \* TEI JN 3712 \*  
 \*\*\*\*\*

FILE NAME: C:\XDRIVE\3712\EX200.DAT  
 TIME/DATE OF STUDY: 17:48 01/13/2020

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--\*TIME-OF-CONCENTRATION MODEL\*--

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  
 \*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000  
 USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.3500

\*ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD\*

\*\*\*\*\*

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

=====

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 769.00  
 ELEVATION DATA: UPSTREAM(FEET) = 771.20 DOWNSTREAM(FEET) = 764.50

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.200

\* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.696

SUBAREA Tc AND LOSS RATE DATA (AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
NATURAL FAIR COVER						
"OPEN BRUSH"	B	1.40	0.31	1.00	84	26.01
COMMERCIAL	B	2.30	0.45	0.10	76	11.20

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.44

SUBAREA RUNOFF (CFS) = 11.83

TOTAL AREA (ACRES) = 3.70 PEAK FLOW RATE (CFS) = 11.83

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 3.70 TC (MIN.) = 11.20  
 EFFECTIVE AREA (ACRES) = 3.70 AREA-AVERAGED Fm (INCH/HR) = 0.14  
 AREA-AVERAGED Fp (INCH/HR) = 0.33 AREA-AVERAGED Ap = 0.44  
 PEAK FLOW RATE (CFS) = 11.83

=====

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
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Ver. 8.0 Release Date: 01/01/99 License ID 1435

Analysis prepared by:

THIENES ENGINEERING  
16800 VALLEY VIEW AVENUE  
LA MIRADA CA 90638  
PH: (714) 521-4811 FAX: (714) 521-4173

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

\* EXISTING CONDITION \*  
\* NODE 300-301 \*  
\* TEL JN 3712 \*  
\*\*\*\*\*

FILE NAME: C:\XDRIVE\3712\EX300.DAT  
TIME/DATE OF STUDY: 17:43 01/13/2020

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--\*TIME-OF-CONCENTRATION MODEL\*--

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  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000  
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.3500

\*ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD\*

\*\*\*\*\*

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 198.00  
ELEVATION DATA: UPSTREAM (FEET) = 766.47 DOWNSTREAM (FEET) = 765.03

Tc = K \* [(LENGTH\*\* 3.00) / (ELEVATION CHANGE)] \*\* 0.20  
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 15.672  
\* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.021  
SUBAREA Tc AND LOSS RATE DATA (AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
NATURAL FAIR COVER "OPEN BRUSH"	B	0.60	0.31	1.00	84	15.67

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.31  
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.00  
SUBAREA RUNOFF (CFS) = 1.46  
TOTAL AREA (ACRES) = 0.60 PEAK FLOW RATE (CFS) = 1.46

=====

END OF STUDY SUMMARY:  
TOTAL AREA (ACRES) = 0.60 TC (MIN.) = 15.67  
EFFECTIVE AREA (ACRES) = 0.60 AREA-AVERAGED Fm (INCH/HR) = 0.31  
AREA-AVERAGED Fp (INCH/HR) = 0.31 AREA-AVERAGED Ap = 1.00  
PEAK FLOW RATE (CFS) = 1.46

=====

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
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Analysis prepared by:

THIENES ENGINEERING  
 16800 VALLEY VIEW AVENUE  
 LA MIRADA CA 90638  
 PH: (714) 521-4811 FAX: (714) 521-4173

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
 \* EXISTING CONDITION \*  
 \* NODE 310-311 \*  
 \* TEI JN 3712 \*  
 \*\*\*\*\*

FILE NAME: C:\XDRIVE\3712\EX310.DAT  
 TIME/DATE OF STUDY: 17:50 01/13/2020

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--\*TIME-OF-CONCENTRATION MODEL\*--

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  
 \*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000  
 USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.3500

\*ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD\*

\*\*\*\*\*

FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 21

=====

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 158.00  
 ELEVATION DATA: UPSTREAM (FEET) = 766.64 DOWNSTREAM (FEET) = 765.50

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$   
 SUBAREA ANALYSIS USED MINIMUM  $T_c$  (MIN.) = 14.342  
 \* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.186  
 SUBAREA  $T_c$  AND LOSS RATE DATA (AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	$F_p$ (INCH/HR)	$A_p$ (DECIMAL)	SCS CN	$T_c$ (MIN.)
NATURAL FAIR COVER "OPEN BRUSH"	B	0.30	0.31	1.00	84	14.34

SUBAREA AVERAGE PERVIOUS LOSS RATE,  $F_p$  (INCH/HR) = 0.31  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION,  $A_p$  = 1.00  
 SUBAREA RUNOFF (CFS) = 0.78  
 TOTAL AREA (ACRES) = 0.30 PEAK FLOW RATE (CFS) = 0.78

=====

END OF STUDY SUMMARY:  
 TOTAL AREA (ACRES) = 0.30  $T_c$  (MIN.) = 14.34  
 EFFECTIVE AREA (ACRES) = 0.30 AREA-AVERAGED  $F_m$  (INCH/HR) = 0.31  
 AREA-AVERAGED  $F_p$  (INCH/HR) = 0.31 AREA-AVERAGED  $A_p$  = 1.00  
 PEAK FLOW RATE (CFS) = 0.78

=====

END OF RATIONAL METHOD ANALYSIS

**HYDROLOGY**  
**PROPOSED CONDITION**

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
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 Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
 \* TEI 3712 \*  
 \* PROPOSED CONDITION - FRONTAGE OF SITE DRAINING DIRECTLY \*  
 \* TO COUNTY ROAD - 100-YEAR EVENT \*  
 \*\*\*\*\*

FILE NAME: W:\3712\90P.DAT  
 TIME/DATE OF STUDY: 16:30 04/08/2020

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--\*TIME-OF-CONCENTRATION MODEL\*--

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  
 \*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000  
 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3500

\*ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD\*

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

NO.	HALF- WIDTH (FT)	CROWN CROSSFALL (FT)	STREET-CROSSFALL:			CURB HEIGHT (FT)	GUTTER-GEOMETRIES:			MANNING HIKE FACTOR (n)
			IN- SIDE	OUT-/PARK- SIDE / WAY	AREA		WIDTH (FT)	LIP (FT)		
1	30.0	20.0	0.018/0.018/0.020		0.67	2.00	0.0312	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)  
 \*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 90.00 TO NODE 91.00 IS CODE = 21  
 \*\*\*\*\*

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 548.00  
 ELEVATION DATA: UPSTREAM(FEET) = 766.80 DOWNSTREAM(FEET) = 762.05

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$   
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.790  
 \* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.006  
 SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.25	0.42	0.100	76	9.79
URBAN POOR COVER "TURF"	B	0.40	0.22	1.000	90	16.91

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.23  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.654  
 SUBAREA RUNOFF(CFS) = 2.25  
 TOTAL AREA(ACRES) = 0.65 PEAK FLOW RATE(CFS) = 2.25

END OF STUDY SUMMARY:  
 TOTAL AREA(ACRES) = 0.6 TC(MIN.) = 9.79  
 EFFECTIVE AREA(ACRES) = 0.65 AREA-AVERAGED Fm(INCH/HR) = 0.15  
 AREA-AVERAGED Fp(INCH/HR) = 0.23 AREA-AVERAGED Ap = 0.654  
 PEAK FLOW RATE(CFS) = 2.25

=====

END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
 \* TEI 3712 \*  
 \* PROPOSED CONDITION, TRIB. TO SAN ANTONIO \*  
 \* CREEK CHANNEL, 100-YEAR EVENT \*  
 \*\*\*\*\*

FILE NAME: W:\3712\100P.DAT  
 TIME/DATE OF STUDY: 10:13 04/10/2020

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--\*TIME-OF-CONCENTRATION MODEL\*--

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  
 \*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000  
 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3500

\*ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD\*

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

NO.	HALF- WIDTH (FT)	CROWN CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP (FT) (FT)	MANNING HIKE FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0312	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)

\*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21  
 -----

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 196.00  
 ELEVATION DATA: UPSTREAM(FEET) = 767.95 DOWNSTREAM(FEET) = 765.73

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$   
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.151  
 \* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.295  
 SUBAREA Tc AND LOSS RATE DATA(AMC III):  
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc  
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)  
 COMMERCIAL B 2.65 0.42 0.100 76 6.15  
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100  
 SUBAREA RUNOFF(CFS) = 12.53  
 TOTAL AREA(ACRES) = 2.65 PEAK FLOW RATE(CFS) = 12.53

\*\*\*\*\*  
 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) = 760.50 DOWNSTREAM(FEET) = 759.62  
 FLOW LENGTH(FEET) = 289.00 MANNING'S N = 0.012  
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.7 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 4.77  
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 12.53  
 PIPE TRAVEL TIME(MIN.) = 1.01 Tc(MIN.) = 7.16  
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 112.00 = 485.00 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.) = 7.16  
 RAINFALL INTENSITY(INCH/HR) = 4.83  
 AREA-AVERAGED Fm(INCH/HR) = 0.04  
 AREA-AVERAGED Fp(INCH/HR) = 0.42  
 AREA-AVERAGED Ap = 0.10  
 EFFECTIVE STREAM AREA(ACRES) = 2.65  
 TOTAL STREAM AREA(ACRES) = 2.65  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 12.53

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 200.00  
 ELEVATION DATA: UPSTREAM(FEET) = 769.79 DOWNSTREAM(FEET) = 766.78

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$   
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.858  
 \* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.452  
 SUBAREA Tc AND LOSS RATE DATA(AMC III):

100P.RES  
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc  
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)  
 COMMERCIAL B 1.95 0.42 0.100 76 5.86  
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100  
 SUBAREA RUNOFF(CFS) = 9.49  
 TOTAL AREA(ACRES) = 1.95 PEAK FLOW RATE(CFS) = 9.49

\*\*\*\*\*  
 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) = 762.20 DOWNSTREAM(FEET) = 759.62  
 FLOW LENGTH(FEET) = 34.00 MANNING'S N = 0.012  
 DEPTH OF FLOW IN 12.0 INCH PIPE IS 9.0 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.97  
 ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 9.49  
 PIPE TRAVEL TIME(MIN.) = 0.04 Tc(MIN.) = 5.90  
 LONGEST FLOWPATH FROM NODE 110.00 TO NODE 112.00 = 234.00 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.) = 5.90  
 RAINFALL INTENSITY(INCH/HR) = 5.43  
 AREA-AVERAGED Fm(INCH/HR) = 0.04  
 AREA-AVERAGED Fp(INCH/HR) = 0.42  
 AREA-AVERAGED Ap = 0.10  
 EFFECTIVE STREAM AREA(ACRES) = 1.95  
 TOTAL STREAM AREA(ACRES) = 1.95  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 9.49

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	12.53	7.16	4.834	0.42(0.04)	0.10	2.7	100.00
2	9.49	5.90	5.431	0.42(0.04)	0.10	2.0	110.00

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

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	21.10	5.90	5.431	0.42(0.04)	0.10	4.1	110.00
2	20.97	7.16	4.834	0.42(0.04)	0.10	4.6	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:  
 PEAK FLOW RATE(CFS) = 21.10 Tc(MIN.) = 5.90  
 EFFECTIVE AREA(ACRES) = 4.13 AREA-AVERAGED Fm(INCH/HR) = 0.04  
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10  
 TOTAL AREA(ACRES) = 4.6  
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 112.00 = 485.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 112.00 TO NODE 153.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 759.62 DOWNSTREAM(FEET) = 757.66  
 FLOW LENGTH(FEET) = 636.00 MANNING'S N = 0.012  
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.8 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.52  
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 21.10  
 PIPE TRAVEL TIME(MIN.) = 1.92 Tc(MIN.) = 7.82  
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 153.00 = 1121.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 153.00 TO NODE 153.00 IS CODE = 10

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

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 120.00 TO NODE 121.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 90.00  
 ELEVATION DATA: UPSTREAM(FEET) = 764.75 DOWNSTREAM(FEET) = 763.54

Tc = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\*0.20  
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000  
 \* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.996  
 SUBAREA Tc AND LOSS RATE DATA(AMC III):  
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc  
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)  
 COMMERCIAL B 0.45 0.42 0.100 76 5.00  
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100  
 SUBAREA RUNOFF(CFS) = 2.41  
 TOTAL AREA(ACRES) = 0.45 PEAK FLOW RATE(CFS) = 2.41

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 121.00 TO NODE 131.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 759.74 DOWNSTREAM(FEET) = 759.40  
 FLOW LENGTH(FEET) = 105.00 MANNING'S N = 0.012  
 DEPTH OF FLOW IN 15.0 INCH PIPE IS 8.6 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 3.34  
 ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 2.41  
PIPE TRAVEL TIME(MIN.) = 0.52 Tc(MIN.) = 5.52  
LONGEST FLOWPATH FROM NODE 120.00 TO NODE 131.00 = 195.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 131.00 TO NODE 131.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

TOTAL NUMBER OF STREAMS = 2  
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MIN.) = 5.52  
RAINFALL INTENSITY(INCH/HR) = 5.65  
AREA-AVERAGED Fm(INCH/HR) = 0.04  
AREA-AVERAGED Fp(INCH/HR) = 0.42  
AREA-AVERAGED Ap = 0.10  
EFFECTIVE STREAM AREA(ACRES) = 0.45  
TOTAL STREAM AREA(ACRES) = 0.45  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.41

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 233.00  
ELEVATION DATA: UPSTREAM(FEET) = 765.19 DOWNSTREAM(FEET) = 762.70

Tc = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\*0.20  
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.669  
\* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.044  
SUBAREA Tc AND LOSS RATE DATA(AMC III):  
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc  
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)  
COMMERCIAL B 1.45 0.42 0.100 76 6.67  
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42  
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100  
SUBAREA RUNOFF(CFS) = 6.53  
TOTAL AREA(ACRES) = 1.45 PEAK FLOW RATE(CFS) = 6.53

\*\*\*\*\*  
FLOW PROCESS FROM NODE 131.00 TO NODE 131.00 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.) = 6.67  
RAINFALL INTENSITY(INCH/HR) = 5.04  
AREA-AVERAGED Fm(INCH/HR) = 0.04  
AREA-AVERAGED Fp(INCH/HR) = 0.42  
AREA-AVERAGED Ap = 0.10  
EFFECTIVE STREAM AREA(ACRES) = 1.45  
TOTAL STREAM AREA(ACRES) = 1.45  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.53

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	2.41	5.52	5.647	0.42( 0.04)	0.10	0.4	120.00
2	6.53	6.67	5.044	0.42( 0.04)	0.10	1.5	130.00

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

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	8.47	5.52	5.647	0.42( 0.04)	0.10	1.7	120.00
2	8.68	6.67	5.044	0.42( 0.04)	0.10	1.9	130.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:  
PEAK FLOW RATE(CFS) = 8.68 Tc(MIN.) = 6.67  
EFFECTIVE AREA(ACRES) = 1.90 AREA-AVERAGED Fm(INCH/HR) = 0.04  
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10  
TOTAL AREA(ACRES) = 1.9  
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 131.00 = 233.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 131.00 TO NODE 142.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 759.40 DOWNSTREAM(FEET) = 758.84  
FLOW LENGTH(FEET) = 183.00 MANNING'S N = 0.012  
DEPTH OF FLOW IN 21.0 INCH PIPE IS 16.1 INCHES  
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.37  
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1  
PIPE-FLOW(CFS) = 8.68  
PIPE TRAVEL TIME(MIN.) = 0.70 Tc(MIN.) = 7.37  
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 142.00 = 416.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 142.00 TO NODE 142.00 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.) = 7.37  
RAINFALL INTENSITY(INCH/HR) = 4.75  
AREA-AVERAGED Fm(INCH/HR) = 0.04  
AREA-AVERAGED Fp(INCH/HR) = 0.42  
AREA-AVERAGED Ap = 0.10  
EFFECTIVE STREAM AREA(ACRES) = 1.90  
TOTAL STREAM AREA(ACRES) = 1.90  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.68

\*\*\*\*\*  
FLOW PROCESS FROM NODE 140.00 TO NODE 141.00 IS CODE = 21

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

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 280.00  
 ELEVATION DATA: UPSTREAM(FEET) = 766.40 DOWNSTREAM(FEET) = 762.60

Tc = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\*0.20  
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.842  
 \* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.967  
 SUBAREA Tc AND LOSS RATE DATA(AMC III):  
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc  
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)  
 COMMERCIAL B 2.45 0.42 0.100 76 6.84  
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100  
 SUBAREA RUNOFF(CFS) = 10.86  
 TOTAL AREA(ACRES) = 2.45 PEAK FLOW RATE(CFS) = 10.86

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 141.00 TO NODE 142.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 759.00 DOWNSTREAM(FEET) = 758.84  
 FLOW LENGTH(FEET) = 40.00 MANNING'S N = 0.012  
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.1 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.23  
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 10.86  
 PIPE TRAVEL TIME(MIN.) = 0.13 Tc(MIN.) = 6.97  
 LONGEST FLOWPATH FROM NODE 140.00 TO NODE 142.00 = 320.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 142.00 TO NODE 142.00 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.) = 6.97  
 RAINFALL INTENSITY(INCH/HR) = 4.91  
 AREA-AVERAGED Fm(INCH/HR) = 0.04  
 AREA-AVERAGED Fp(INCH/HR) = 0.42  
 AREA-AVERAGED Ap = 0.10  
 EFFECTIVE STREAM AREA(ACRES) = 2.45  
 TOTAL STREAM AREA(ACRES) = 2.45  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 10.86

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	8.47	6.22	5.258	0.42( 0.04)	0.10	1.7	120.00
2	8.68	7.37	4.752	0.42( 0.04)	0.10	1.9	130.00
2	10.86	6.97	4.912	0.42( 0.04)	0.10	2.5	140.00

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

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	18.86	6.22	5.258	0.42( 0.04)	0.10	3.8	120.00
2	19.47	6.97	4.912	0.42( 0.04)	0.10	4.3	140.00
3	19.18	7.37	4.752	0.42( 0.04)	0.10	4.4	130.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:  
 PEAK FLOW RATE(CFS) = 19.47 Tc(MIN.) = 6.97  
 EFFECTIVE AREA(ACRES) = 4.26 AREA-AVERAGED Fm(INCH/HR) = 0.04  
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10  
 TOTAL AREA(ACRES) = 4.4  
 LONGEST FLOWPATH FROM NODE 130.00 TO NODE 142.00 = 416.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 142.00 TO NODE 152.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 758.84 DOWNSTREAM(FEET) = 757.71  
 FLOW LENGTH(FEET) = 321.00 MANNING'S N = 0.012  
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 19.5 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.76  
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 19.47  
 PIPE TRAVEL TIME(MIN.) = 0.93 Tc(MIN.) = 7.90  
 LONGEST FLOWPATH FROM NODE 130.00 TO NODE 152.00 = 737.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 152.00 TO NODE 152.00 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.) = 7.90  
 RAINFALL INTENSITY(INCH/HR) = 4.56  
 AREA-AVERAGED Fm(INCH/HR) = 0.04  
 AREA-AVERAGED Fp(INCH/HR) = 0.42  
 AREA-AVERAGED Ap = 0.10  
 EFFECTIVE STREAM AREA(ACRES) = 4.26  
 TOTAL STREAM AREA(ACRES) = 4.35  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 19.47

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 150.00 TO NODE 151.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<<<  
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 483.00  
 ELEVATION DATA: UPSTREAM(FEET) = 769.79 DOWNSTREAM(FEET) = 763.24

Tc = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\*0.20  
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 8.511

\* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.357  
 SUBAREA TC AND LOSS RATE DATA(AMC III):  
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc  
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)  
 COMMERCIAL B 1.15 0.42 0.100 76 8.51  
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100  
 SUBAREA RUNOFF(CFS) = 4.47  
 TOTAL AREA(ACRES) = 1.15 PEAK FLOW RATE(CFS) = 4.47

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 151.00 TO NODE 152.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 760.20 DOWNSTREAM(FEET) = 757.71  
 FLOW LENGTH(FEET) = 8.00 MANNING'S N = 0.012  
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.00  
 DEPTH OF FLOW IN 12.0 INCH PIPE IS 3.8 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 21.25  
 ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 4.47  
 PIPE TRAVEL TIME(MIN.) = 0.01 Tc(MIN.) = 8.52  
 LONGEST FLOWPATH FROM NODE 150.00 TO NODE 152.00 = 491.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 152.00 TO NODE 152.00 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.) = 8.52  
 RAINFALL INTENSITY(INCH/HR) = 4.36  
 AREA-AVERAGED Fm(INCH/HR) = 0.04  
 AREA-AVERAGED Fp(INCH/HR) = 0.42  
 AREA-AVERAGED Ap = 0.10  
 EFFECTIVE STREAM AREA(ACRES) = 1.15  
 TOTAL STREAM AREA(ACRES) = 1.15  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.47

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	18.86	7.19	4.823	0.42( 0.04)	0.10	3.8	120.00
1	19.47	7.90	4.557	0.42( 0.04)	0.10	4.3	140.00
1	19.18	8.33	4.415	0.42( 0.04)	0.10	4.4	130.00
2	4.47	8.52	4.355	0.42( 0.04)	0.10	1.1	150.00

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

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	23.03	7.19	4.823	0.42( 0.04)	0.10	4.8	120.00
2	23.80	7.90	4.557	0.42( 0.04)	0.10	5.3	140.00
3	23.61	8.33	4.415	0.42( 0.04)	0.10	5.5	130.00
4	23.39	8.52	4.355	0.42( 0.04)	0.10	5.5	150.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:  
 PEAK FLOW RATE(CFS) = 23.80 Tc(MIN.) = 7.90  
 EFFECTIVE AREA(ACRES) = 5.33 AREA-AVERAGED Fm(INCH/HR) = 0.04  
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10  
 TOTAL AREA(ACRES) = 5.5  
 LONGEST FLOWPATH FROM NODE 130.00 TO NODE 152.00 = 737.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 152.00 TO NODE 153.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 757.71 DOWNSTREAM(FEET) = 757.66  
 FLOW LENGTH(FEET) = 15.00 MANNING'S N = 0.012  
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 23.4 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.80  
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 23.80  
 PIPE TRAVEL TIME(MIN.) = 0.04 Tc(MIN.) = 7.94  
 LONGEST FLOWPATH FROM NODE 130.00 TO NODE 153.00 = 752.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 153.00 TO NODE 153.00 IS CODE = 11

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

\*\* MAIN STREAM CONFLUENCE DATA \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	23.03	7.23	4.806	0.42( 0.04)	0.10	4.8	120.00
2	23.80	7.94	4.542	0.42( 0.04)	0.10	5.3	140.00
3	23.61	8.37	4.401	0.42( 0.04)	0.10	5.5	130.00
4	23.39	8.56	4.342	0.42( 0.04)	0.10	5.5	150.00

LONGEST FLOWPATH FROM NODE 130.00 TO NODE 153.00 = 752.00 FEET.

\*\* MEMORY BANK # 1 CONFLUENCE DATA \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	21.10	7.82	4.586	0.42( 0.04)	0.10	4.1	110.00
2	20.97	9.08	4.191	0.42( 0.04)	0.10	4.6	100.00

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 153.00 = 1121.00 FEET.

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	43.49	7.23	4.806	0.42( 0.04)	0.10	8.6	120.00
2	44.76	7.82	4.586	0.42( 0.04)	0.10	9.4	110.00
3	44.88	7.94	4.542	0.42( 0.04)	0.10	9.5	140.00
4	44.65	8.37	4.401	0.42( 0.04)	0.10	9.8	130.00
5	44.41	8.56	4.342	0.42( 0.04)	0.10	9.9	150.00
6	43.53	9.08	4.191	0.42( 0.04)	0.10	10.1	100.00

TOTAL AREA(ACRES) = 10.1

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 44.88 TC(MIN.) = 7.942
EFFECTIVE AREA(ACRES) = 9.51 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 10.1
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 153.00 = 1121.00 FEET.

\*\*\*\*\*
FLOW PROCESS FROM NODE 153.00 TO NODE 153.00 IS CODE = 81

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

MAINLINE TC(MIN.) = 7.94
\* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.542
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
NATURAL POOR COVER
"OPEN BRUSH" B 0.25 0.20 1.000 92
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA AREA(ACRES) = 0.25 SUBAREA RUNOFF(CFS) = 0.98
EFFECTIVE AREA(ACRES) = 9.76 AREA-AVERAGED Fm(INCH/HR) = 0.05
AREA-AVERAGED Fp(INCH/HR) = 0.38 AREA-AVERAGED Ap = 0.12
TOTAL AREA(ACRES) = 10.4 PEAK FLOW RATE(CFS) = 44.88
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

\*\*\*\*\*
FLOW PROCESS FROM NODE 153.00 TO NODE 154.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 757.66 DOWNSTREAM(FEET) = 757.55
FLOW LENGTH(FEET) = 33.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.86
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 44.88
PIPE TRAVEL TIME(MIN.) = 0.08 TC(MIN.) = 8.02
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 154.00 = 1154.00 FEET.

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 10.4 TC(MIN.) = 8.02
EFFECTIVE AREA(ACRES) = 9.76 AREA-AVERAGED Fm(INCH/HR) = 0.05
AREA-AVERAGED Fp(INCH/HR) = 0.38 AREA-AVERAGED Ap = 0.123
PEAK FLOW RATE(CFS) = 44.88

\*\* PEAK FLOW RATE TABLE \*\*

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Contains 6 rows of data.

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
 (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
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 Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
 \* TEI 3712  
 \* PROPOSED CONDITION - AREA TRIB. TO EX. 24"  
 \* SD IN EAST END AVE. - 100-YEAR EVENT  
 \*\*\*\*\*

FILE NAME: W:\3712\200P.DAT  
 TIME/DATE OF STUDY: 15:37 04/08/2020

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--\*TIME-OF-CONCENTRATION MODEL\*--

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  
 \*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000  
 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3500

\*ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD\*

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

NO.	HALF-CROWN TO STREET-CROSSFALL:		CURB / OUT-/PARK- / SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GUTTER LIP (FT)	GEOMETRIES HIKE (FT)	MANNING FACTOR (n)
	WIDTH (FT)	CROSSFALL (FT)						
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	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)  
 \*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 111.00  
 ELEVATION DATA: UPSTREAM(FEET) = 767.71 DOWNSTREAM(FEET) = 765.94

Tc = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\*0.20  
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000  
 \* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.996  
 SUBAREA TC AND LOSS RATE DATA(AMC III):  
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc  
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)  
 COMMERCIAL B 0.55 0.42 0.100 76 5.00  
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100  
 SUBAREA RUNOFF(CFS) = 2.95  
 TOTAL AREA(ACRES) = 0.55 PEAK FLOW RATE(CFS) = 2.95

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

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

ELEVATION DATA: UPSTREAM(FEET) = 761.61 DOWNSTREAM(FEET) = 760.83  
 FLOW LENGTH(FEET) = 154.00 MANNING'S N = 0.012  
 DEPTH OF FLOW IN 15.0 INCH PIPE IS 8.4 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 4.15  
 ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 2.95  
 PIPE TRAVEL TIME(MIN.) = 0.62 Tc(MIN.) = 5.62  
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 265.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 IS CODE = 81  
 \*\*\*\*\*

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

MAINLINE Tc(MIN.) = 5.62  
 \* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.590  
 SUBAREA LOSS RATE DATA(AMC III):  
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS  
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN  
 COMMERCIAL B 0.30 0.42 0.100 76  
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100  
 SUBAREA AREA(ACRES) = 0.30 SUBAREA RUNOFF(CFS) = 1.50  
 EFFECTIVE AREA(ACRES) = 0.85 AREA-AVERAGED Fm(INCH/HR) = 0.04  
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10  
 TOTAL AREA(ACRES) = 0.9 PEAK FLOW RATE(CFS) = 4.24

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 31  
 \*\*\*\*\*

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

ELEVATION DATA: UPSTREAM(FEET) = 760.83 DOWNSTREAM(FEET) = 760.00  
 FLOW LENGTH(FEET) = 53.00 MANNING'S N = 0.013  
 DEPTH OF FLOW IN 12.0 INCH PIPE IS 9.6 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.31  
 ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 4.24  
PIPE TRAVEL TIME(MIN.) = 0.14 TC(MIN.) = 5.76  
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 318.00 FEET.

=====  
END OF STUDY SUMMARY:  
TOTAL AREA(ACRES) = 0.9 TC(MIN.) = 5.76  
EFFECTIVE AREA(ACRES) = 0.85 AREA-AVERAGED Fm(INCH/HR)= 0.04  
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.100  
PEAK FLOW RATE(CFS) = 4.24  
=====

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

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
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 Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
 \* TEI 3712 \*  
 \* PROPOSED CONDITION - AREA TRIB. TO CHINO \*  
 \* STORM CHANNEL - 100-YEAR EVENT \*  
 \*\*\*\*\*

FILE NAME: W:\3712\300P.DAT  
 TIME/DATE OF STUDY: 11:43 04/14/2020

===== USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION: =====

--\*TIME-OF-CONCENTRATION MODEL\*--

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  
 \*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000  
 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3500

\*ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD\*

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

NO.	WIDTH (FT)	CROSSFALL (FT)	IN- / SIDE	OUT- / SIDE	PARK- / WAY	HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018	0.018	0.020	0.67	2.00	0.0313	0.167	0.0150

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)  
 \*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

\*\*\*\*\* FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21 \*\*\*\*\*

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<  
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 185.00  
 ELEVATION DATA: UPSTREAM(FEET) = 768.43 DOWNSTREAM(FEET) = 766.31

Tc = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\*0.20  
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.997  
 \* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.376  
 SUBAREA Tc AND LOSS RATE DATA(AMC III):  
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc  
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)  
 COMMERCIAL B 0.45 0.42 0.100 76 6.00  
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100  
 SUBAREA RUNOFF(CFS) = 2.16  
 TOTAL AREA(ACRES) = 0.45 PEAK FLOW RATE(CFS) = 2.16

\*\*\*\*\* FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 31 \*\*\*\*\*

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

ELEVATION DATA: UPSTREAM(FEET) = 761.94 DOWNSTREAM(FEET) = 761.00  
 FLOW LENGTH(FEET) = 188.00 MANNING'S N = 0.012  
 DEPTH OF FLOW IN 12.0 INCH PIPE IS 8.2 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 3.78  
 ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 2.16  
 PIPE TRAVEL TIME(MIN.) = 0.83 Tc(MIN.) = 6.83  
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 373.00 FEET.

\*\*\*\*\* FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 IS CODE = 81 \*\*\*\*\*

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

MAINLINE Tc(MIN.) = 6.83  
 \* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.974  
 SUBAREA LOSS RATE DATA(AMC III):  
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS  
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN  
 COMMERCIAL B 0.15 0.42 0.100 76  
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100  
 SUBAREA AREA(ACRES) = 0.15 SUBAREA RUNOFF(CFS) = 0.67  
 EFFECTIVE AREA(ACRES) = 0.60 AREA-AVERAGED Fm(INCH/HR) = 0.04  
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10  
 TOTAL AREA(ACRES) = 0.6 PEAK FLOW RATE(CFS) = 2.66

\*\*\*\*\* FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31 \*\*\*\*\*

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

ELEVATION DATA: UPSTREAM(FEET) = 761.00 DOWNSTREAM(FEET) = 760.21  
 FLOW LENGTH(FEET) = 157.00 MANNING'S N = 0.012  
 DEPTH OF FLOW IN 12.0 INCH PIPE IS 9.8 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 3.88  
 ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 2.66  
PIPE TRAVEL TIME(MIN.) = 0.67 Tc(MIN.) = 7.50  
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 530.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

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

MAINLINE Tc(MIN.) = 7.50  
\* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.701  
SUBAREA LOSS RATE DATA(AMC III):  
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS  
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN  
COMMERCIAL B 0.45 0.42 0.100 76  
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42  
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100  
SUBAREA AREA(ACRES) = 0.45 SUBAREA RUNOFF(CFS) = 1.89  
EFFECTIVE AREA(ACRES) = 1.05 AREA-AVERAGED Fm(INCH/HR) = 0.04  
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10  
TOTAL AREA(ACRES) = 1.0 PEAK FLOW RATE(CFS) = 4.40

\*\*\*\*\*  
FLOW PROCESS FROM NODE 303.00 TO NODE 312.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 760.17 DOWNSTREAM(FEET) = 759.88  
FLOW LENGTH(FEET) = 73.00 MANNING'S N = 0.012  
DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.4 INCHES  
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.18  
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
PIPE-FLOW(CFS) = 4.40  
PIPE TRAVEL TIME(MIN.) = 0.29 Tc(MIN.) = 7.79  
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 312.00 = 603.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 312.00 TO NODE 312.00 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.) = 7.79  
RAINFALL INTENSITY(INCH/HR) = 4.59  
AREA-AVERAGED Fm(INCH/HR) = 0.04  
AREA-AVERAGED Fp(INCH/HR) = 0.42  
AREA-AVERAGED Ap = 0.10  
EFFECTIVE STREAM AREA(ACRES) = 1.05  
TOTAL STREAM AREA(ACRES) = 1.05  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.40

\*\*\*\*\*  
FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 408.00  
ELEVATION DATA: UPSTREAM(FEET) = 768.33 DOWNSTREAM(FEET) = 763.69

Tc = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\*0.20  
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 8.241  
\* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.443  
SUBAREA Tc AND LOSS RATE DATA(AMC III):  
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc  
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)  
COMMERCIAL B 0.55 0.42 0.100 76 8.24  
NATURAL POOR COVER "OPEN BRUSH" B 0.15 0.20 1.000 92 14.23  
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.26  
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.293  
SUBAREA RUNOFF(CFS) = 2.75  
TOTAL AREA(ACRES) = 0.70 PEAK FLOW RATE(CFS) = 2.75

\*\*\*\*\*  
FLOW PROCESS FROM NODE 311.00 TO NODE 312.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 760.23 DOWNSTREAM(FEET) = 759.88  
FLOW LENGTH(FEET) = 16.00 MANNING'S N = 0.012  
DEPTH OF FLOW IN 12.0 INCH PIPE IS 6.0 INCHES  
PIPE-FLOW VELOCITY(FEET/SEC.) = 7.07  
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1  
PIPE-FLOW(CFS) = 2.75  
PIPE TRAVEL TIME(MIN.) = 0.04 Tc(MIN.) = 8.28  
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 312.00 = 424.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 312.00 TO NODE 312.00 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.) = 8.28  
RAINFALL INTENSITY(INCH/HR) = 4.43  
AREA-AVERAGED Fm(INCH/HR) = 0.08  
AREA-AVERAGED Fp(INCH/HR) = 0.26  
AREA-AVERAGED Ap = 0.29  
EFFECTIVE STREAM AREA(ACRES) = 0.70  
TOTAL STREAM AREA(ACRES) = 0.70  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.75

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	4.40	7.79	4.595	0.42( 0.04)	0.10	1.0	300.00
2	2.75	8.28	4.431	0.26( 0.08)	0.29	0.7	310.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	7.09	7.79	4.595	0.32( 0.06)	0.17	1.7	300.00
2	6.99	8.28	4.431	0.32( 0.06)	0.18	1.8	310.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 7.09 Tc(MIN.) = 7.79  
 EFFECTIVE AREA(ACRES) = 1.71 AREA-AVERAGED Fm(INCH/HR) = 0.06  
 AREA-AVERAGED Fp(INCH/HR) = 0.32 AREA-AVERAGED Ap = 0.17  
 TOTAL AREA(ACRES) = 1.8  
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 312.00 = 603.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 312.00 TO NODE 313.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 759.88 DOWNSTREAM(FEET) = 756.55  
 FLOW LENGTH(FEET) = 212.00 MANNING'S N = 0.013  
 DEPTH OF FLOW IN 15.0 INCH PIPE IS 11.1 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.28  
 ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 7.09  
 PIPE TRAVEL TIME(MIN.) = 0.49 Tc(MIN.) = 8.28  
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 313.00 = 815.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 313.00 TO NODE 313.00 IS CODE = 81

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

MAINLINE Tc(MIN.) = 8.28  
 \* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.431  
 SUBAREA LOSS RATE DATA(AMC III):  
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS  
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN  
 COMMERCIAL B 0.20 0.42 0.100 76  
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100  
 SUBAREA AREA(ACRES) = 0.20 SUBAREA RUNOFF(CFS) = 0.79  
 EFFECTIVE AREA(ACRES) = 1.91 AREA-AVERAGED Fm(INCH/HR) = 0.05  
 AREA-AVERAGED Fp(INCH/HR) = 0.32 AREA-AVERAGED Ap = 0.17  
 TOTAL AREA(ACRES) = 2.0 PEAK FLOW RATE(CFS) = 7.52

END OF STUDY SUMMARY:  
 TOTAL AREA(ACRES) = 2.0 TC(MIN.) = 8.28  
 EFFECTIVE AREA(ACRES) = 1.91 AREA-AVERAGED Fm(INCH/HR) = 0.05  
 AREA-AVERAGED Fp(INCH/HR) = 0.32 AREA-AVERAGED Ap = 0.167  
 PEAK FLOW RATE(CFS) = 7.52

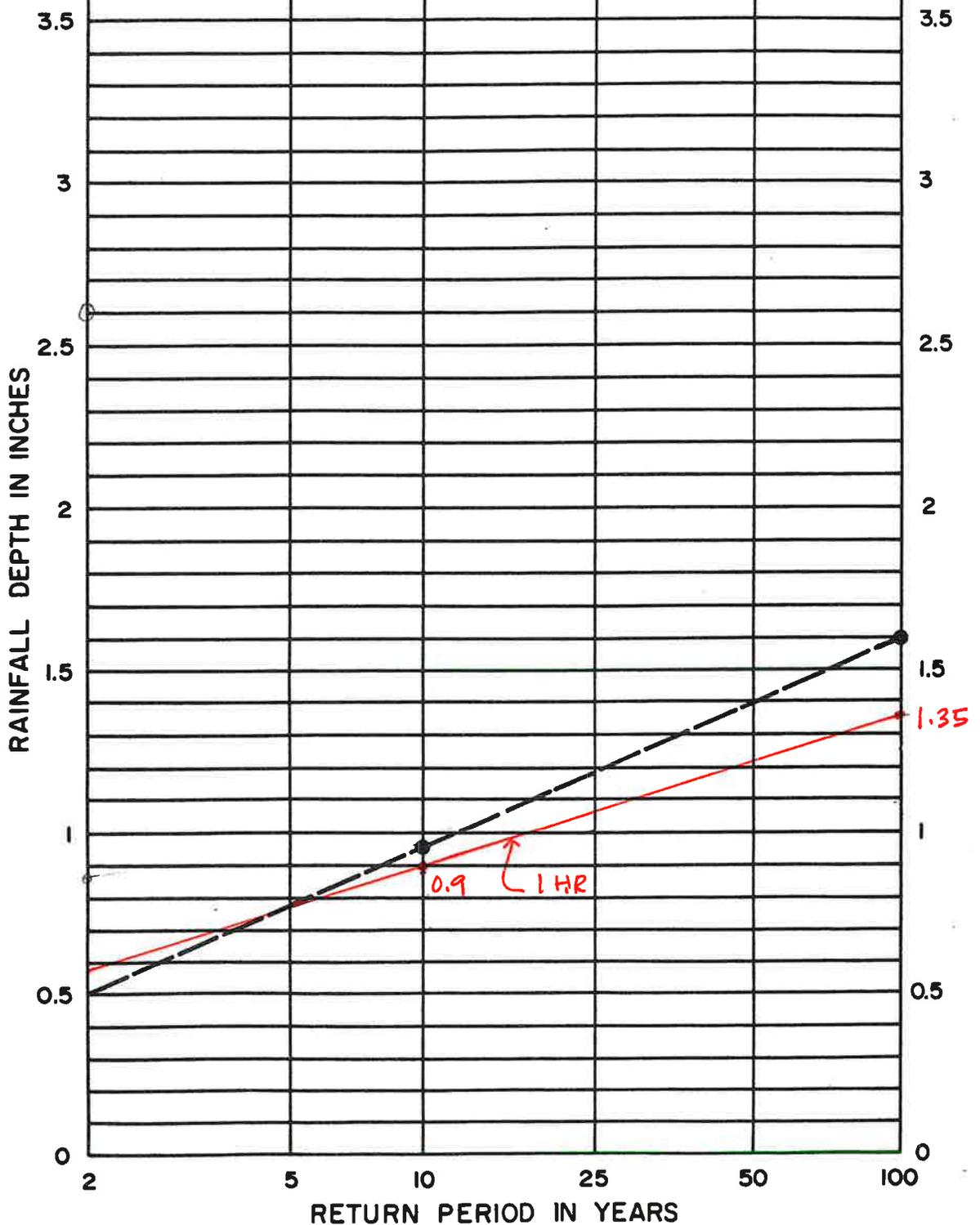
\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	7.52	8.28	4.431	0.32( 0.05)	0.17	1.9	300.00
2	7.42	8.77	4.281	0.32( 0.05)	0.17	2.0	310.00

END OF RATIONAL METHOD ANALYSIS

# **APPENDIX C**

## **DETENTION CALCULATIONS**



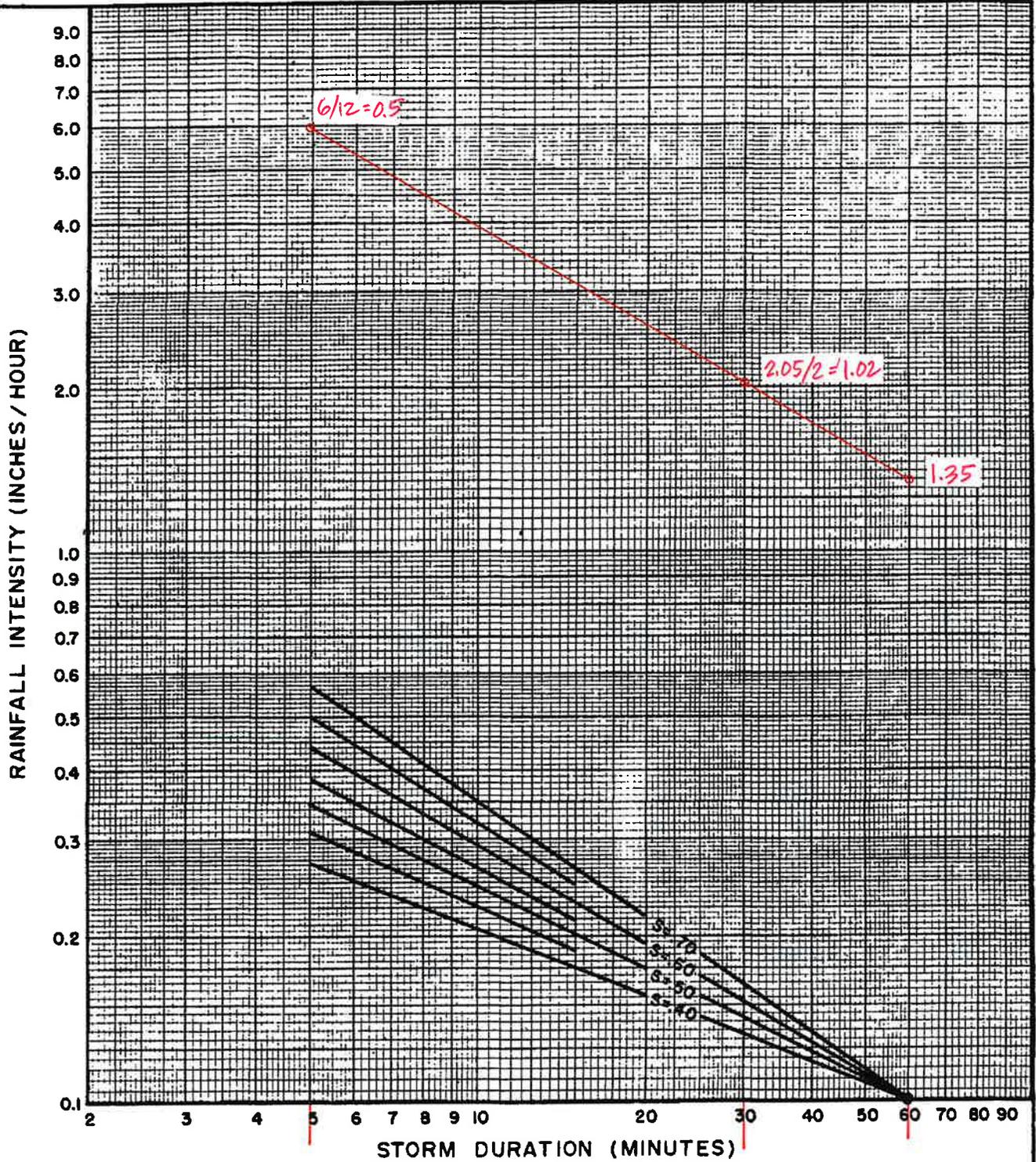
**NOTE:**

1. FOR INTERMEDIATE RETURN PERIODS PLOT 10-YEAR AND 100-YEAR ONE HOUR VALUES FROM MAPS, THEN CONNECT POINTS AND READ VALUE FOR DESIRED RETURN PERIOD. FOR EXAMPLE GIVEN 10-YEAR ONE HOUR = 0.95" AND 100-YEAR ONE HOUR = 1.60", 25-YEAR ONE HOUR = 1.18".

REFERENCE: NOAA ATLAS 2, VOLUME XI - CAL., 1973

**SAN BERNARDINO COUNTY  
HYDROLOGY MANUAL**

**RAINFALL DEPTH VERSUS  
RETURN PERIOD FOR  
PARTIAL DURATION SERIES**



DESIGN STORM FREQUENCY = 100 YEARS  
 ONE HOUR POINT RAINFALL = 1.35 INCHES  
 LOG-LOG SLOPE = 0.6  
 PROJECT LOCATION = COUNTY RD #1 EAST END

**SAN BERNARDINO COUNTY**  
 HYDROLOGY MANUAL

**INTENSITY - DURATION  
 CURVES  
 CALCULATION SHEET**

POINT RAINFALL - INCHES

50.0  
40.0  
30.0  
20.0  
10.0  
5.0  
4.0  
3.0  
2.0  
1.0  
0.5  
0.4  
0.3  
0.2  
0.1

5 10 20 30 40 50 100 200 300 400 500 1000

STORM DURATION - MINUTES

1.35

2.4

3.45

1HR

3HRS

6HRS

PROJECT LOCATION COUNTY ROAD 9 EAST END AVE

NOTES TEL JOB # 372C

**SAN BERNARDINO COUNTY**  
HYDROLOGY MANUAL

AREA - AVERAGED  
MASS RAINFALL  
PLOTTING SHEET

OMP COUNTY AND EAST END  
PONDING AT BLDG 1 TRUCK YARD

Elevation	Depth (feet)	Area (sq. ft.)	Volume (c.f.)	$\Sigma$ Volume (c.f.)	$\Sigma$ Volume (ac-ft)	Q(Discharge) (cfs)
762.60	0.00	0	113	113	0.00	2.60
762.80	0.20	1131	569	682	0.016	3.70
763.00	0.40	4561	1452	2,134	0.049	4.60
763.20	0.60	9958	2471	4,605	0.106	5.30
763.40	0.80	14750	3395	8,000	0.184	5.90
763.60	1.00	19200	4289	12,289	0.282	6.50
763.80	1.20	23692				

ASSUMED PIPE SIZE 15"

\*\*\*\*\*

NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)  
AND LOW LOSS FRACTION ESTIMATIONS

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Analysis prepared by:

THIENES ENGINEERING  
16800 VALLEY VIEW AVENUE  
LA MIRADA CA 90638  
PH: (714) 521-4811 FAX: (714) 521-4173

\*\*\* NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)  
AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 7.40 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	5.85	10.00	76.( 56.)	0.423	0.933

TOTAL AREA (Acres) = 5.85

AREA-AVERAGED LOSS RATE,  $\bar{F}_m$  (in./hr.) = 0.042

AREA-AVERAGED LOW LOSS FRACTION,  $\bar{Y}$  = 0.067

\*\*\*\*\*  
 SMALL AREA UNIT HYDROGRAPH MODEL

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Analysis prepared by:

THIENES ENGINEERING  
 16800 VALLEY VIEW AVENUE  
 LA MIRADA CA 90638  
 PH: (714) 521-4811 FAX: (714) 521-4173

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90  
 TOTAL CATCHMENT AREA(ACRES) = 4.35  
 SOIL-LOSS RATE, Fm, (INCH/HR) = 0.046  
 LOW LOSS FRACTION = 0.067  
 TIME OF CONCENTRATION (MIN.) = 6.97  
 RATIONAL METHOD PEAK FLOW RATE (DEFINED BY USER)  
 IS USED FOR SMALL AREA PEAK Q  
 USER SPECIFIED RAINFALL VALUES ARE USED  
 RETURN FREQUENCY (YEARS) = 100  
 5-MINUTE POINT RAINFALL VALUE (INCHES) = 0.50  
 30-MINUTE POINT RAINFALL VALUE (INCHES) = 1.02  
 1-HOUR POINT RAINFALL VALUE (INCHES) = 1.35  
 3-HOUR POINT RAINFALL VALUE (INCHES) = 2.40  
 6-HOUR POINT RAINFALL VALUE (INCHES) = 3.45  
 24-HOUR POINT RAINFALL VALUE (INCHES) = 7.40

-----  
 TOTAL CATCHMENT RUNOFF VOLUME (ACRE-FEET) = 2.25  
 TOTAL CATCHMENT SOIL-LOSS VOLUME (ACRE-FEET) = 0.43

\*\*\*\*\*

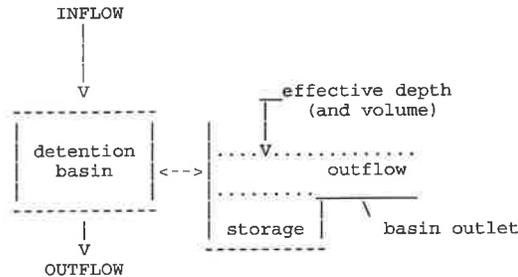
TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	5.0	10.0	15.0	20.0
0.09	0.0022	0.62	.Q	.	.	.	.
0.20	0.0081	0.62	.Q	.	.	.	.
0.32	0.0141	0.62	.Q	.	.	.	.
0.43	0.0201	0.63	.Q	.	.	.	.
0.55	0.0261	0.63	.Q	.	.	.	.
0.67	0.0322	0.63	.Q	.	.	.	.
0.78	0.0382	0.63	.Q	.	.	.	.
0.90	0.0443	0.63	.Q	.	.	.	.
1.01	0.0504	0.64	.Q	.	.	.	.
1.13	0.0565	0.64	.Q	.	.	.	.
1.25	0.0627	0.64	.Q	.	.	.	.
1.36	0.0689	0.64	.Q	.	.	.	.
1.48	0.0750	0.65	.Q	.	.	.	.
1.60	0.0813	0.65	.Q	.	.	.	.
1.71	0.0875	0.65	.Q	.	.	.	.
1.83	0.0937	0.65	.Q	.	.	.	.
1.94	0.1000	0.66	.Q	.	.	.	.
2.06	0.1063	0.66	.Q	.	.	.	.
2.18	0.1126	0.66	.Q	.	.	.	.
2.29	0.1190	0.66	.Q	.	.	.	.
2.41	0.1254	0.67	.Q	.	.	.	.
2.52	0.1318	0.67	.Q	.	.	.	.
2.64	0.1382	0.67	.Q	.	.	.	.
2.76	0.1446	0.67	.Q	.	.	.	.
2.87	0.1511	0.68	.Q	.	.	.	.
2.99	0.1576	0.68	.Q	.	.	.	.
3.11	0.1641	0.68	.Q	.	.	.	.
3.22	0.1707	0.68	.Q	.	.	.	.
3.34	0.1772	0.69	.Q	.	.	.	.
3.45	0.1838	0.69	.Q	.	.	.	.
3.57	0.1905	0.69	.Q	.	.	.	.
3.69	0.1971	0.69	.Q	.	.	.	.
3.80	0.2038	0.70	.Q	.	.	.	.
3.92	0.2105	0.70	.Q	.	.	.	.
4.03	0.2173	0.70	.Q	.	.	.	.
4.15	0.2241	0.71	.Q	.	.	.	.
4.27	0.2309	0.71	.Q	.	.	.	.
4.38	0.2377	0.71	.Q	.	.	.	.
4.50	0.2446	0.72	.Q	.	.	.	.
4.62	0.2514	0.72	.Q	.	.	.	.
4.73	0.2584	0.72	.Q	.	.	.	.
4.85	0.2653	0.73	.Q	.	.	.	.
4.96	0.2723	0.73	.Q	.	.	.	.
5.08	0.2793	0.73	.Q	.	.	.	.
5.20	0.2864	0.74	.Q	.	.	.	.
5.31	0.2935	0.74	.Q	.	.	.	.
5.43	0.3006	0.74	.Q	.	.	.	.
5.54	0.3078	0.75	.Q	.	.	.	.
5.66	0.3150	0.75	.Q	.	.	.	.
5.78	0.3222	0.75	.Q	.	.	.	.
5.89	0.3295	0.76	.Q	.	.	.	.
6.01	0.3368	0.76	.Q	.	.	.	.
6.13	0.3441	0.77	.Q	.	.	.	.
6.24	0.3515	0.77	.Q	.	.	.	.
6.36	0.3589	0.78	.Q	.	.	.	.
6.47	0.3664	0.78	.Q	.	.	.	.
6.59	0.3739	0.78	.Q	.	.	.	.
6.71	0.3814	0.79	.Q	.	.	.	.

6.82	0.3890	0.79	.Q	.	.	.	.
6.94	0.3966	0.80	.Q	.	.	.	.
7.06	0.4043	0.80	.Q	.	.	.	.
7.17	0.4120	0.81	.Q	.	.	.	.
7.29	0.4198	0.81	.Q	.	.	.	.
7.40	0.4276	0.81	.Q	.	.	.	.
7.52	0.4354	0.82	.Q	.	.	.	.
7.64	0.4433	0.82	.Q	.	.	.	.
7.75	0.4513	0.83	.Q	.	.	.	.
7.87	0.4593	0.84	.Q	.	.	.	.
7.98	0.4673	0.84	.Q	.	.	.	.
8.10	0.4754	0.85	.Q	.	.	.	.
8.22	0.4836	0.85	.Q	.	.	.	.
8.33	0.4918	0.86	.Q	.	.	.	.
8.45	0.5001	0.86	.Q	.	.	.	.
8.57	0.5084	0.87	.Q	.	.	.	.
8.68	0.5168	0.88	.Q	.	.	.	.
8.80	0.5252	0.88	.Q	.	.	.	.
8.91	0.5337	0.89	.Q	.	.	.	.
9.03	0.5423	0.89	.Q	.	.	.	.
9.15	0.5509	0.90	.Q	.	.	.	.
9.26	0.5596	0.91	.Q	.	.	.	.
9.38	0.5684	0.92	.Q	.	.	.	.
9.49	0.5772	0.92	.Q	.	.	.	.
9.61	0.5861	0.93	.Q	.	.	.	.
9.73	0.5950	0.94	.Q	.	.	.	.
9.84	0.6041	0.95	.Q	.	.	.	.
9.96	0.6132	0.95	.Q	.	.	.	.
10.08	0.6224	0.96	.Q	.	.	.	.
10.19	0.6317	0.97	.Q	.	.	.	.
10.31	0.6410	0.98	.Q	.	.	.	.
10.42	0.6505	0.99	.Q	.	.	.	.
10.54	0.6600	1.00	.Q	.	.	.	.
10.66	0.6696	1.01	.Q	.	.	.	.
10.77	0.6793	1.02	.Q	.	.	.	.
10.89	0.6892	1.03	.Q	.	.	.	.
11.00	0.6991	1.04	.Q	.	.	.	.
11.12	0.7091	1.05	.Q	.	.	.	.
11.24	0.7192	1.06	.Q	.	.	.	.
11.35	0.7294	1.07	.Q	.	.	.	.
11.47	0.7398	1.08	.Q	.	.	.	.
11.59	0.7502	1.09	.Q	.	.	.	.
11.70	0.7608	1.11	.Q	.	.	.	.
11.82	0.7715	1.12	.Q	.	.	.	.
11.93	0.7823	1.14	.Q	.	.	.	.
12.05	0.7933	1.15	.Q	.	.	.	.
12.17	0.8041	1.11	.Q	.	.	.	.
12.28	0.8149	1.12	.Q	.	.	.	.
12.40	0.8257	1.14	.Q	.	.	.	.
12.51	0.8368	1.16	.Q	.	.	.	.
12.63	0.8480	1.18	.Q	.	.	.	.
12.75	0.8594	1.19	.Q	.	.	.	.
12.86	0.8710	1.22	.Q	.	.	.	.
12.98	0.8828	1.23	.Q	.	.	.	.
13.10	0.8948	1.26	.Q	.	.	.	.
13.21	0.9070	1.28	.Q	.	.	.	.
13.33	0.9195	1.31	.Q	.	.	.	.
13.44	0.9322	1.33	.Q	.	.	.	.
13.56	0.9451	1.37	.Q	.	.	.	.
13.68	0.9584	1.39	.Q	.	.	.	.
13.79	0.9720	1.44	.Q	.	.	.	.
13.91	0.9859	1.46	.Q	.	.	.	.
14.03	1.0001	1.51	.Q	.	.	.	.
14.14	1.0148	1.54	.Q	.	.	.	.
14.26	1.0299	1.60	.Q	.	.	.	.
14.37	1.0454	1.63	.Q	.	.	.	.
14.49	1.0614	1.71	.Q	.	.	.	.
14.61	1.0780	1.75	.Q	.	.	.	.
14.72	1.0953	1.84	.Q	.	.	.	.
14.84	1.1132	1.89	.Q	.	.	.	.
14.95	1.1320	2.01	.Q	.	.	.	.
15.07	1.1517	2.08	.Q	.	.	.	.
15.19	1.1725	2.25	.Q	.	.	.	.
15.30	1.1946	2.35	.Q	.	.	.	.
15.42	1.2166	2.24	.Q	.	.	.	.
15.54	1.2377	2.17	.Q	.	.	.	.
15.65	1.2607	2.61	.Q	.	.	.	.
15.77	1.2874	2.96	.Q	.	.	.	.
15.88	1.3220	4.26	.Q	.	.	.	.
16.00	1.3709	5.93	.Q	.	.	.	.
16.12	1.4930	19.50	.Q	.	.	.	.
16.23	1.6031	3.43	.Q	.	.	.	.
16.35	1.6309	2.36	.Q	.	.	.	.
16.46	1.6540	2.46	.Q	.	.	.	.
16.58	1.6762	2.16	.Q	.	.	.	.
16.70	1.6960	1.95	.Q	.	.	.	.
16.81	1.7140	1.79	.Q	.	.	.	.
16.93	1.7306	1.67	.Q	.	.	.	.
17.05	1.7462	1.57	.Q	.	.	.	.
17.16	1.7608	1.48	.Q	.	.	.	.
17.28	1.7747	1.41	.Q	.	.	.	.
17.39	1.7880	1.35	.Q	.	.	.	.
17.51	1.8007	1.30	.Q	.	.	.	.
17.63	1.8129	1.25	.Q	.	.	.	.
17.74	1.8247	1.21	.Q	.	.	.	.
17.86	1.8361	1.17	.Q	.	.	.	.
17.97	1.8472	1.13	.Q	.	.	.	.
18.09	1.8580	1.12	.Q	.	.	.	.
18.21	1.8688	1.13	.Q	.	.	.	.

18.32	1.8795	1.10	.Q	.	.	.	.	.	.
18.44	1.8900	1.08	.Q	.	.	.	.	.	.
18.56	1.9002	1.05	.Q	.	.	.	.	.	.
18.67	1.9102	1.03	.Q	.	.	.	.	.	.
18.79	1.9200	1.01	.Q	.	.	.	.	.	.
18.90	1.9296	0.99	.Q	.	.	.	.	.	.
19.02	1.9391	0.97	.Q	.	.	.	.	.	.
19.14	1.9484	0.96	.Q	.	.	.	.	.	.
19.25	1.9575	0.94	.Q	.	.	.	.	.	.
19.37	1.9664	0.93	.Q	.	.	.	.	.	.
19.48	1.9753	0.91	.Q	.	.	.	.	.	.
19.60	1.9840	0.90	.Q	.	.	.	.	.	.
19.72	1.9925	0.89	.Q	.	.	.	.	.	.
19.83	2.0010	0.87	.Q	.	.	.	.	.	.
19.95	2.0093	0.86	.Q	.	.	.	.	.	.
20.07	2.0175	0.85	.Q	.	.	.	.	.	.
20.18	2.0256	0.84	.Q	.	.	.	.	.	.
20.30	2.0336	0.83	.Q	.	.	.	.	.	.
20.41	2.0415	0.82	.Q	.	.	.	.	.	.
20.53	2.0493	0.81	.Q	.	.	.	.	.	.
20.65	2.0570	0.80	.Q	.	.	.	.	.	.
20.76	2.0647	0.79	.Q	.	.	.	.	.	.
20.88	2.0722	0.78	.Q	.	.	.	.	.	.
21.00	2.0797	0.77	.Q	.	.	.	.	.	.
21.11	2.0870	0.76	.Q	.	.	.	.	.	.
21.23	2.0943	0.76	.Q	.	.	.	.	.	.
21.34	2.1016	0.75	.Q	.	.	.	.	.	.
21.46	2.1087	0.74	.Q	.	.	.	.	.	.
21.58	2.1158	0.73	.Q	.	.	.	.	.	.
21.69	2.1228	0.73	.Q	.	.	.	.	.	.
21.81	2.1298	0.72	.Q	.	.	.	.	.	.
21.92	2.1367	0.71	.Q	.	.	.	.	.	.
22.04	2.1435	0.71	.Q	.	.	.	.	.	.
22.16	2.1503	0.70	.Q	.	.	.	.	.	.
22.27	2.1570	0.70	.Q	.	.	.	.	.	.
22.39	2.1637	0.69	.Q	.	.	.	.	.	.
22.51	2.1703	0.68	.Q	.	.	.	.	.	.
22.62	2.1768	0.68	.Q	.	.	.	.	.	.
22.74	2.1833	0.67	.Q	.	.	.	.	.	.
22.85	2.1898	0.67	.Q	.	.	.	.	.	.
22.97	2.1962	0.66	.Q	.	.	.	.	.	.
23.09	2.2025	0.66	.Q	.	.	.	.	.	.
23.20	2.2088	0.65	.Q	.	.	.	.	.	.
23.32	2.2151	0.65	.Q	.	.	.	.	.	.
23.43	2.2213	0.64	.Q	.	.	.	.	.	.
23.55	2.2275	0.64	.Q	.	.	.	.	.	.
23.67	2.2336	0.64	.Q	.	.	.	.	.	.
23.78	2.2397	0.63	.Q	.	.	.	.	.	.
23.90	2.2457	0.63	.Q	.	.	.	.	.	.
24.02	2.2517	0.62	.Q	.	.	.	.	.	.
24.13	2.2547	0.00	Q	.	.	.	.	.	.

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:  
 CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 6.970  
 DEAD STORAGE(AF) = 0.00  
 SPECIFIED DEAD STORAGE(AF) FILLED = 0.00  
 ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00



DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:  
 TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 6

* BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	**BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)
* 0.000	0.000	0.000**	0.400	0.016	3.700*
* 0.600	0.049	4.600**	0.800	0.106	5.300*
* 1.000	0.184	5.900**	1.200	0.282	6.500*

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

INTERVAL NUMBER	DEPTH (FEET)	{S-O*DT/2} (ACRE-FEET)	{S+O*DT/2} (ACRE-FEET)
1	0.00	0.00000	0.00000
2	0.40	-0.00176	0.03376
3	0.60	0.02692	0.07108
4	0.80	0.08056	0.13144
5	1.00	0.15568	0.21232
6	1.20	0.25080	0.31320

WHERE S=STORAGE(AF); O=OUTFLOW(AF/MIN.); DT=UNIT INTERVAL(MIN.)

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 DETENTION BASIN ROUTING RESULTS:

NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES  
 OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE  
 AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

TIME (HRS)	DEAD-STORAGE FILLED (AF)	INFLOW (CFS)	EFFECTIVE DEPTH (FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME (AF)
0.085	0.000	0.62	0.07	0.33	0.003
0.201	0.000	0.62	0.07	0.65	0.003
0.317	0.000	0.62	0.07	0.66	0.003
0.434	0.000	0.63	0.07	0.66	0.003
0.550	0.000	0.63	0.07	0.66	0.003
0.666	0.000	0.63	0.07	0.66	0.003
0.782	0.000	0.63	0.07	0.66	0.003
0.898	0.000	0.63	0.07	0.67	0.003
1.014	0.000	0.64	0.07	0.67	0.003
1.131	0.000	0.64	0.07	0.67	0.003
1.247	0.000	0.64	0.07	0.67	0.003
1.363	0.000	0.64	0.07	0.68	0.003
1.479	0.000	0.65	0.07	0.68	0.003
1.595	0.000	0.65	0.07	0.68	0.003
1.711	0.000	0.65	0.07	0.68	0.003
1.828	0.000	0.65	0.07	0.69	0.003
1.944	0.000	0.66	0.07	0.69	0.003
2.060	0.000	0.66	0.07	0.69	0.003
2.176	0.000	0.66	0.08	0.69	0.003
2.292	0.000	0.66	0.08	0.70	0.003
2.408	0.000	0.67	0.08	0.70	0.003
2.525	0.000	0.67	0.08	0.70	0.003
2.641	0.000	0.67	0.08	0.70	0.003
2.757	0.000	0.67	0.08	0.71	0.003
2.873	0.000	0.68	0.08	0.71	0.003
2.989	0.000	0.68	0.08	0.71	0.003
3.105	0.000	0.68	0.08	0.71	0.003
3.222	0.000	0.68	0.08	0.72	0.003
3.338	0.000	0.69	0.08	0.72	0.003
3.454	0.000	0.69	0.08	0.72	0.003
3.570	0.000	0.69	0.08	0.73	0.003
3.686	0.000	0.69	0.08	0.73	0.003
3.802	0.000	0.70	0.08	0.73	0.003
3.919	0.000	0.70	0.08	0.74	0.003
4.035	0.000	0.70	0.08	0.74	0.003
4.151	0.000	0.71	0.08	0.74	0.003
4.267	0.000	0.71	0.08	0.75	0.003
4.383	0.000	0.71	0.08	0.75	0.003
4.499	0.000	0.72	0.08	0.75	0.003
4.616	0.000	0.72	0.08	0.76	0.003
4.732	0.000	0.72	0.08	0.76	0.003
4.848	0.000	0.73	0.08	0.76	0.003
4.964	0.000	0.73	0.08	0.77	0.003
5.080	0.000	0.73	0.08	0.77	0.003
5.196	0.000	0.74	0.08	0.77	0.003
5.313	0.000	0.74	0.08	0.78	0.003
5.429	0.000	0.74	0.08	0.78	0.003
5.545	0.000	0.75	0.08	0.78	0.003
5.661	0.000	0.75	0.09	0.79	0.003
5.777	0.000	0.75	0.09	0.79	0.003
5.893	0.000	0.76	0.09	0.80	0.003
6.010	0.000	0.76	0.09	0.80	0.003
6.126	0.000	0.77	0.09	0.80	0.003
6.242	0.000	0.77	0.09	0.81	0.004
6.358	0.000	0.78	0.09	0.81	0.004
6.474	0.000	0.78	0.09	0.82	0.004
6.590	0.000	0.78	0.09	0.82	0.004
6.707	0.000	0.79	0.09	0.83	0.004
6.823	0.000	0.79	0.09	0.83	0.004
6.939	0.000	0.80	0.09	0.84	0.004
7.055	0.000	0.80	0.09	0.84	0.004
7.171	0.000	0.81	0.09	0.85	0.004
7.287	0.000	0.81	0.09	0.85	0.004
7.404	0.000	0.81	0.09	0.86	0.004
7.520	0.000	0.82	0.09	0.86	0.004
7.636	0.000	0.82	0.09	0.87	0.004
7.752	0.000	0.83	0.09	0.87	0.004
7.868	0.000	0.84	0.09	0.88	0.004
7.984	0.000	0.84	0.10	0.88	0.004
8.101	0.000	0.85	0.10	0.89	0.004
8.217	0.000	0.85	0.10	0.89	0.004
8.333	0.000	0.86	0.10	0.90	0.004
8.449	0.000	0.86	0.10	0.91	0.004
8.565	0.000	0.87	0.10	0.91	0.004
8.681	0.000	0.88	0.10	0.92	0.004
8.798	0.000	0.88	0.10	0.92	0.004
8.914	0.000	0.89	0.10	0.93	0.004
9.030	0.000	0.89	0.10	0.94	0.004
9.146	0.000	0.90	0.10	0.95	0.004
9.262	0.000	0.91	0.10	0.95	0.004
9.378	0.000	0.92	0.10	0.96	0.004
9.495	0.000	0.92	0.10	0.97	0.004
9.611	0.000	0.93	0.11	0.98	0.004
9.727	0.000	0.94	0.11	0.98	0.004
9.843	0.000	0.95	0.11	0.99	0.004
9.959	0.000	0.95	0.11	1.00	0.004
10.075	0.000	0.96	0.11	1.01	0.004
10.192	0.000	0.97	0.11	1.02	0.004
10.308	0.000	0.98	0.11	1.03	0.004
10.424	0.000	0.99	0.11	1.03	0.004

10.540	0.000	1.00	0.11	1.04	0.005
10.656	0.000	1.01	0.11	1.05	0.005
10.773	0.000	1.02	0.12	1.06	0.005
10.889	0.000	1.03	0.12	1.08	0.005
11.005	0.000	1.04	0.12	1.09	0.005
11.121	0.000	1.05	0.12	1.10	0.005
11.237	0.000	1.06	0.12	1.11	0.005
11.353	0.000	1.07	0.12	1.12	0.005
11.469	0.000	1.08	0.12	1.13	0.005
11.586	0.000	1.09	0.12	1.15	0.005
11.702	0.000	1.11	0.13	1.16	0.005
11.818	0.000	1.12	0.13	1.17	0.005
11.934	0.000	1.14	0.13	1.19	0.005
12.050	0.000	1.15	0.13	1.20	0.005
12.167	0.000	1.11	0.13	1.19	0.005
12.283	0.000	1.12	0.13	1.18	0.005
12.399	0.000	1.14	0.13	1.19	0.005
12.515	0.000	1.16	0.13	1.21	0.005
12.631	0.000	1.18	0.13	1.23	0.005
12.747	0.000	1.19	0.14	1.25	0.005
12.863	0.000	1.22	0.14	1.27	0.006
12.980	0.000	1.23	0.14	1.29	0.006
13.096	0.000	1.26	0.14	1.32	0.006
13.212	0.000	1.28	0.15	1.34	0.006
13.328	0.000	1.31	0.15	1.37	0.006
13.444	0.000	1.33	0.15	1.39	0.006
13.561	0.000	1.37	0.16	1.42	0.006
13.677	0.000	1.39	0.16	1.45	0.006
13.793	0.000	1.44	0.16	1.49	0.007
13.909	0.000	1.46	0.17	1.52	0.007
14.025	0.000	1.51	0.17	1.56	0.007
14.141	0.000	1.54	0.18	1.61	0.007
14.258	0.000	1.60	0.18	1.65	0.007
14.374	0.000	1.63	0.19	1.70	0.007
14.490	0.000	1.71	0.19	1.76	0.008
14.606	0.000	1.75	0.20	1.82	0.008
14.722	0.000	1.84	0.21	1.89	0.008
14.838	0.000	1.89	0.22	1.97	0.009
14.955	0.000	2.01	0.23	2.06	0.009
15.071	0.000	2.08	0.24	2.16	0.009
15.187	0.000	2.25	0.26	2.28	0.010
15.303	0.000	2.35	0.27	2.42	0.011
15.419	0.000	2.24	0.25	2.41	0.010
15.535	0.000	2.17	0.25	2.32	0.010
15.652	0.000	2.61	0.30	2.52	0.012
15.768	0.000	2.96	0.34	2.93	0.013
15.884	0.000	4.26	0.44	3.49	0.022
16.000	0.000	5.93	0.54	4.11	0.040
16.116	0.000	19.50	0.98	5.10	0.178
16.232	0.000	3.43	0.93	5.77	0.156
16.348	0.000	2.36	0.85	5.56	0.125
16.465	0.000	2.46	0.77	5.32	0.097
16.581	0.000	2.16	0.67	5.03	0.070
16.697	0.000	1.95	0.57	4.66	0.044
16.813	0.000	1.79	0.43	4.15	0.021
16.929	0.000	1.67	0.22	2.96	0.009
17.045	0.000	1.57	0.18	1.86	0.007
17.162	0.000	1.48	0.17	1.61	0.007
17.278	0.000	1.41	0.16	1.52	0.006
17.394	0.000	1.35	0.15	1.45	0.006
17.510	0.000	1.30	0.15	1.39	0.006
17.626	0.000	1.25	0.14	1.34	0.006
17.743	0.000	1.21	0.14	1.29	0.005
17.859	0.000	1.17	0.13	1.25	0.005
17.975	0.000	1.13	0.13	1.21	0.005
18.091	0.000	1.12	0.13	1.19	0.005
18.207	0.000	1.13	0.13	1.18	0.005
18.323	0.000	1.10	0.13	1.17	0.005
18.440	0.000	1.08	0.12	1.15	0.005
18.556	0.000	1.05	0.12	1.12	0.005
18.672	0.000	1.03	0.12	1.10	0.005
18.788	0.000	1.01	0.12	1.08	0.005
18.904	0.000	0.99	0.11	1.05	0.005
19.020	0.000	0.97	0.11	1.04	0.004
19.137	0.000	0.96	0.11	1.02	0.004
19.253	0.000	0.94	0.11	1.00	0.004
19.369	0.000	0.93	0.11	0.98	0.004
19.485	0.000	0.91	0.10	0.97	0.004
19.601	0.000	0.90	0.10	0.95	0.004
19.717	0.000	0.89	0.10	0.94	0.004
19.833	0.000	0.87	0.10	0.93	0.004
19.950	0.000	0.86	0.10	0.91	0.004
20.066	0.000	0.85	0.10	0.90	0.004
20.182	0.000	0.84	0.10	0.89	0.004
20.298	0.000	0.83	0.09	0.88	0.004
20.414	0.000	0.82	0.09	0.87	0.004
20.530	0.000	0.81	0.09	0.86	0.004
20.647	0.000	0.80	0.09	0.85	0.004
20.763	0.000	0.79	0.09	0.84	0.004
20.879	0.000	0.78	0.09	0.83	0.004
20.995	0.000	0.77	0.09	0.82	0.004
21.111	0.000	0.76	0.09	0.81	0.003
21.228	0.000	0.76	0.09	0.80	0.003
21.344	0.000	0.75	0.09	0.79	0.003
21.460	0.000	0.74	0.08	0.78	0.003
21.576	0.000	0.73	0.08	0.78	0.003
21.692	0.000	0.73	0.08	0.77	0.003
21.808	0.000	0.72	0.08	0.76	0.003
21.924	0.000	0.71	0.08	0.76	0.003

22.041	0.000	0.71	0.08	0.75	0.003
22.157	0.000	0.70	0.08	0.74	0.003
22.273	0.000	0.70	0.08	0.74	0.003
22.389	0.000	0.69	0.08	0.73	0.003
22.505	0.000	0.68	0.08	0.72	0.003
22.622	0.000	0.68	0.08	0.72	0.003
22.738	0.000	0.67	0.08	0.71	0.003
22.854	0.000	0.67	0.08	0.71	0.003
22.970	0.000	0.66	0.08	0.70	0.003
23.086	0.000	0.66	0.07	0.70	0.003
23.202	0.000	0.65	0.07	0.69	0.003
23.319	0.000	0.65	0.07	0.69	0.003
23.435	0.000	0.64	0.07	0.68	0.003
23.551	0.000	0.64	0.07	0.68	0.003
23.667	0.000	0.64	0.07	0.67	0.003
23.783	0.000	0.63	0.07	0.67	0.003
23.899	0.000	0.63	0.07	0.66	0.003
24.016	0.000	0.62	0.07	0.66	0.003
24.132	0.000	0.00	0.00	0.33	0.000

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1

## **APPENDIX D**

# **HYDRAULIC CALCULATIONS**

DATE: 4/14/2020  
 TIME: 10:34

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	18	4			1.50															
CD	24	4			2.00															

F 0 5 1 5 P

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

EAST END CHINO

HEADING LINE NO 2 IS -

LINE "A"

HEADING LINE NO 3 IS -

100-YEAR

F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS A	SYSTEM OUTLET	U/S DATA	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
1	IS A	SYSTEM OUTLET	U/S DATA	1000.00	757.66	24	762.87				
2	IS A	REACH	U/S DATA	1015.19	757.71	24		0.00	0.00	0.00	0
3	IS A	JUNCTION	U/S DATA	1015.19	757.71	24					
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											
4	IS A	REACH	U/S DATA	1295.14	758.68	24		0.00	0.00	0.00	0
5	IS A	REACH	U/S DATA	1330.48	758.81	24		22.50	90.00	0.00	0
6	IS A	REACH	U/S DATA	1336.21	758.84	24		0.00	0.00	0.00	0
7	IS A	JUNCTION	U/S DATA	1340.87	758.85	18					
8	IS A	REACH	U/S DATA	1380.86	759.00	18		0.00	0.00	0.00	0
9	IS A	SYSTEM HEADWORKS	U/S DATA	1380.86	759.00	18					

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

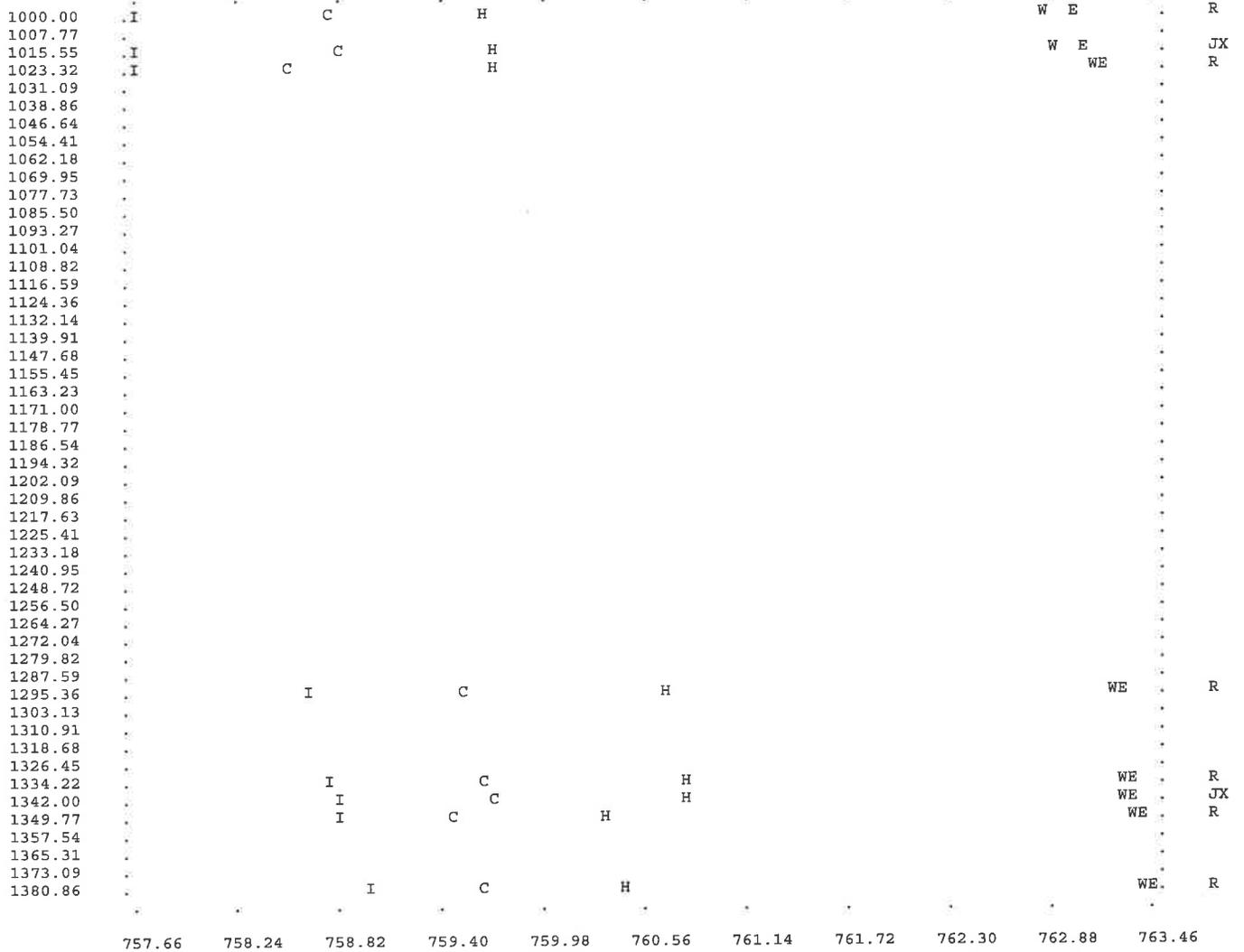
WATER SURFACE PROFILE LISTING

EAST END CHINO  
 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					
1000.00	757.66	5.210	762.870	10.3	3.28	0.167	763.037	0.00	1.149	2.00	0.00	0.00	0	0.00
15.19	0.00329					.001766	0.03		1.270			0.00		
1015.19	757.71	5.187	762.897	10.3	3.28	0.167	763.064	0.00	1.149	2.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.001163	0.00					0.00		
1015.19	757.71	5.415	763.125	5.8	1.85	0.053	763.178	0.00	0.851	2.00	0.00	0.00	0	0.00
279.95	0.00347					.000560	0.16		0.880			0.00		
1295.14	758.68	4.602	763.282	5.8	1.85	0.053	763.335	0.00	0.851	2.00	0.00	0.00	0	0.00
35.34	0.00368					.000560	0.02		0.870			0.00		
1330.48	758.81	4.502	763.312	5.8	1.85	0.053	763.365	0.00	0.851	2.00	0.00	0.00	0	0.00

5.73	0.00524						.000560	0.00		0.790			0.00	
1336.21	758.84	4.475	763.315	5.8	1.85	0.053	763.368	0.00	0.851		2.00	0.00	0.00	0 0.00
JUNCT STR	0.00215						.000605	0.00					0.00	
1340.87	758.85	4.543	763.393	2.9	1.64	0.042	763.435	0.00	0.647		1.50	0.00	0.00	0 0.00
39.99	0.00375						.000649	0.03		0.670			0.00	
1380.86	759.00	4.419	763.419	2.9	1.64	0.042	763.461	0.00	0.647		1.50	0.00	0.00	0

EAST END CHINO  
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: 4/14/2020  
 TIME: 11: 5

F0515P  
 WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE WIDTH	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)
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CD	18	4				1.50															
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F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

EAST END CHINO

HEADING LINE NO 2 IS -

LATERAL "A-1"

HEADING LINE NO 3 IS -

100-YEAR

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS A	U/S DATA	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
1	IS A SYSTEM OUTLET		1001.00	757.96	18	763.02				
2	IS A REACH		1009.41	759.20	18		0.00	0.00	0.00	0
3	IS A SYSTEM HEADWORKS		1009.41	759.20	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  
 WATER SURFACE PROFILE LISTING

PAGE 1

EAST END CHINO  
 LATERAL "A-1"  
 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		
1001.00	757.96	5.060	763.020	4.5	2.55	0.101	763.121	0.00	0.814	1.50	0.00	0.00	0	0.00
8.41	0.14744					.001564	0.01		0.320			0.00		
1009.41	759.20	3.833	763.033	4.5	2.55	0.101	763.134	0.00	0.814	1.50	0.00	0.00	0	

\*\* WARNING NO. 22 \*\* - NO PLOT GENERATED, BAD DATA OR NOT ENOUGH POINTS, 3 OR LESS

DATE: 4/14/2020  
 TIME: 11: 2

F0515P  
 WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE WIDTH	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 -

EAST END CHINO

HEADING LINE NO 2 IS -

LATERAL "A-2"

HEADING LINE NO 3 IS -

100-YEAR

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS	A	SYSTEM OUTLET	STATION	INVERT	SECT	W S ELEV														
1	IS	A	SYSTEM OUTLET	1000.00	758.85	18	763.36														
2	IS	A	REACH	1183.09	759.40	18		N	0.012												
3	IS	A	JUNCTION	1190.30	759.42	18		N	0.012	Q3	0.5	Q4	0.0	INVERT-3	759.42	INVERT-4	0.00	PHI 3	90.00	PHI 4	0.00
4	IS	A	REACH	1295.65	759.74	18		N	0.012												
5	IS	A	SYSTEM HEADWORKS	1295.65	759.74	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

EAST END CHINO  
 LATERAL "A-2"  
 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
1000.00	758.85	4.510	763.360	2.9	1.64	0.042	763.402	0.00	0.647	1.50	0.00	0.00	0	0.00
183.09	0.00300					.000649	0.12			0.720		0.00		
1183.09	759.40	4.079	763.479	2.9	1.64	0.042	763.521	0.00	0.647	1.50	0.00	0.00	0	0.00
JUNCT STR	0.00277					.000547	0.00					0.00		
1190.30	759.42	4.089	763.509	2.4	1.36	0.029	763.538	0.00	0.586	1.50	0.00	0.00	0	0.00
105.35	0.00304					.000445	0.05			0.640		0.00		
1295.65	759.74	3.816	763.556	2.4	1.36	0.029	763.585	0.00	0.586	1.50	0.00	0.00	0	0.00

EAST END CHINO  
 LATERAL "A-2"  
 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
1000.00	758.85	4.510	763.360	2.9	1.64	0.042	763.402	0.00	0.647	1.50	0.00	0.00	0	0.00
1006.03														
1012.07														
1018.10														
1024.13														
1030.17														
1036.20														
1042.24														
1048.27														
1054.30														
1060.34														
1066.37														
1072.40														
1078.44														
1084.47														



DATE: 4/14/2020  
 TIME: 10:23

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	24	4			2.00															
CD	30	4			2.50															
CD	36	4			3.00															

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

EAST END CHINO

HEADING LINE NO 2 IS -

LINE "B"

HEADING LINE NO 3 IS -

100-YEAR

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS	A	SYSTEM OUTLET	STATION	INVERT	SECT	W S ELEV													
			U/S DATA	986.00	755.91	30	762.00													
ELEMENT NO	2	IS	A REACH	STATION	INVERT	SECT		N				RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1000.00	757.55	30		0.024				0.00	0.00	0.00	0					
ELEMENT NO	3	IS	A REACH	STATION	INVERT	SECT		N				RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1022.99	757.62	30		0.012				0.00	0.00	0.00	0					
ELEMENT NO	4	IS	A REACH	STATION	INVERT	SECT		N				RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1028.89	757.64	30		0.012				22.50	15.00	0.00	0					
ELEMENT NO	5	IS	A REACH	STATION	INVERT	SECT		N				RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1033.42	757.65	30		0.012				0.00	0.00	0.00	0					
ELEMENT NO	6	IS	A JUNCTION	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4					
			U/S DATA	1038.33	757.66	36	30	0	0.012	10.3	0.0	757.66	0.00	90.00	0.00					
ELEMENT NO	7	IS	A REACH	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1259.07	758.37	36			0.012			0.00	0.00	0.00	0					
ELEMENT NO	8	IS	A REACH	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1273.11	758.42	36			0.012			22.50	36.00	0.00	0					
ELEMENT NO	9	IS	A REACH	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1277.91	758.43	36			0.012			0.00	0.00	0.00	1					
ELEMENT NO	10	IS	A REACH	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1526.90	759.18	36			0.012			0.00	0.00	0.00	0					
ELEMENT NO	11	IS	A REACH	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1531.81	759.19	36			0.012			0.00	0.00	0.00	1					
ELEMENT NO	12	IS	A REACH	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1561.20	759.28	36			0.012			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	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1582.50	759.35	36			0.012			22.50	24.00	0.00	0					
ELEMENT NO	14	IS	A REACH	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1600.09	759.40	36			0.012			0.00	0.00	0.00	0					
ELEMENT NO	15	IS	A REACH	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1609.91	759.43	36			0.012			22.50	25.00	0.00	0					
ELEMENT NO	16	IS	A REACH	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG PT	MAN	H				
			U/S DATA	1657.48	759.57	36			0.012			0.00	0.00	0.00	0					

ELEMENT NO	IS A	REACH	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H		
17	IS A	REACH	1667.30	759.60	36	0.012	22.50	25.00	0.00	0		
18	IS A	REACH	1673.80	759.62	36	0.012	0.00	0.00	0.00	0		
19	IS A	JUNCTION	1678.72	759.63	30	0.012	8.6	0.0	759.63	0.00	45.00	0.00
20	IS A	REACH	1906.86	760.32	30	0.012	0.00	0.00	0.00	0		
21	IS A	REACH	1918.64	760.35	30	0.012	22.50	30.00	0.00	0		
22	IS A	REACH	1967.49	760.50	30	0.012	0.00	0.00	0.00	0		
23	IS A	SYSTEM HEADWORKS	1967.49	760.50	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

EAST END CHINO  
 LINE "B"  
 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		
986.00	755.91	6.090	762.000	31.4	6.40	0.635	762.635	0.00	1.909	2.50	0.00	0.00	0	0.00
14.00	0.11714					.019974	0.28		1.120			0.00		
1000.00	757.55	4.730	762.280	31.4	6.40	0.635	762.915	0.00	1.909	2.50	0.00	0.00	0	0.00
22.99	0.00304					.004994	0.11		2.500			0.00		
1022.99	757.62	4.774	762.394	31.4	6.40	0.635	763.029	0.00	1.909	2.50	0.00	0.00	0	0.00
5.90	0.00339					.004994	0.03		2.500			0.00		
1028.89	757.64	4.836	762.476	31.4	6.40	0.635	763.111	0.00	1.909	2.50	0.00	0.00	0	0.00
4.53	0.00221					.004994	0.02		2.500			0.00		
1033.42	757.65	4.848	762.498	31.4	6.40	0.635	763.133	0.00	1.909	2.50	0.00	0.00	0	0.00
JUNCT STR	0.00204					.002923	0.01					0.00		
1038.33	757.66	5.568	763.228	21.1	2.98	0.138	763.366	0.00	1.476	3.00	0.00	0.00	0	0.00
220.74	0.00322					.000853	0.19		1.525			0.00		
1259.07	758.37	5.046	763.416	21.1	2.98	0.138	763.554	0.00	1.476	3.00	0.00	0.00	0	0.00
14.04	0.00356					.000853	0.01		1.480			0.00		
1273.11	758.42	5.025	763.445	21.1	2.98	0.138	763.583	0.00	1.476	3.00	0.00	0.00	0	0.00
4.80	0.00208					.000853	0.00		1.743			0.00		
1277.91	758.43	5.026	763.456	21.1	2.98	0.138	763.594	0.00	1.476	3.00	0.00	0.00	0	0.00
248.99	0.00301					.000853	0.21		1.555			0.00		
1526.90	759.18	4.489	763.669	21.1	2.98	0.138	763.807	0.00	1.476	3.00	0.00	0.00	0	0.00
4.91	0.00204					.000853	0.00		1.756			0.00		
1531.81	759.19	4.490	763.680	21.1	2.98	0.138	763.818	0.00	1.476	3.00	0.00	0.00	0	0.00
29.39	0.00306					.000853	0.03		1.550			0.00		

□ LICENSEE: THIENES ENGINEERING F0515P PAGE 2

WATER SURFACE PROFILE LISTING

EAST END CHINO  
 LINE "B"  
 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		
1561.20	759.28	4.425	763.705	21.1	2.98	0.138	763.843	0.00	1.476	3.00	0.00	0.00	0	0.00

21.30	0.00329					.000853	0.02			1.516			0.00	
1582.50	759.35	4.387	763.737	21.1	2.98	0.138	763.875	0.00	1.476		3.00	0.00	0.00	0 0.00
17.59	0.00284					.000853	0.02			1.583			0.00	
1600.09	759.40	4.352	763.752	21.1	2.98	0.138	763.890	0.00	1.476		3.00	0.00	0.00	0 0.00
9.82	0.00305					.000853	0.01			1.550			0.00	
1609.91	759.43	4.345	763.775	21.1	2.98	0.138	763.913	0.00	1.476		3.00	0.00	0.00	0 0.00
47.57	0.00294					.000853	0.04			1.566			0.00	
1657.48	759.57	4.246	763.816	21.1	2.98	0.138	763.954	0.00	1.476		3.00	0.00	0.00	0 0.00
9.82	0.00305					.000853	0.01			1.550			0.00	
1667.30	759.60	4.239	763.839	21.1	2.98	0.138	763.977	0.00	1.476		3.00	0.00	0.00	0 0.00
6.50	0.00308					.000853	0.01			1.546			0.00	
1673.80	759.62	4.224	763.844	21.1	2.98	0.138	763.982	0.00	1.476		3.00	0.00	0.00	0 0.00
JUNCT STR	0.00203					.000822	0.00						0.00	
1678.72	759.63	4.294	763.924	12.5	2.55	0.101	764.025	0.00	1.187		2.50	0.00	0.00	0 0.00
228.14	0.00302					.000791	0.18			1.265			0.00	
1906.86	760.32	3.784	764.104	12.5	2.55	0.101	764.205	0.00	1.187		2.50	0.00	0.00	0 0.00
11.78	0.00255					.000791	0.01			1.332			0.00	
1918.64	760.35	3.775	764.125	12.5	2.55	0.101	764.226	0.00	1.187		2.50	0.00	0.00	0 0.00
48.85	0.00307					.000791	0.04			1.260			0.00	
1967.49	760.50	3.664	764.164	12.5	2.55	0.101	764.265	0.00	1.187		2.50	0.00	0.00	0

0.00□

EAST END CHINO  
LINE "B"  
100-YEAR

986.00	I		C	H						W	E			R	
1006.03														R	
1026.06		I				C	H			W	E			R	
1046.09		I				C	H			W	E			R	
1066.12		I				C	H			W	E			R	
1086.15		I			C		H			W	E			JX	
1106.18														R	
1126.21															
1146.24															
1166.27															
1186.30															
1206.33															
1226.36															
1246.40															
1266.43				I			C		H		W	E		R	
1286.46				I			C		H		W	E		R	
1306.49				I			C		H		W	E		R	
1326.52															
1346.55															
1366.58															
1386.61															
1406.64															
1426.67															
1446.70															
1466.73															
1486.76															
1506.79															
1526.82															
1546.85						I		C		H		W	E	R	
1566.88						I		C		H		W	E	R	
1586.91						I		C		H		W	E	R	
1606.94						I		C		H		W	E	R	
1626.97						I		C		H		W	E	R	
1647.00						I		C		H		W	E	R	
1667.03						I		C		H		W	E	R	
1687.06						I		C		H		W	E	R	
1707.09						I		C		H		W	E	JX	
1727.13						I		C		H		W	E	R	
1747.16															
1767.19															
1787.22															
1807.25															
1827.28															
1847.31															
1867.34															
1887.37															
1907.40							I		C		H		W	E	R
1927.43							I		C		H		W	E	R
1947.46															
1967.49							I		C		H		W	E	R

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: 4/14/2020  
 TIME: 11:19

F0515P  
 WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE WIDTH	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	24	4				2.00														

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

EAST END CHINO

HEADING LINE NO 2 IS -

LATERAL "B-1"

HEADING LINE NO 3 IS -

100-YEAR

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS A	U/S DATA	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
1	IS A SYSTEM OUTLET		1001.95	759.84	24	763.88				
2	IS A REACH		1037.03	762.20	24		0.00	0.00	0.00	0
3	IS A SYSTEM HEADWORKS		1037.03	762.20	24	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

EAST END CHINO  
 LATERAL "B-1"  
 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		
1001.95	759.84	4.040	763.880	9.5	3.02	0.142	764.022	0.00	1.102	2.00	0.00	0.00	0	0.00
31.02	0.06728				.001489	0.05			0.520			0.00		
1032.97	761.93	2.000	763.927	9.5	3.02	0.142	764.069	0.00	1.102	2.00	0.00	0.00	0	0.00
2.59	0.06728				.001394	0.00			0.520			0.00		
1035.56	762.10	1.814	763.915	9.5	3.17	0.156	764.071	0.00	1.102	2.00	0.00	0.00	0	0.00
1.40	0.06728				.001360	0.00			0.520			0.00		
1036.96	762.20	1.706	763.901	9.5	3.33	0.172	764.073	0.00	1.102	2.00	0.00	0.00	0	0.00
0.07	0.06728				.001410	0.00			0.520			0.00		
1037.03	762.20	1.701	763.901	9.5	3.34	0.173	764.074	0.00	1.102	2.00	0.00	0.00	0	0.00

EAST END CHINO  
 LATERAL "B-1"  
 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
1001.95	.I													
1002.67														
1003.38														
1004.10														
1004.81														
1005.53														
1006.25														
1006.96														
1007.68														
1008.39														
1009.11														
1009.83														
1010.54														
1011.26														
1011.97														
1012.69														
1013.40														
1014.12														
1014.84														

1015.55											
1016.27											
1016.98											
1017.70											
1018.42											
1019.13											
1019.85											
1020.56											
1021.28											
1022.00											
1022.71											
1023.43											
1024.14											
1024.86											
1025.58											
1026.29											
1027.01											
1027.72											
1028.44											
1029.15											
1029.87											
1030.59											
1031.30											
1032.02											
1032.73											
1033.45					I		C		X E	R	
1034.17											
1034.88											
1035.60					I		C		W X	R	
1036.31											
1037.03						I		C	W E H	R	
	759.84	760.28	760.71	761.15	761.58	762.02	762.46	762.89	763.33	763.76	764.20

N O T E S

1. GLOSSARY

- I = INVERT ELEVATION
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- Y = WALL ENTRANCE OR EXIT

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

DATE: 4/14/2020  
 TIME: 13:43

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	12	4			1.00															
CD	18	4			1.50															
CD	24	4			2.00															

F 0 5 1 5 P

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

EAST END CHINO

HEADING LINE NO 2 IS -

LINE "C"

HEADING LINE NO 3 IS -

100-YEAR

F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS	A	SYSTEM OUTLET	STATION	INVERT	SECT	W S ELEV													
1	IS	A	SYSTEM OUTLET	1000.00	756.55	24	764.00													
2	IS	A	REACH	1033.10	757.81	24		N	0.013			RADIUS	ANGLE	ANG PT	MAN	H				
3	IS	A	REACH	1068.44	759.16	24		N	0.013			RADIUS	ANGLE	ANG PT	MAN	H				
4	IS	A	REACH	1072.77	759.18	24		N	0.013			RADIUS	ANGLE	ANG PT	MAN	H				
5	IS	A	REACH	1203.81	759.83	24		N	0.012			RADIUS	ANGLE	ANG PT	MAN	H				
6	IS	A	REACH	1212.55	759.88	24		N	0.012			RADIUS	ANGLE	ANG PT	MAN	H				
7	IS	A	JUNCTION	1212.55	759.88	24		N	0.012	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4					
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																				
8	IS	A	REACH	1239.16	760.01	24		N	0.012			RADIUS	ANGLE	ANG PT	MAN	H				
9	IS	A	REACH	1269.29	760.16	24		N	0.012			RADIUS	ANGLE	ANG PT	MAN	H				
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS																				
10	IS	A	REACH	1273.96	760.19	18		N	0.012			RADIUS	ANGLE	ANG PT	MAN	H				
11	IS	A	REACH	1278.15	760.21	18		N	0.012			RADIUS	ANGLE	ANG PT	MAN	H				
12	IS	A	JUNCTION	1278.15	760.21	18		N	0.012	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4					
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

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS	A	REACH	STATION	INVERT	SECT														
13	IS	A	REACH	1435.11	761.00	18		N	0.012			RADIUS	ANGLE	ANG PT	MAN	H				
14	IS	A	JUNCTION	1435.11	761.00	18		N	0.012	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4					
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																				
15	IS	A	REACH																	

ELEMENT NO	IS A REACH	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
16			1576.50	761.71	18	0.012	0.00	0.00	0.00	0
17			1588.40	761.77	18	0.012	22.50	19.00	0.00	0
18			1622.53	761.94	18	0.012	0.00	0.00	0.00	0
19	SYSTEM HEADWORKS		1622.53	761.94	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

EAST END CHINO  
 LINE "C"  
 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					
1000.00	756.55	7.450	764.000	7.1	2.26	0.079	764.079	0.00	0.946	2.00	0.00	0.00	0	0.00
33.10	0.03807					.000985	0.03		0.540			0.00		
1033.10	757.81	6.223	764.033	7.1	2.26	0.079	764.112	0.00	0.946	2.00	0.00	0.00	0	0.00
35.34	0.03820					.000985	0.03		0.540			0.00		
1068.44	759.16	4.923	764.083	7.1	2.26	0.079	764.162	0.00	0.946	2.00	0.00	0.00	0	0.00
4.33	0.00462					.000985	0.00		0.952			0.00		
1072.77	759.18	4.912	764.092	7.1	2.26	0.079	764.171	0.00	0.946	2.00	0.00	0.00	0	0.00
131.04	0.00496					.000839	0.11		0.891			0.00		
1203.81	759.83	4.371	764.201	7.1	2.26	0.079	764.280	0.00	0.946	2.00	0.00	0.00	0	0.00
8.74	0.00572					.000839	0.01		0.860			0.00		
1212.55	759.88	4.337	764.217	7.1	2.26	0.079	764.296	0.00	0.946	2.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.000581	0.00					0.00		
1212.55	759.88	4.406	764.286	4.4	1.40	0.030	764.316	0.00	0.737	2.00	0.00	0.00	0	0.00
26.61	0.00488					.000322	0.01		0.690			0.00		
1239.16	760.01	4.289	764.299	4.4	1.40	0.030	764.329	0.00	0.737	2.00	0.00	0.00	0	0.00
30.13	0.00498					.000322	0.01		0.690			0.00		
1269.29	760.16	4.149	764.309	4.4	2.49	0.096	764.405	0.00	0.805	1.50	0.00	0.00	0	0.00
4.67	0.00642					.001495	0.01		0.730			0.00		
1273.96	760.19	4.131	764.321	4.4	2.49	0.096	764.417	0.00	0.805	1.50	0.00	0.00	0	0.00
4.19	0.00477					.001495	0.01		0.800			0.00		
1278.15	760.21	4.117	764.327	4.4	2.49	0.096	764.423	0.00	0.805	1.50	0.00	0.00	0	0.00
JUNCT STR	0.00000					.001029	0.00					0.00		

□ LICENSEE: THIENES ENGINEERING F0515P PAGE 2

WATER SURFACE PROFILE LISTING

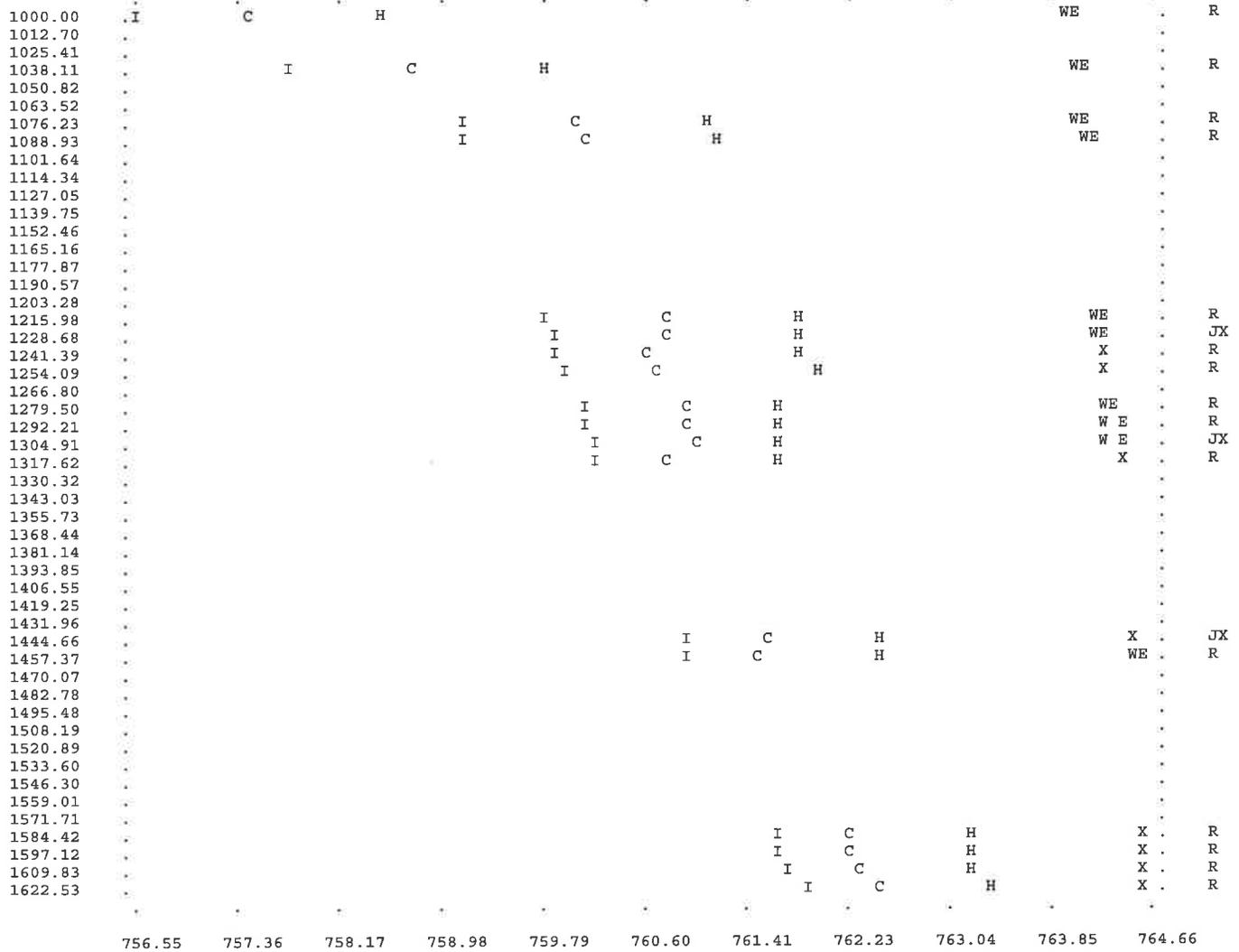
EAST END CHINO  
 LINE "C"  
 100-YEAR

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					
1278.15	760.21	4.237	764.447	2.7	1.53	0.036	764.483	0.00	0.623	1.50	0.00	0.00	0	0.00
156.96	0.00503					.000563	0.09		0.600			0.00		
1435.11	761.00	3.536	764.536	2.7	1.53	0.036	764.572	0.00	0.623	1.50	0.00	0.00	0	0.00
JUNCT STR	0.00000					.000469	0.00					0.00		
1435.11	761.00	3.560	764.560	2.2	1.25	0.024	764.584	0.00	0.560	1.50	0.00	0.00	0	0.00
141.39	0.00502					.000374	0.05		0.530			0.00		

1576.50	761.71	2.903	764.613	2.2	1.25	0.024	764.637	0.00	0.560	1.50	0.00	0.00	0	0.00
4.67	0.00428					.000374	0.00		0.560			0.00		
1581.17	761.73	2.886	764.616	2.2	1.25	0.024	764.640	0.00	0.560	1.50	0.00	0.00	0	0.00
7.23	0.00553					.000374	0.00		0.520			0.00		
1588.40	761.77	2.851	764.621	2.2	1.25	0.024	764.645	0.00	0.560	1.50	0.00	0.00	0	0.00
34.13	0.00498					.000374	0.01		0.540			0.00		
1622.53	761.94	2.693	764.633	2.2	1.25	0.024	764.657	0.00	0.560	1.50	0.00	0.00	0	0.00

0.00

EAST END CHINO  
LINE "C"  
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: 4/14/2020  
 TIME: 15: 7

F0515P  
 WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE WIDTH	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	12	4				1.00															
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 -

EAST END CHINO

HEADING LINE NO 2 IS -

LINE "D"

HEADING LINE NO 3 IS -

100-YEAR

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS	A	SYSTEM OUTLET	U/S DATA	STATION	INVERT	SECT	W S ELEV														
1	IS	A	SYSTEM OUTLET	U/S DATA	944.91	759.67	18	761.40														
2	IS	A	REACH	U/S DATA	961.45	760.03	18		N	0.013												
3	IS	A	REACH	U/S DATA	965.45	760.12	18		N	0.013												
4	IS	A	REACH	U/S DATA	996.68	760.80	18		N	0.012												
5	IS	A	JUNCTION	U/S DATA	1000.00	760.85	12		N	0.012	Q3	1.2	Q4	0.0	INVERT-3	760.85	INVERT-4	0.00	PHI 3	90.00	PHI 4	0.00
6	IS	A	REACH	U/S DATA	1016.36	760.96	12		N	0.012												
7	IS	A	REACH	U/S DATA	1022.25	760.96	12		N	0.012												
8	IS	A	REACH	U/S DATA	1052.22	761.11	12		N	0.012												
9	IS	A	REACH	U/S DATA	1060.23	761.15	12		N	0.012												
10	IS	A	REACH	U/S DATA	1097.84	761.33	12		N	0.012												
11	IS	A	REACH	U/S DATA	1122.54	761.46	12		N	0.012												
12	IS	A	REACH	U/S DATA	1153.67	761.61	12		N	0.012												
13	IS	A	SYSTEM HEADWORKS	U/S DATA	1153.67	761.61	12		N	0.012												

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

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  
 WATER SURFACE PROFILE LISTING

PAGE 1

EAST END CHINO  
 LINE "D"  
 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		

944.91	759.67	1.730	761.400	4.2	2.38	0.088	761.488	0.00	0.785	1.50	0.00	0.00	0	0.00
11.41	0.02176					.001582	0.02			0.530		0.00		
956.32	759.92	1.500	761.418	4.2	2.38	0.088	761.506	0.00	0.785	1.50	0.00	0.00	0	0.00
5.13	0.02176					.001474	0.01			0.530		0.00		
961.45	760.03	1.389	761.419	4.2	2.46	0.094	761.513	0.00	0.785	1.50	0.00	0.00	0	0.00
3.73	0.02250					.001423	0.01			0.530		0.00		
965.18	760.11	1.301	761.415	4.2	2.58	0.103	761.518	0.00	0.785	1.50	0.00	0.00	0	0.00
0.27	0.02250					.001468	0.00			0.530		0.00		
965.45	760.12	1.295	761.415	4.2	2.59	0.104	761.519	0.00	0.785	1.50	0.00	0.00	0	0.00
2.85	0.02177					.001312	0.00			0.510		0.00		
968.30	760.18	1.226	761.408	4.2	2.72	0.115	761.523	0.00	0.785	1.50	0.00	0.00	0	0.00
2.39	0.02177					.001440	0.00			0.510		0.00		
970.69	760.23	1.166	761.400	4.2	2.85	0.126	761.526	0.00	0.785	1.50	0.00	0.00	0	0.00
2.05	0.02177					.001595	0.00			0.510		0.00		
972.74	760.28	1.112	761.391	4.2	2.99	0.139	761.530	0.00	0.785	1.50	0.00	0.00	0	0.00
1.21	0.02177					.001780	0.00			0.510		0.00		
973.95	760.30	1.063	761.368	4.2	3.14	0.153	761.521	0.00	0.785	1.50	0.00	0.00	0	0.00
HYDRAULIC JUMP														0.00
973.95	760.30	0.545	760.850	4.2	7.24	0.814	761.664	0.00	0.785	1.50	0.00	0.00	0	0.00
3.11	0.02177					.016049	0.05			0.510		0.00		
977.06	760.37	0.564	760.937	4.2	6.90	0.739	761.676	0.00	0.785	1.50	0.00	0.00	0	0.00
5.99	0.02177					.014062	0.08			0.510		0.00		

LICENSEE: THIENES ENGINEERING

F0515P  
WATER SURFACE PROFILE LISTING

PAGE 2

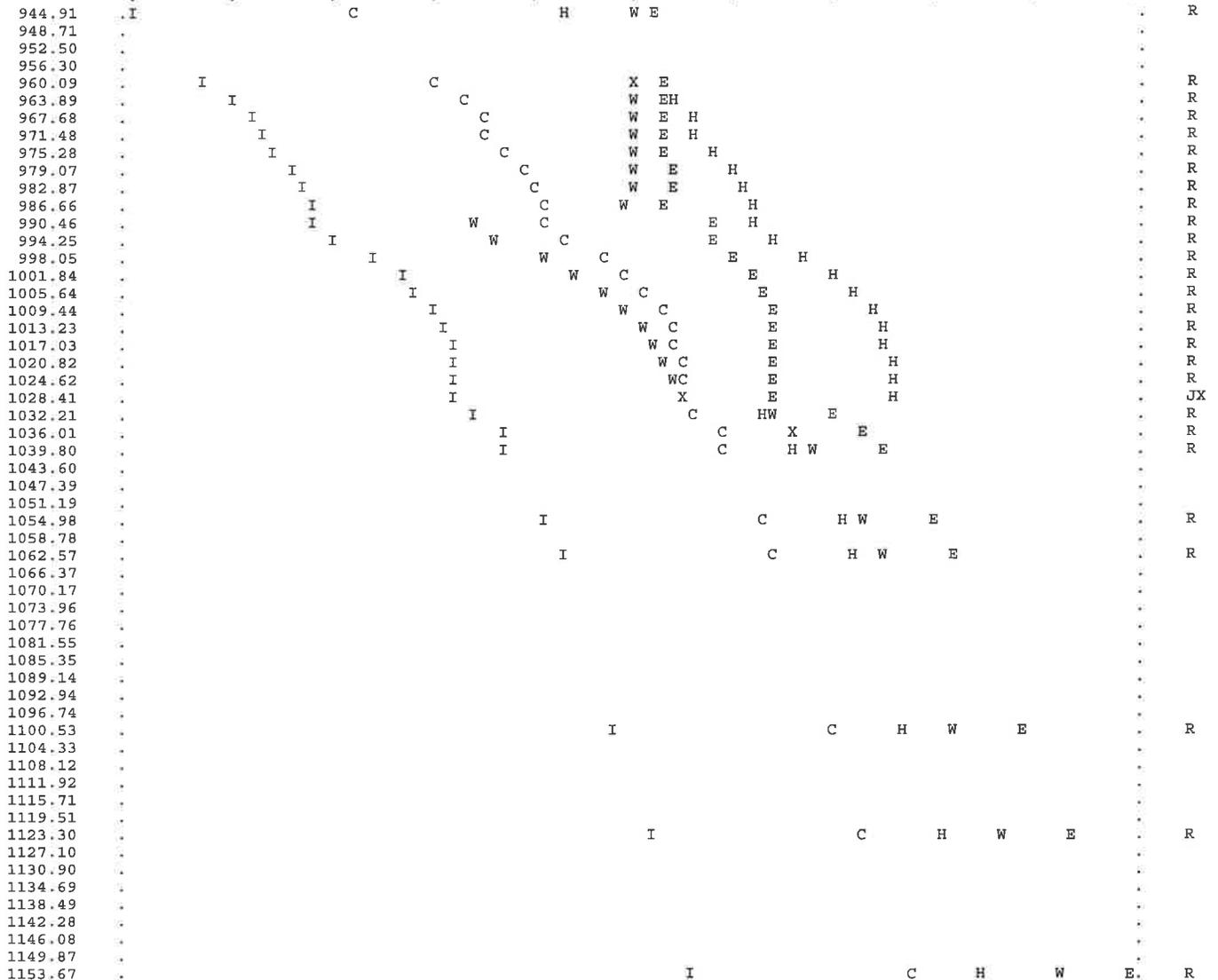
EAST END CHINO  
LINE "D"  
100-YEAR

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		
983.05	760.50	0.585	761.088	4.2	6.58	0.673	761.761	0.00	0.785	1.50	0.00	0.00	0	0.00
4.26	0.02177					.012342	0.05			0.510		0.00		
987.31	760.60	0.606	761.202	4.2	6.28	0.612	761.814	0.00	0.785	1.50	0.00	0.00	0	0.00
3.07	0.02177					.010832	0.03			0.510		0.00		
990.38	760.66	0.628	761.291	4.2	5.98	0.556	761.847	0.00	0.785	1.50	0.00	0.00	0	0.00
2.24	0.02177					.009511	0.02			0.510		0.00		
992.62	760.71	0.651	761.363	4.2	5.71	0.506	761.869	0.00	0.785	1.50	0.00	0.00	0	0.00
1.63	0.02177					.008355	0.01			0.510		0.00		
994.25	760.75	0.675	761.422	4.2	5.44	0.460	761.882	0.00	0.785	1.50	0.00	0.00	0	0.00
1.16	0.02177					.007343	0.01			0.510		0.00		
995.41	760.77	0.700	761.472	4.2	5.19	0.417	761.889	0.00	0.785	1.50	0.00	0.00	0	0.00
0.72	0.02177					.006459	0.00			0.510		0.00		
996.13	760.79	0.727	761.515	4.2	4.94	0.379	761.894	0.00	0.785	1.50	0.00	0.00	0	0.00
0.46	0.02177					.005685	0.00			0.510		0.00		
996.59	760.80	0.754	761.552	4.2	4.71	0.345	761.897	0.00	0.785	1.50	0.00	0.00	0	0.00
0.09	0.02177					.004998	0.00			0.510		0.00		
996.68	760.80	0.785	761.585	4.2	4.49	0.313	761.898	0.00	0.785	1.50	0.00	0.00	0	0.00
JUNCT STR	0.01506					.005358	0.02					0.00		
1000.00	760.85	1.019	761.869	3.0	3.82	0.227	762.096	0.00	0.743	1.00	0.00	0.00	0	0.00
16.36	0.00672					.006041	0.10			0.770		0.00		
1016.36	760.96	1.008	761.968	3.0	3.82	0.227	762.195	0.00	0.743	1.00	0.00	0.00	0	0.00

EAST END CHINO  
 LINE "D"  
 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		
1022.25	760.96	1.062	762.022	3.0	3.82	0.227	762.249	0.00	0.743	1.00	0.00	0.00	0	0.00
29.97	0.00500					.006041	0.18					0.00		
1052.22	761.11	1.093	762.203	3.0	3.82	0.227	762.430	0.00	0.743	1.00	0.00	0.00	0	0.00
8.01	0.00499					.006041	0.05					0.00		
1060.23	761.15	1.123	762.273	3.0	3.82	0.227	762.500	0.00	0.743	1.00	0.00	0.00	0	0.00
37.61	0.00479					.006041	0.23					0.00		
1097.84	761.33	1.170	762.500	3.0	3.82	0.227	762.727	0.00	0.743	1.00	0.00	0.00	0	0.00
24.70	0.00526					.006041	0.15					0.00		
1122.54	761.46	1.227	762.687	3.0	3.82	0.227	762.914	0.00	0.743	1.00	0.00	0.00	0	0.00
31.13	0.00482					.006041	0.19					0.00		
1153.67	761.61	1.265	762.875	3.0	3.82	0.227	763.102	0.00	0.743	1.00	0.00	0.00	0	0.00

EAST END CHINO  
 LINE "D"  
 100-YEAR



759.67 760.01 760.36 760.70 761.04 761.39 761.73 762.07 762.42 762.76 763.10

NOTES

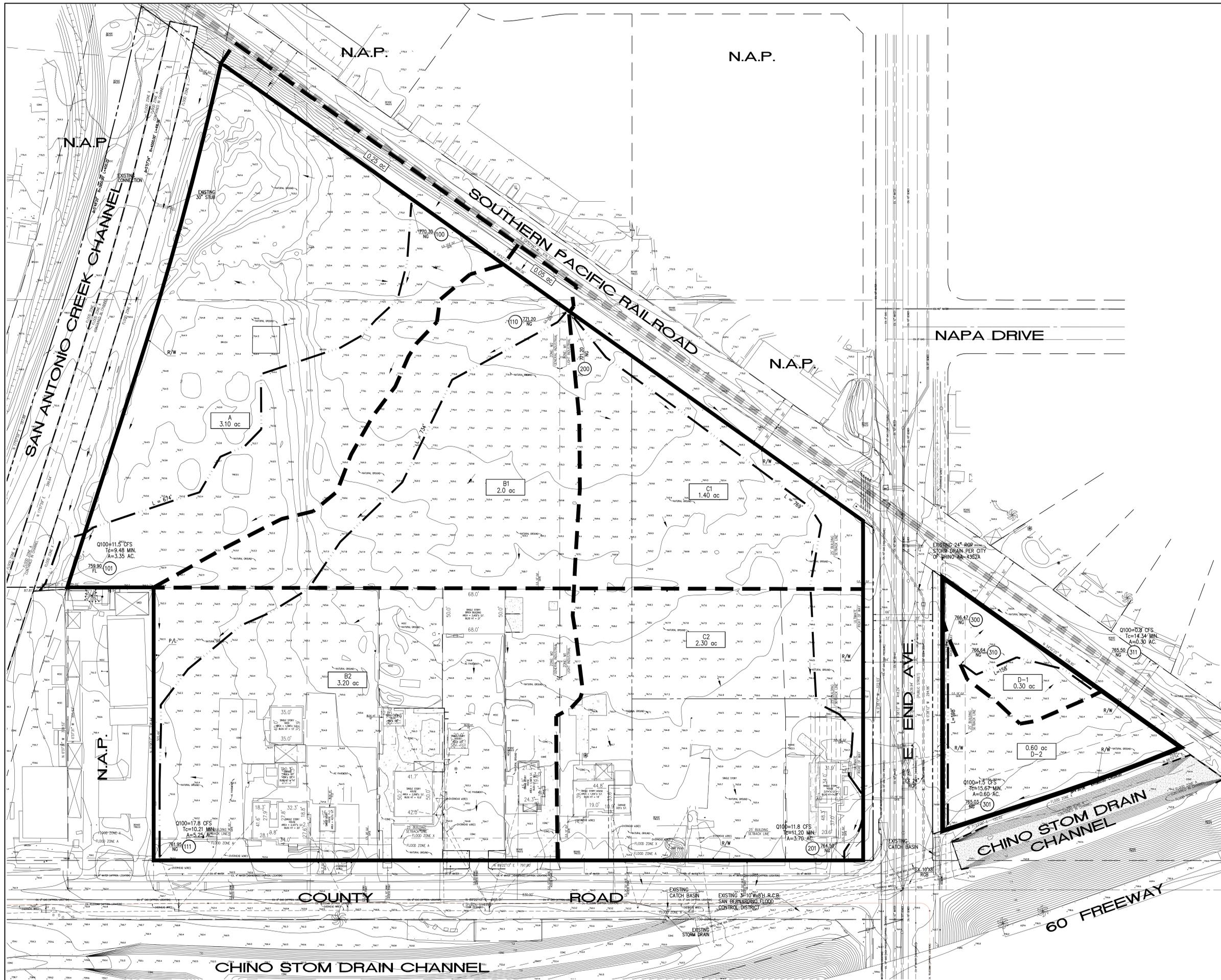
1. GLOSSARY

- 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

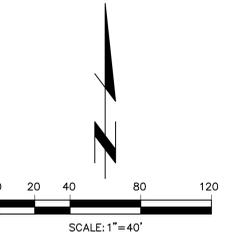
# **APPENDIX E**

## **HYDROLOGY MAP**



VICINITY MAP  
N.T.S.

LEGEND	
	PROJECT BOUNDARY
	SUBAREA BOUNDARY
	SUBAREA AREA
	NODE NUMBER
	DRAINAGE FLOW
	FLOW PATH



Last Update: 4/14/20  
0: 13700-3799/3712/3712/10-EX.dwg

**CITY OF CHINO**  
PUBLIC WORKS DEPARTMENT  
**EXISTING CONDITION**  
**HYDROLOGY MAP**  
FOR  
**EAST END AVE INDUSTRIAL BUILDING**

PREPARED FOR:  
**ALERE PROPERTY GROUP LLC**  
100 BAYVIEW CIRCLE, SUITE 310  
NEWPORT BEACH, CA 92660  
P: (949) 509-5000

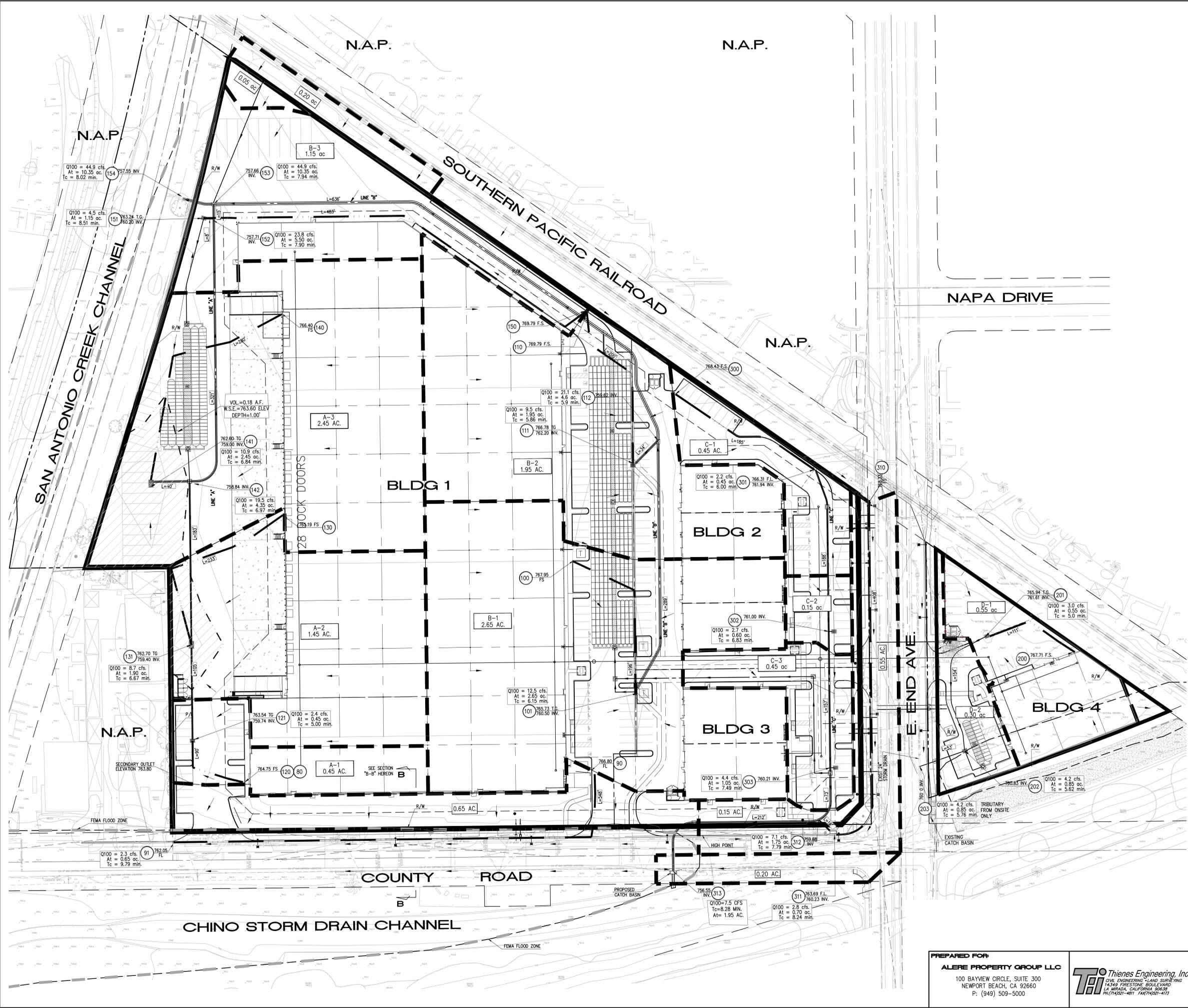
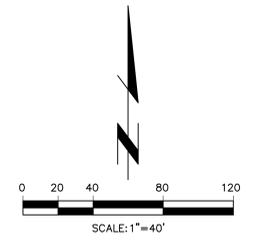
**Tai** Thienes Engineering, Inc.  
CIVIL ENGINEERING • LAND SURVEYING  
14340 FIRESTONE BOULEVARD  
LA MIRADA, CALIFORNIA 90638  
PH: (714) 521-4811 FAX: (714) 521-4773

Designed by _____	Approved by _____	Date _____
Checked by _____	Public Works Director _____	R.C.E.
Designed by _____		
Date _____		
Checked by _____		
Date _____		
Sheet <b>1</b> of <b>1</b>	of <b>1</b>	Sheets



VICINITY MAP  
N.T.S.

LEGEND	
	PROJECT BOUNDARY
	SUBAREA BOUNDARY
	SUBAREA AREA
	NODE NUMBER
	DRAINAGE FLOW
	FLOW PATH
	DETENTION AREA



<b>CITY OF CHINO</b> PUBLIC WORKS DEPARTMENT	
<b>PRELIMINARY HYDROLOGY MAP</b>	
<b>FOR EAST END AVE INDUSTRIAL BUILDING</b>	
Designed by _____	Approved by _____ Date _____
Checked by _____	Public Works Director R.C.E.
Date _____	
Checked by _____	
Date _____	
Sheet <b>1</b> of <b>1</b> Sheets	3712/1 OF 1 SHEET

PREPARED FOR:  
**ALERE PROPERTY GROUP LLC**  
100 BAYVIEW CIRCLE, SUITE 300  
NEWPORT BEACH, CA 92660  
P: (949) 509-5000



Least Update: 4/14/20  
CS:13700-3712/1 OF 1 SHEET PRELIM.dwg