

PRELIMINARY
HYDROLOGY-HYDRAULICS
REPORT

FOR

HOTEL and GAS STATION
APN: 0252-161-43, 45
18497 Valley Boulevard
Bloomington, California

PREPARED BY:

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1/12/22

INTRODUCTION

STUDY LOCATION:

This study area consists of approximately 2.5 acres of vacant land to be developed for a Hotel Complex and Gas Station. It is located at 18497 Valley Boulevard in Bloomington in the unincorporated area of San Bernardino county. The project may be accessed via Cedar Avenue north from Interstate 10, thence west on Valley Boulevard to the project site.

PURPOSE OF THE REPORT:

The purpose of this report is to determine the existing and proposed runoff and to mitigate the increase in volume due to this development if there are any.

The project is a proposed Hotel Complex and Gas Station. It involves construction of Hotel building, Commercial Building, Gas Station Pump Canopy, parking spaces, landscaping, trash enclosure, and parking light standards.

The objective of this report is to determine the basic hydrologic response of the proposed development to both onsite and offsite storm runoff and to establish storm drain facility design criteria for this localized unit for review by the County of San Bernardino. The project is an in-fill in nature.

HYDROLOGY METHODOLOGY:

The rational method hydrology system used on the analysis of the subject site is the San Bernardino County Hydrology Manual dated August, 1986

SUMMARY:

The site is a 2.50-acre vacant property proposed for Hotel Complex and Gas Station. The proposed project involves construction of Hotel building, Commercial building, Gas Station canopy, asphalt paving, sidewalk, street lights, and landscaping. The current drainage pattern is from northwest to southeast and proposed drainage pattern will be the same.

To the north of the project is an improved Valley Boulevard, therefore, it will not have significant impact to the project.

To the south of the project is an existing Self Storage Complex with its own drainage system and separated by Block walls, therefore, it will not have significant impact to the project.

To the east of the project is an improved Linden Avenue, therefore, it will not have significant impact to the project.

The site is in Group "A" of the Hydrologic Soils Group Map.

The following is a runoff summary for 25-year and 100-year storm frequencies for Pre-development and Post Development condition of the project.

Pre-Development

Area I

25-Year = 4.66 cfs

100-Year = 6.00 cfs

Post Development

25-Year = 7.13 cfs

100-Year = 8.90 cfs

The above result shows that there is an increase of 2.47 cfs and 2.90 cfs for 25-year and 100-year frequencies respectively.

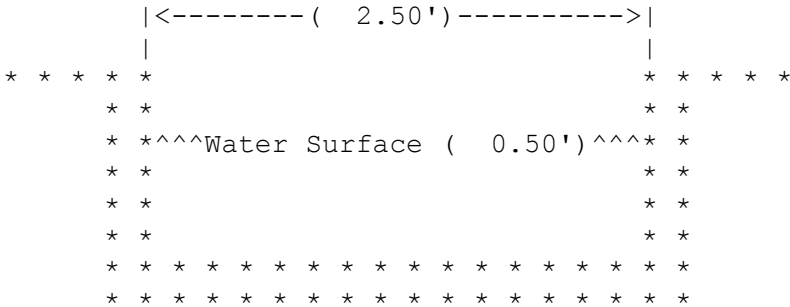
The increased of runoff from the predevelopment to post development in a 100-year frequency is 2.90 cfs. This increase could be easily contain in the proposed WQMP Underground infiltration basin (stormtech). The volume of the proposed WQMP underground infiltration basin is 9,396 c.f. which is more than the calculated volume of 1,550 c.f., the equivalent volume (2.90 cfs) that needs to be mitigated.

An under sidewalk drain of 2.5 feet wide has a capacity of 10.17 cfs which is more than enough to handle the calculated Q100-year runoff of 8.90 cfs.

CONCLUSION:

This Preliminary Hydrology and Hydraulics Report concludes that the proposed project is safe and feasible for Hydrology and Drainage standpoint.

PARKWAY DRAIN, CAPACITY CALCULATION



Rectangular Open Channel

Flowrate	10.172	CFS
Velocity	8.138	fps
Depth of Flow	0.500	feet
Critical Depth	0.801	feet
Total Depth	0.500	feet
Base Width	2.500	feet
Slope of Channel	2.000	%
X-Sectional Area	1.250	sq. ft.
Wetted Perimeter	3.500	feet
AR^(2/3)	0.629	
Mannings 'n'	0.013	

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)

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

- * 25 YEAR *
 - * PREDEVELOPMENT *
 - * VALLEY HOTEL *
- *****

FILE NAME: LINDEL.DAT
TIME/DATE OF STUDY: 2: 4 3/ 1/1999

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT (YEAR) = 25.00
 SPECIFIED MINIMUM PIPE SIZE (INCH) = 12.00
 SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
 USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
 10-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = .910
 100-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = 1.290
 COMPUTED RAINFALL INTENSITY DATA:
 STORM EVENT = 25.00 1-HOUR INTENSITY (INCH/HOUR) = 1.0405
 SLOPE OF INTENSITY DURATION CURVE = .6000

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

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

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NATURAL POOR COVER

TC = $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$
 INITIAL SUBAREA FLOW-LENGTH = 470.00
 UPSTREAM ELEVATION = 1109.10
 DOWNSTREAM ELEVATION = 1101.69
 ELEVATION DIFFERENCE = 7.41
 $TC = .525 * [(470.00 ** 3.00) / (7.41)] ** .20 = 14.108$
 25 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.480
 SOIL CLASSIFICATION IS "A"
 NATURAL POOR COVER "BARREN" SUBAREA LOSS RATE, Fm (INCH/HR) = .4100
 SUBAREA RUNOFF (CFS) = 4.66
 TOTAL AREA (ACRES) = 2.50 PEAK FLOW RATE (CFS) = 4.66

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END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 2.50
 EFFECTIVE AREA (ACRES) = 2.50
 PEAK FLOW RATE (CFS) = 4.66

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END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)

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

* 100 YEAR *
* PREDEVELOPMENT *
* VALLEY HOTEL *

FILE NAME: LINDE2.DAT
TIME/DATE OF STUDY: 2: 6 3/ 1/1999

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*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 = 1.00
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE = .6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.2900

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

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

=====

NATURAL POOR COVER

TC = $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$
INITIAL SUBAREA FLOW-LENGTH = 470.00
UPSTREAM ELEVATION = 1109.10
DOWNSTREAM ELEVATION = 1101.69
ELEVATION DIFFERENCE = 7.41
TC = $.525 * [(470.00 ** 3.00) / (7.41)] ** .20 = 14.108$
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.075
SOIL CLASSIFICATION IS "A"
NATURAL POOR COVER "BARREN" SUBAREA LOSS RATE, Fm (INCH/HR) = .4100
SUBAREA RUNOFF (CFS) = 6.00
TOTAL AREA (ACRES) = 2.50 PEAK FLOW RATE (CFS) = 6.00

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END OF STUDY SUMMARY:
TOTAL AREA (ACRES) = 2.50
EFFECTIVE AREA (ACRES) = 2.50
PEAK FLOW RATE (CFS) = 6.00

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END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)

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

- * 25 YEAR *
 - * POST DEVELOPMENT *
 - * VALLEY HOTEL *
- *****

FILE NAME: LINDE3.DAT
TIME/DATE OF STUDY: 2:10 3/ 1/1999

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT (YEAR) = 25.00
 SPECIFIED MINIMUM PIPE SIZE (INCH) = 12.00
 SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
 USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
 10-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = .910
 100-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = 1.290
 COMPUTED RAINFALL INTENSITY DATA:
 STORM EVENT = 25.00 1-HOUR INTENSITY (INCH/HOUR) = 1.0405
 SLOPE OF INTENSITY DURATION CURVE = .6000

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

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

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DEVELOPMENT IS COMMERCIAL

TC = $K * [(LENGTH^{.304} * 3.00) / (ELEVATION\ CHANGE)^{.20}]$.20
 INITIAL SUBAREA FLOW-LENGTH = 517.00
 UPSTREAM ELEVATION = 1110.23
 DOWNSTREAM ELEVATION = 1103.83
 ELEVATION DIFFERENCE = 6.40
 TC = $.304 * [(517.00^{.304} * 3.00) / (6.40)^{.20}]$.20 = 8.907
 25 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.268
 SOIL CLASSIFICATION IS "A"
 COMMERCIAL SUBAREA LOSS RATE, Fm (INCH/HR) = .0970
 SUBAREA RUNOFF (CFS) = 7.13
 TOTAL AREA (ACRES) = 2.50 PEAK FLOW RATE (CFS) = 7.13

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END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 2.50
 EFFECTIVE AREA (ACRES) = 2.50
 PEAK FLOW RATE (CFS) = 7.13

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END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)

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

- * 100 YEAR *
 - * POST DEVELOPMENT *
 - * VALLEY HOTEL *
- *****

FILE NAME: LINDE4.DAT
TIME/DATE OF STUDY: 2:12 3/ 1/1999

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*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 = 1.00
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE = .6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.2900

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

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

=====

DEVELOPMENT IS COMMERCIAL

TC = $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$
 INITIAL SUBAREA FLOW-LENGTH = 517.00
 UPSTREAM ELEVATION = 1110.23
 DOWNSTREAM ELEVATION = 1103.83
 ELEVATION DIFFERENCE = 6.40
 $TC = .304 * [(517.00 ** 3.00) / (6.40)] ** .20 = 8.907$
 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.052
 SOIL CLASSIFICATION IS "A"
 COMMERCIAL SUBAREA LOSS RATE, Fm (INCH/HR) = .0970
 SUBAREA RUNOFF (CFS) = 8.90
 TOTAL AREA (ACRES) = 2.50 PEAK FLOW RATE (CFS) = 8.90

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END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 2.50
 EFFECTIVE AREA (ACRES) = 2.50
 PEAK FLOW RATE (CFS) = 8.90

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END OF RATIONAL METHOD ANALYSIS

NOT TO SCALE

SAN BERNARDINO AVE.



VALLEY

CHERRY AVE

BLVD

CITRUS AVE

SIERRA AVE

LINDEN AVE

CEDAR AVE

SITE



SAN

BERNARDINO

CITRUS

FRWY

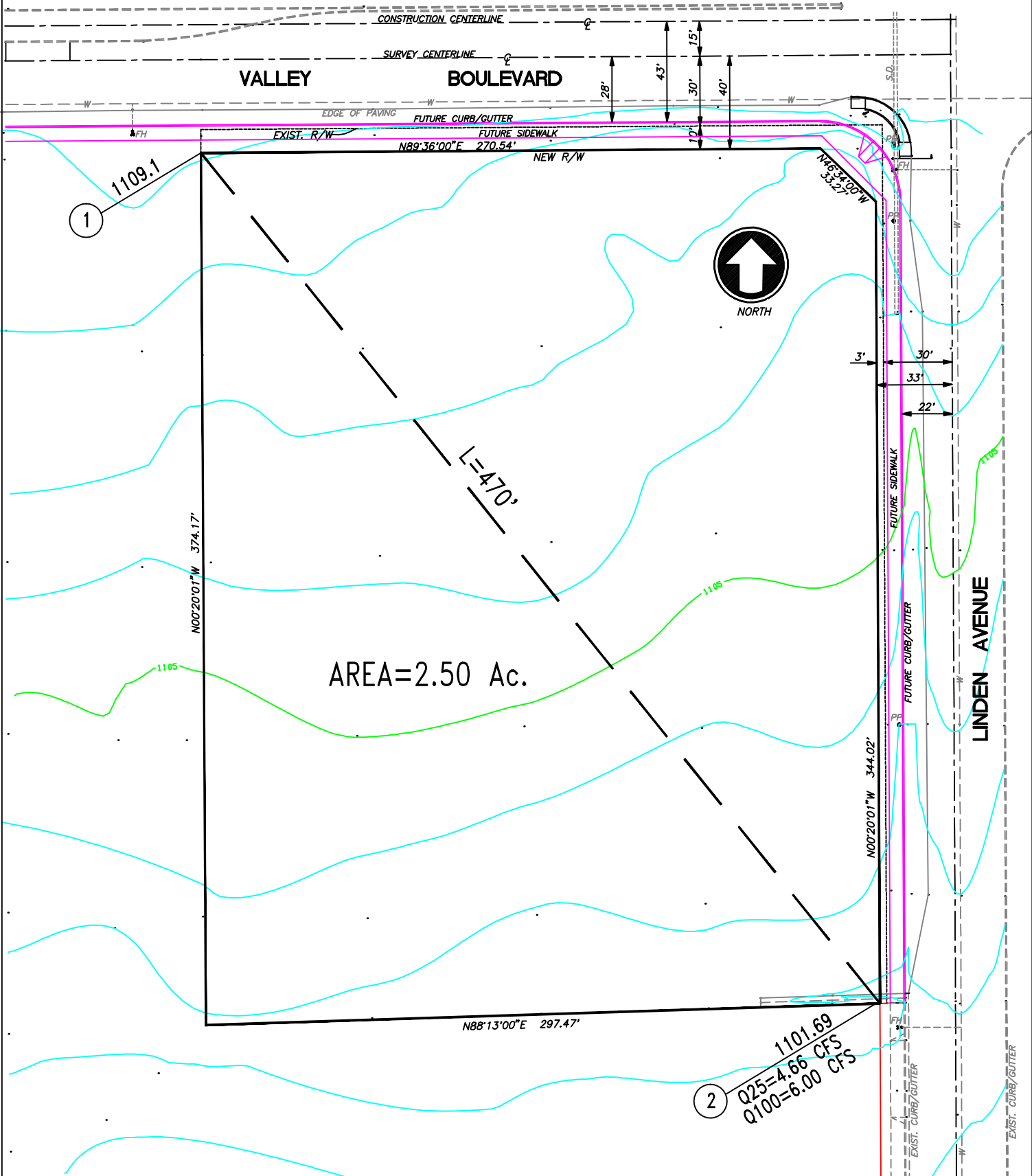


UP

RR AVE

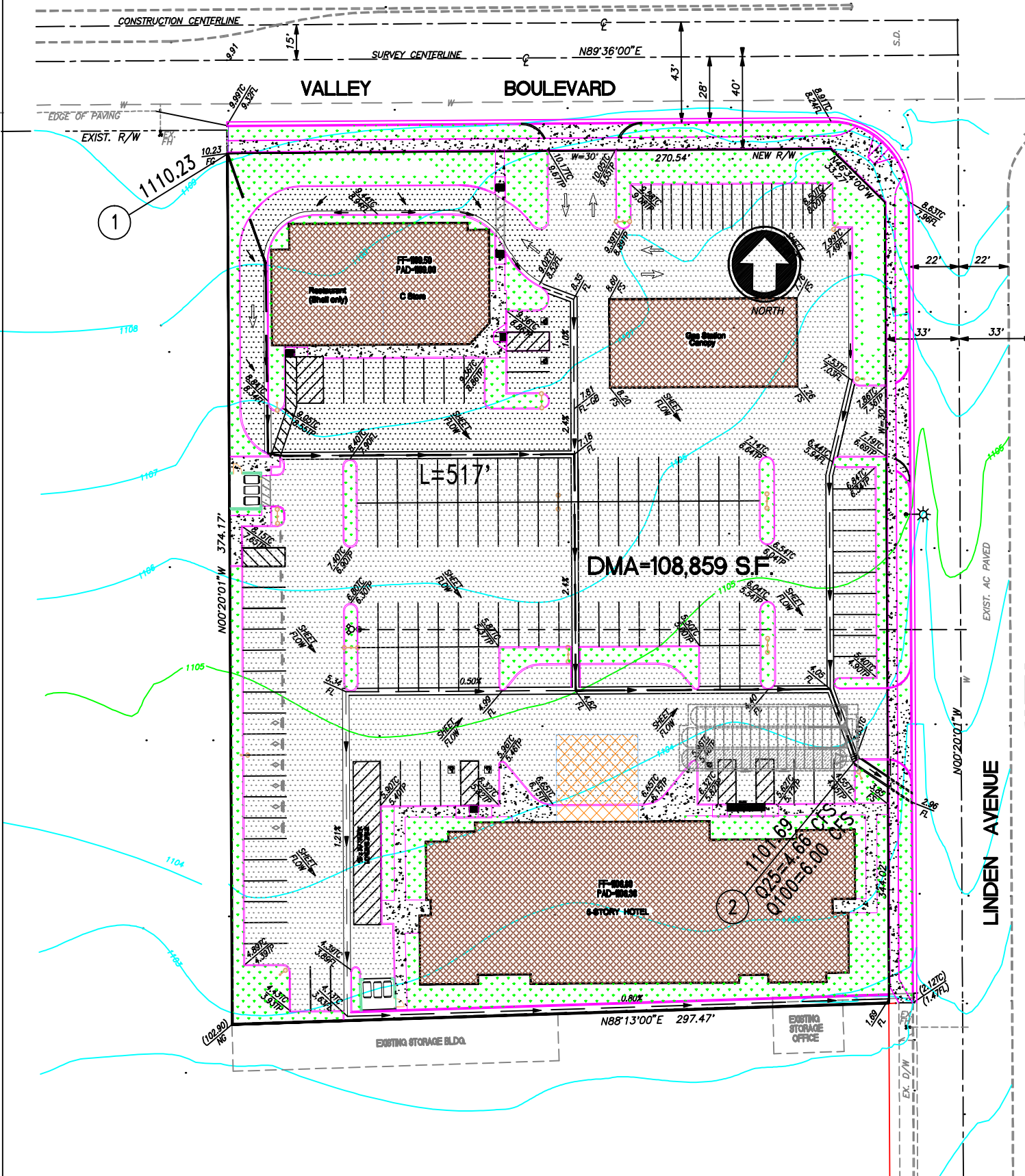
SLOVER

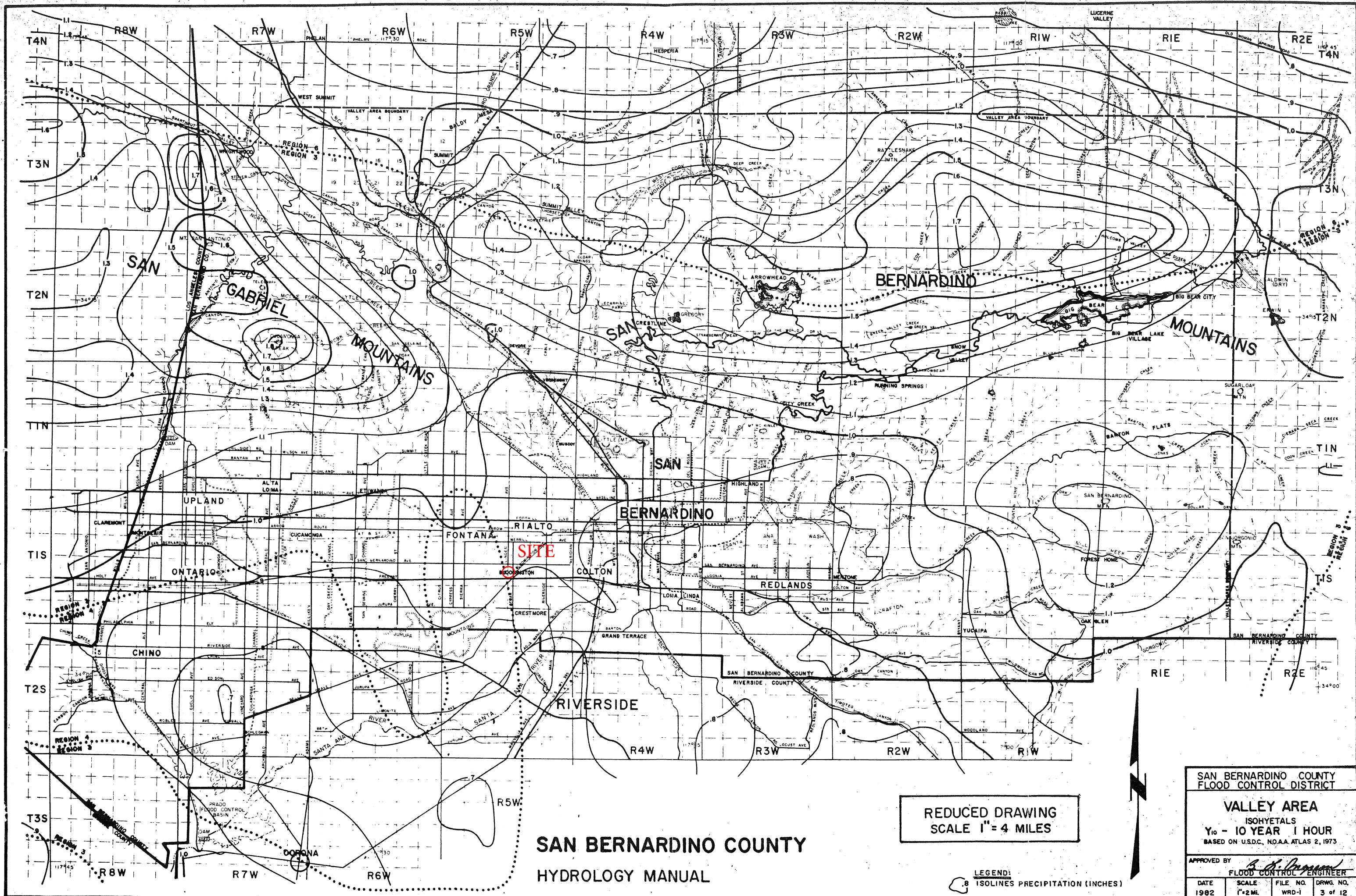
HYDROLOGY MAP PRE-DEVELOPMENT



HYDROLOGY MAP

POST DEVELOPMENT





**SAN BERNARDINO COUNTY
HYDROLOGY MANUAL**

REDUCED DRAWING
SCALE 1" = 4 MILES

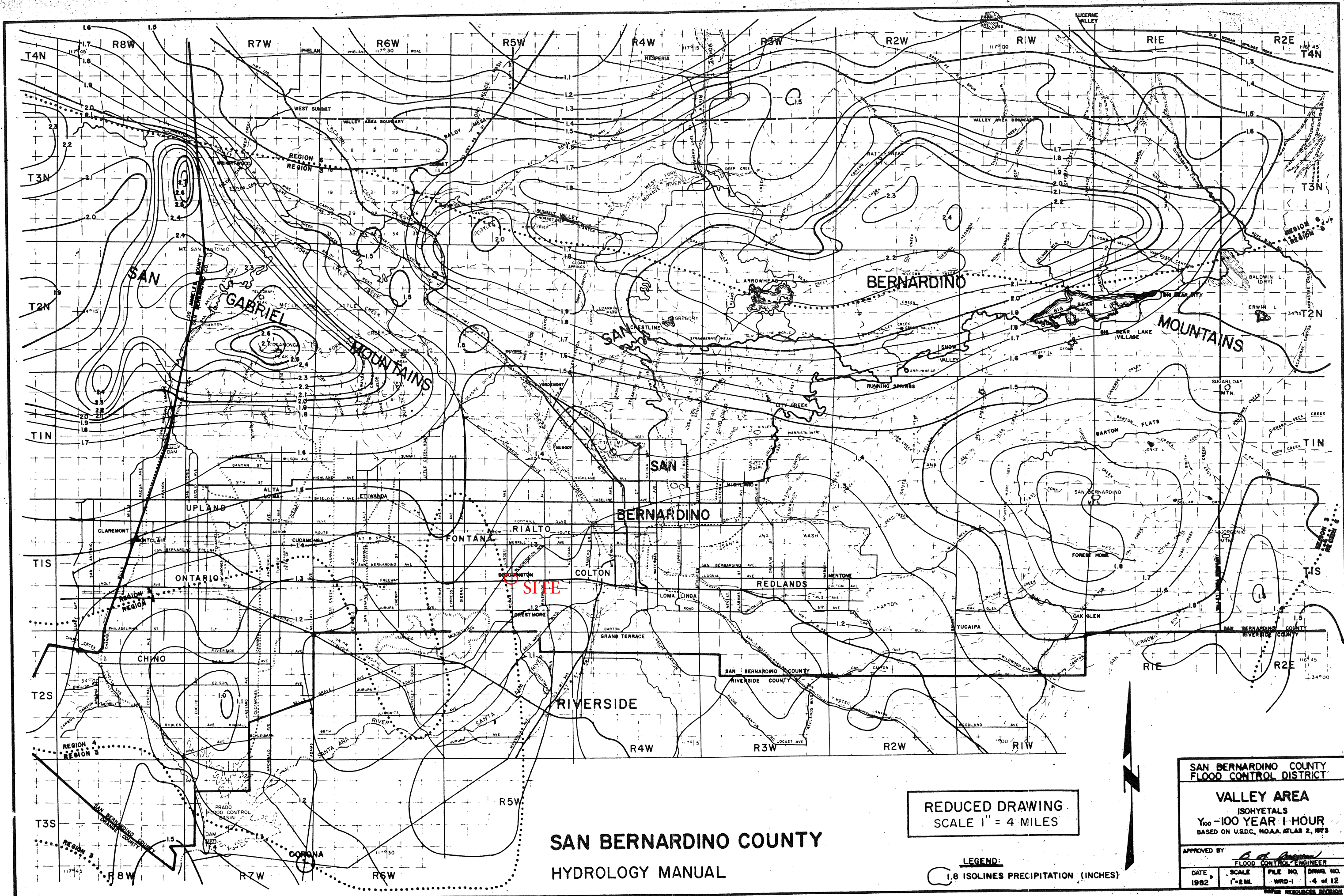
LEGEND:
8 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

VALLEY AREA
ISOHYETALS
Y₁₀ - 10 YEAR 1 HOUR
BASED ON U.S.D.C. NO. AA ATLAS 2, 1973

APPROVED BY
R. H. Brown
FLOOD CONTROL ENGINEER

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



**SAN BERNARDINO COUNTY
HYDROLOGY MANUAL**

REDUCED DRAWING
SCALE 1" = 4 MILES

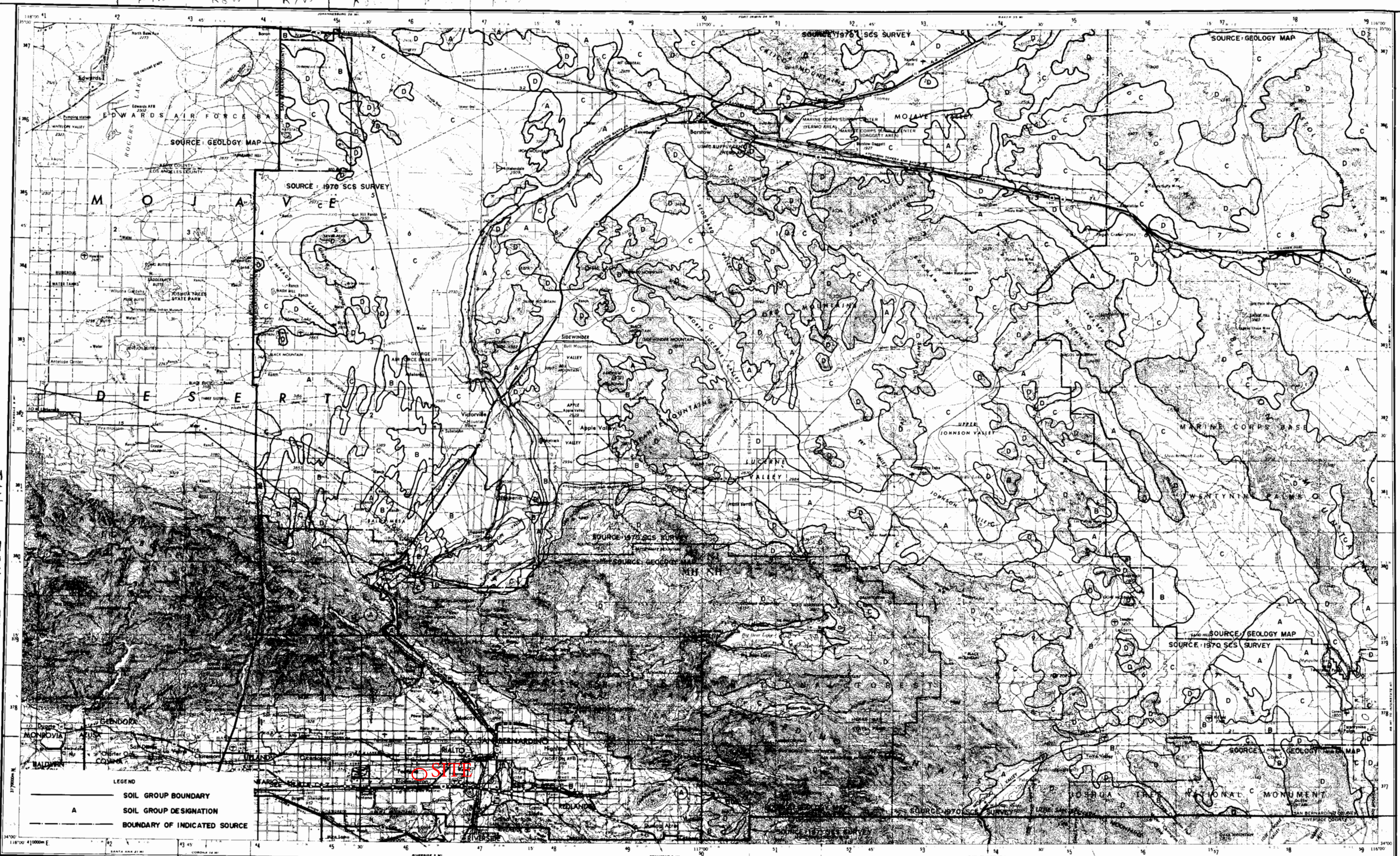
LEGEND:
1.8 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

VALLEY AREA
ISOHYETALS
Y₁₀₀ - 100 YEAR 1-HOUR
BASED ON U.S.D.C. NOAA ATLAS 2, 1973

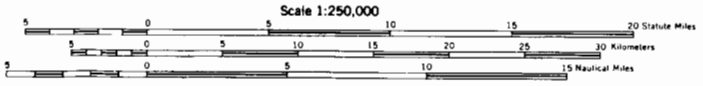
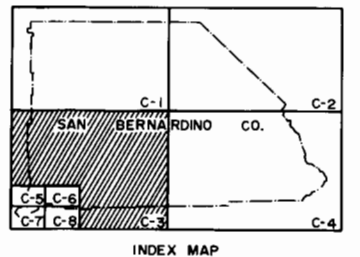
APPROVED BY *B. J. [Signature]*
FLOOD CONTROL ENGINEER

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



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

SAN BERNARDINO COUNTY
 HYDROLOGY MANUAL



Scale 1:250,000
 CONTOUR INTERVAL 200 FEET
 WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS
 TRANSVERSE MERCATOR PROJECTION
 BLACK NUMBERED LINES INDICATE THE 4200 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 11
 1983 MAGNETIC DECLINATION FROM TRUE NORTH VARIES FROM 1.9M (200 MILES) EASTERLY FOR THE CENTER OF THE WEST EDGE TO 1.9° (210 MILES) WESTERLY FOR THE CENTER OF THE EAST EDGE

BASE MAP REPRODUCED FROM U.S.G.S. "SAN BERNARDINO" TOPOGRAPHIC MAP
SCALE REDUCED BY 1/2



HYDROLOGIC SOILS GROUP MAP
 FOR
 SOUTHCENTRAL AREA