Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING

PRELIMINARY HYDROLOGY CALCULATIONS

FOR

SIERRA GATEWAY
SOUTHEAST CORNER OF SIERRA AVENUE
AND DUNCAN CANYON ROAD
FONTANA, CA

PREPARED FOR

ACACIA REAL ESTATE GROUP, INC.
260 NEWPORT CENTER DRIVE, SUITE 100
NEWPORT BEACH, CA 92260
PHONE: (949) 640-9995

SEPTEMBER 7, 2021

JOB NO. 3994

PREPARED BY

THIENES ENGINEERING
14349 FIRESTONE BLVD.
LA MIRADA, CALIFORNIA 90638
PHONE: (714) 521-4811
FAX: (714) 521-4173

PRELIMINARY HYDROLOGY CALCULATIONS

FOR

SIERRA GATEWAY

PREPARED UNDER
THE SUPERVISION OF

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

INTRODUCTION

A: PROJECT LOCATION

The project site is located southeast from the corner of Sierra Avenue and Duncan Canyon Road, in the City Fontana, California. Please see following page for vicinity map.

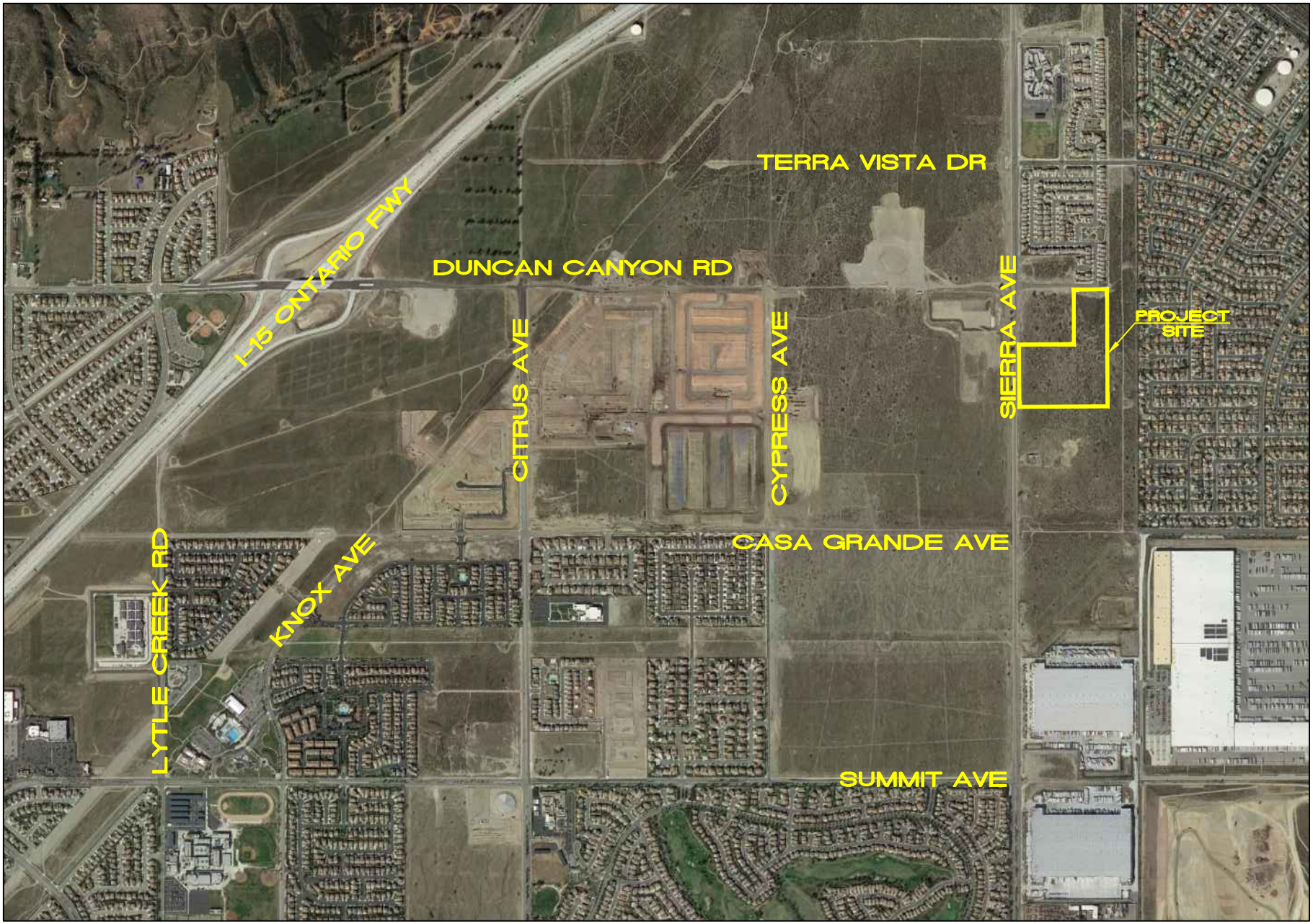
B: STUDY PURPOSE

The purpose of this study is to determine the existing condition and proposed condition 100-year peak flow rates from the project site.

C: PROJECT STAFF:

Thienes Engineering staff involved in this study include:

Reinhard Stenzel



Last Update: 8/10/21
O:\3900-3999\3994\3994VicMap.dwg

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

"VICINITY MAP"

FOR

SIERRA GATEWAY

DISCUSSION

Project Description

The project site encompasses approximately 19.0 acres. Proposed improvements include two (2) warehouse type buildings that are approximately 279,277 square feet (bldg. 1) and 83,498 square feet (bldg. 2). There will be a truck dock and yard on the south side of building1 and on the west side of building 2. Trailer parking will be located at the south of building 1. Vehicle parking will be on the east, north, and west sides of building 1 and north and south sides of building 2. Landscape areas will be along the perimeter and throughout the site.

Existing Conditions

The project site is an undeveloped dirt lot with a fair cover of open brush and rocks scattered throughout. The site generally drains from north to south and surface drains to the property located to the south. The existing condition 100-year peak flow rate from the project site is approximately 29.4 cfs, in which 16.0 cfs is from the east (nodes 100-102) and 13.4 cfs is from the west (nodes 110-111).

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

Master Plan Storm Drain

The City of Fontana – North Fontana Master Storm Drainage Plan tabled the site public storm drain in Sierra Avenue. Proposed site will add a 36" RCP extension along the property frontage, Pub "A" based on the Master Storm Plan.

The recent development of the site south of the project provided a 48" RCP extension to the Sierra Avenue storm drain reinforced concrete box.

See Appendix "A" for referenced material.

Proposed Conditions

The proposed improvements are designed to discharge site runoff to a proposed extension storm drain system in Sierra Avenue, Pub "A", consistent with the City of Fontana Master Storm Drain Plan.

Runoff from the truck yard, vehicle parking lots, and drive aisle surrounding Building 2 will surface drain to catch basins. A proposed storm drain system, Line "B", will convey flows to the west through north drive aisle on Building 1 and discharge in Pub "A".

Runoff from the vehicle parking lot north of Building 1 will surface drain to catch basins. A proposed storm drain system, Line "D", will convey flows to the west discharging into Line "B". Line "B" discharges in Pub "A".

Runoff from the south truck yard and vehicle parking lots (west and east) at Building 1 will surface drain south to catch basins. A proposed storm drain system, Line "C", will convey flows to the west and discharge in Pub "A".

The total proposed condition 100-year peak flow rate from the improved project site is approximately 91.8 cfs. The storm drain system in Sierra Avenue is designed for a 100-year storm event and the commercial buildout of the tributary areas. Therefore, the proposed improvements will not have a negative impact on the downstream facilities.

See Appendix "B" for proposed condition hydrology calculations, and Appendix "D" for the proposed condition hydrology map.

Offsite Drainage:

The undeveloped property northwest from the project site to Duncan Canyon Road surface drains from north to south towards the project. Approximately 7.95 acres surface drains through the project site. Runoff surface drains onto a proposed concrete channel. The channel will be constructed with several CB's to collect the run-on. A proposed storm drain, Line "E" will collect the run-on and convey westerly discharging into Line "B". Line "B" discharges in Pub "A".

See Appendix "B" for off-site hydrology calculations, and Appendix "D" for the existing condition hydrology map.

Methodology

Hydrology calculations were computed using the Advanced Engineering Software's (AES) Rational Method Hydrology program for San Bernardino County. The site has a soil type of "A" per the San Bernardino County Hydrology Manual.

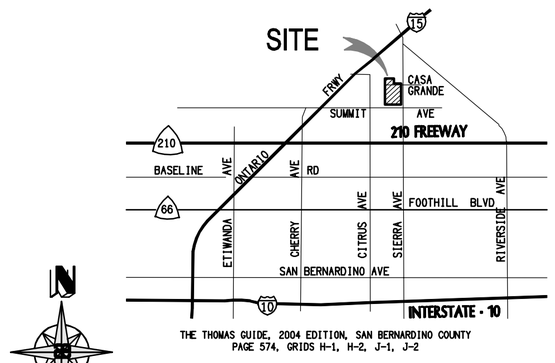
See Appendix "A" for referenced materials.

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

APPENDIX A

REFERENCE MATERIALS

MASTER PLAN DRAINAGE EXHIBIT
SUMMIT AT ROSENA



THE THOMAS GUIDE, 2004 EDITION, SAN BERNARDINO COUNTY
PAGE 574, GRIDS H-1, H-2, J-1, J-2

VICINITY MAP
N.T.S.

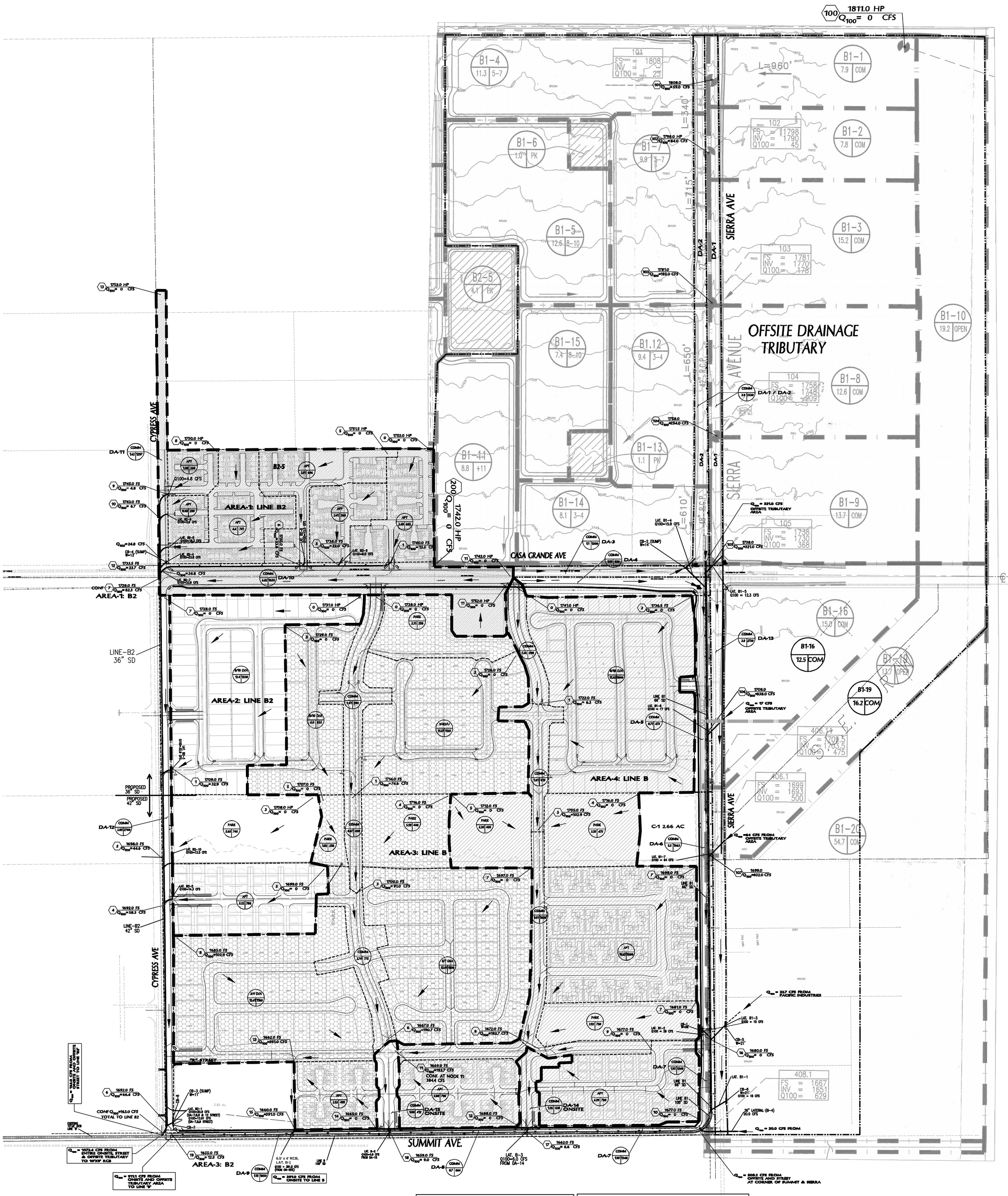


TABLE-1: FLOW DATA TO LINE B / B1

ONSITE TRACT:

AREA-3: Q100 = 190.7 CFS AT NODE 6
AREA-4: Q100 = 193.7 CFS AT NODE 11
CONFLUENCE AT NODE 11:Q100 = 384.4 CFS
TOTAL AT NODE 15: Q100 = **391.0 CFS** , LATERAL B1

ONSITE STREET:

DA-15: Q100 = **4.9 CFS**, LATERAL B2
DA-16: Q100 = **6.0 CFS**, LATERAL B3

OFFSITE CONCENTRATED FLOW:

COMMERCIAL TRIBUTARY AREA : Q100 = **20.0 CFS**, LATERAL NORTH EAST OF SIERRA-SUMMIT

OFFSITE STREET

DA2 & DA-3: Q100 = **15.9 CFS**, LATERAL B1-4
DA1: Q100 = **12.3 CFS**, LATERAL B1-5
DA4, DA5& DA-6: Q100 = **29.0 CFS**, LATERAL B1-2
DA-13: Q100 = **30 CFS**, LATERAL B1-1, LATERAL B1-3

OFFSITE TRIBUTARY AREA
OFFSITE COMM. AREA (12.5 AC) = 17.0 CFS (LAT B1-6)
OFFSITE SCE AREA (35.4 AC) = 64.0 CFS (LAT B1-7)

NORTH EAST OF TRACT: Q100 = **402.0 CFS (TOTAL)**

TOTAL FLOW TO LINE B / B1: Q100 = 911.10 CFS

TABLE-2: FLOW DATA TO LINE B2

ONSITE TRACT:

AREA-1: Q100 = **82.3 CFS**
AREA-2: Q100 = **80.3 CFS**
Q100 = 14.3, LATERAL B2-1
Q100 = 12.5 CFS, LATERAL B2-10
Q100 = 32.9 CFS, LATERAL B2-3

OFFSITE STREET

DA7, DA8, DA9 & DA12: Q100 = **20.6 CFS**, LATERAL B1-4

TOTAL FLOW TO LINE B2: Q100 = 161.3 CFS

TOTAL FLOW FROM ONSITE TRACK, ONSITE & OFFSITE STREET, AND OFFSITE TRIBUTARY AREA: Q100 = 1072.4 CFS

GRAPHIC SCALE
250 0 125 250
(IN FEET)
1 inch = 250 ft.

PLOT DATE: October 15, 2018 aeuser1

Prepared By:
ALLARD ENGINEERING
Civil Engineering - Land Surveying - Land Planning
8253 Sierra Avenue, Fontana, California 92335
(909) 356-1815 Fax (909) 356-1795

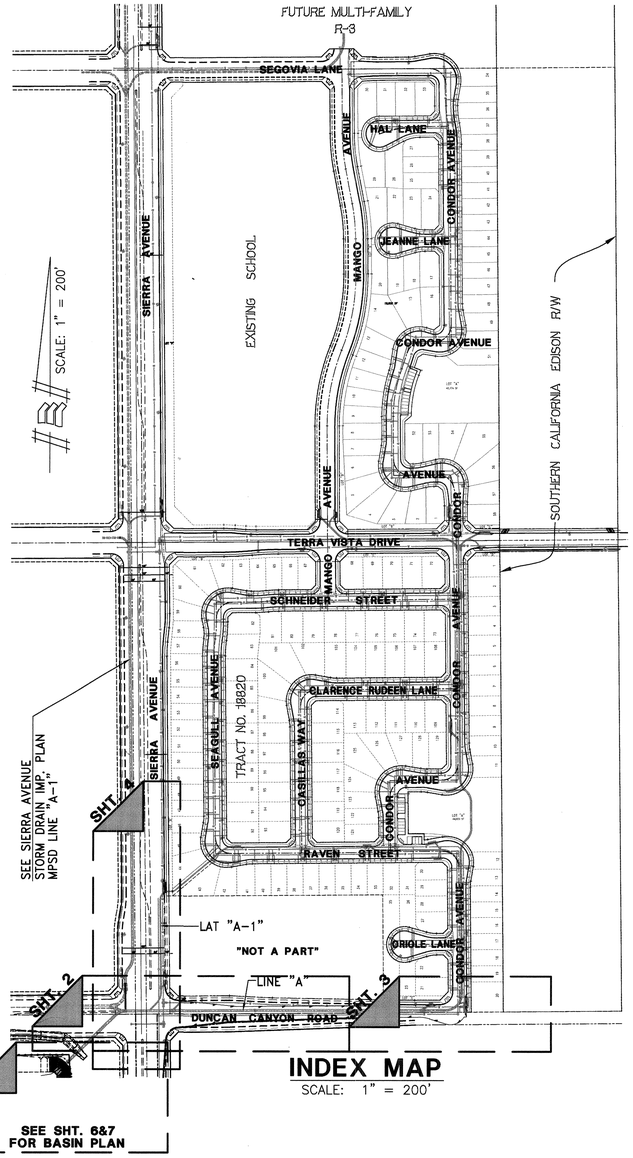
Prepared For:
LENNAR HOMES OF CALIFORNIA, INC.
980 MONTECITO DRIVE, SUITE 302
CORONA, CA 92879
(951) 817-3545

SUMMIT AT ROSENA
MASTER PLAN DRAINAGE EXHIBIT
CITY OF FONTANA

CITY OF FONTANA
OFF-SITE STORM DRAIN IMPROVEMENT PLANS
DUNCAN CANYON STORM DRAIN
TRACT NO. 18820

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THESE PLANS, THE CITY OF FONTANA STANDARD PLANS, THE CONTRACT PROVISIONS AND THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION ("GREEN BOOK") AND THE STATE OF CALIFORNIA D. O. T. STD. SPEC'S AND PLANS. ALL REFERENCE SPECIFICATIONS AND STANDARDS SHALL BE THE LATEST EDITION UNLESS OTHERWISE NOTED.
2. WHEN A TECHNICAL CONFLICT IS FOUND TO EXIST IN THE CONTRACT DOCUMENTS THAT CAN NOT BE RESOLVED BY REFERENCE TO PRECEDENCE PROVISIONS IN THE "GREEN BOOK", THE CONTRACTOR SHALL IMMEDIATELY REPORT SAID CONFLICT TO THE CITY ENGINEER FOR RESOLUTION.
3. ALL MATERIALS AND METHODS ARE SUBJECT TO THE APPROVAL OF THE CITY ENGINEER.
4. ADVANCE CONSTRUCTION SIGNING INDICATING DURATION OF PROJECT SHALL BE IN PLACE ONE WEEK PRIOR TO IMPLEMENTING DETOURS.
5. CONSTRUCTION PERMITS SHALL BE OBTAINED FROM THE CITY OF FONTANA COMMUNITY DEVELOPMENT DEPARTMENT, ENGINEERING DIVISION PRIOR TO THE START OF ANY WORK, INSPECTION COORDINATION SHALL BE REQUESTED AT LEAST TWO WORKING DAYS PRIOR TO THE START OF ANY WORK IN PUBLIC RIGHT-OF-WAY WITHIN THE CITY LIMITS. CALL (909) 350-7610.
6. THE CONTRACTOR SHALL CONFORM TO ALL TRAFFIC CONTROL POLICIES, METHODS AND PROCEDURES DESCRIBED IN THE STATE OF CALIFORNIA MANUAL OF TRAFFIC CONTROLS, LATEST NON-METRIC EDITION UNLESS OTHERWISE DIRECTED BY THE CITY TRAFFIC ENGINEER.
7. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO MAINTAIN BARRICADES, DELINEATORS OR OTHER TRAFFIC CONTROL DEVICES AT ALL TIMES.
8. THE CONTRACTOR SHALL OBTAIN A PERMIT TO PERFORM EXCAVATION OR TRENCH WORK FOR TRENCHES 5 FEET OR GREATER IN DEPTH FROM THE CALIFORNIA STATE DIVISION OF INDUSTRIAL SAFETY.
9. THE WALLS AND FACES OF ALL EXCAVATIONS GREATER THAN FIVE (5) FEET IN DEPTH SHALL BE GUARDED BY SHORING, SLOPING OF THE GROUND OR OTHER APPROVED MEANS PURSUANT TO THE REQUIREMENTS OF THE DIVISION OF INDUSTRIAL SAFETY OF THE STATE OF CALIFORNIA. TRENCHES LESS THAN FIVE (5) FEET SHALL ALSO BE GUARDED WHEN THE POTENTIAL EXISTS FOR GROUND MOVEMENT.
10. NO MATERIAL OR EQUIPMENT SHALL BE STORED IN THE PUBLIC RIGHT OF WAY WITHOUT OBTAINING A SEPARATE PERMIT FOR THAT PURPOSE.
11. THE LOCATIONS OF UTILITIES SHOWN HAVE BEEN DETERMINED FROM AVAILABLE INFORMATION, HOWEVER, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE, IN THE FIELD, THE TRUE LOCATION AND ELEVATION OF ANY EXISTING UTILITIES, AND TO EXERCISE PROPER PRECAUTION TO AVOID DAMAGE THERETO. THE CONTRACTOR SHALL CONTRACT UNDERGROUND SERVICE ALERT AT 1-800-227-2600 TWO WORKING DAYS BEFORE EXCAVATION.
12. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION WITH ALL UTILITY COMPANIES INCLUDING, BUT NOT LIMITED TO GAS, TELEPHONE, ELECTRIC, CABLE TELEVISION, LANDSCAPING, LANDSCAPE IRRIGATION, DOMESTIC WATER, RECLAIMED WATER, SEWER, STORM DRAIN, FLOOD CONTROL AND CALTRANS, ALL UTILITY COMPANIES SHALL BE GIVEN TWO WORKING DAYS NOTICE PRIOR TO WORK AROUND THEIR FACILITIES.
13. THE CONTRACTOR SHALL NOT OPERATE ANY FIRE HYDRANT OR WATER MAIN VALVES WITHOUT APPROPRIATE AGENCY AUTHORIZATION. CONTRACTOR SHALL COORDINATE WITH THE APPROPRIATE WATER COMPANY FOR VALVE OPERATION AND WATER REQUIREMENTS.
14. STATIONING REFERS TO THE CENTERLINE OF STORM DRAIN EXCEPT WHERE OTHERWISE NOTED.
15. ADEQUATE CONSTRUCTION CONTROL STAKES SHALL BE SET BY THE ENGINEER TO ENABLE THE CONTRACTOR TO CONSTRUCT THE WORK TO THE PLAN GRADES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PRESERVATION OF BENCHMARKS AND CONSTRUCTION CONTROL STAKING DURING CONSTRUCTION.
16. THE CONTRACTOR SHALL NOT DISTURB EXISTING SURVEY MONUMENTS, MONUMENT TIES OR BENCH MARKS WITHOUT PRIOR NOTIFICATION TO THE CITY ENGINEER.
17. REMOVAL AND REPLACEMENT OF EXISTING SURVEY CONTROL, INCLUDING SURVEY MONUMENTS, MONUMENT TIES AND BENCH MARKS, SHALL BE DONE BY A REGISTERED CIVIL ENGINEER OR LICENSED LAND SURVEYOR. SURVEY MONUMENTS THAT WILL BE DESTROYED AS A RESULT OF THIS CONSTRUCTION SHALL BE REPLACED. THE CONTRACTOR SHALL NOTIFY THE ENGINEER ONE WEEK PRIOR TO CONSTRUCTION SO THAT TIES TO MONUMENTS CAN BE ESTABLISHED FOR LATER REPLACEMENT OF THE MONUMENT.
18. THE CONTRACTOR SHALL MAINTAIN ACCESS FOR LOCAL RESIDENTS AND BUSINESSES AT ALL TIMES. A MINIMUM 12 FOOT LANE SHALL BE MAINTAINED AT ALL TIMES IN THE CONSTRUCTION AREA FOR RESIDENTS AND EMERGENCY VEHICLES.
19. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN AN EFFECTIVE MEANS OF DUST CONTROL, INCLUDING ADEQUATE WATERING, AT ALL TIMES.
20. THE CONTRACTOR SHALL NOT CAUSE ANY EXCAVATED MATERIAL, MUD, SILT OR DEBRIS TO BE DEPOSITED ONTO PUBLIC OR PRIVATE PROPERTY ADJACENT TO THE RIGHT OF WAY DURING CONSTRUCTION WITHOUT PRIOR WRITTEN APPROVAL.
21. NO TRENCH BACKFILL SHALL TAKE PLACE WITHOUT PRIOR APPROVAL OF THE CITY INSPECTOR.
22. A GEOTECHNICAL ENGINEER SHALL CERTIFY ALL BACKFILL COMPACTION, FAILURE TO OBTAIN THE REQUIRED DENSITY SHALL REQUIRE RE-WORKING OF THAT PORTION OF THE WORK UNTIL THE SPECIFIED DENSITY IS OBTAINED.
23. CARE SHOULD BE TAKEN TO PREVENT GRADES, DITCHES, AND SWALES FROM UNDERMINING STREET IMPROVEMENTS. UPON INSPECTION OF THE SITE, THE CITY ENGINEER MAY REQUIRE TEMPORARY NON-ERODEABLE SWALES ENTERING OR LEAVING IMPROVEMENTS.
24. ALL EXPOSED CONCRETE SURFACES SHALL CONFORM IN GRADE, COLOR AND FINISH TO MATCH EXISTING CONCRETE.
25. NO OPEN TRENCH SHALL BE ALLOWED AT THE END OF THE DAY WITHOUT PRIOR APPROVAL OF THE CITY ENGINEER.
26. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL EXPOSE EXISTING FACILITIES, AND VERIFY ELEVATION AND LOCATION OF CONNECTIONS. CITY APPROVAL OF CONNECTIONS TO EXISTING FACILITIES DOES NOT IMPLY CORRECTNESS OF ELEVATIONS OR LOCATIONS SHOWN ON THE PLANS.
27. IF EXISTING UTILITIES OR ANY OTHER FACILITIES CONFLICT WITH THE PROPOSED IMPROVEMENTS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND ALL AFFECTED AGENCIES IMMEDIATELY.
28. NO CONCRETE SHALL BE PLACED UNTIL THE FORMS AND REINFORCING STEEL HAVE BEEN PLACED, INSPECTED AND APPROVED.
29. ALL UNDERGROUND UTILITIES SHALL BE INSTALLED, TESTED AND APPROVED PRIOR TO PAVING OR STREETS.
30. APPROVED SOILS STERILANT IS REQUIRED UNDER ALL NEW ASPHALT PAVEMENT PRIOR TO PLACEMENT.
31. ALL MANHOLES, CLEANOUT FRAMES, COVERS AND VALVE BOXES SHALL BE RAISED TO FINISHED GRADE BY THE PAVING CONTRACTOR UPON COMPLETION OF PAVING.
32. UPON COMPLETION OF CONSTRUCTION, CONTRACTOR SHALL RESTORE ALL SIGNING, STRIPING, BARRICADES, AND OTHER TRAFFIC CONTROL DEVICES TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.
33. AS-BUILT DRAWINGS SHALL BE PROVIDED BY THE CONTRACTOR TO THE ENGINEER OF RECORD, WHO SHALL PROVIDE RECORD DRAWINGS TO THE CITY ENGINEER.
34. "THE CONCRETE COATING ON THE INSIDE OF ALL REINFORCED CONCRETE PIPES MUST BE INCREASED TO PROVIDE A MINIMUM OF 1-1/2" OVER THE REINFORCING WHEN THE DESIGN VELOCITIES EXCEED 20 FEET PER SECOND. THE CONCRETE DESIGN STRENGTH IN THESE REACHES SHALL BE fc=5,000 psi FOR VELOCITIES EXCEDDING 20 FEET PER SECOND AND fc=6,000 psi FOR VELOCITIES EXCEEDING 30 FEET PER SECOND."
35. MINIMUM D-LOAD FOR ALL R.C.P. IS 1350.



INDEX MAP
SCALE: 1" = 200'

SEE SHT. 6&7 FOR BASIN PLAN

PRIVATE ENGINEER'S NOTICE TO CONTRACTORS

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A SEARCH OF AVAILABLE RECORDS; TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO EXISTING UTILITIES EXCEPT THOSE SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN ON THESE DRAWINGS. THE CONTRACTOR FURTHER ASSUMES ALL LIABILITY AND RESPONSIBILITY FOR THE UTILITY PIPES, CONDUITS OR STRUCTURES SHOWN OR NOT SHOWN ON THESE DRAWINGS.

THE CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR THE JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT; INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND SHALL REPORT ALL DISCREPANCIES TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF ANY WORK. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE ENGINEER OF ANY DISCREPANCIES. BEGINNING OF WORK MEANS ACCEPTANCE OF CONDITIONS.

CONTRACTOR SHALL COMPLY WITH ALL N.P.D.E.S. REQUIREMENTS.

CONTRACTOR SHALL ADJUST TO FINISH GRADE ALL MANHOLE RIMS, WATER VALVE BOXES, UTILITY BOXES AND LIDS, ETC.

CONTRACTOR SHALL PROVIDE ALL THE NECESSARY PIPE FITTINGS TO COMPLETE THE WORK.

THE ENGINEER PREPARING THESE PLANS SHALL NOT BE HELD RESPONSIBLE OR LIABLE FOR UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THESE PLANS MUST BE REQUESTED IN WRITING AND MUST BE APPROVED BY THE ENGINEER OF RECORD.

QUANTITIES SHOWN HEREON ARE PROVIDED FOR PERMIT AND BONDING PURPOSES ONLY.
CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THEIR OWN QUANTITIES PRIOR TO BIDDING AND CONSTRUCTION. THE ENGINEER IS NOT RESPONSIBLE FOR DISCREPANCIES IN FINAL CONSTRUCTION QUANTITIES.

LEGEND

A.C.	ASPHALTIC CONCRETE	(R)	RIDGE LINE
B.C.	BEGIN CURVE	R/W	RIGHT OF WAY
B.V.C.	BEG. VERTICAL CURVE	TAN.	TANGENT
B.W.	BACK SIDEWALK	T.C.	TOP OF CURB
C.B.	CATCH BASIN	W	WIDTH
C.L.	CENTERLINE	V	VERTICAL DEPTH
E.C.	END CURVE	(590.69)	INDICATES EXISTING ELEVATION
E.P.	EDGE PAVEMENT	590.69	INDICATES PROPOSED ELEVATION
E.G.	EDGE GRADE	[590.69]	INDICATES FUTURE ELEVATION
E.V.C.	END VERTICAL CURVE		INDICATES SLOPE 2:1
F.L.	FLOW LINE		AC PAVEMENT
F.S.	FINISH SURFACE		REMOVAL
G.B.	GRADE BREAK		GRIND
H.P.	HIGH POINT	///	EDGE OF PAVEMENT
INV.	INVERT		
O.C.	ON CURVE		
P.C.C.	PORTLAND CEMENT CONCRETE		
T.FTG.	TOP OF FOOTING		
THDW	TOP OF HEADWALL		

CITY OF FONTANA UTILITY NOTIFICATION LIST

SEWER:
CITY OF FONTANA
8353 SIERRA AVENUE
FONTANA, CA 92335
PHONE: 909.350.6632

GAS:
SOUTHERN CALIFORNIA GAS COMPANY
16231 VALLEY BLVD.
FONTANA, CA 92335
PHONE: 909.428.8411

ELECTRIC:
SOUTHERN CALIFORNIA EDISON COMPANY
7951 REDWOOD AVE.
FONTANA, CA 92336
PHONE: 909.357.6221

CABLE:
TIME WARNER CABLE
1205 DUPONT AVENUE
ONTARIO, CA. 91761
PHONE: 909.390.4738

TELEPHONE:
AT&T
11464 TELEGRAPH ROAD
SANTA FE SPRINGS, CA 90670
PHONE: 714.666.5415

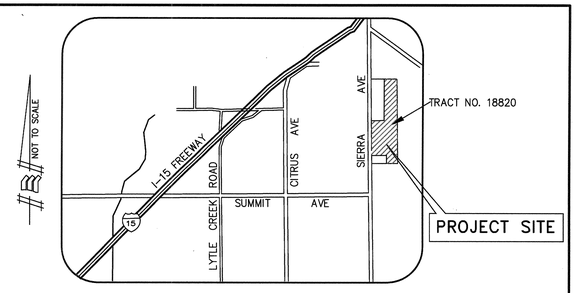
WATER:
WEST VALLEY WATER DISTRICT
855 W. BASELINE ROAD
RIALTO, CA 92377
PHONE: 909.875.1361

OWNER/DEVELOPER:

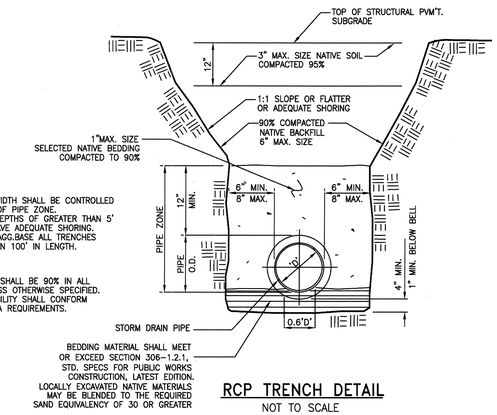
LCD SIERRA CREST, LLC
1156 N. MOUNTAIN AVE.
UPLAND, CA 91786-0670
PHONE: 909.985.0971
CONTACT: GARTH CHAMBERS

ENGINEER:

MADOLE AND ASSOCIATES, INC.
CONSULTING CIVIL ENGINEERS
& LAND PLANNERS
9302 PITTSBURGH AVE., SUITE 230
RANCHO CUCAMONGA, CA 91730
PHONE: 909.481.6322
FAX: 909.481.6320
CONTACT: MARK BERTONE



VICINITY MAP
NOT TO SCALE



NOTES:
1. TRENCH WIDTH SHALL BE CONTROLLED TO TOP OF PIPE ZONE.
2. TRENCH DEPTHS OF GREATER THAN 5' SHALL HAVE ADEQUATE SHORING.
3. CLASS II AGG.BASE ALL TRENCHES LESS THAN 100' IN LENGTH.

NOTE:
COMPACTION SHALL BE 90% IN ALL ZONES UNLESS OTHERWISE SPECIFIED. TRENCH STABILITY SHALL CONFORM TO CAL-OSHA REQUIREMENTS.

RCP TRENCH DETAIL
NOT TO SCALE

CONSTRUCTION NOTES / QUANTITIES

1	INSTALL 18" RCP STORM DRAIN (D-LOAD PER PROFILE)	57 L.F.
2	INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)	399 L.F.
3	INSTALL 24" CSP, GA. 6 STORM DRAIN	7 L.F.
4	INSTALL 54" RCP STORM DRAIN (D-LOAD PER PROFILE)	130 L.F.
5	INSTALL 60" RCP STORM DRAIN (D-LOAD PER PROFILE)	683 L.F.
6	INSTALL 66" RCP STORM DRAIN (D-LOAD PER PROFILE)	127 L.F.
7	CONSTRUCT MANHOLE PER CITY OF FONTANA STD. PLAN 3012	2 EA.
8	CONSTRUCT CURB OPENING CATCH BASIN PER CITY OF FONTANA STD. DWG. NO. 3004.	3 EA.
9	CONSTRUCT JUNCTION STRUCTURE PER CITY OF FONTANA STD. PLAN 3009	2 EA.
10	CONSTRUCT CONCRETE COLLAR PER CITY OF FONTANA STD. PLAN 3022	1 EA.
11	CONSTRUCT MANHOLE PER CITY OF FONTANA STD. PLAN 3013	1 EA.
12	CONSTRUCT JUNCTION STRUCTURE PER CITY OF FONTANA STD. PLAN 3010	1 EA.
13	CONSTRUCT HEADWALL PER CALTRAN STD. PLAN D90 WITH TYPE "A" WINGWALLS, SEE DETAIL ON SHEET 5.	1 EA.
14	PLACE & GROUT 1/4 TON ROCK RIP-RAP. (3' DEEP)	440 S.F.
15	INSTALL 6' HIGH TUBULAR STEEL FENCE PER DETAIL ON SHEET 8.	2,104 L.F.
16	CONSTRUCT INLET "TYPE V" PER DETAIL ON SHEET 3	1 EA.
17	CONSTRUCT PIPE CLOSURE - TYPE B PER SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT SEE DETAIL ON SHEET 5	2 EA.
18	CONSTRUCT MANHOLE PER CITY OF FONTANA STD. PLAN 3011	1 EA.
19	INSTALL 60" HDPE STORM DRAIN	240 LF
20	APPLY HYDROSEED SLURRY PER SPECIFICATIONS SHOWN ON SHEET 8.	407,910 S.F.
21	CONSTRUCT 5" THICK CONCRETE SPILLWAY W/ #4 RE-BAR @ 18" O.C. EACH WAY.	5,160 S.F.
22	CONSTRUCT PIPE GATE PER SBCFCD STD. SP 209, DETAIL ON SHEET 8.	1 EA.

BENCH MARK: BM #00484
1.5 MI. N ALONG SIERRA AVE. FROM HIGHLAND AVE, 63 FT. E OF 1/4 CORNER 19-20, T1N,R5W & C/L SIERRA, 34 FT. E & 55 FT. S OF PP #7070868 50-58, 3 GALV. STEEL WITNESS POSTS, 5 FT. HIGH "UNICO" SIGN 7 FT. N OF MON.
ELEVATION: 1739.006

BASIS OF BEARINGS:
THE BEARING OF N00°35'43"W ALONG THE C.L. OF SIERRA AVE., AS SHOWN ON TR. NO. 14500 M.B. 251/70-74, WAS USED AS THE BASIS OF BEARING FOR THIS MAP.

DIGALERT
DIAL BEFORE YOU DIG — TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REV.	REVISION DESCRIPTION	DATE	ENGR.	CITY	DATE

SHOULD CONSTRUCTION OF THE REQUIRED IMPROVEMENTS NOT COMMENCE WITHIN TWO YEARS OF THE DATE OF APPROVAL SHOWN HEREON AND CARRIED FORTH IN A DILIGENT MANNER, THE CITY ENGINEER MAY REQUIRE REVISIONS TO THE PLANS TO BRING THEM INTO CONFORMANCE WITH CONDITIONS AND STANDARDS IN EFFECT.

REGISTERED PROFESSIONAL ENGINEER WENDELL L. IWATSURU No. 36637 Exp: 06-30-14 CIVIL STATE OF CALIFORNIA

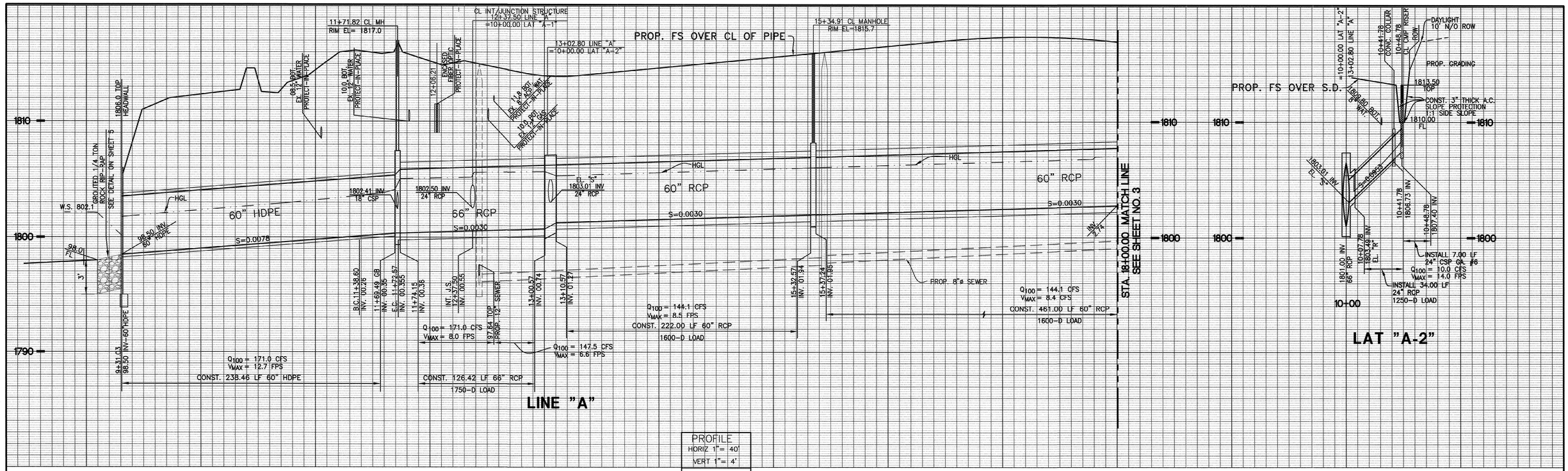
PREPARED UNDER THE SUPERVISION OF:
MADOLE & ASSOCIATES, INC. Engineering Communities for Life
9302 PITTSBURGH AVE, SUITE 230 RANCHO CUCAMONGA, CA. 91730 PHONE: 909.481.6322 FAX: 909.481.6320
WENDELL L IWATSURU RCE 36637 DATE 6/6/12 EXP. 6-30-14

CITY OF FONTANA, CALIFORNIA
OFF-SITE STORM DRAIN IMPROVEMENT PLANS
TITLE SHEET
DUNCAN CANYON STORM DRAIN
TRACT NO. 18820

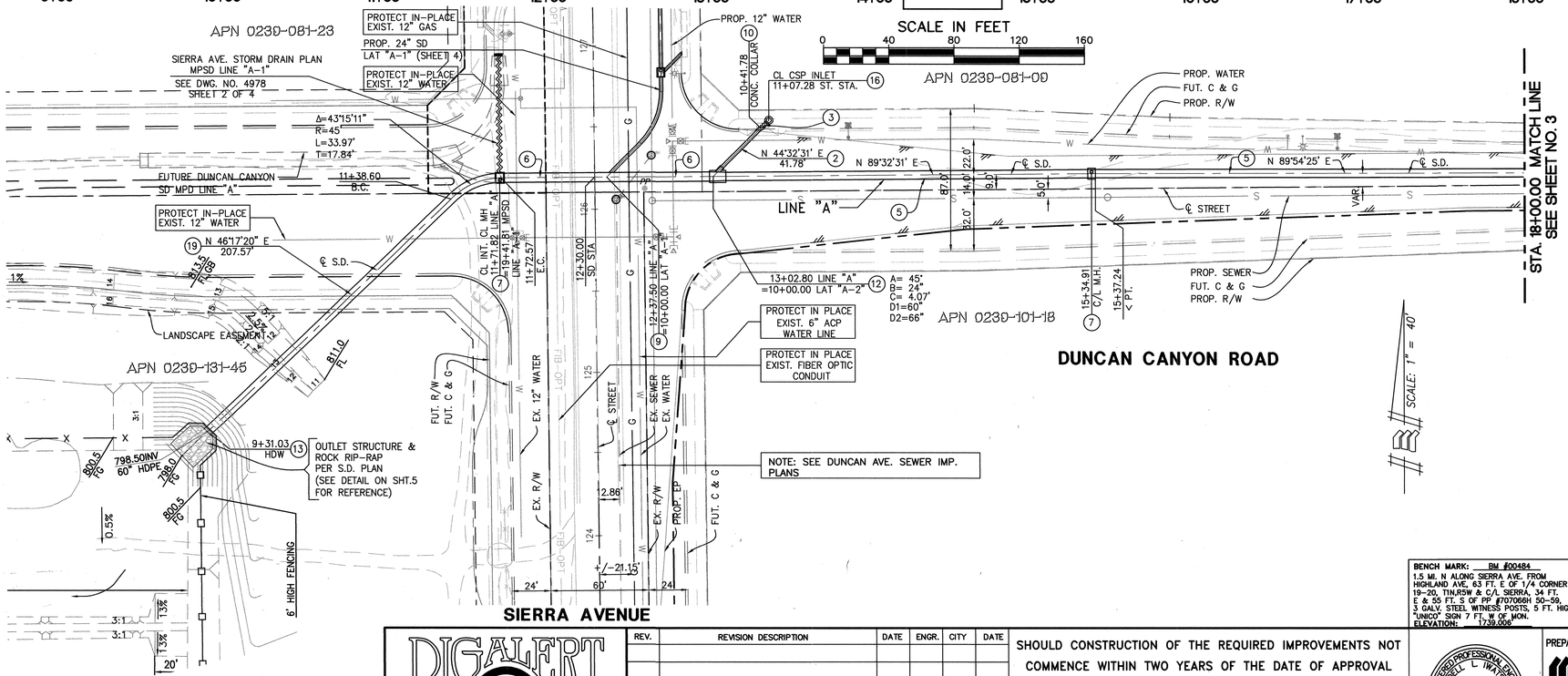
DRAWN BY:	LLP
DESIGNED BY:	WLI
CHECKED BY:	WLI
SCALE:	AS SHOWN
DATE:	NOV. 2012
DRAWING NO.	4977
SHEET	1/8

APPROVED BY: 2-19-13
CITY ENGINEER R.C.E. 51152 DATE

126-2404 OFFSITE S.D. IMP. PLANS TR.18820



PROFILE
HORIZ 1"= 40'
VERT 1"= 4'
PLAN 1"= 40'



CONSTRUCTION NOTES

1. INSTALL 18" RCP STORM DRAIN (D-LOAD PER PROFILE)
2. INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)
3. INSTALL 24" CSP, GA. 6 STORM DRAIN
4. INSTALL 54" RCP STORM DRAIN (D-LOAD PER PROFILE)
5. INSTALL 60" RCP STORM DRAIN (D-LOAD PER PROFILE)
6. INSTALL 66" RCP STORM DRAIN (D-LOAD PER PROFILE)
7. CONSTRUCT MANHOLE PER CITY OF FONTANA STD. PLAN 3012
8. CONSTRUCT CURB OPENING CATCH BASIN PER CITY OF FONTANA STD. DWG. NO. 3004.
9. CONSTRUCT JUNCTION STRUCTURE PER CITY OF FONTANA STD. PLAN 3009
10. CONSTRUCT CONCRETE COLLAR PER CITY OF FONTANA STD. PLAN 3022
11. CONSTRUCT MANHOLE PER CITY OF FONTANA STD. PLAN 3013
12. CONSTRUCT JUNCTION STRUCTURE PER CITY OF FONTANA STD. PLAN 3010
13. CONSTRUCT HEADWALL PER CALTRAN STD. PLAN D90 WITH TYPE "A" WINGWALLS, SEE DETAIL ON SHEET 5.
14. PLACE & GROUT 1/4 TON ROCK RIP-RAP. (3' DEEP)
15. INSTALL 6' HIGH TUBULAR STEEL FENCE PER DETAIL ON SHEET 8.
16. CONSTRUCT INLET "TYPE V" PER DETAIL ON SHEET 3
17. CONSTRUCT PIPE CLOSURE – TYPE B PER SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT SEE DETAIL ON SHEET 5
18. CONSTRUCT MANHOLE PER CITY OF FONTANA STD. PLAN 3011
19. INSTALL 60" HDPE STORM DRAIN

BENCH MARK: BM #00484
1.5 MI. N ALONG SIERRA AVE. FROM HIGHLAND AVE., 63 FT. E OF 1/4 CORNER 19-20, T1N,R5W & C/L SIERRA, 34 FT. S & 55 FT. S OF PP #7D7068H 50-59, 3 GALV. STEEL WITNESS POSTS, 5 FT. HIGH "UNICO" SIGN 7 FT. W OF MON.
ELEVATION: 1739.006

BASIS OF BEARINGS:
THE BEARING OF N00°35'43"W ALONG THE C.L. OF SIERRA AVE., AS SHOWN ON TR. NO. 14500 M.B. 251/70-74, WAS USED AS THE BASIS OF BEARING FOR THIS MAP.

DIGALERT
DIAL BEFORE YOU DIG
TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REV.	REVISION DESCRIPTION	DATE	ENGR.	CITY	DATE

SHOULD CONSTRUCTION OF THE REQUIRED IMPROVEMENTS NOT COMMENCE WITHIN TWO YEARS OF THE DATE OF APPROVAL SHOWN HEREON AND CARRIED FORTH IN A DILIGENT MANNER, THE CITY ENGINEER MAY REQUIRE REVISIONS TO THE PLANS TO BRING THEM INTO CONFORMANCE WITH CONDITIONS AND STANDARDS IN EFFECT.

REGISTERED PROFESSIONAL ENGINEER WENDELL L. WATSON No. 36637 Exp: 06-30-14 CIVIL STATE OF CALIFORNIA

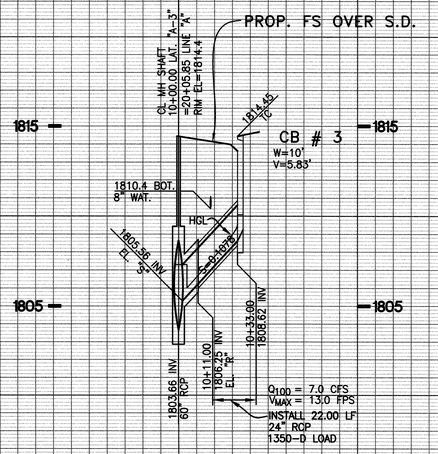
PREPARED UNDER THE SUPERVISION OF:
WENDELL L. WATSON RCE 36637 DATE: 1/29/14 EXP. 6-30-14

MADOLE & ASSOCIATES, INC. Engineering Communities for Life
9202 PITTSBURGH AVE, SUITE 200 RANCHO CUCAMONGA, CA. 91730
PHONE: 909-481-5320 FAX: 909-481-5320

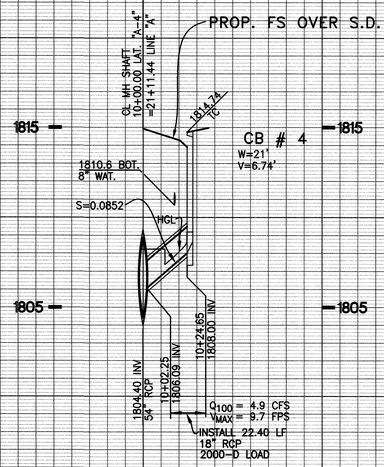
CITY OF FONTANA, CALIFORNIA
OFF-SITE STORM DRAIN IMPROVEMENT PLANS
DUNCAN CANYON STORM DRAIN PLAN TRACT NO. 18820

DRAWN BY: LLP/AJ		SCALE: AS SHOWN	
DESIGNED BY: WLI		DATE: NOV. 2012	
CHECKED BY: WLI	APPROVED BY: CITY ENGINEER R.C.E. 51152 DATE 2-13-13	DRAWING NO. 4977	2/8

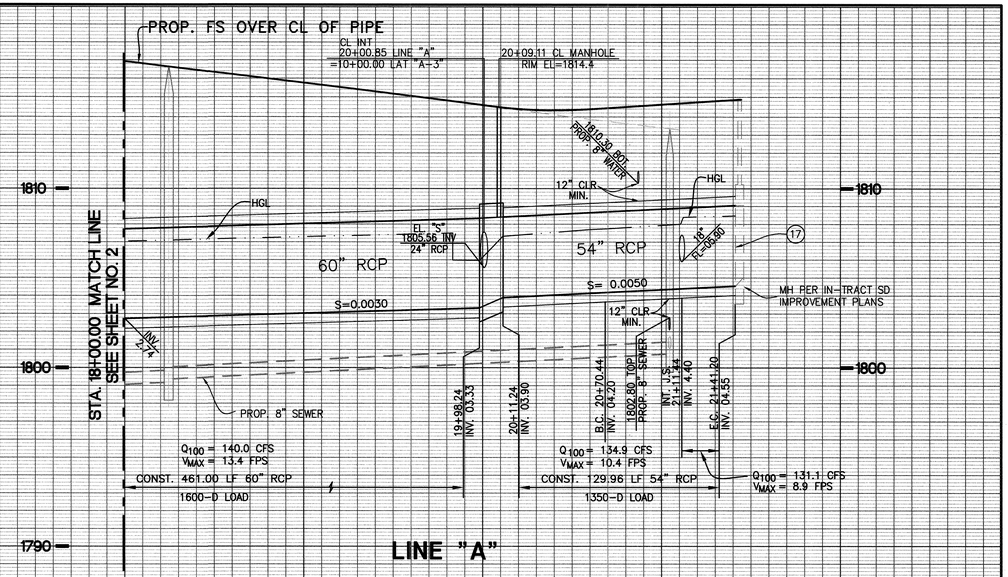
126-2404 OFFSITE S.D. IMP. PLANS TR.18820



LAT "A-3"



LAT "A-4"



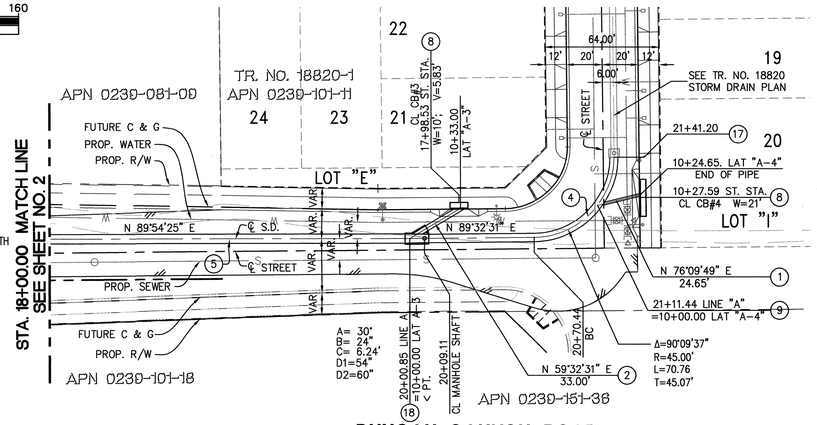
LINE "A"

PROFILE
HORIZ 1"= 40'
VERT 1"= 4'
PLAN 1"= 40'

10+00 | 10+00 | 18+00 | 19+00 | 20+00 | 21+00

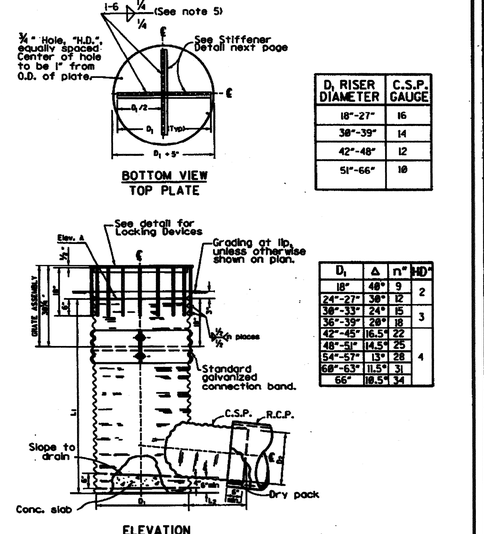
SCALE IN FEET
0 40 80 120 160

CONDOR AVENUE



DUNCAN CANYON ROAD

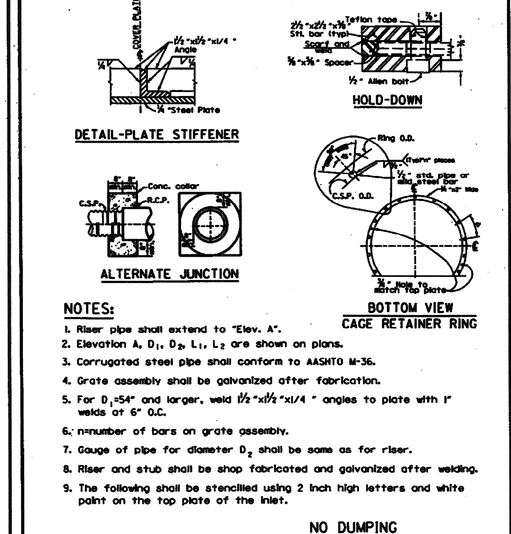
SCALE: 1" = 40'



D_1 RISER DIAMETER	C.S.P. GAUGE
18"-27"	16
30"-39"	14
42"-48"	12
51"-66"	10

D_1	Δ	n*	HD*
18"	40°	9	2
24"-27"	30°	12	
30"-33"	24°	15	3
36"-39"	20°	18	
42"-45"	16.5°	22	
48"-51"	14.5°	25	4
54"-57"	13°	28	
60"-63"	11.5°	31	
66"	10.5°	34	

ORANGE COUNTY RESOURCES & DEVELOPMENT MANAGEMENT DEPARTMENT	STD. PLAN
Approved R. L. Mikesell, Chief Engineer Adopted: Res. 77-92 Revised: Res. 96-546; 05-268	1305
INLET TYPE V	SHT. 1 OF 2

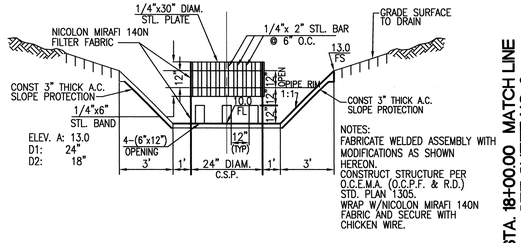


NOTES:

1. Riser pipe shall extend to "Elev. A".
2. Elevation A, D_1, D_2, L_1, L_2 are shown on plans.
3. Corrugated steel pipe shall conform to AASHTO M-36.
4. Grate assembly shall be galvanized after fabrication.
5. For D_1=54" and larger, weld 1½"-x1½"-x1/4" angles to plate with 1" welds at 6" O.C.
6. n=number of bars on grate assembly.
7. Gauge of pipe for diameter D_2 shall be same as for riser.
8. Riser and stub shall be shop fabricated and galvanized after welding.
9. The following shall be stenciled using 2 inch high letters and white paint on the top plate of the inlet.

NO DUMPING
DRAINS TO OCEAN

ORANGE COUNTY RESOURCES & DEVELOPMENT MANAGEMENT DEPARTMENT	STD. PLAN
Approved R. L. Mikesell, Chief Engineer Adopted: Res. 77-92 Revised: Res. 96-546; 05-268	1305
INLET TYPE V	SHT. 2 OF 2



NOTES:
FABRICATE WELDED ASSEMBLY WITH MODIFICATIONS AS SHOWN HEREON.
CONSTRUCT STRUCTURE PER O.C.E.M.A. (O.C.P.F. & R.D.) STD. PLAN 1305.
WRAP W/NICOLON MIRAFI 140N FABRIC AND SECURE WITH CHICKEN WIRE.

(16) MODIFIED "TYPE V" INLET
SCALE: NTS

CONSTRUCTION NOTES

1. INSTALL 18" RCP STORM DRAIN (D-LOAD PER PROFILE)
2. INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)
3. INSTALL 24" CSP, GA. 6 STORM DRAIN
4. INSTALL 54" RCP STORM DRAIN (D-LOAD PER PROFILE)
5. INSTALL 60" RCP STORM DRAIN (D-LOAD PER PROFILE)
6. INSTALL 66" RCP STORM DRAIN (D-LOAD PER PROFILE)
7. CONSTRUCT MANHOLE PER CITY OF FONTANA STD. PLAN 3012
8. CONSTRUCT CURB OPENING CATCH BASIN PER CITY OF FONTANA STD. DWG. NO. 3004.
9. CONSTRUCT JUNCTION STRUCTURE PER CITY OF FONTANA STD. PLAN 3009
10. CONSTRUCT CONCRETE COLLAR PER CITY OF FONTANA STD. PLAN 3022
11. CONSTRUCT MANHOLE PER CITY OF FONTANA STD. PLAN 3013
12. CONSTRUCT JUNCTION STRUCTURE PER CITY OF FONTANA STD. PLAN 3010
13. CONSTRUCT HEADWALL PER CALTRAN STD. PLAN D90 WITH TYPE "A" WINGWALLS, SEE DETAIL ON SHEET 5.
14. PLACE & GROUT 1/4 TON ROCK RIP-RAP (3' DEEP)
15. INSTALL 6' HIGH TUBULAR STEEL FENCE PER DETAIL ON SHEET 8.
16. CONSTRUCT INLET "TYPE V" PER DETAIL ON SHEET 3
17. CONSTRUCT PIPE CLOSURE – TYPE B PER SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT SEE DETAIL ON SHEET 5
18. CONSTRUCT MANHOLE PER CITY OF FONTANA STD. PLAN 3011
19. INSTALL 60" HDPE STORM DRAIN

BENCH MARK: BM #00484	BASIS OF BEARINGS:
1.5 MI. N ALONG SIERRA AVE. FROM HIGHLAND AVE, 63 FT. E OF 1/4 CORNER 19-20, T1N,R5W & C/L SIERRA, 34 FT. E & 55 FT. S OF PP #7070661H 50-59, 3 GALV. STEEL WITNESS POSTS, 5 FT. HIGH "UNICOT" SIGN 7 FT. W OF MON. ELEVATION: 1739.006	THE BEARING OF N00°35'43"W ALONG THE C.L. OF SIERRA AVE., AS SHOWN ON TR. NO. 14500 M.B. 251/70-74, WAS USED AS THE BASIS OF BEARING FOR THIS MAP.

(16)
NTS

DIGALERT
DIAL BEFORE YOU DIG
TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REV.	REVISION DESCRIPTION	DATE	ENGR.	CITY	DATE

SHOULD CONSTRUCTION OF THE REQUIRED IMPROVEMENTS NOT COMMENCE WITHIN TWO YEARS OF THE DATE OF APPROVAL SHOWN HEREON AND CARRIED FORTH IN A DILIGENT MANNER, THE CITY ENGINEER MAY REQUIRE REVISIONS TO THE PLANS TO BRING THEM INTO CONFORMANCE WITH CONDITIONS AND STANDARDS IN EFFECT.

REGISTERED PROFESSIONAL ENGINEER WENDELL L IWATSURU No. 36637 Exp: 06-30-14 CIVIL STATE OF CALIFORNIA

PREPARED UNDER THE SUPERVISION OF:
MADOLE & ASSOCIATES, INC. Engineering Communities for Life
9302 PITTSBURGH AVE. SUITE 220 RANCHO CUCAMONGA, CA. 91730 PHONE: 909.481.5920 FAX: 909.481.5930
WENDELL L IWATSURU RCE 36637 DATE 11/29/12 EXP. 6-30-14

CITY OF FONTANA, CALIFORNIA
OFF-SITE STORM DRAIN IMPROVEMENT PLANS

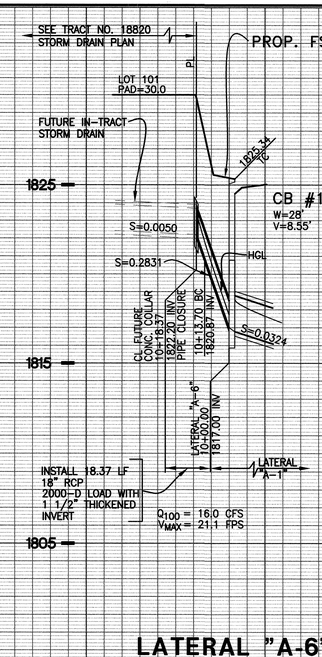
DRAWN BY: LLP/AJ	DESIGNED BY: WLI	CHECKED BY: WLI

DUNCAN CANYON STORM DRAIN PLAN
TRACT NO. 18820

APPROVED BY: CITY ENGINEER R.C.E. 51152 DATE 2.13.13

SCALE: AS SHOWN	DATE: NOV. 2012	DRAWING NO. 4977	3/8

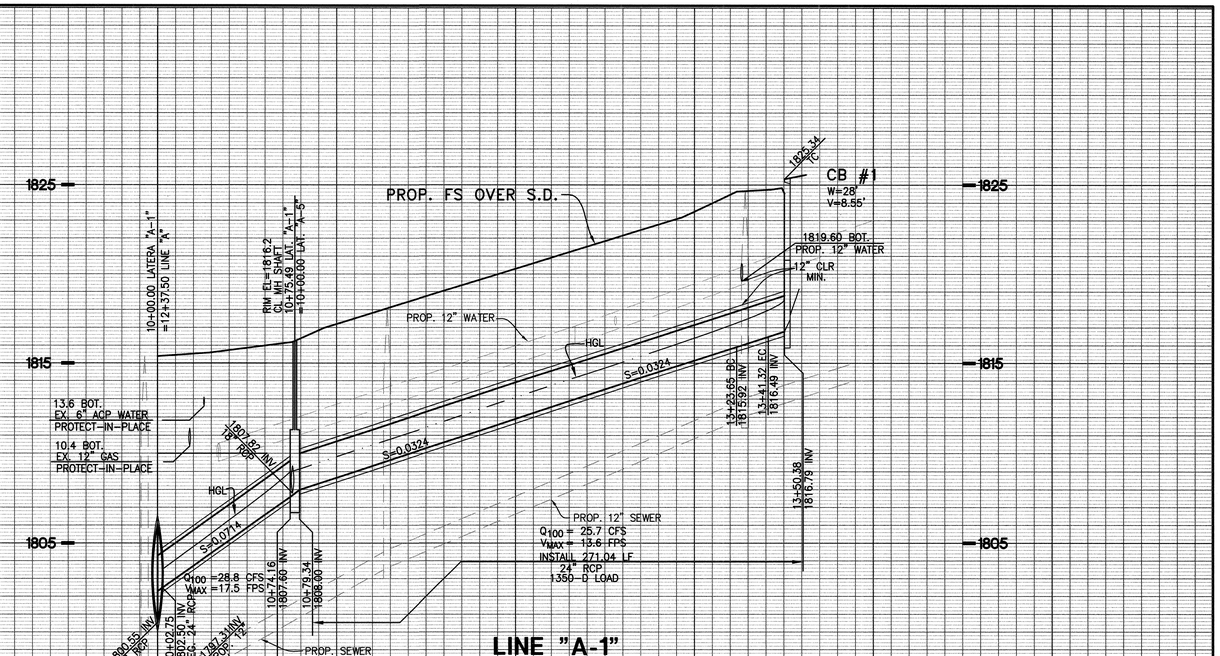
126-2404 S.D. IMP. PLANS TR.18820



LINE "A-5"

LATERAL "A-6"

PROFILE
HORIZ 1"= 40'
VERT 1"= 4'
PLAN 1"= 40'

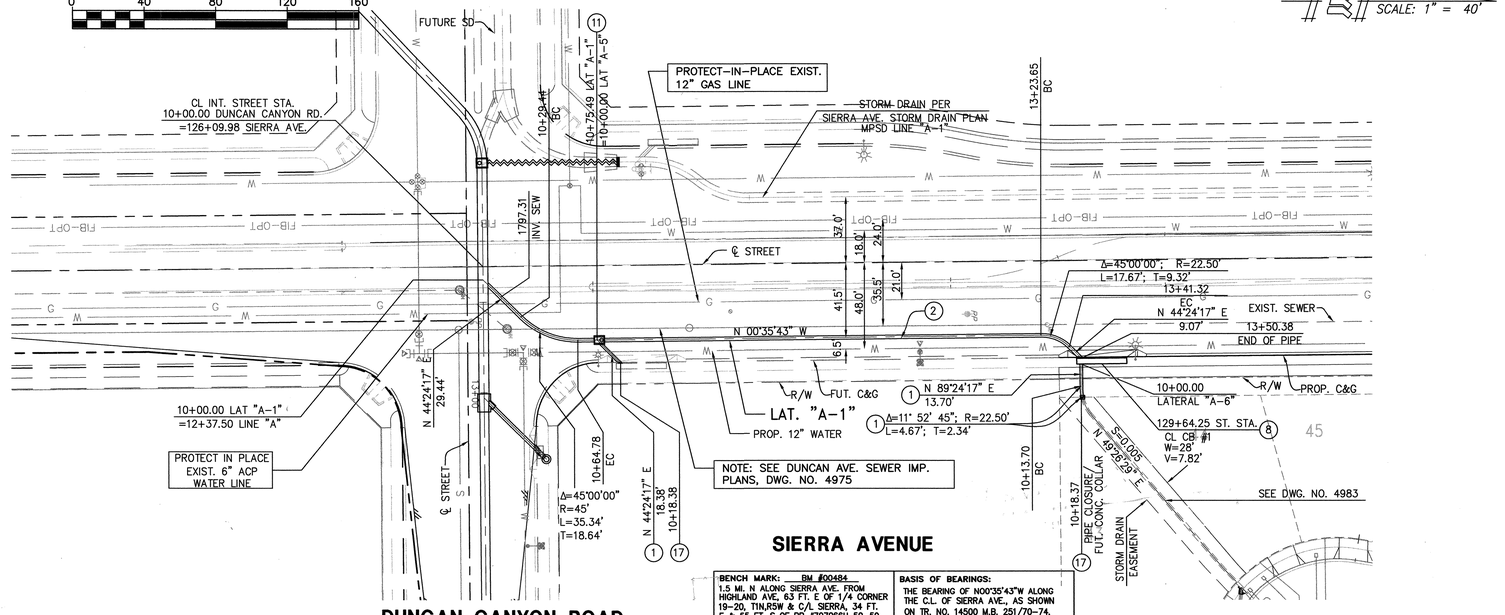


LINE "A-1"

SCALE IN FEET

0 40 80 120 160

SCALE: 1" = 40'



SIERRA AVENUE

PROTECT IN PLACE EXIST. 6" ACP WATER LINE

DUNCAN CANYON ROAD
SEE SHEET NO. 2

BENCH MARK: BM #000484
1.5 MI. N ALONG SIERRA AVE. FROM HIGHLAND AVE, 63 FT. E OF 1/4 CORNER 19-20, T1N,R5W & C/L SIERRA, 34 FT. E & 55 FT. S OF PP #7070684 50-59, 3 GALV. STEEL WITNESS POSTS, 5 FT. HIGH "UNICO" SIGN 7 FT. W OF MON.
ELEVATION: 1739.005'

BASIS OF BEARINGS:
THE BEARING OF N00°35'43"W ALONG THE C.L. OF SIERRA AVE., AS SHOWN ON TR. NO. 14500 M.B. 251/70-74, WAS USED AS THE BASIS OF BEARING FOR THIS MAP.

CONSTRUCTION NOTES

1. INSTALL 18" RCP STORM DRAIN (D-LOAD PER PROFILE)
2. INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)
3. INSTALL 24" CSP, GA. 6 STORM DRAIN
4. INSTALL 54" RCP STORM DRAIN (D-LOAD PER PROFILE)
5. INSTALL 60" RCP STORM DRAIN (D-LOAD PER PROFILE)
6. INSTALL 66" RCP STORM DRAIN (D-LOAD PER PROFILE)
7. CONSTRUCT MANHOLE PER CITY OF FONTANA STD. PLAN 3012
8. CONSTRUCT CURB OPENING CATCH BASIN PER CITY OF FONTANA STD. DWG. NO. 3004.
9. CONSTRUCT JUNCTION STRUCTURE PER CITY OF FONTANA STD. PLAN 3009
10. CONSTRUCT CONCRETE COLLAR PER CITY OF FONTANA STD. PLAN 3022
11. CONSTRUCT MANHOLE PER CITY OF FONTANA STD. PLAN 3013
12. CONSTRUCT JUNCTION STRUCTURE PER CITY OF FONTANA STD. PLAN 3010
13. CONSTRUCT HEADWALL PER CALTRAN STD. PLAN D90 WITH TYPE "A" WINGWALLS, SEE DETAIL ON SHEET 5.
14. PLACE & GROUT 1/4 TON ROCK RIP-RAP. (3' DEEP)
15. INSTALL 6' HIGH TUBULAR STEEL FENCE PER DETAIL ON SHEET 8.
16. CONSTRUCT INLET "TYPE V" PER DETAIL ON SHEET 3
17. CONSTRUCT PIPE CLOSURE - TYPE B PER SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT SEE DETAIL ON SHEET 5
18. CONSTRUCT MANHOLE PER CITY OF FONTANA STD. PLAN 3011
19. INSTALL 60" HDPE STORM DRAIN

DIGALERT
DIAL BEFORE YOU DIG
TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REV.	REVISION DESCRIPTION	DATE	ENGR.	CITY	DATE

SHOULD CONSTRUCTION OF THE REQUIRED IMPROVEMENTS NOT COMMENCE WITHIN TWO YEARS OF THE DATE OF APPROVAL SHOWN HEREON AND CARRIED FORTH IN A DILIGENT MANNER, THE CITY ENGINEER MAY REQUIRE REVISIONS TO THE PLANS TO BRING THEM INTO CONFORMANCE WITH CONDITIONS AND STANDARDS IN EFFECT.

REGISTERED PROFESSIONAL ENGINEER WENDELL L. IWATSURU No. 36637 Exp: 06-30-14 CIVIL STATE OF CALIFORNIA

PREPARED UNDER THE SUPERVISION OF:

MADOLE & ASSOCIATES, INC
Engineering Communities for Life
9302 PITTSBURGH AVE, SUITE 200
RANCHO CUCAMONGA, CA. 91730
PHONE: 909.481.5322
FAX: 909.481.5320

WENDELL L. IWATSURU RCE 36637 DATE 11/29/12 EXP. 6-30-14

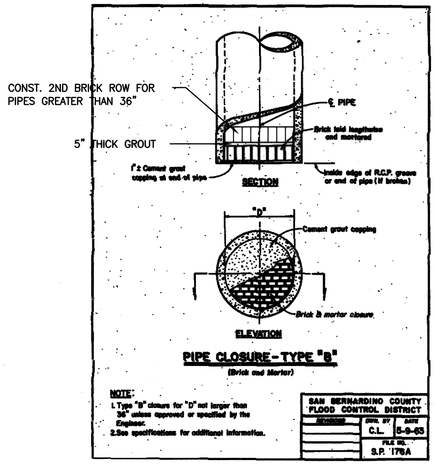
CITY OF FONTANA, CALIFORNIA

OFF-SITE STORM DRAIN IMPROVEMENT PLANS

DUNCAN CANYON STORM DRAIN PLAN
TRACT NO. 18820

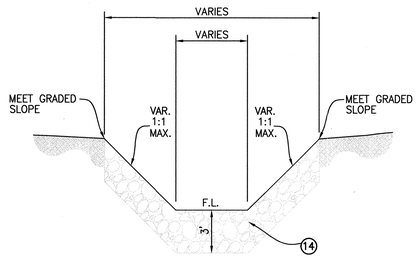
DRAWN BY:	LLP/AJ
DESIGNED BY:	WLI
CHECKED BY:	WLI
APPROVED BY:	CITY ENGINEER R.C.E. 51152 DATE 2-13-13
SCALE:	AS SHOWN
DATE:	NOV. 2012
DRAWING NO.	4977
SHEET	4 / 8

126-2404 OFFSITE S.D. IMP. PLANS TR.18820

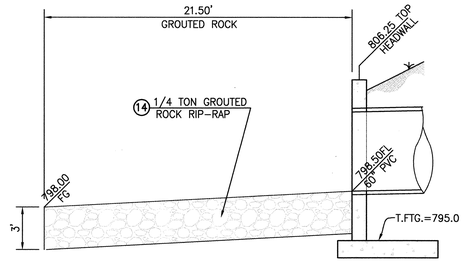


17 PIPE CLOSURE TYPE "B"
NTS

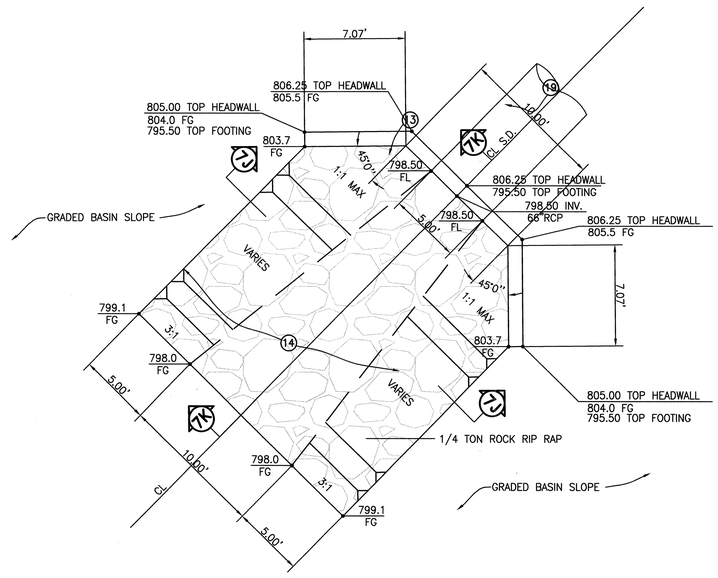
NOTE: MODIFY CLOSURE AS NOTED ABOVE



SECTION 7J
SCALE: 1" = 5'

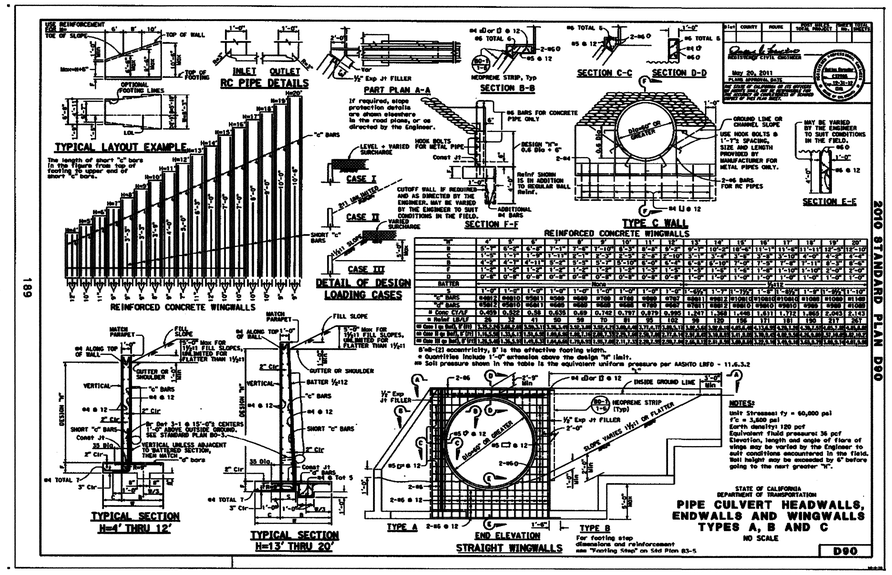


SECTION 7K
SCALE: 1" = 5'



STORM DRAIN OUTLET DETAIL
SCALE: 1" = 5'

SCALE: 1" = 5'



13 USE DATA FOR H= 6', 9', 10', 12' TO 15'
NTS

NOTES:

OPEN ROCK PLACEMENT (REFER TO CALTRANS STD. SPEC. SECT. 72)
EXCAVATE THE FOOTING TRENCH ALONG THE TOE OF THE SLOPE.

SURFACE IRREGULARITIES OF THE ROCK SLOPE PROTECTION MUST NOT VARY FROM THE PLANNED SLOPE BY MORE THAN 1–FOOT.

AT THE COMPLETION OF THE SLOPE PROTECTION WORK, FILL THE VOIDS IN THE FOOTING TRENCH WITH EXCAVATED MATERIAL.

METHOD B PLACEMENT:
ROCKS SHALL BE PLACED AS TO PROVIDE A MINIMUM OF VOIDS WITH THE LARGER ROCKS IN THE TOE COURSE AND ON THE OUTSIDE SURFACE OF THE SLOPE PROTECTION.

GROUTED ROCK PLACEMENT (REFER TO CALTRANS STD. SPEC. SECT. 72)
EXCAVATION AND THE PLACEMENT OF THE ROCK SHALL COMPLY WITH THE ABOVE AS STATED FOR THE OPEN ROCK PLACEMENT.

THE SURFACE OF THE ROCKS SHALL BE CLEAN AND MOISTENED.

IMMEDIATELY AFTER DEPOSITING, SPADE AND ROD THE GROUT INTO PLACE.

THE OUTER ROCKS MUST BE EXPOSED AND PROJECT ABOVE THE GROUT 1/3 OF THE ROCK DIAMETER.

CONSTRUCTION NOTES

13 CONSTRUCT HEADWALL PER CALTRAN STD. PLAN D90 WITH TYPE "A" WINGWALLS, (SEE DETAIL HEREON).

14 PLACE & GROUT 1/4 TON ROCK RIPRAP.

17 CONSTRUCT PIPE CLOSURE – TYPE B PER SAN BERNARDINO COUNTY FLOOD DISTRICT SEE DETAIL ON SHEET HEREON

19 INSTALL 60" HDPE STORM DRAIN

BENCH MARK: BM #00484
1.5 MI. N ALONG SIERRA AVE. FROM HIGHLAND AVE, 63 FT. E OF 1/4 CORNER 19–20, T1N,R5W & C/L SIERRA, 34 FT. E & 55 FT. S OF PP #707066H 50–59, 3 GALV. STEEL WITNESS POSTS, 5 FT. HIGH "UNICO" SIGN 7 FT. W OF MON.
ELEVATION: 1739.006'

BASIS OF BEARINGS:
THE BEARING OF N00°35'43"W ALONG THE C.L. OF SIERRA AVE., AS SHOWN ON TR. NO. 14500 M.B. 251/70–74, WAS USED AS THE BASIS OF BEARING FOR THIS MAP.

DIGALERT
DIAL BEFORE YOU DIG
TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1–800–227–2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REV.	REVISION DESCRIPTION	DATE	ENGR.	CITY	DATE

SHOULD CONSTRUCTION OF THE REQUIRED IMPROVEMENTS NOT COMMENCE WITHIN TWO YEARS OF THE DATE OF APPROVAL SHOWN HEREON AND CARRIED FORTH IN A DILIGENT MANNER, THE CITY ENGINEER MAY REQUIRE REVISIONS TO THE PLANS TO BRING THEM INTO CONFORMANCE WITH CONDITIONS AND STANDARDS IN EFFECT.

REGISTERED PROFESSIONAL ENGINEER WENDELL L IWATSURU No. 36637 Exp: 06-30-14 CIVIL STATE OF CALIFORNIA

PREPARED UNDER THE SUPERVISION OF:
MADOLE & ASSOCIATES, INC.
Engineering Communities for Life
9302 PITTSBURGH AVE, SUITE 230
RANCHO CUCAMONGA, CA. 91730
PHONE: 909-481-5322
FAX: 909-481-5320
WENDELL L IWATSURU RCE 36637 DATE 11/19/12 EXP. 6-30-14

CITY OF FONTANA, CALIFORNIA
OFF-SITE STORM DRAIN IMPROVEMENT PLANS
DUNCAN CANYON STORM DRAIN PLAN
TRACT NO. 18820

DRAWN BY: LLP
DESIGNED BY: WLI
CHECKED BY: WLI
SCALE: AS SHOWN
DATE: NOV. 2012
APPROVED BY: CITY ENGINEER R.C.E. 51152 DATE 2.13.13
DRAWING NO. 4977
5/8

125–2404 S.D. IMP. PLANS TR.18820

(FUTURE)
DUNCAN CANYON ROAD

RETENTION/INFILTRATION BASIN

STOCKPILE
(SEE SHT.7)

FUTURE STREET

SIERRA AVENUE

PROTECT IN-PLACE EXIST. 12" WATER

PROP. 60" HDPE S.D. SEE S.D. PLAN SHT. 2

EXIST. WATERLINE

EXIST. E.P.

EXIST. WATER

EXIST. FIBER OPTIC

6' HIGH FENCING

D/L

TOE OF SLOPE: 1798.0

TOE OF SLOPE: 1797.0

TOP OF BERM: 1804

TOE OF SLOPE: 1796.5

TOP OF BERM: 1804

798.5 TOP BERM

799.0 TOP SPILLWAY

30' SPILLWAY

GRADED BERM

798.5 OINV 60" HDPE

OUTLET STRUCTURE & ROCK RIP-RAP PER S.D. PLAN (SEE DETAIL ON SHT.5 FOR REFERENCE)

16' WIDE ACCESS ROAD DECOMPOSED GRANITE COMPACTED TO 95%

GATE

FUTURE IMPROVEMENTS

EXIST. EP

CL SIERRA AVENUE

EXIST. R/W

SEE SHT. 7

635'

280'

200'

300'

160'

20'

30'

16'

3:1

5:1

2:1

0.5%

1%

3.9%

8%

7%

17%

10%

OPEN ROCK PLACEMENT (REFER TO CALTRANS STD. SPEC. SECT. 72)
EXCAVATE THE FOOTING TRENCH ALONG THE TOE OF THE SLOPE.

SURFACE IRREGULARITIES OF THE ROCK SLOPE PROTECTION MUST NOT VARY FROM THE PLANNED SLOPE BY MORE THAN 1-FOOT.

AT THE COMPLETION OF THE SLOPE PROTECTION WORK, FILL THE VOIDS IN THE FOOTING TRENCH WITH EXCAVATED MATERIAL.

METHOD B PLACEMENT:
ROCKS SHALL BE PLACED AS TO PROVIDE A MINIMUM OF VOIDS WITH THE LARGER ROCKS IN THE TOE COURSE AND ON THE OUTSIDE SURFACE OF THE SLOPE PROTECTION.

GROUTED ROCK PLACEMENT (REFER TO CALTRANS STD. SPEC. SECT. 72)
EXCAVATION AND THE PLACEMENT OF THE ROCK SHALL COMPLY WITH THE ABOVE AS STATED FOR THE OPEN ROCK PLACEMENT.

THE SURFACE OF THE ROCKS SHALL BE CLEAN AND MOISTENED.

IMMEDIATELY AFTER DEPOSITING, SPADE AND ROD THE GROUT INTO PLACE.

THE OUTER ROCKS MUST BE EXPOSED AND PROJECT ABOVE THE GROUT 1/3 OF THE ROCK DIAMETER.

BASIN GRADING CONSTRUCTION NOTES
ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE RECOMMENDATIONSOF THE GEOTECHNICAL ENGINEER.

THE SUBGRADE/AREA FOR THE FOUNDATION OF THE BERMS SHALL BE REMOVED, REPLACED, AND RECOMPACTED PRIOR TO THE CONSTRUCTION OF THE BERMS IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEER.

THE BOTTOM OF THE BASIN SHALL BE SCARIFIED SUBSEQUENT TO THE GRADING TO THE DEPTH RECOMMENDED BY THE GEOTECHNICAL ENGINEER TO RE-ESTABLISH SOIL POROSITY.

CONSTRUCTION NOTES

(13) CONSTRUCT HEADWALL PER CALTRAN STD. PLAN D90 WITH TYPE "A" WINGWALLS, (SEE DETAIL HEREON).
(14) PLACE & GROUT 1/4 TON ROCK RIPRAP.
(15) INSTALL 6' HIGH TUBULAR STEEL FENCE PER DETAIL ON SHEET 8.
(19) INSTALL 60" HDPE STORM DRAIN
(20) APPLY HYDROSEED SLURRY PER SPECIFICATIONS SHOWN ON SHEET 8.
(21) CONSTRUCT 5" THICK CONCRETE SPILLWAY W/ #4 RE-BAR @ 18" O.C. EACH WAY.
(22) CONSTRUCT PIPE GATE PER SBCFCD STD. SP 209, DETAIL ON SHEET 8.

SCALE: 1" = 40'

SCALE IN FEET
0 40 80 120 160

BENCH MARK: BM #00484
1.5 MI. N ALONG SIERRA AVE. FROM HIGHLAND AVE, 63 FT. E OF 1/4 CORNER 19-20, T1N,R5W & C/L SIERRA, 34 FT. E & 55 FT. S OF PP #707066H 50-59, 3 GALV. STEEL WITNESS POSTS, 5 FT. HIGH "UNICO" SIGN 7 FT. W OF MON.
ELEVATION: 1739.006

BASIS OF BEARINGS:
THE BEARING OF N00°35'43"W ALONG THE C.L. OF SIERRA AVE., AS SHOWN ON TR. NO. 14500 M.B. 251/70-74, WAS USED AS THE BASIS OF BEARING FOR THIS MAP.

DIGALERT
DIAL BEFORE YOU DIG — TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REV.	REVISION DESCRIPTION	DATE	ENGR.	CITY	DATE

SHOULD CONSTRUCTION OF THE REQUIRED IMPROVEMENTS NOT COMMENCE WITHIN TWO YEARS OF THE DATE OF APPROVAL SHOWN HEREON AND CARRIED FORTH IN A DILIGENT MANNER, THE CITY ENGINEER MAY REQUIRE REVISIONS TO THE PLANS TO BRING THEM INTO CONFORMANCE WITH CONDITIONS AND STANDARDS IN EFFECT.

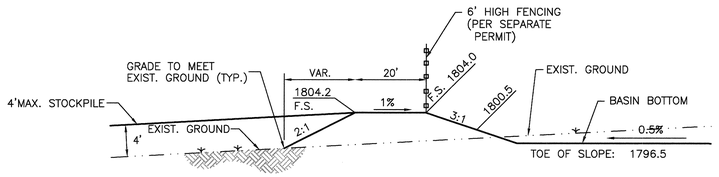
REGISTERED PROFESSIONAL ENGINEER WENDELL L. WATSURU No. 36637 Exp: 06-30-14 CIVIL STATE OF CALIFORNIA

PREPARED UNDER THE SUPERVISION OF:
MADOLE & ASSOCIATES, INC
Engineering Communities for Life
8302 PITTSBURGH AVE, SUITE 200, RANCHO CUCAMONGA, CA 91730
PHONE 909-481-5320 FAX 909-481-5320
WENDELL L. WATSURU RCE 36637 DATE 12/14/12 EXP. 6-30-14

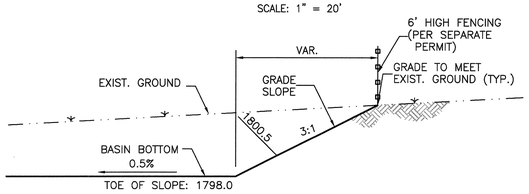
CITY OF FONTANA, CALIFORNIA
OFF-SITE STORM DRAIN IMPROVEMENT PLANS
TRACT NO. 18820
RETENTION/INFILTRATION BASIN

DRAWN BY:	TY/RM	SCALE:	AS SHOWN
DESIGNED BY:	WLI/RM	DATE:	NOV. 2012
CHECKED BY:	WLI	APPROVED BY:	
		CITY ENGINEER R.C.E. 51152 DATE	2-13-13
		DRAWING NO.	4977
			6/8

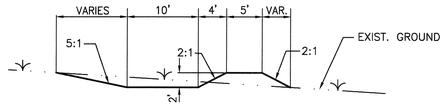
126-2404 S.D. IMP. PLANS TR.18820



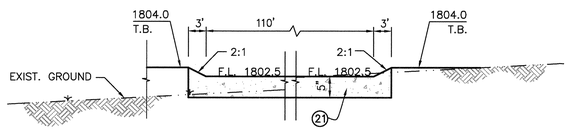
SECTION 7A
SCALE: 1" = 20'



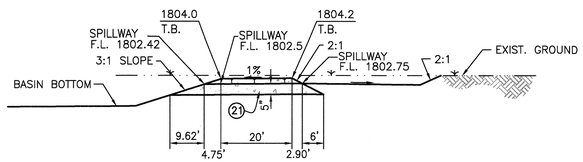
SECTION 7B
SCALE: 1" = 20'



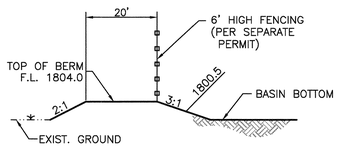
SECTION 7C
SCALE: 1" = 10'



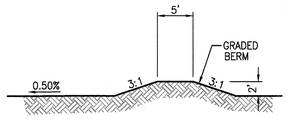
SECTION 7D
SCALE: 1" = 20'



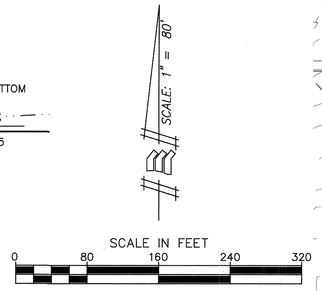
SECTION 7E
SCALE: 1" = 20'

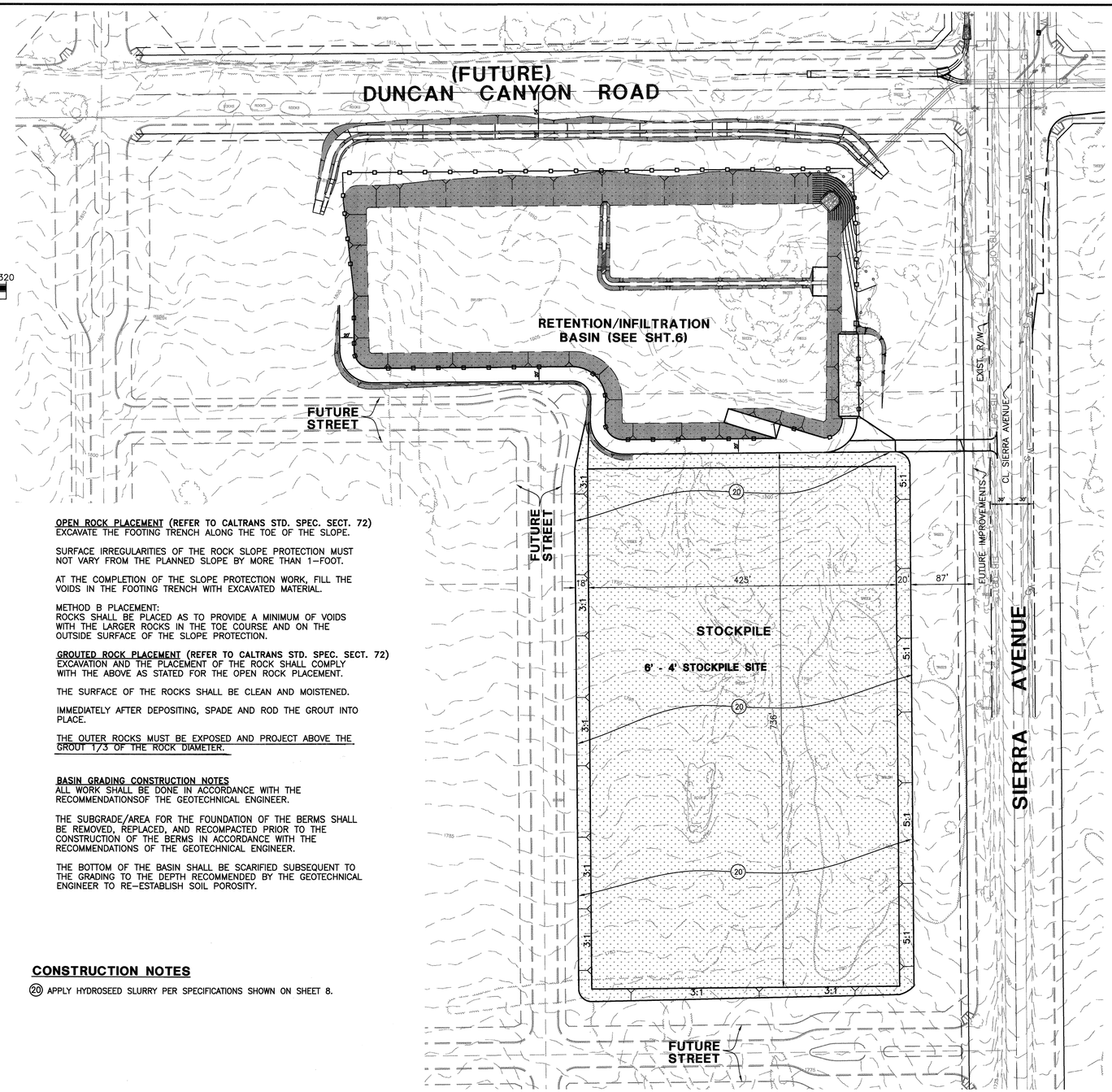


SECTION 7F
SCALE: 1" = 20'



SECTION 7G
SCALE: 1" = 20'





OPEN ROCK PLACEMENT (REFER TO CALTRANS STD. SPEC. SECT. 72)
EXCAVATE THE FOOTING TRENCH ALONG THE TOE OF THE SLOPE.

SURFACE IRREGULARITIES OF THE ROCK SLOPE PROTECTION MUST NOT VARY FROM THE PLANNED SLOPE BY MORE THAN 1-FOOT.

AT THE COMPLETION OF THE SLOPE PROTECTION WORK, FILL THE VOIDS IN THE FOOTING TRENCH WITH EXCAVATED MATERIAL.

METHOD B PLACEMENT:
ROCKS SHALL BE PLACED AS TO PROVIDE A MINIMUM OF VOIDS WITH THE LARGER ROCKS IN THE TOE COURSE AND ON THE OUTSIDE SURFACE OF THE SLOPE PROTECTION.

GROUTED ROCK PLACEMENT (REFER TO CALTRANS STD. SPEC. SECT. 72)
EXCAVATION AND THE PLACEMENT OF THE ROCK SHALL COMPLY WITH THE ABOVE AS STATED FOR THE OPEN ROCK PLACEMENT.

THE SURFACE OF THE ROCKS SHALL BE CLEAN AND MOISTENED.

IMMEDIATELY AFTER DEPOSITING, SPADE AND ROD THE GROUT INTO PLACE.

THE OUTER ROCKS MUST BE EXPOSED AND PROJECT ABOVE THE GROUT 1/3 OF THE ROCK DIAMETER.

BASIN GRADING CONSTRUCTION NOTES
ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE RECOMMENDATIONSOF THE GEOTECHNICAL ENGINEER.

THE SUBGRADE/AREA FOR THE FOUNDATION OF THE BERMS SHALL BE REMOVED, REPLACED, AND RECOMPACTED PRIOR TO THE CONSTRUCTION OF THE BERMS IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEER.

THE BOTTOM OF THE BASIN SHALL BE SCARIFIED SUBSEQUENT TO THE GRADING TO THE DEPTH RECOMMENDED BY THE GEOTECHNICAL ENGINEER TO RE-ESTABLISH SOIL POROSITY.

CONSTRUCTION NOTES

(20) APPLY HYDROSEED SLURRY PER SPECIFICATIONS SHOWN ON SHEET 8.

BENCH MARK: BM #00484
1.5 MI. N ALONG SIERRA AVE. FROM HIGHLAND AVE. 63 FT. E OF 1/4 CORNER 19-20, T1N,R5W & C/L SIERRA, 34 FT. E & 55 FT. S OF PP #707068H 50-59, 3 GALV. STEEL WITNESS POSTS, 5 FT. HIGH "UNICO" SIGN 7 FT. W OF MON.
ELEVATION: 1739.006

BASIS OF BEARINGS:
THE BEARING OF N00°35'43"W ALONG THE C.L. OF SIERRA AVE., AS SHOWN ON TR. NO. 14500 M.B. 251/70-74, WAS USED AS THE BASIS OF BEARING FOR THIS MAP.

DIGALERT
DIAL BEFORE YOU DIG — TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REV.	REVISION DESCRIPTION	DATE	ENGR.	CITY	DATE

SHOULD CONSTRUCTION OF THE REQUIRED IMPROVEMENTS NOT COMMENCE WITHIN TWO YEARS OF THE DATE OF APPROVAL SHOWN HEREON AND CARRIED FORTH IN A DILIGENT MANNER, THE CITY ENGINEER MAY REQUIRE REVISIONS TO THE PLANS TO BRING THEM INTO CONFORMANCE WITH CONDITIONS AND STANDARDS IN EFFECT.

REGISTERED PROFESSIONAL ENGINEER WENDELL L. IWATSURU No. 36637 Exp: 06-30-14 CIVIL STATE OF CALIFORNIA

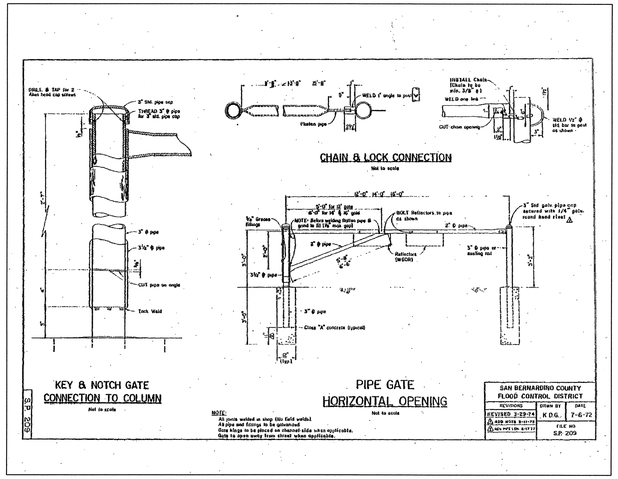
PREPARED UNDER THE SUPERVISION OF:
MADOLE & ASSOCIATES, INC. Engineering Communities for Life
3002 PITTSBURGH AVE, SUITE 230 RANCHO CUCAMONGA, CA. 91730 PHONE 909.481.6322 FAX 909.481.6320
WENDELL L. IWATSURU RCE 36637 DATE 2/4/12 EXP. 6-30-14

CITY OF FONTANA, CALIFORNIA
OFF-SITE STORM DRAIN IMPROVEMENT PLANS
TRACT NO. 18820
STOCKPILE AREA

DRAWN BY:	TY/RM
DESIGNED BY:	WLI/RM
CHECKED BY:	WLI
SCALE:	AS SHOWN
DATE:	NOV. 2012
DRAWING NO.	4977
SHEET	7/8

APPROVED BY: 2-13-13
CITY ENGINEER R.C.E. 51152 DATE

126-2404 S.D. IMP. PLANS TR.18820



22 PIPE GATE

SBCFCD STD. SP 209

20 GROUNDCOVER

CHAPARRAL SAGE SCRUB MIX - Non Irrigated Erosion Control

Hydroseed mixes are available through S&S Seeds (805) 684-0436. Confirm species listed above prior to ordering.

SPECIES	COMMON NAME	BULK #'s/ ACRE	MIN % PLS*
Artemisia californica	California Sagebrush	2.00	10
Encelia farinosa	Brittlebush	2.00	25
Eriophyllum confertiflorum	Golden Yarrow	2.00	25
Eriogonum fasciculatum	California Buckwheat	8.00	10
Eriodictyon trichocalyx	Hairy Yerba Santa	2.00	30
Eschscholzia californica	California Poppy	2.00	85
Lasthenia californica	Dwarf Goldfields	1.00	50
Lotus scoparius	Deerweed	6.00	85
Lupinus hirsutissimus	Stinging Lupine	2.00	80
Nassella pulchra	Purple Needlegrass	4.00	75
Phacelia ciliata	Great Valley Phacelia	2.00	80
Salvia apiana	White sage	2.00	25
Salvia mellifera	Black sage	2.00	40
Trifolium willdenovii	Tomcat Clover	2.00	85
Vulpia microstachys	Small Fescue	6.00	85
Yucca whipplei	Our Lord's Candle	2.00	60
		49.00	

* MIN % PLS (Pure Live Seed) = Seed Purity x Germination Rate

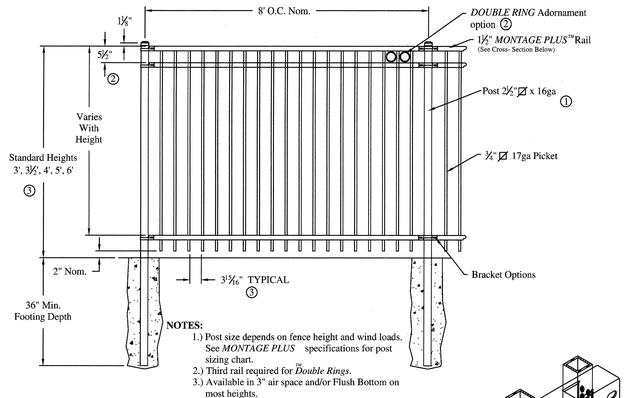
Seed: 49 lbs per acre

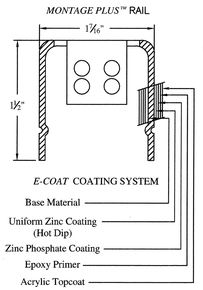
HYDROSEED SLURRY SPECIFICATION:

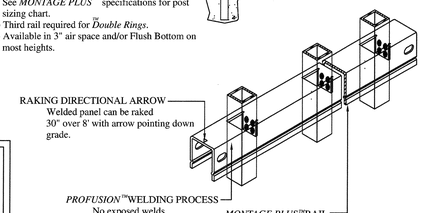
- Slope angles up to 2:1
- Slope length maximum of 50 ft. (without slope interruption devices
- Low to moderately erosive soil types
- Functional longevity requirement of up to 6 months

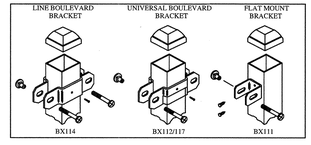
We recommend the following materials:

Product	Application Rate
Promatrix BFM	2,000 - 3,500 lbs./acre
Hydropost Premium Compost	1,000 lbs./acre
Biosol Forte 7-2-1 Organic fertilizer	800 lbs./acre
AM 120 Mycorrhizal inoculum	60 lbs./acre
Tri-C Soluble Humate	1 lb./acre
Seed mix as prescribed by S & S Seeds	









15 TUBULAR STEEL FENCE

BENCH MARK: BM #00484
1.5 MI. N ALONG SIERRA AVE. FROM HIGHLAND AVE, 63 FT. E OF 1/4 CORNER 19-20, T1N,R5W & C/L SIERRA, 34 FT. E & 55 FT. S OF PP #707066H 50-59, 3 GALV. STEEL WITNESS POSTS, 5 FT. HIGH "UNICO" SIGN 7 FT. W OF MON.
ELEVATION: 1739.006

BASIS OF BEARINGS:
THE BEARING OF N00°35'43"W ALONG THE C.L. OF SIERRA AVE., AS SHOWN ON TR. NO. 14500 M.B. 251/70-74, WAS USED AS THE BASIS OF BEARING FOR THIS MAP.

DIGALERT
DIAL BEFORE YOU DIG
TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

REV.	REVISION DESCRIPTION	DATE	ENGR.	CITY	DATE

SHOULD CONSTRUCTION OF THE REQUIRED IMPROVEMENTS NOT COMMENCE WITHIN TWO YEARS OF THE DATE OF APPROVAL SHOWN HEREON AND CARRIED FORTH IN A DILIGENT MANNER, THE CITY ENGINEER MAY REQUIRE REVISIONS TO THE PLANS TO BRING THEM INTO CONFORMANCE WITH CONDITIONS AND STANDARDS IN EFFECT.

REGISTERED PROFESSIONAL ENGINEER WENDELL L. IWATSURU No. 36637 Exp: 06-30-14 CIVIL STATE OF CALIFORNIA

PREPARED UNDER THE SUPERVISION OF:
MADOLE & ASSOCIATES, INC
Engineering Communities for Life
9302 PITTSBURGH AVE., SUITE 200
RANCHO CUCAMONGA, CA. 91730
PHONE: 909.481.6320
FAX: 909.481.6320
WENDELL L. IWATSURU DATE: 2/14/13
RCE 36637 EXP. 6-30-14

CITY OF FONTANA, CALIFORNIA
OFF-SITE STORM DRAIN IMPROVEMENT PLANS
TRACT NO. 18820
DETAIL SHEET
RETENTION BASIN // STOCKPILE AREA

DRAWN BY:	TY/RM
DESIGNED BY:	WLI/RM
CHECKED BY:	WLI
SCALE:	AS SHOWN
DATE:	NOV. 2012
DRAWING NO.	4977
SHEET	8 / 8

APPROVED BY: 2-13-13
CITY ENGINEER R.C.E. 51152 DATE

126-2404 S.D. IMP. PLANS TR.18820

DUNCAN CANYON RD

CASA GRANDE DR

SUMMIT AVE

RIALTO PIPELINE
MWD LINE

ETIWANDA PIPELINE
MWD LINE
12'-0" DIA

DEVORE FREEWAY (I15)

RICH BASIN

DEBRIS BASIN

HIGHLAND (FUTURE ROUTE 30)

HIGHLAND CHANNEL

SIERRA AVE

CITRUS AVE

OLEANDER AVE

CYPRESS AVE

BEECH AVE

HEMLOCK AVE

KNOX AVE

SAN SEVAINE RD

FONTANA

CITY LIMIT

AIRPORT

Well

Water Tanks

Fri City

Reservoir

A1 A2 A3 B B1 B2 B3 B4 B5 B6 C C1 C2 C3 C4 C5 C6

LEGEND

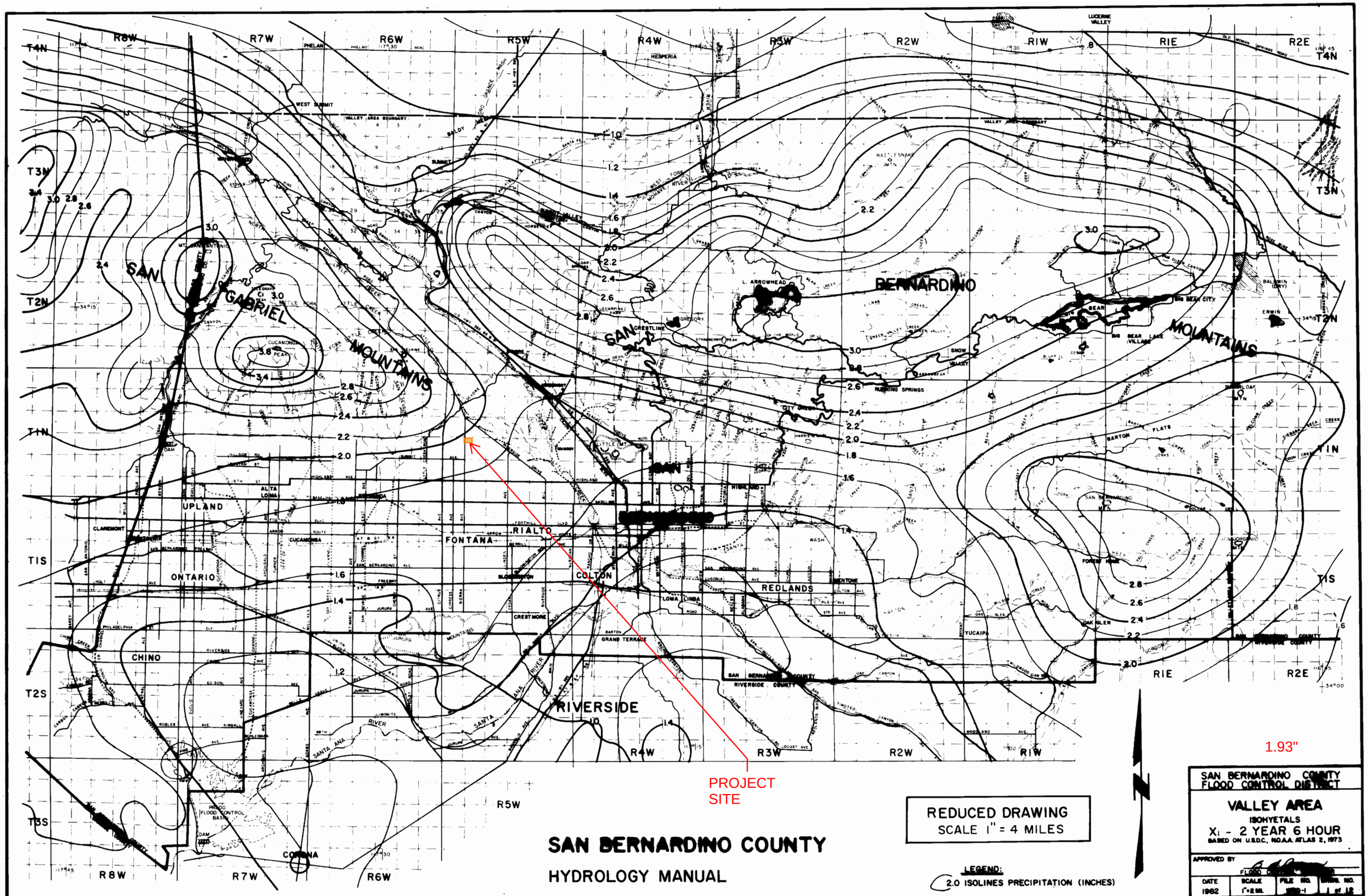
- EXISTING CHANNEL
- PROPOSED CONCRETE BOX
- PROPOSED CHANNEL
- PROPOSED PIPE
- EXISTING R.C. BOX
- EXISTING PIPE
- DRAINAGE AREA BOUNDARY

Hall & Foreman, Inc.
0 REDH L AVENUE COSTA MESA, CA 9 626-3428 14) 641-6777
IVIL ENGINEERING LAND PLANNING LAND SURVEYING

CITY OF FONTANA, CALIFORNIA
PUBLIC WORKS DEPARTMENT

DRAWN BY E.R.	CITY OF FONTANA NORTH FONTANA MASTER STORM DRAINAGE PLAN	SCALE: 1" = 1000'
DESIGNED BY L.G.		DATE:
CHECKED BY G.P.		
JOB NO. 3547	DR. NO. 2150	SHT. NO. 1 OF 1

6-12-92



SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

REDUCED DRAWING
SCALE 1" = 4 MILES

LEGEND:
2.0 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

VALLEY AREA
ISOHYETALS
X_1 - 2 YEAR 6 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973

APPROVED BY
FLOOD CONTROL ENGINEER

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

FIGURE B-1

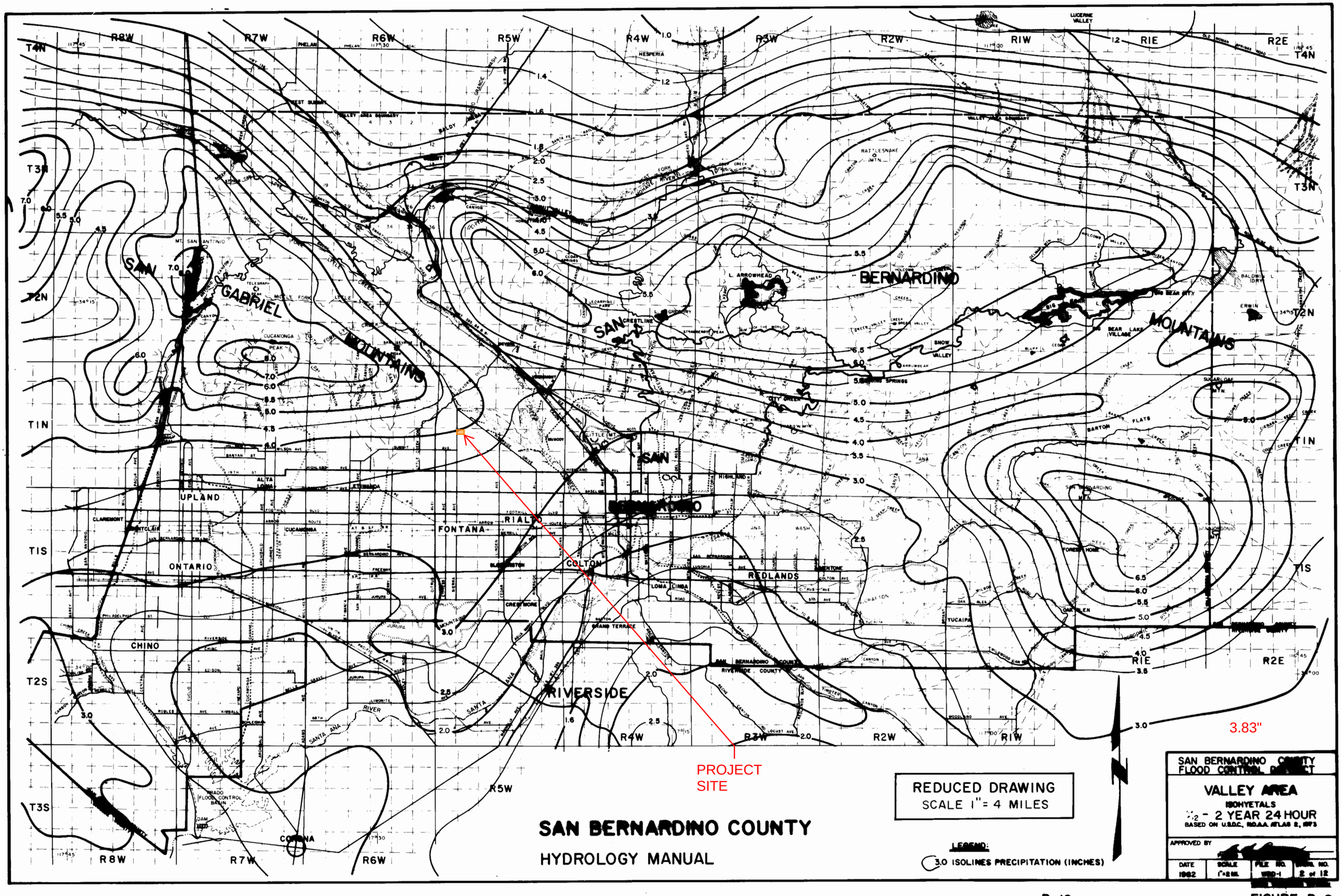
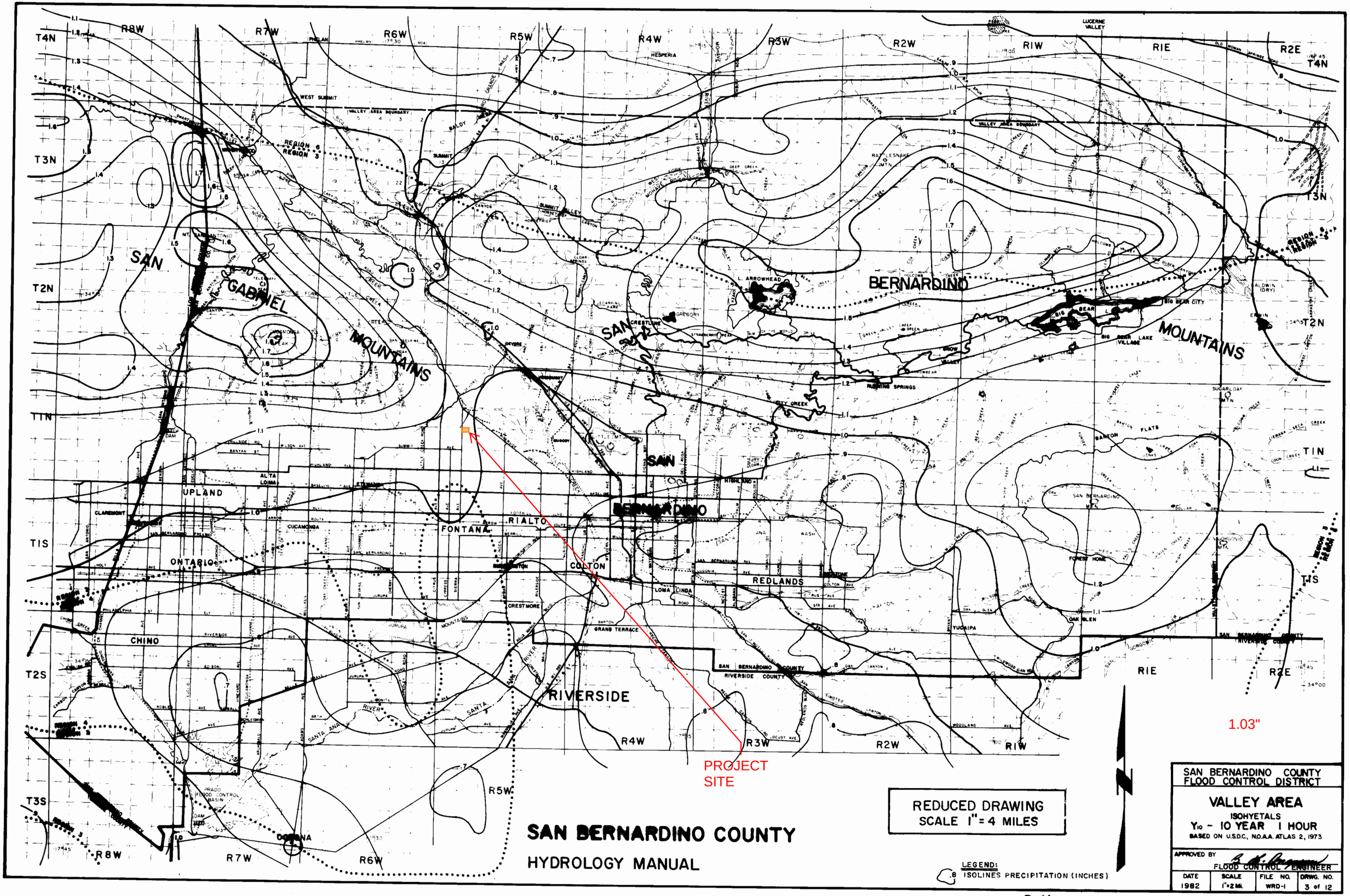

R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
T4N
T3N
T2N
T1N
T1S
T2S
T3S
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
UPLAND
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
REDLANDS
LOMA LINDA
SAN BERNARDINO
RIVERSIDE
CORONA
HESPERIA
VICTORVILLE
APPLE VALLEY
LUCERNE VALLEY
BIG BEAR CITY
BIG BEAR LAKE
SNOW VALLEY
ARROWBEAR
L. ARROWHEAD
CRESTLINE
YUCAIPA
CITY CREEK
SAN TIMOTEO CANYON
SANTA ANA RIVER
MOUNTAIN VIEW
PROJECT SITE
3.83"
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
3.0 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
½ - 2 YEAR 24 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
DATE 1982
SCALE 1"=2 MI.
FILE NO. HYD-1
DRWG. NO. 2 of 12

FIGURE B-2



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

REDUCED DRAWING
SCALE 1" = 4 MILES

LEGEND:
.8 ISOLINES PRECIPITATION (INCHES)

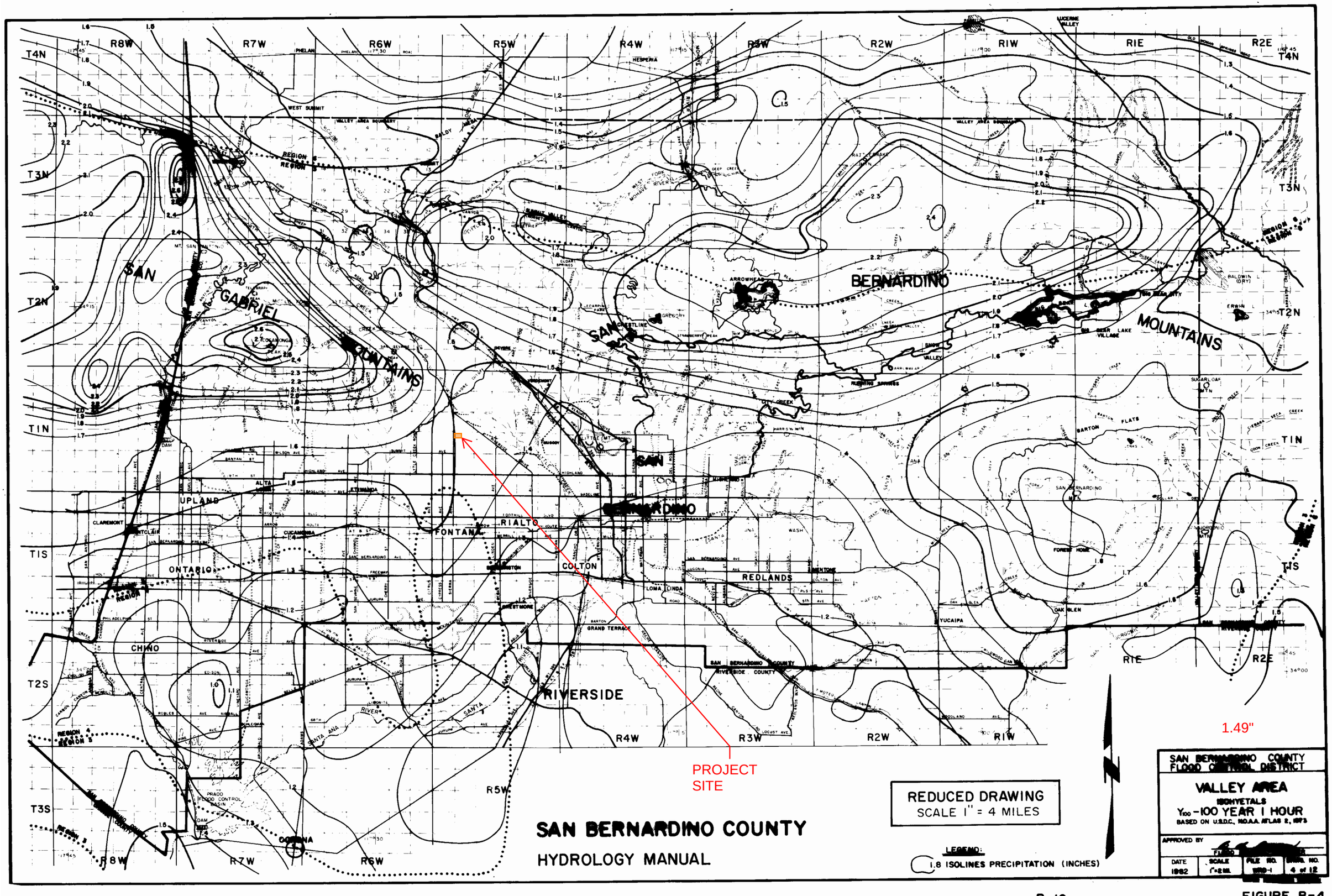
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

VALLEY AREA
ISOHYETALS
Y_{10} - 10 YEAR 1 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973

APPROVED BY _____ FLOOD CONTROL ENGINEER

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

FIGURE B-3



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

REDUCED DRAWING
SCALE 1" = 4 MILES

LEGEND:
1.8 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

VALLEY AREA
ISOHYETALS
Y_{100} - 100 YEAR 1 HOUR
BASED ON U.S.D.C., NOAA ATLAS 2, 1973

APPROVED BY			
DATE	SCALE	FILE NO.	SHEET NO.
1982	1"=2MI.	VAD-1	4 of 12

FIGURE B-4

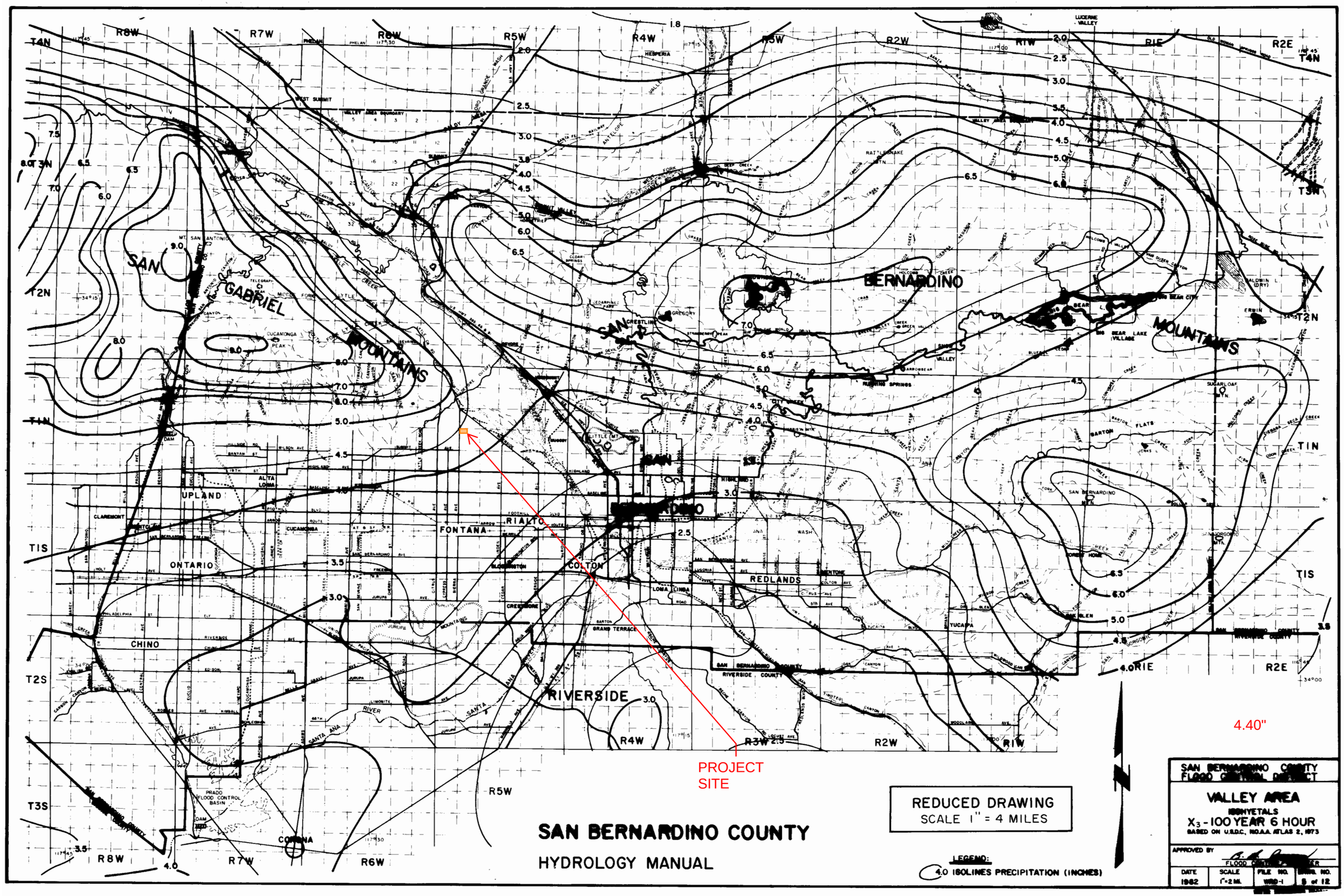

SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO
UPLAND
ONTARIO
CHINO
CLAREMONT
FONTANA
RIALTO
COLTON
REDLANDS
LOMA LINDA
GRAND TERRACE
CRESTLINE
RUNNING SPRINGS
ARROWBEAR
BIG BEAR LAKE
BIG BEAR CITY
SUGARLOAF
FAWNSKIN
BARTON FLATS
YUCAIPA
CALIMESA
RIVERSIDE
COLTON
SAN BERNARDINO
HESPERIA
VICTORVILLE
LUCERNE VALLEY
PRADO FLOOD CONTROL BASIN
CORONA
SANTA ANA RIVER
SAN ANDREAS FAULT
MT. SAN ANTONIO
CUCAMONGA PEAK
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
PROJECT SITE
4.40"
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
4.0 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
X3 - 100 YEAR 6 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
DATE 1982
SCALE 1"=2 MI.
FILE NO. WRD-1
SHEET NO. 8 of 12

FIGURE B-5

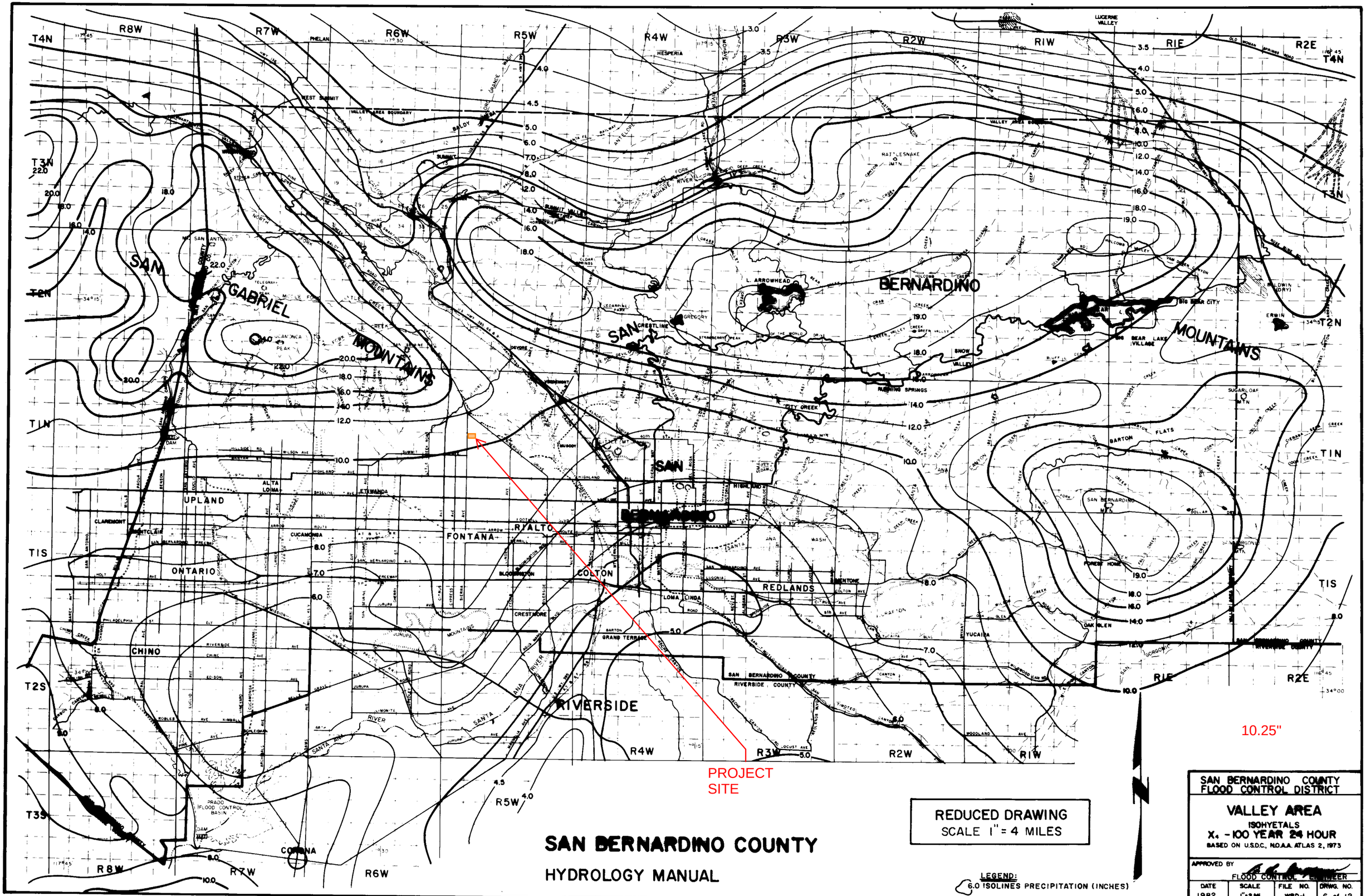
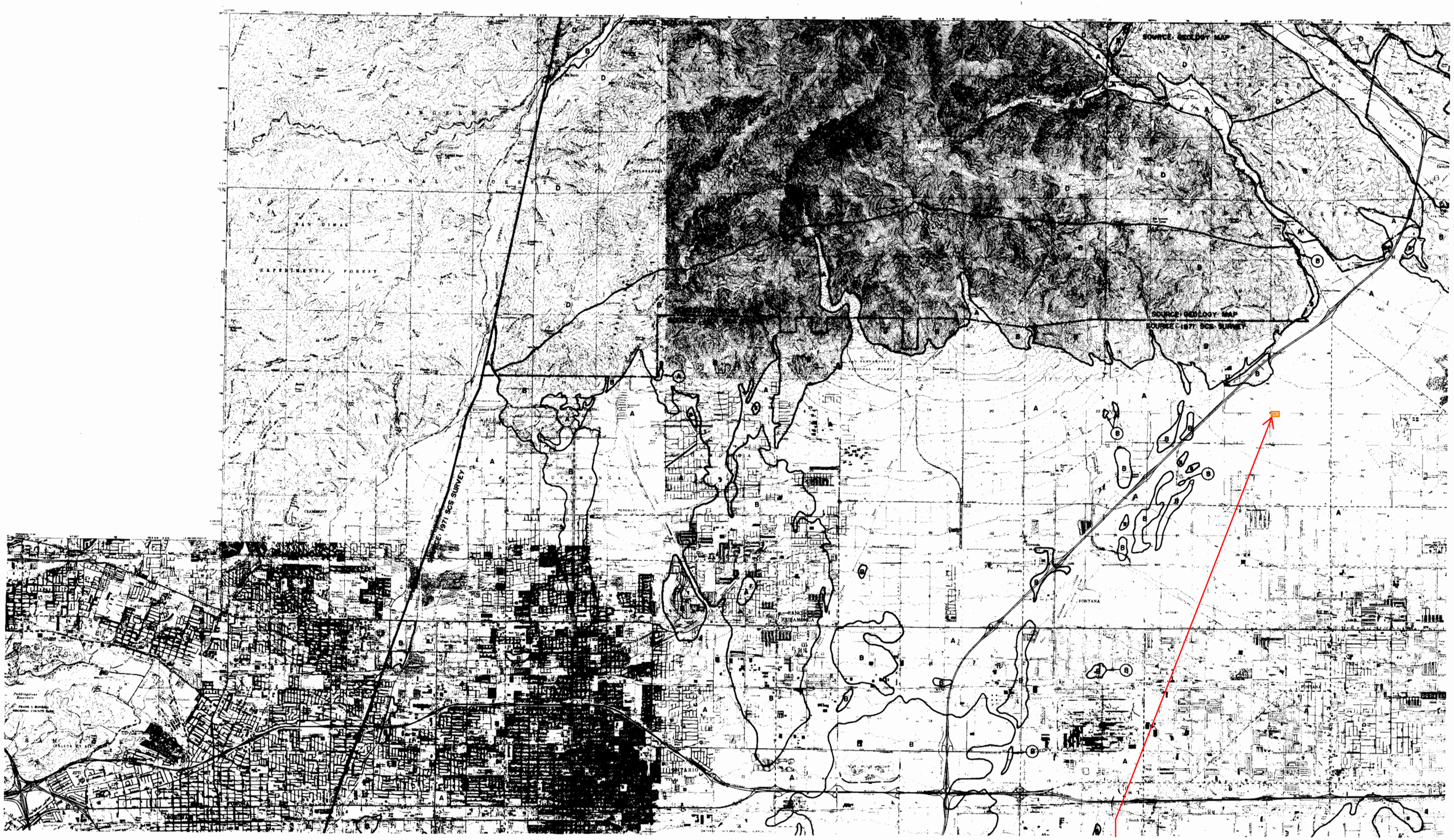
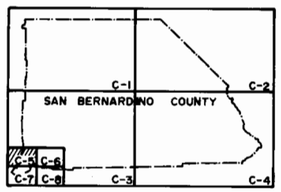

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
PROJECT SITE
10.25"
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
6.0 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
X₄ - 100 YEAR 24 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE 1982
SCALE 1"=2 MI.
FILE NO. WRD-1
DRWG. NO. 6 of 12
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO
RIVERSIDE
UPLAND
ONTARIO
CHINO
CUCAMONGA
FONTANA
RIALTO
COLTON
REDLANDS
LOMA LINDA
CRESTMORE
GRAND TERRACE
CRESTLINE
L. ARROWHEAD
RUNNING SPRINGS
SNOW VALLEY
BIG BEAR CITY
BEAR LAKE VILLAGE
ERWIN
FAWNSKIN
SUGARLOAF
BARTON FLATS
YUCAIPA
CLAREMONT
ALTA LOMA
ETIWANDA
HIGHLAND
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
PRADO FLOOD CONTROL BASIN
CORONA
HESPERIA
LUCERNE VALLEY
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E

FIGURE B-6





INDEX MAP

LEGEND

SOIL GROUP BOUNDARY

A SOIL GROUP DESIGNATION

BOUNDARY OF INDICATED SOURCE

SCALE 1:48,000

SCALE REDUCED BY 1/2

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST-A AREA

APPENDIX B

HYDROLOGY CALCULATIONS

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 *************************
* 3994 - SIERRA GATEWAY                                                 *
* SIERRA AVENUE AND DUNCAN CANYON ROAD                                  *
* EXISTING CONDITION 100-YR                                             *
 ************************************************************************

  FILE NAME: C:\XDRIVE\3994\100X.DAT
  TIME/DATE OF STUDY: 11:41 08/13/2021
==========================================================================
  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) = 1.5000

  *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) =   751.00
  ELEVATION DATA: UPSTREAM(FEET) =   1813.80  DOWNSTREAM(FEET) =   1789.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   26.225
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.465
```

```
  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.)
  NATURAL GOOD COVER
  "OPEN BRUSH"                 A        5.10      0.69       1.00    61   26.23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.69
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA RUNOFF(CFS) =      8.16
  TOTAL AREA(ACRES) =      5.10   PEAK FLOW RATE(CFS) =      8.16

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1789.40  DOWNSTREAM(FEET) =   1772.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   540.00   CHANNEL SLOPE =  0.0313
  CHANNEL FLOW THRU SUBAREA(CFS) =      8.16
  FLOW VELOCITY(FEET/SEC) =   4.20 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.14   Tc(MIN.) =  28.37
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =  1291.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN) =  28.37
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.351
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"                 A        5.55      0.69       1.00    61
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.69
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA AREA(ACRES) =    5.55      SUBAREA RUNOFF(CFS) =    8.32
  EFFECTIVE AREA(ACRES) =    10.65   AREA-AVERAGED Fm(INCH/HR) =  0.69
  AREA-AVERAGED Fp(INCH/HR) =  0.69  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =    10.65       PEAK FLOW RATE(CFS) =      15.96
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =     10.65  TC(MIN.) =     28.37
  EFFECTIVE AREA(ACRES) =     10.65  AREA-AVERAGED Fm(INCH/HR)=  0.69
  AREA-AVERAGED Fp(INCH/HR) =  0.69  AREA-AVERAGED Ap =  1.00
  PEAK FLOW RATE(CFS)   =     15.96
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
            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 ************************
* 3994 - SIERRA GATEWAY                                               *
* SIERRA AVENUE AND DUNCAN CANYON ROAD                                *
* EXISTING CONDITION 100-YR                                           *
 **********************************************************************

  FILE NAME: C:\3994\110X.DAT
  TIME/DATE OF STUDY: 10:42 08/13/2021
==========================================================================
  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) = 1.5000

  *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) =   678.00
  ELEVATION DATA: UPSTREAM(FEET) =   1793.10  DOWNSTREAM(FEET) =   1774.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   26.040
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.475
```

```
  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.)
  NATURAL GOOD COVER
  "OPEN BRUSH"                 A        8.35      0.69      1.00    61   26.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.69
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA RUNOFF(CFS) =     13.45
  TOTAL AREA(ACRES) =      8.35   PEAK FLOW RATE(CFS) =     13.45
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      8.35  TC(MIN.) =     26.04
  EFFECTIVE AREA(ACRES) =      8.35  AREA-AVERAGED Fm(INCH/HR)=  0.69
  AREA-AVERAGED Fp(INCH/HR) =  0.69  AREA-AVERAGED Ap =  1.00
  PEAK FLOW RATE(CFS)   =     13.45
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS

1
```

```
******************************************************************************
            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 ************************
* 3994 - SIERRA GATEWAY                                                 *
* SIERRA AVENUE AND DUNCAN CANYON ROAD                                  *
* EXISTING CONDITION 100-YR                                             *
 ******************************************************************************

  FILE NAME: C:\3994\200X.DAT
  TIME/DATE OF STUDY: 10:47 08/13/2021
==============================================================================
  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) = 1.5000

  *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) =   664.00
  ELEVATION DATA: UPSTREAM(FEET) =   1815.70  DOWNSTREAM(FEET) =   1793.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   24.890
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.543
  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.)
```

```
  NATURAL GOOD COVER
  "OPEN BRUSH"                A        7.95      0.69      1.00    61   24.89
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.69
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA RUNOFF(CFS) =     13.29
  TOTAL AREA(ACRES) =      7.95   PEAK FLOW RATE(CFS) =     13.29
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      7.95  TC(MIN.) =     24.89
  EFFECTIVE AREA(ACRES) =      7.95  AREA-AVERAGED Fm(INCH/HR)=  0.69
  AREA-AVERAGED Fp(INCH/HR) =  0.69  AREA-AVERAGED Ap =  1.00
  PEAK FLOW RATE(CFS)   =     13.29
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS

1
```

PROPOSED 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 *************************
* TEI JOB NO 3994                                                      *
* SIERRA AVENUE AND DUNCAN CANYON ROAD                                 *
* PROPOSED CONDITION 100-YEAR                                          *
 ************************************************************************

  FILE NAME: C:\XDRIVE\3994\100P.DAT
  TIME/DATE OF STUDY: 14:55 09/07/2021
==============================================================================
  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) = 1.5000

  *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) =   191.00
  ELEVATION DATA: UPSTREAM(FEET) =   1813.47  DOWNSTREAM(FEET) =   1806.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.662
  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                 A        0.70      0.80       0.10    52    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA RUNOFF(CFS) =      4.15
  TOTAL AREA(ACRES) =      0.70   PEAK FLOW RATE(CFS) =      4.15

******************************************************************************
  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) =  1802.70  DOWNSTREAM(FEET) =  1791.62
  FLOW LENGTH(FEET) =   595.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.80
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      4.15
  PIPE TRAVEL TIME(MIN.) =   1.46    Tc(MIN.) =   6.46
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =   786.00 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.) =   6.46
  RAINFALL INTENSITY(INCH/HR) =   5.71
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =    0.70
  TOTAL STREAM AREA(ACRES) =    0.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.15

****************************************************************************
  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) =   404.00
  ELEVATION DATA: UPSTREAM(FEET) =   1814.07  DOWNSTREAM(FEET) =   1802.65

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.842
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.519
  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                 A        2.65      0.80       0.10    52    6.84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA RUNOFF(CFS) =     12.97
  TOTAL AREA(ACRES) =      2.65   PEAK FLOW RATE(CFS) =     12.97

****************************************************************************
  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) =  1798.65  DOWNSTREAM(FEET) =  1791.62
  FLOW LENGTH(FEET) =     9.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  37.44
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     12.97
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =   6.85
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =   413.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   6.85
  RAINFALL INTENSITY(INCH/HR) =   5.52
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =    2.65
  TOTAL STREAM AREA(ACRES) =    2.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.97

  ** CONFLUENCE DATA **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1      4.15   6.46    5.714  0.80( 0.08) 0.10     0.7     100.00
      2     12.97   6.85    5.517  0.80( 0.08) 0.10     2.7     110.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     16.83   6.46    5.714  0.80( 0.08) 0.10     3.2     100.00
      2     16.98   6.85    5.517  0.80( 0.08) 0.10     3.4     110.00
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     16.98    Tc(MIN.) =     6.85
  EFFECTIVE AREA(ACRES) =     3.35   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =      3.35
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =   786.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1791.62  DOWNSTREAM(FEET) =  1789.15
  FLOW LENGTH(FEET) =   162.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.96
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     16.98
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =   7.15
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    122.00 =   948.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   7.15
  RAINFALL INTENSITY(INCH/HR) =   5.38
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =    3.35
  TOTAL STREAM AREA(ACRES) =    3.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     16.98

****************************************************************************
  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) =   507.00
  ELEVATION DATA: UPSTREAM(FEET) =   1810.03  DOWNSTREAM(FEET) =   1793.09

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.246
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.332
  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                  A        1.15      0.80       0.10    52    7.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA RUNOFF(CFS) =      5.44
  TOTAL AREA(ACRES) =      1.15   PEAK FLOW RATE(CFS) =      5.44

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1790.50  DOWNSTREAM(FEET) =  1789.15
  FLOW LENGTH(FEET) =   301.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.31
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      5.44
  PIPE TRAVEL TIME(MIN.) =   1.16    Tc(MIN.) =   8.41
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =   808.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   8.41
  RAINFALL INTENSITY(INCH/HR) =   4.88
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =    1.15
  TOTAL STREAM AREA(ACRES) =    1.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.44

  ** CONFLUENCE DATA **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     16.83   6.76    5.560  0.80( 0.08) 0.10     3.2     100.00
      1     16.98   7.15    5.377  0.80( 0.08) 0.10     3.4     110.00
      2      5.44   8.41    4.876  0.80( 0.08) 0.10     1.1     120.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     21.82   6.76    5.560  0.80( 0.08) 0.10     4.1     100.00
      2     22.08   7.15    5.377  0.80( 0.08) 0.10     4.3     110.00
      3     20.81   8.41    4.876  0.80( 0.08) 0.10     4.5     120.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     22.08    Tc(MIN.) =     7.15
  EFFECTIVE AREA(ACRES) =     4.33   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =      4.50
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    122.00 =   948.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1789.15  DOWNSTREAM(FEET) =  1786.12
  FLOW LENGTH(FEET) =   493.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.76
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     22.08
  PIPE TRAVEL TIME(MIN.) =   1.22    Tc(MIN.) =   8.36
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    132.00 =  1441.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   8.36
  RAINFALL INTENSITY(INCH/HR) =   4.89
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =    4.33
  TOTAL STREAM AREA(ACRES) =    4.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     22.08

****************************************************************************
  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) =   608.00
  ELEVATION DATA: UPSTREAM(FEET) =   1803.61  DOWNSTREAM(FEET) =   1791.31

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.615
```

```
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.807
  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                   A        0.90      0.80       0.10    52    8.61
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA RUNOFF(CFS) =      3.83
  TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      3.83

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1787.31  DOWNSTREAM(FEET) =  1786.12
  FLOW LENGTH(FEET) =     6.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.33
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      3.83
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   8.62
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    132.00 =   614.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   8.62
  RAINFALL INTENSITY(INCH/HR) =   4.80
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =    0.90
  TOTAL STREAM AREA(ACRES) =    0.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.83

  ** CONFLUENCE DATA **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     21.82   7.98    5.034  0.80( 0.08) 0.10     4.1     100.00
      1     22.08   8.36    4.893  0.80( 0.08) 0.10     4.3     110.00
      1     20.81   9.63    4.495  0.80( 0.08) 0.10     4.5     120.00
      2      3.83   8.62    4.805  0.80( 0.08) 0.10     0.9     130.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     25.53   7.98    5.034  0.80( 0.08) 0.10     5.0     100.00
      2     25.86   8.36    4.893  0.80( 0.08) 0.10     5.2     110.00
      3     24.39   9.63    4.495  0.80( 0.08) 0.10     5.4     120.00
      4     25.65   8.62    4.805  0.80( 0.08) 0.10     5.3     130.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     25.86    Tc(MIN.) =     8.36
  EFFECTIVE AREA(ACRES) =     5.20   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =      5.40
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    132.00 =  1441.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    141.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1786.12  DOWNSTREAM(FEET) =  1785.26
  FLOW LENGTH(FEET) =   172.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.53
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     25.86
  PIPE TRAVEL TIME(MIN.) =   0.44    Tc(MIN.) =   8.80
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    141.00 =  1613.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    141.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   8.80
  RAINFALL INTENSITY(INCH/HR) =   4.75
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =    5.20
  TOTAL STREAM AREA(ACRES) =    5.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     25.86

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =  24.89   RAINFALL INTENSITY(INCH/HR) =  2.54
  EFFECTIVE AREA(ACRES) =     7.95
  TOTAL AREA(ACRES) =     7.95        PEAK FLOW RATE(CFS) =     13.30
  AREA-AVERAGED Fm(INCH/HR) =   0.48  AREA-AVERAGED Fp(INCH/HR) =   0.69
  AREA-AVERAGED Ap =  0.69
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
        CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1786.51  DOWNSTREAM(FEET) =  1785.77
  FLOW LENGTH(FEET) =   149.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.56
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     13.30
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =  25.34
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    141.00 =   763.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    141.00 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.) =  25.34
  RAINFALL INTENSITY(INCH/HR) =   2.52
  AREA-AVERAGED Fm(INCH/HR) =  0.48
  AREA-AVERAGED Fp(INCH/HR) =  0.69
  AREA-AVERAGED Ap =  0.69
  EFFECTIVE STREAM AREA(ACRES) =    7.95
  TOTAL STREAM AREA(ACRES) =    7.95
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.30

  ** CONFLUENCE DATA **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     25.53   8.42    4.875  0.80( 0.08) 0.10     5.0     100.00
      1     25.86   8.80    4.745  0.80( 0.08) 0.10     5.2     110.00
      1     24.39  10.08    4.375  0.80( 0.08) 0.10     5.4     120.00
      1     25.65   9.06    4.663  0.80( 0.08) 0.10     5.3     130.00
      2     13.30  25.34    2.516  0.69( 0.48) 0.69     7.9     140.00

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

```
  ** PEAK FLOW RATE TABLE **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     35.06   8.42    4.875  0.71( 0.22) 0.31     7.6     100.00
      2     35.53   8.80    4.745  0.71( 0.22) 0.30     8.0     110.00
      3     35.41   9.06    4.663  0.71( 0.22) 0.31     8.1     130.00
      4     34.50  10.08    4.375  0.71( 0.23) 0.32     8.6     120.00
      5     27.13  25.34    2.516  0.70( 0.32) 0.45    13.4     140.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     35.53    Tc(MIN.) =     8.80
  EFFECTIVE AREA(ACRES) =     7.96   AREA-AVERAGED Fm(INCH/HR) =  0.22
  AREA-AVERAGED Fp(INCH/HR) =  0.71  AREA-AVERAGED Ap =  0.30
  TOTAL AREA(ACRES) =     13.35
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    141.00 =  1613.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =     13.35  TC(MIN.) =      8.80
  EFFECTIVE AREA(ACRES) =      7.96  AREA-AVERAGED Fm(INCH/HR)=  0.22
  AREA-AVERAGED Fp(INCH/HR) =  0.71  AREA-AVERAGED Ap =  0.30
  PEAK FLOW RATE(CFS)   =     35.53

  ** PEAK FLOW RATE TABLE **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     35.06   8.42    4.875  0.71( 0.22) 0.31     7.6     100.00
      2     35.53   8.80    4.745  0.71( 0.22) 0.30     8.0     110.00
      3     35.41   9.06    4.663  0.71( 0.22) 0.31     8.1     130.00
      4     34.50  10.08    4.375  0.71( 0.23) 0.32     8.6     120.00
      5     27.13  25.34    2.516  0.70( 0.32) 0.45    13.4     140.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

1
```

```
************************************************************************
            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 *************************
* TEI JOB NO 3994                                                      *
* SIERRA AVENUE AND DUNCAN CANYON ROAD                                 *
* PROPOSED CONDITION 100-YEAR                                          *
 ************************************************************************

  FILE NAME: C:\XDRIVE\3994\200P.DAT
  TIME/DATE OF STUDY: 15:13 09/03/2021
========================================================================
  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) = 1.5000

  *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) =   536.00
  ELEVATION DATA: UPSTREAM(FEET) =   1789.52  DOWNSTREAM(FEET) =   1774.61

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.686
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.147
  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                 A        1.65      0.80       0.10    52    7.69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA RUNOFF(CFS) =      7.53
  TOTAL AREA(ACRES) =      1.65   PEAK FLOW RATE(CFS) =      7.53

************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    212.00 IS CODE =  31
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1772.45  DOWNSTREAM(FEET) =  1771.39
  FLOW LENGTH(FEET) =   301.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.25
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      7.53
  PIPE TRAVEL TIME(MIN.) =   1.18    Tc(MIN.) =   8.87
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    212.00 =   837.00 FEET.

************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    212.00 IS CODE =   1
------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
========================================================================
```

```
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   8.87
  RAINFALL INTENSITY(INCH/HR) =   4.72
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =    1.65
  TOTAL STREAM AREA(ACRES) =    1.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.53

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   205.00
  ELEVATION DATA: UPSTREAM(FEET) =   1781.56  DOWNSTREAM(FEET) =   1778.76

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.032
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.952
  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                 A        2.15      0.80       0.10    52    6.03
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA RUNOFF(CFS) =     11.36
  TOTAL AREA(ACRES) =      2.15   PEAK FLOW RATE(CFS) =     11.36

****************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    212.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1774.76  DOWNSTREAM(FEET) =  1771.39
  FLOW LENGTH(FEET) =    32.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.09
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     11.36
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   6.06
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    212.00 =   237.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    212.00 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.) =   6.06
  RAINFALL INTENSITY(INCH/HR) =   5.93
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =    2.15
  TOTAL STREAM AREA(ACRES) =    2.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.36

  ** CONFLUENCE DATA **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1      7.53   8.87    4.725  0.80( 0.08) 0.10     1.6     200.00
      2     11.36   6.06    5.934  0.80( 0.08) 0.10     2.2     210.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     16.54   8.87    4.725  0.80( 0.08) 0.10     3.8     200.00
      2     17.85   6.06    5.934  0.80( 0.08) 0.10     3.3     210.00
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     17.85    Tc(MIN.) =     6.06
  EFFECTIVE AREA(ACRES) =     3.28   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =      3.80
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    212.00 =   837.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    213.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1771.39  DOWNSTREAM(FEET) =  1770.67
  FLOW LENGTH(FEET) =   205.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  22.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.13
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     17.85
  PIPE TRAVEL TIME(MIN.) =   0.67    Tc(MIN.) =   6.73
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    213.00 =  1042.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    213.00 TO NODE    213.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN) =   6.73
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.574
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        2.10      0.80       0.10    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA AREA(ACRES) =    2.10      SUBAREA RUNOFF(CFS) =   10.38
  EFFECTIVE AREA(ACRES) =     5.38   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =     5.90       PEAK FLOW RATE(CFS) =      26.60

****************************************************************************
  FLOW PROCESS FROM NODE    213.00 TO NODE    214.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1770.67  DOWNSTREAM(FEET) =  1769.96
  FLOW LENGTH(FEET) =   205.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.76
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     26.60
  PIPE TRAVEL TIME(MIN.) =   0.59    Tc(MIN.) =   7.32
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    214.00 =  1247.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    214.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN) =   7.32
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.299
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        2.15      0.80       0.10    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA AREA(ACRES) =    2.15      SUBAREA RUNOFF(CFS) =   10.10
  EFFECTIVE AREA(ACRES) =     7.53   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =     8.05       PEAK FLOW RATE(CFS) =      35.36

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    225.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =  1769.96  DOWNSTREAM(FEET) =  1769.23
  FLOW LENGTH(FEET) =   208.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  27.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.18
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     35.36
  PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =   7.88
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    225.00 =  1455.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    215.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN) =   7.88
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.069
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        0.45      0.80      0.10    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA AREA(ACRES) =    0.45      SUBAREA RUNOFF(CFS) =    2.02
  EFFECTIVE AREA(ACRES) =     7.98   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =     8.50       PEAK FLOW RATE(CFS) =      35.83

****************************************************************************
  FLOW PROCESS FROM NODE    225.00 TO NODE    225.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    221.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   662.00
  ELEVATION DATA: UPSTREAM(FEET) =   1799.20  DOWNSTREAM(FEET) =   1780.69

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.354
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.896
  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                 A        3.90      0.80      0.10    52    8.35
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA RUNOFF(CFS) =     16.91
  TOTAL AREA(ACRES) =      3.90   PEAK FLOW RATE(CFS) =     16.91

****************************************************************************
  FLOW PROCESS FROM NODE    221.00 TO NODE    224.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1776.69  DOWNSTREAM(FEET) =  1769.53
  FLOW LENGTH(FEET) =   939.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.91
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     16.91
  PIPE TRAVEL TIME(MIN.) =   2.26    Tc(MIN.) =  10.62
  LONGEST FLOWPATH FROM NODE    220.00 TO NODE    224.00 =  1601.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    224.00 TO NODE    224.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  10.62
  RAINFALL INTENSITY(INCH/HR) =   4.24
  AREA-AVERAGED Fm(INCH/HR) =  0.08
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.80
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =    3.90
  TOTAL STREAM AREA(ACRES) =    3.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     16.91

****************************************************************************
  FLOW PROCESS FROM NODE    222.00 TO NODE    223.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   467.00
  ELEVATION DATA: UPSTREAM(FEET) =   1792.82  DOWNSTREAM(FEET) =   1780.88

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.397
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.267
  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                 A        1.20      0.80       0.10    52    7.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA RUNOFF(CFS) =      5.60
  TOTAL AREA(ACRES) =      1.20   PEAK FLOW RATE(CFS) =      5.60

****************************************************************************
  FLOW PROCESS FROM NODE    223.00 TO NODE    224.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1776.88  DOWNSTREAM(FEET) =  1769.53
  FLOW LENGTH(FEET) =    13.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  26.48
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      5.60
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   7.41
  LONGEST FLOWPATH FROM NODE    222.00 TO NODE    224.00 =   480.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    224.00 TO NODE    224.00 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.) =   7.41
  RAINFALL INTENSITY(INCH/HR) =   5.26
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =    1.20
  TOTAL STREAM AREA(ACRES) =    1.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.60

  ** CONFLUENCE DATA **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     16.91  10.62    4.240  0.80( 0.08) 0.10     3.9     220.00
      2      5.60   7.41    5.263  0.80( 0.08) 0.10     1.2     222.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     21.40  10.62    4.240  0.80( 0.08) 0.10     5.1     220.00
      2     20.29   7.41    5.263  0.80( 0.08) 0.10     3.9     222.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     21.40    Tc(MIN.) =    10.62
  EFFECTIVE AREA(ACRES) =     5.10   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
```

```
  TOTAL AREA(ACRES) =      5.10
  LONGEST FLOWPATH FROM NODE    220.00 TO NODE    224.00 =  1601.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    224.00 TO NODE    225.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1769.53  DOWNSTREAM(FEET) =  1769.23
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.34
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     21.40
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =  10.71
  LONGEST FLOWPATH FROM NODE    220.00 TO NODE    225.00 =  1641.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    225.00 TO NODE    225.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     20.29   7.50    5.225  0.80( 0.08) 0.10     3.9     222.00
      2     21.40  10.71    4.218  0.80( 0.08) 0.10     5.1     220.00
  LONGEST FLOWPATH FROM NODE    220.00 TO NODE    225.00 =  1641.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     35.83   7.88    5.069  0.80( 0.08) 0.10     8.0     210.00
      2     31.66  10.71    4.218  0.80( 0.08) 0.10     8.5     200.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE    225.00 =     0.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     55.42   7.50    5.225  0.80( 0.08) 0.10    11.5     222.00
      2     53.06  10.71    4.218  0.80( 0.08) 0.10    13.6     220.00
      3     56.25   7.88    5.069  0.80( 0.08) 0.10    12.0     210.00
      4     53.05  10.71    4.218  0.80( 0.08) 0.10    13.6     200.00
    TOTAL AREA(ACRES) =     13.60

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       56.25  Tc(MIN.) =    7.884
  EFFECTIVE AREA(ACRES) =     12.04  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =     13.60
  LONGEST FLOWPATH FROM NODE    220.00 TO NODE    225.00 =  1641.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    225.00 TO NODE    225.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =     13.60  TC(MIN.) =      7.88
  EFFECTIVE AREA(ACRES) =     12.04  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
  PEAK FLOW RATE(CFS)   =     56.25

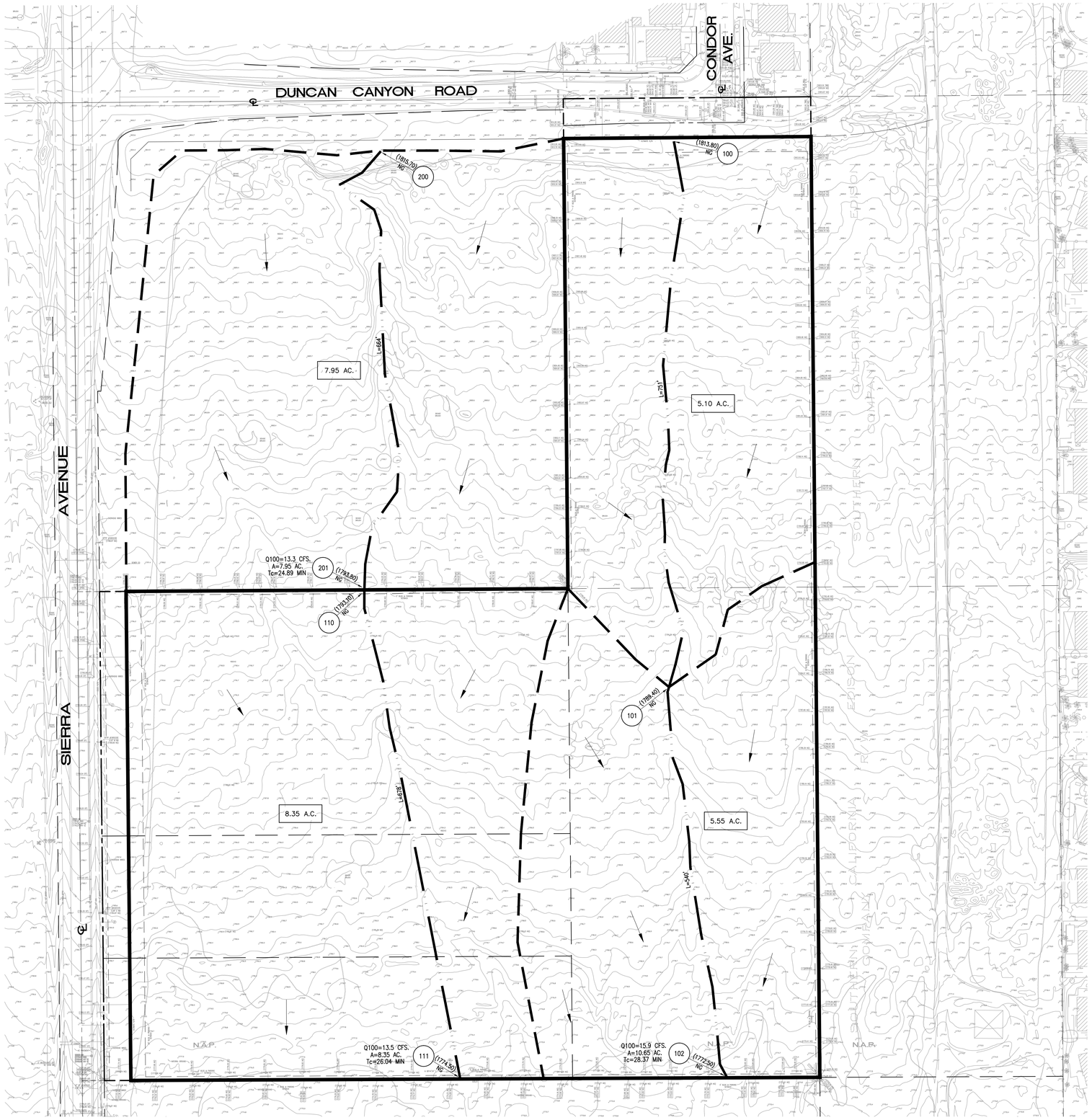
  ** PEAK FLOW RATE TABLE **
   STREAM     Q     Tc   Intensity   Fp(Fm)     Ap   Ae     HEADWATER
   NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)       (ACRES)    NODE
      1     55.42   7.50    5.225  0.80( 0.08) 0.10    11.5     222.00
      2     56.25   7.88    5.069  0.80( 0.08) 0.10    12.0     210.00
      3     53.06  10.71    4.218  0.80( 0.08) 0.10    13.6     220.00
      4     53.05  10.71    4.218  0.80( 0.08) 0.10    13.6     200.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

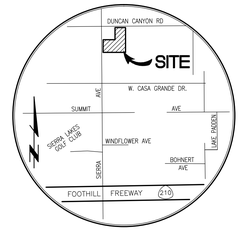
APPENDIX C

HYDRAULIC CALCULATIONS

APPENDIX D

HYDROLOGY MAPS





VICINITY MAP
N.T.S.

LEGEND	
	PROJECT BOUNDARY
	SUBAREA BOUNDARY
	FLOW PATH
4.10 AC.	SUBAREA AREA
100	NODE NUMBER
	FLOW DIRECTION

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

Last Update:8/13/21
O:\3900-3999\3994\3994HYD-EX.dwg

CITY OF SAN BERNARDINO
PUBLIC WORKS DEPARTMENT

HYDROLOGY EXISTING MAP

SIERRA GATEWAY

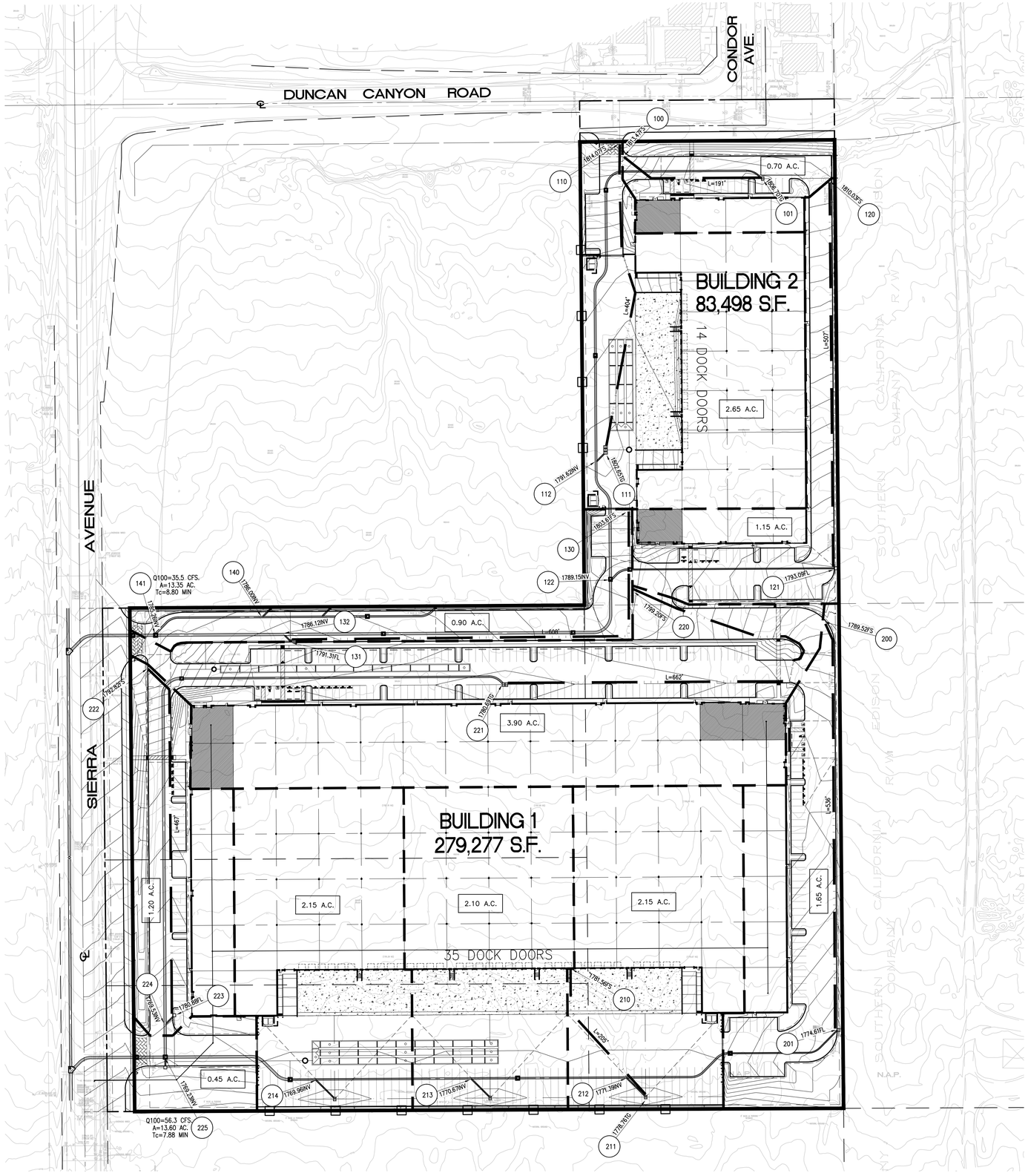
SE Sierra Ave + Duncan Canyon Rd

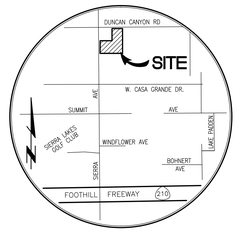
3994 /1 OF 1 SHEET

PREPARED FOR:
ACACIA REAL ESTATE GROUP, INC.
260 NEWPORT CENTER DRIVE
SUITE 100
NEWPORT BEACH, CA 92660
PHONE: (949) 640-9995

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

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____
Approved by _____ Date _____
Public Works Director R.C.E. 28129
Sheet 1 of 1 Sheets





VICINITY MAP
N.T.S.

LEGEND	
	PROJECT BOUNDARY
	SUBAREA BOUNDARY
	FLOW PATH
4.10 AC.	SUBAREA AREA
100	NODE NUMBER
	FLOW DIRECTION

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

Last Update: 9/7/21
O:_3900-3999\3994_3994HYD.dwg

CITY OF SAN BERNARDINO
PUBLIC WORKS DEPARTMENT

HYDROLOGY MAP PROPOSED CONDITION

SIERRA GATEWAY

SE Sierra Ave + Duncan Canyon Rd

3994 /1 OF 1 SHEET

PREPARED FOR:
ACACIA REAL ESTATE GROUP, INC.
260 NEWPORT CENTER DRIVE
SUITE 100
NEWPORT BEACH, CA 92660
PHONE: (949) 640-9995

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

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

Approved by _____ Date _____

Public Works Director _____ R.C.E. 28129

Sheet 1 of 1 Sheets