PRELIMINARY HYDROLOGY REPORT

LOMA LINDA UNIVERSITY MEDICAL CENTER

CAMPUS TRANSFORMATION PROJECT

LOMA LINDA, CALIFORNIA

May 13, 2013
July 22, 3013 (Final)

Prepared For:

Loma Linda University Adventist Health Sciences Center
P.O. Box 2000
Loma Linda, California 92354

Prepared By:

KETTLER LEWECK
ENGINEERING
151 W. Market Street
San Diego, California 92101
(619) 269-3449

REGISTERED PROFESSIONAL ENGINEER
STEVEN C. KETTLER
No. C48358
Exp. 6-30-2014
CIVIL
STATE OF CALIFORNIA

Steven C. Kettler RCE 48,358
Registration Expires 6-30-2014

TABLE OF CONTENTS

SECTION		PAGE
I.	INTRODUCTION	1
II	PROJECT LOCATION	1
III.	PROJECT DESCRIPTION	1
IV.	PRE-DEVELOPED DRAINAGE CONDITION	6
V.	DEVELOPED DRAINAGE CONDITION	6
VI.	HYDROLOGY METHODOLOGY	7
VII.	STORMWATER QUALITY (CONSTRUCTION AND POST CONSTRUCTION)	12
VIII.	HYDROLOGIC CONDITIONS OF CONCERN	12
IX.	DISCUSSION AND CONCLUSION	13

LIST OF FIGURES

FIGURE 1	SITE VICINITY MAP	5
FIGURE 2	DEVELOPED CONDITION SITE PLAN	9

LIST OF TABLES

TABLE 1	PRE-DEVELOPED AND DEVELOPED HYDROLOGY SUMMARY	10
TABLE 2	PRE-DEVELOPED AND DEVELOPED FLOW SUMMARY	11

EXHIBITS

EXHIBIT A	PRE-DEVELOPED CONDITION DRAINAGE BASIN MAP
EXHIBIT B	DEVELOPED CONDITION DRAINAGE BASIN MAP
EXHIBIT C	EXISTING PUBLIC STORM DRAIN FACILITIES
EXHIBIT D	EXISTING PRIVATE STROM DRAIN FACILITIES

APPENDICES

APPENDIX A	PRELIMINARY HYDROLOGY CALCULATIONS
APPENDIX B	HYDROLOGY REFERENCE MATERIAL
APPENDIX C	NATIONAL RESOURCE CONSERVATION SERVICE WEB SOIL SURVEY

I. INTRODUCTION

The purpose of this Preliminary Hydrology Report is to document the required City of Loma Linda design procedures and requirements, evaluate the overall pre-developed and developed drainage conditions, and document impacts, if any, to the existing public drainage facilities on or adjacent to the Loma Linda University Adventist Health Sciences Campus (LLUAHSC) in support of the Loma Linda University Medical Center Campus Transformation project and associated Environmental Impact Report (EIR). It is understood that the City of Loma Linda requires the County of San Bernardino hydrology standards and requirements by followed when preparing hydrology studies. This study will briefly address the water quality and hydrologic conditions of concern requirements. Finally, this study will not include the detailed hydraulic calculations of the proposed storm drain facilities. These calculations will be included in future storm drain studies as part of the construction document and associated construction permits. The intent if for these future studies to follow the framework contained in this preliminary hydrology report.

II. PROJECT LOCATION

The Loma Linda University Medical Center Project is located in the City of Loma Linda, California. The limits of the project are generally Campus Street to the west, Barton Road to the south, Anderson Street, Stewart Street and Orange Grove Street to the east, and Academy Drive to the north. Refer to Figure 1, Site Vicinity Map.

III. PROJECT DESCRIPTION

The proposed Campus Transformation Project represents a multi-phased upgrade of LLUMC's facilities. The Proposed Project includes a Master Plan that provides for modernization of existing facilities including a new central plant with utility upgrades, a new dedicated electrical substation, construction of a new research building, an addition to the dental school, a new parking structure for patients and visitors, and a replacement of the main hospital structure in response to California's SB 1953 Hospital Seismic Safety Act mandate.

Proposed facilities and improvements associated with the Master Plan include: 1) a six-story, approximately 250,000 square-foot, 760-space patient and visitor parking structure; 2) a twelve-story, approximately 732,000 square-foot hospital with 464 beds to replace seismically-noncompliant existing hospital tower, and 80 parking spaces; 3) an approximate 50,000 square-foot central utility plant; 4) an approximate 14,000 square-foot Southern California Edison (SCE) off-site electrical substation; 5) a two-story, approximately 9,000 square-foot addition to the existing dental school; 6) a four-story approximately 90,000 square-foot research building; and 7) tenant improvements and adaptive reuse of the vacated portions of the existing hospital.

The proposed new hospital would consist of acute care hospital space, some of which will remain as shell space for future build out. The facility will have shared and support services located in the first three levels of a shared podium, with two bed towers above serving separate

pediatric and adult populations. The new hospital would provide for the relocation and decommissioning of the existing acute care services in seismically non-compliant structures. The new building would include approximately 464 patient beds, new Pediatric and Adult Emergency Departments, Perioperative Suites, Imaging Departments, and other support service departments. The total licensed capacity of the Medical Center would decrease from the current license of 719 beds to a total of approximately 650 beds. Upon completion of the new building and surrounding site, all inpatient functions will transfer to the new adjacent location.

The new parking structure would be located on the northwest corner of Barton Road and Campus Street. The 1.9-acre site is currently developed with 83 surface parking spaces. Improvements would include a new access point on Barton Road and removal of the 83 surface parking spaces. The new hospital would be located on the Project site off of Anderson Street between Barton Road and Prospect Avenue. The area for the new hospital is currently developed with 550 surface parking spaces. Improvements at the site would include two new access points on Barton Road and two new road alignments on Anderson Street at Prospect Avenue and Starr Street. The new central utility plant would be located on the Project site off of Anderson Street between Stewart Street and the Union Pacific Railroad. The area proposed for the central utility plant is currently developed with 40 surface parking spaces and a 10,000 square-foot Housekeeping Building (formerly the Radiation Safety Building), which would be demolished to allow for construction of the central utility plant. A new SCE electrical substation would be needed to serve the Proposed Project and would be located on a 1.3-acre City Park site located on Anderson Street just north of the UPRR.

The 8,900-square foot dental school addition would occur on the north side of the existing School of Dentistry (Prince Hall) located at 11029 University Avenue. Approximately 3,000 square feet of the existing building will need to be remodeled to accommodate the addition. The addition will be designed to complement the existing architecture and fit appropriately up to the cul-de-sac.

A new 90,000-square-foot research facility is proposed on or near the site of Risley Hall, an existing laboratory and classroom building. The new facility will provide expanded laboratory and research office space as well as space for new high-tech research modalities to allow for increased interdisciplinary research. The facility is planned to be a three to four-story structural steel building approximately 50 feet in height.

The Proposed Project would occur within two phases over an approximate 10-year period. A description of Phases 1 and 2 is provided herein.

PHASE 1: New Parking Structure, Make Ready, Hospital Tower, and SCE Substation

New Patient and Visitor Parking Structure: In order to maintain operations during the construction of the new hospital, a six-level, 720-space parking structure would be constructed east of Campus Street adjacent to the existing hospital's South Tower to replace the existing surface lots on the site of the new hospital. Construction of the parking structure would require the demolition of approximately 83 surface parking stalls currently dedicated to hospital

administration. Modifications to site access, circulation and various landscaping improvements are proposed. A new access point from Barton Road is also proposed for the parking structure.

On-site make ready work: Site clearing and excavation for the new hospital footprint would include temporary relocation and rerouting of various underground utilities. As these utilities serve the existing acute care buildings, a building permit from Office of Statewide Health Planning and Development (OSHPD) would be required. West of Anderson Street and north of Barton Road the new hospital footprint would result in the demolition of approximately 550 surface parking spaces and require a new site access point to align with Prospect Avenue. Modifications to site access, circulation and various landscaping improvements are also proposed.

New Hospital: Proposed construction includes a 732,000 square-foot acute care hospital, with portions to remain as shell space for future build out. The hospital would have support services located in the first three levels of a shared podium, with bed towers above serving separate pediatric and adult populations. The new hospital would provide for the relocation and decommissioning of the existing acute care services that are currently in existing buildings that SB1953 will deem as seismically non-compliant structures starting in the year 2020. The new building will include approximately 464 private patient bedrooms, new pediatric and adult emergency departments, perioperative suites, imaging departments, and other support services. The total licensed capacity of the facility will decrease from the current license of 719 beds to 650 beds.

New Electrical Substation - To support the Proposed Project a new connection to the power grid would be required with Southern California Edison (SCE). The hospital would require a redundant connection from the Cardiff and San Bernardino services areas (both support 66kV systems). Easements would be required on several properties to allow for the connection. Upon completion of the new substation, the existing substation, located adjacent to the campus's existing Central Utilities Plant (CUP), would be decommissioned. LLUM is currently evaluating service options with SCE under a Method of Service (MOS) study; all options would occur at the existing 1.3-acre City Park located north of the Union Pacific Railroad.

PHASE 2: New Central Utility Plant, Existing Hospital Adaptive Re-use, New Research building, and Dental School addition

Central Utility Plant: The existing central utility plant and co-generation plant/chiller building, located west of Anderson Street and south of University Avenue, serves the campus and the existing hospital with efficient and centralized power and other utilities. A new 34,000-square foot plant is proposed in order to: respond to SB 1953 mandates, modernize obsolete and antiquated utility services, avoid disruption to ongoing patient care activities, and allow for increased future capacity. Construction of the new CUP would occur near the thermal energy storage tank, located east of Anderson Street and just south of the Union Pacific Railroad tracks. Construction activities would require the removal of the existing 10,000-square foot Housekeeping Building (formerly the Radiation Safety Building) and 40 surface parking spaces. The new single-story central utilities plant and co-generation/chiller building would house six

(6) chillers, four (4) co-generation gas turbines, and a mezzanine. A new 4,000-square foot cooling yard is proposed for the containment of eight (8) cooling towers. Upon completion of the new plant, the existing plant would be decommissioned. Due to cost constraints, the existing plant may only be renovated with expanded services provided at the new hospital.

Re-use of the existing Hospital - Towers A & C: The decommissioning and relocation of acute services would allow for the adaptive reuse of approximately 400,000-square feet within the existing hospital's A and C towers. The new uses are anticipated to be split between existing support spaces, continuing outpatient services and possible future educational services. Construction activities are anticipated to include demolition required for seismic separation. Modifications to site access, circulation and various landscaping improvements are also proposed.

Research Building: In an effort to build on Loma Linda University's notable history of pioneering medical research, a new research facility is proposed on campus that would transform the University's ability to provide interdisciplinary and translational research in a single facility. This transformational research is vital to this vision and will ensure a continuation of groundbreaking studies that will save lives and improve the quality of life and provision of healthcare.

The proposed facility would be located on or near the site of Risley Hall, an existing laboratory and classroom building. The new facility would provide expanded laboratory and research office space as well as space for new high-tech research modalities to allow for increased interdisciplinary research.

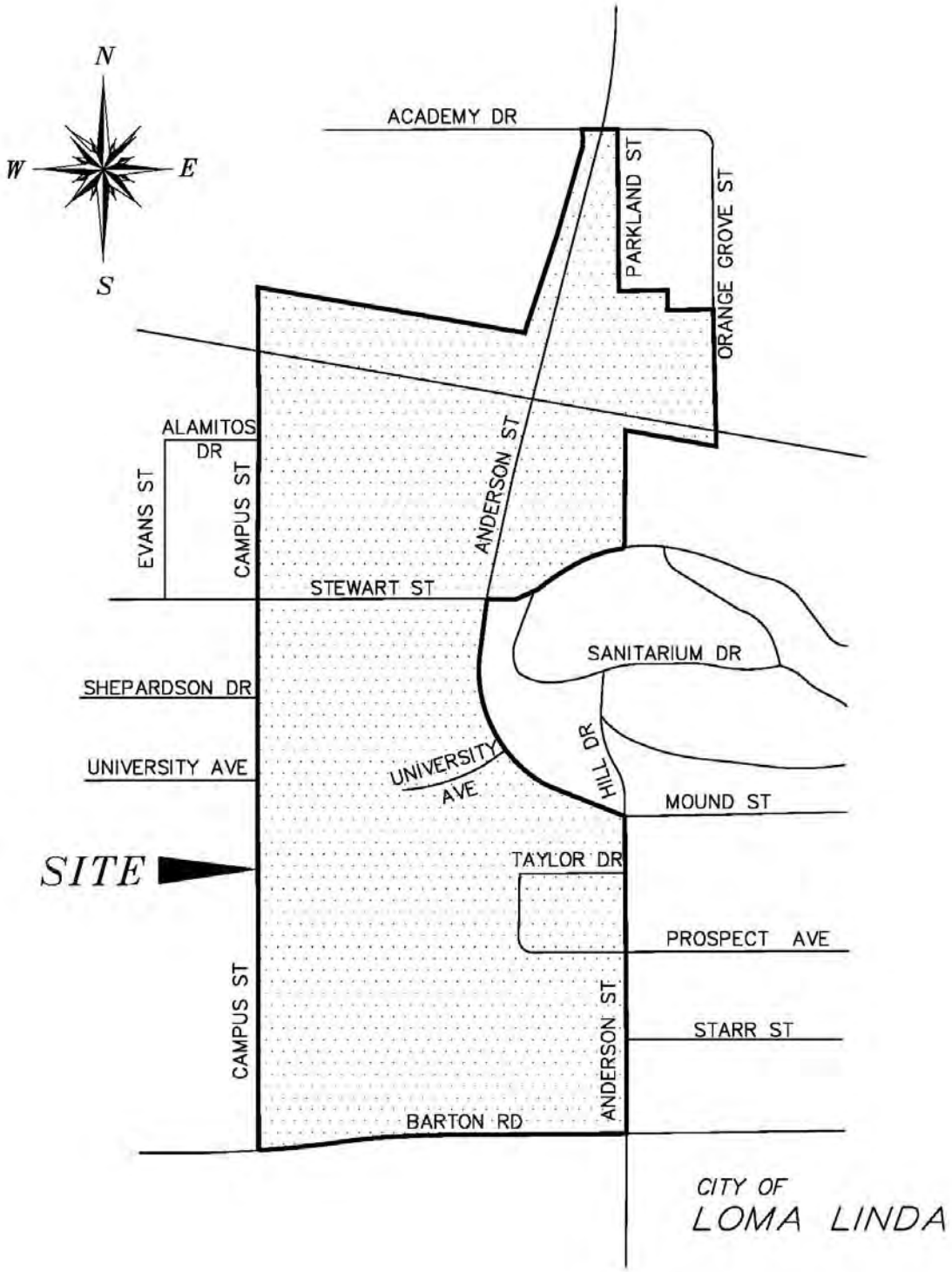
The proposed 3-4 story (approximately 50 feet in height) 90,000 square-foot facility would complement the architecture of existing buildings located within the northern campus area. Structures within this area include facilities built between the 1930's and the 1980's. Utility services would be provided from either the proposed or renovated CUP through the existing utility tunnel.

Dental School Addition: The proposed addition would be constructed on the north side of the School of Dentistry (Prince Hall). The proposed expansion would create an additional 4,450 square feet on each of two floors for a total added floor area of 8,900 square feet.

The first floor of the addition would provide additional reception, administration and consultant space and an expanded and reconfigured waiting area for the Surgery Center for Dentistry. The second floor would add a resident's lounge, support staff space and offices as well as expanded clinical dentistry space for several specialties.

Approximately 3,000 square feet of the existing building would be remodeled to accommodate the addition. The structural system for the addition would be structural steel with a concrete slab on metal deck. The addition would be designed to complement the existing architecture and fit appropriately up to the cul-de-sac. Like the existing structure, the roof would be flat. Utility services would be provided from the Central Utility Plant through the tunnel.

FIGURE 1



SITE VICINITY MAP

IV. PRE-DEVELOPED ONSITE DRAINAGE CONDITION

The project area of the campus consists of existing buildings, public streets (i.e. Campus Street, Anderson Street, Taylor Street, Taylor Court, Prospect Avenue, University Avenue, and Stewart Street), private drives, and surface parking areas, hardscape areas, and landscape areas.

Although there are landscape areas on the campus, the majority of the proposed projects areas are comprised of impervious surfaces (i.e. existing buildings, asphalt parking areas and/or hardscape improvements). Runoff from the initial study area will be conveyed to both public and private on-site storm drain facilities. The public drainage facilities, as documented on the City's website, include two separate systems with the size/diameter of the main storm drain pipes ranging from 36-inch to 48-inch, one located in Anderson Street heading generally north towards the existing Union Pacific Railroad facility where it traverses west and the second located in Barton Street where it traverses north in Campus Street. The two systems join on the south side of the existing railroad facilities at the north end of Campus Street in the existing cul-de-sac before crossing under the existing railroad facility and discharging into an existing County drainage channel on the north side of the railroad facility. This existing drainage channel drains north to San Timoteo Creek. Refer to Exhibit C for the Existing Public Storm Drain Facilities. In addition to the public storm drain facilities, there exist private storm drain facilities on the campus. The size/diameter of the private storm drain pipes include 6-inch, 8-inch, 10-inch, 12-inch, 18-inch, and 24-inch. There may also be smaller diameter landscape drains and pipes. Refer to Exhibit D for the Existing Private Storm Drain Facilities focused primarily in the southern portion of the campus.

Storm water from the proposed project areas is collected in onsite private and public storm drain systems. Storm water is conveyed in the underground systems north and northwest toward the point of confluence or study point identified as SP1. SP1 is located at the confluence of two existing drainage channels just south of Academy Street.

From the project Study Point (SP1) runoff from the project, along with runoff from other portions of the larger drainage basin, flows north in an unlined channel where it discharges into the San Timoteo Creek. The San Timoteo Creek is a concrete lined channel that flows from the southeast to the northwest. This creek crosses under Interstate 10 and flows northwest and discharges into the Santa Ana River. The Santa Ana River flows west/southwest towards the Prado Flood Control Basin.

Refer to Exhibit A for the Pre-Developed Condition Drainage Basin Map.

V. DEVELOPED ONSITE DRAINAGE CONDITION

The proposed project consists of a number of new building projects developed over a period of time. The proposed improvements within the project area include a: new patient and visitor parking structure, on-site make ready work including the easterly entry drive realignment and

handicap parking lot and the demolition of existing parking in the area of the new hospital tower, new hospital tower (including the decommissioning of a portion of the existing hospital, the emergency department Barton Road access, underground parking structure along Anderson adjacent to the new hospital,), new Southern California Edison electrical substation, new or renovated central utility plant, new research building, and dental school addition. In addition to these projects, the proposed work may also include the demolition and/or revisions of miscellaneous onsite public and private roadway improvements within Taylor Street, Taylor Court, and Prospect Avenue (i.e. driveways, street lights, water and sewer services, etc.) and possible offsite road improvements, as may be included in the project's traffic study. The campus improvements also include the proton re-feed, utility make ready, demolition/removal of a portion of the existing housing/structures located adjacent to Prospect Avenue, west of Anderson Street, and trailer relocation projects. Finally, the proposed projects may include the demolition of the existing Housekeeping Building (formerly the Radiation Safety Building) located north of Stewart Street and east of Anderson Street. This demolition is part of one of two alternatives identified for the Central Utility Plant project.

The proposed projects will be designed to include pervious surfaces greater than or equal to the existing condition to maintain consistency with the pre-developed condition. Runoff from the developed condition will also be conveyed to both public and private on-site storm drain facilities consistent with the existing condition. The proposed projects may include changes to the existing storm drain facilities (i.e. existing private storm drains in conflict with the proposed buildings will be relocated or additional private storm drain as required to support the proposed buildings will be incorporated into the project design). However, the public drainage facilities, as documented on the City's website, described above, and shown on Exhibit C are not anticipated to be changed significantly.

Storm water will be collected in the onsite private and public storm drain systems. Storm water is conveyed in the underground systems north and northwest toward the point of confluence or study point identified as SP1. SP1 is located at the confluence of two existing drainage channels just south of Academy Street.

Refer to Exhibit B for the Developed Condition Drainage Basin Map.

VI. HYDROLOGY METHODOLOGY

All drainage basins/sub-basins analyzed are less than one square mile. Therefore, the Rational Method (Q=CIA) was utilized to estimate peak discharges, volumes, velocities, and flow durations for the 10-year and 100-year storm frequencies. In general, the Rational Method Hydrology calculations followed the County of San Bernardino's Hydrology Manual.

The following criteria were used in calculating the pre-developed and developed runoff coefficient (C-value), time of concentrations (T_c), Intensity (I), and peak flow rates (Q). Refer to Appendix A for the hydrology calculations.

- Pre-developed and developed Initial Sub-Area Time of Concentration's were computed using the County of San Bernardino's Time of Concentration Nomograph, Figure D-1. Travel times in closed and open drainage systems were then calculated using Manning's Equation and an overall Time of Concentration were used to calculate intensity values.

- Intensity values were estimated using the County of San Bernardino's Intensity-Duration Curves, Figure D-3.

- The soil classifications were based off of the Nation Resource Conservation Service (NRCS) Web Soil Survey. All soil types within the Project Limits are identified as Hydrologic Group B. A copy of the NRCS Web Soil Survey is included in Appendix C.

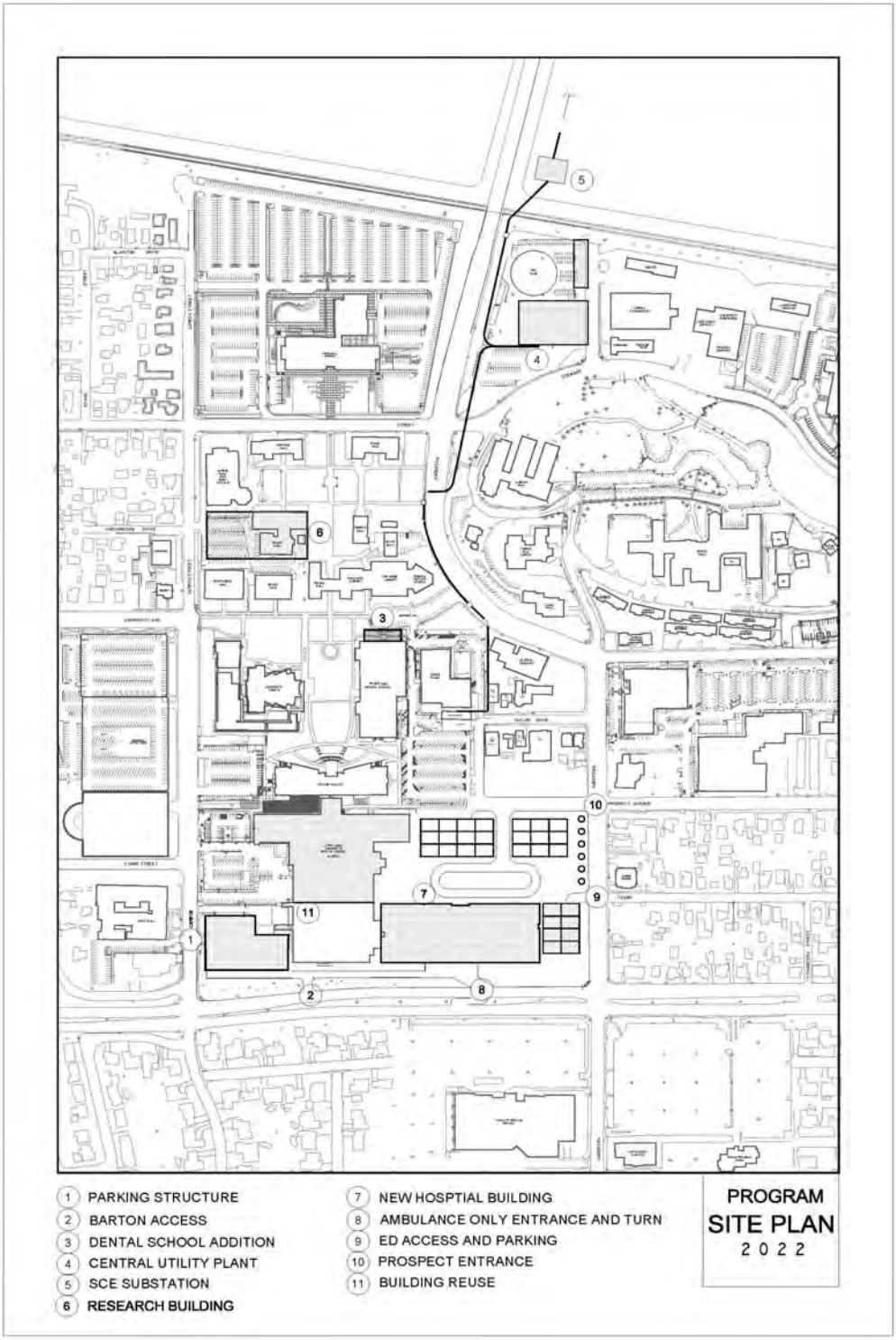
- A detailed analysis of impervious and pervious areas within the project limits was not completed at this time. Instead, runoff coefficients were selected based on NRCS Land Use Elements. The San Bernardino County Hydrology Manual does not include information regarding Land Use Elements and correlating runoff coefficients. Therefore, the San Diego County Hydrology Manual Table 3-1, *Runoff Coefficients for Urban Areas* was used. This table provides Runoff Coefficients for various soil types and Land Use Elements. Similar to Section D.5 of the San Bernardino County Hydrology Manual, the Land Use Elements and resulting Runoff Coefficients in Table 3-1 are based on ratios of impervious area to total area. A copy of Table 3-1 is included in Appendix B.

- Runoff volumes were estimated suing the County of San Bernardino's Hydrology Manual, Section J.

The Rational Method (Q=CIA) was used to determine the preliminary pre-developed and developed storm flows for the project. Preliminary flows were estimated using times of concentrations and runoff coefficients for both the existing and proposed conditions as summarized in Appendix A. The project topography, reference/as-built drawings, and site visits were used to establish the limits of the existing condition drainage basins. A preliminary grading and drainage plan for the developed condition was not available to support this study. However, the preliminary site plan (Figure 2) was used along with the existing condition topography to develop drainage basins. The intent is to design the proposed buildings and associated site improvements consistent with the existing condition in terms of limits and characteristics of the drainage basin(s). Gutter flow capacity for the adjacent public streets (i.e. Barton Street, Campus Street, and Anderson Street) wasn't confirmed as the amount of runoff directed into these facilities will be maintained between the pre-developed and developed condition. The design approach described above will be confirmed as part of the future permitting process which will include formal, detailed drainage studies for the project(s).

Refer to Exhibits A and B for the pre-developed and developed condition drainage basins and storm drain facilities, Tables 1 and 2 for the pre-developed and developed condition flow estimates.

FIGURE 2



DEVELOPED CONDITION SITE PLAN

TABLE 1

HYDROLOGY SUMMARY

EXISTING CONDITIONS				
BASIN NUMBER	**AREA (acres)**	**C Value**	**Q_{10} (CFS)**	**Q_{100} (CFS)**
AA	67.70	0.84	76.77	122.27
AB	4.70	0.84	5.92	9.08
AC	2.20	0.32	1.23	1.97
TOTAL	***74.60***	***0.82***	***83.93***	***133.32***

PROPOSED CONDITIONS				
BASIN NUMBER	**AREA (acres)**	**C Value**	**Q_{10} (CFS)**	**Q_{100} (CFS)**
BA	67.70	0.84	76.77	122.27
BB	4.70	0.84	5.92	9.08
BC	2.20	0.32	1.23	1.97
TOTAL	***74.60***	***0.82***	***83.93***	***133.32***

TABLE 2

EXISTING AND PROPOSED FLOW SUMMARY				
DRAINAGE BASIN	**10-YEAR PEAK FLOW (CFS)**	**10-YEAR TOTAL VOLUME[a] (AC-in)**	**100-YEAR PEAK FLOW (CFS)**	**100-YEAR TOTAL VOLUME[a] (AC-in)**
Existing Condition				
AA	76.77	32.189	122.27	51.264
AB	5.92	2.085	9.08	3.198
AC	1.23	0.329	1.97	0.526
TOTAL	**83.93**	**34.60**	**133.32**	**54.99**
Proposed Condition				
BA	76.77	32.189	122.27	51.264
BB	5.92	2.085	9.08	3.198
BC	1.23	0.329	1.97	0.526
TOTAL	**83.93**	**34.60**	**133.32**	**54.99**
DIFFERENCE	**0.00**	**0.00**	**0.00**	**0.00**

VII. STORMWATER QUALITY (CONSTRUCTION AND POST CONSTRUCTION)

The project documentation for the Campus Transformation Project and associated EIR includes a separate Preliminary Water Quality Management Plan (WQMP) which addresses the development of the project to minimize the detrimental effects of urbanization on the beneficial uses of the receiving waters, including effects caused by increased pollutant loads and changes in hydrology. The following is a brief summary of information taken from this separate plan.

Overview

The project is a Category Project.

Project Activities Description

The proposed construction activities include demolition of existing buildings, pavement, sidewalk, landscape and irrigation, utilities, and curb & gutters. In addition, the construction activities will include constructing proposed buildings/structures, concrete sidewalk, concrete curb & gutters, landscape & irrigation, private storm drain facilities, private water, public and private sewer facilities, dry utilities (i.e. gas, electric, etc.), and parking areas.

Based on the "Category" designation, the project will be required to implement Site Design BMPs, Source Control BMP's, and Treatment Control BMPs. These water quality elements/BMPs will treat the runoff to the maximum extent practicable for this project.

In addition to the Water Quality Management Plan, the project will be required to comply with the Statewide General permit for Storm Water Discharges from Construction Activity (Order No. 2009-0009-DWQ: NPDES No. CAS00000002. Storm water BMPs for construction activities will also be required for the project.

Refer to the separate Preliminary Water Quality Management Plan (WQMP) for additional information.

VIII. HYDROLOGIC CONDITIONS OF CONCERN

New developments and redevelopment projects typically result in an increased proportion of impervious surfaces, a reduction in the proportion of porous or pervious surface at the project site, and changes to the drainage network. Common changes to the hydrologic regime resulting from development include increased runoff volume and velocity; reduced infiltration; increased flow frequency, flow duration, and peak flow; and faster time to reach peak flow. These changes could negatively affect the hydrologic regime and be considered a Hydrologic Condition of Concern.

The project design approach is to design the campus projects/improvements to minimize changes in the hydrology to ensure that the post construction runoff rates and velocities do not adversely impact downstream erosion or stream habitat. The intent of the proposed

project design is to minimize impervious surfaces and maximize the proportion of pervious surfaces, in order to allow as much infiltration as possible and consistent with the pre-development condition. The goal of the project site design techniques is to achieve post development runoff rates, volumes, flow velocities, and flow durations that mimic those of the pre-development condition. However, if the project design results in an increase in runoff rates, volumes, flow velocities, and flow durations, then the project design shall include mitigation consistent with the requirements of the San Bernardino County and City of Loma Linda.

IX. DISCUSSION AND CONCLUSIONS

Hydrology

This Preliminary Hydrology Report has been prepared in support of the Loma Linda University Medical Center Campus Transformation project and associated Environmental Impact Report (EIR). The proposed project consists of a number of new building projects developed over a period of time. The proposed improvements within the project area include a: new patient and visitor parking structure, on-site make ready work including the easterly entry drive realignment and handicap parking lot and the demolition of existing parking in the area of the new hospital tower, new hospital tower (including the decommissioning of a portion of the existing hospital, the emergency department Barton Road access, underground parking structure along Anderson adjacent to the new hospital,), new Southern California Edison electrical substation, new or renovated central utility plant, new research building, and dental school addition.

In addition to these projects, the proposed work may also include the demolition and/or revisions of miscellaneous onsite public and private roadway improvements within Taylor Street, Taylor Court, and Prospect Avenue (i.e. driveways, street lights, water and sewer services, etc.) and possible offsite road improvements, as may be included in the project's traffic study. The campus improvements also include the proton re-feed, utility make ready, demolition/removal of a portion of the existing housing/structures located adjacent to Prospect Avenue, west of Anderson Street, and trailer relocation projects. Finally, the proposed projects may include the demolition of the existing Housekeeping Building (formerly the Radiation Safety Building) located north of Stewart Street and east of Anderson Street. This demolition is part of one of two alternatives identified for the Central Utility Plant project.

This Preliminary Hydrology Report documents the design intent of having the redevelopment of the campus be consistent with the pre-developed drainage condition. Specifically, the redevelopment will not change the limits of the drainage basins draining towards study point 1. Furthermore, the estimated amount of runoff associated with the redevelopment will also be less than or equal to the pre-developed condition due to the implementation of pervious surfaces, site and source control BMPs, and LID design procedures.

Recognizing that the estimated redevelopment flows and volumes are less than or equal to the pre-developed condition, the pre-development and development drainage basins are generally consistent, storm runoff from the project will be collected in the same existing drainage facilities, and there are no known issues with the existing public storm drain systems (i.e. onsite and offsite), the proposed project should have no hydraulic impact on the existing adjacent City of Loma Linda storm drain facilities or hydrologic conditions of concern.

Finally, each project will be required to submit construction plans to the City of Loma Linda for a grading permit and/or building permit. These future permit processes will require detailed drainage studies to support the proposed project design. The intent is for these future drainage studies, including the detailed calculations, to follow the framework contained in this preliminary hydrology report demonstrating no increase in peak flow rates or volumes. The goal of the project site design techniques is to achieve post development runoff rates, volumes, flow velocities, and flow durations that mimic those of the pre-development condition. However, if the project design results in an increase in runoff rates, volumes, flow velocities, and flow durations, then the project design shall include mitigation consistent with the requirements of the San Bernardino County and City of Loma Linda.

Water Quality and Hydrologic Conditions of Concern

The proposed project is a Category Project. Based on the identification of the anticipated/potential pollutants of concern noted in the Preliminary Water Quality Management Plan (WQMP), appropriate LID Design Practices, Site Design BMPs, Source Control BMP's, and Treatment Control BMPs will be incorporated into this project to comply with the agency requirements. These water quality elements/BMPs will treat the runoff to the maximum extent practicable for this site.

This study also documented the preliminary runoff rates, volumes, velocities, and flow duration for the pre-developed and developed conditions as required by the County of San Bernardino's Hydrologic Conditions of Concern policy. Based on these estimates and the County's policy, the project isn't anticipated to create a hydrologic condition of concern. However, if the project design results in hydrologic conditions of conceren, then the project design shall include mitigation consistent with the requirements of the San Bernardino County and City of Loma Linda.

The Loma Linda University Adventist Health Sciences Campus (LLUAHSC) will be responsible for the maintenance of the proposed private BMPs identified and will be executing the City required agreement.

Finally, each project will be required to submit construction plans to the City of Loma Linda for a grading permit and/or building permit. These future permit processes will require a detailed Water Quality Management Plan (WQMP) to support the proposed project design. The intent if for these future WQMPs, including the detailed calculations, to follow the framework contained in the preliminary water quality management plan.

APPENDIX A

PRELIMINARY HYDROLOGY CALCULATIONS

Runoff Coefficient Calculations

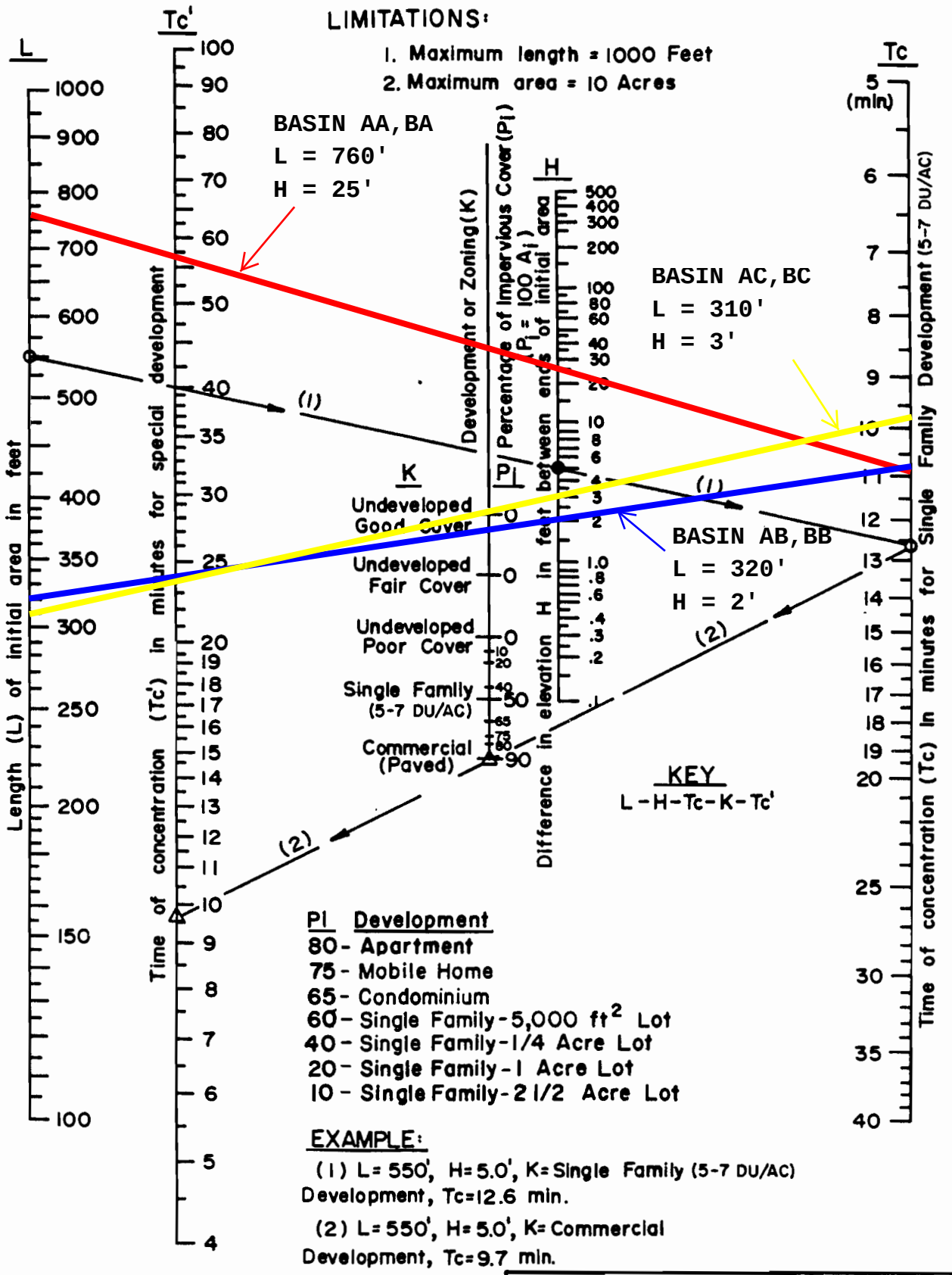
Existing Conditions

Basin	Area (Acres)	Land Use Elemement	% Impervious[a]	C Value[a]
AA	67.7	Commercial/Industrial (O.P. Comm)	90	0.84
AB	4.7	Commercial/Industrial (O.P. Comm)	90	0.84
AC	2.2	Low Density Residential	10	0.32
Total	**74.6**	**Commercial/Industrial (O.P. Comm)**	**87.6**	**0.82**

Proposed Conditions

Basin	Area (Acres)	Land Use Elemement	% Impervious	C Value[a]
BA	67.7	Commercial/Industrial (O.P. Comm)	90	0.84
BB	4.7	Commercial/Industrial (O.P. Comm)	90	0.84
BC	2.2	Low Density Residential	10	0.32
Total	**74.6**	**Commercial/Industrial (O.P. Comm)**	**87.6**	**0.82**

[a,b] % Impervious and Runoff Coefficient according to table 3-1 of the San Diego County Hydrology Manual



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Loma Linda University Medical Center	San Bernardinoo	3/13/2013	006
Location	**Condtion**	**By**	**Checked**
BASIN AA	EXISTING	AMO	SCK

Initial Time (T_i): From Figure D-1

Segment ID		AB				
Flow Length, L	ft	760				
Difference in Elevation, H	ft	25				
Perentage of Impervious Cover, PI		90				
Travel Time, Ti	hr	0.183	+		=	0.183

Shallow Concentrated Flow

Segment ID								
Surface Description								
Flow Length, L	ft							
Watercourse Slope, S	ft/ft							
Average Velocity, V	ft/s							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t =

Channel Flow

Segment ID		BC		CD				
Difference in Elevation, H	ft	61		2				
Average Channel Slope, S	ft/ft	0.018		0.005				
Manning's Roughness Coefficient, n		0.013		0.025				
Velocity, V	ft/s	5.000		2.000				
Flow Length, L	ft	3310		400				
Travel Time, T_t	hr	0.184	+	0.056	+		+	

Combined Travel Time, T_t hr = 0.239

Time of Concetration, T_c hr = *0.423*

min = *25.4*

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P	Paved	U	Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Loma Linda University Medical Center	San Bernardinoo	3/13/2013	006
Location	**Condtion**	**By**	**Checked**
BASIN AB	EXISTING	AMO	SCK

Initial Time (T_i): From Figure D-1

Segment ID		AB				
Flow Length, L	ft	320				
Difference in Elevation, H	ft	2				
Perentage of Impervious Cover, PI		90				
Travel Time, Ti	hr	0.179	+		=	0.179

Shallow Concentrated Flow

Segment ID								
Surface Description								
Flow Length, L	ft							
Watercourse Slope, S	ft/ft							
Average Velocity, V	ft/s							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t =

Channel Flow

Segment ID		BC		CD				
Difference in Elevation, H	ft	10		2				
Average Channel Slope, S	ft/ft	0.008		0.005				
Manning's Roughness Coefficient, n		0.013		0.025				
Velocity, V	ft/s	3.000		2.000				
Flow Length, L	ft	1300		400				
Travel Time, T_t	hr	0.120	+	0.056	+		+	

Combined Travel Time, T_t hr = 0.176

Time of Concetration, T_c hr = *0.355*

min = *21.3*

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P	Paved	U	Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Loma Linda University Medical Center	San Bernardinoo	3/13/2013	006
Location	**Condtion**	**By**	**Checked**
BASIN AC	EXISTING	AMO	SCK

Initial Time (T_i): From Figure D-1

Segment ID		AB				
Flow Length, L	ft	310				
Difference in Elevation, H	ft	3				
Perentage of Impervious Cover, PI		10				
Travel Time, Ti	hr	0.163	+		=	0.163

Shallow Concentrated Flow

Segment ID								
Surface Description								
Flow Length, L	ft							
Watercourse Slope, S	ft/ft							
Average Velocity, V	ft/s							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t =

Channel Flow

Segment ID		BC		CD				
Difference in Elevation, H	ft	2		5				
Average Channel Slope, S	ft/ft	0.010		0.005				
Manning's Roughness Coefficient, n		0.013		0.025				
Velocity, V	ft/s	4.000		3.000				
Flow Length, L	ft	200		1000				
Travel Time, T_t	hr	0.014	+	0.093	+		+	

Combined Travel Time, T_t hr = 0.106

Time of Concetration, T_c hr = *0.269*

min = *16.1*

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P	Paved	U	Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Loma Linda University Medical Center	San Bernardinoo	3/13/2013	006
Location	**Condtion**	**By**	**Checked**
BASIN BA	DEVELOPED	AMO	SCK

Initial Time (T_i): From Figure D-1

Segment ID		AB				
Flow Length, L	ft	760				
Difference in Elevation, H	ft	25				
Perentage of Impervious Cover, PI		90				
Travel Time, Ti	hr	0.183	+		=	0.183

Shallow Concentrated Flow

Segment ID								
Surface Description								
Flow Length, L	ft							
Watercourse Slope, S	ft/ft							
Average Velocity, V	ft/s							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t =

Channel Flow

Segment ID		BC		CD				
Difference in Elevation, H	ft	61		2				
Average Channel Slope, S	ft/ft	0.018		0.005				
Manning's Roughness Coefficient, n		0.013		0.025				
Velocity, V	ft/s	5.000		2.000				
Flow Length, L	ft	3310		400				
Travel Time, T_t	hr	0.184	+	0.056	+		+	

Combined Travel Time, T_t hr = 0.239

Time of Concetration, T_c hr = *0.423*

min = *25.4*

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P	Paved	U	Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Loma Linda University Medical Center	San Bernardinoo	3/13/2013	006
Location	**Condtion**	**By**	**Checked**
BASIN BB	DEVELOPED	AMO	SCK

Initial Time (T_i): From Figure D-1

Segment ID		AB				
Flow Length, L	ft	320				
Difference in Elevation, H	ft	2				
Perentage of Impervious Cover, PI		90				
Travel Time, Ti	hr	0.179	+		=	0.179

Shallow Concentrated Flow

Segment ID								
Surface Description								
Flow Length, L	ft							
Watercourse Slope, S	ft/ft							
Average Velocity, V	ft/s							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t =

Channel Flow

Segment ID		BC		CD				
Difference in Elevation, H	ft	10		2				
Average Channel Slope, S	ft/ft	0.008		0.005				
Manning's Roughness Coefficient, n		0.013		0.025				
Velocity, V	ft/s	3.000		2.000				
Flow Length, L	ft	1300		400				
Travel Time, T_t	hr	0.120	+	0.056	+		+	

Combined Travel Time, T_t hr = 0.176

Time of Concetration, T_c hr = *0.355*

min = *21.3*

Legend

Sheet Flow Surface Codes

A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P	Paved	U	Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	

TIME OF CONCENTRATION

Project Information

Project	County	Date	Project No.
Loma Linda University Medical Center	San Bernardinoo	3/13/2013	006
Location	**Condtion**	**By**	**Checked**
BASIN BC	DEVELOPED	AMO	SCK

Initial Time (T_i): From Figure D-1

Segment ID		AB				
Flow Length, L	ft	310				
Difference in Elevation, H	ft	3				
Perentage of Impervious Cover, PI		10				
Travel Time, Ti	hr	0.163	+		=	0.163

Shallow Concentrated Flow

Segment ID								
Surface Description								
Flow Length, L	ft							
Watercourse Slope, S	ft/ft							
Average Velocity, V	ft/s							
Travel Time, T_t	hr		+		+		+	

Combined Travel Time, T_t =

Channel Flow

Segment ID		BC		CD				
Difference in Elevation, H	ft	2		5				
Average Channel Slope, S	ft/ft	0.010		0.005				
Manning's Roughness Coefficient, n		0.013		0.025				
Velocity, V	ft/s	4.000		3.000				
Flow Length, L	ft	200		1000				
Travel Time, T_t	hr	0.014	+	0.093	+		+	

Combined Travel Time, T_t hr = 0.106

Time of Concetration, T_c hr = *0.269*

min = *16.1*

Legend

Sheet Flow Surface Codes

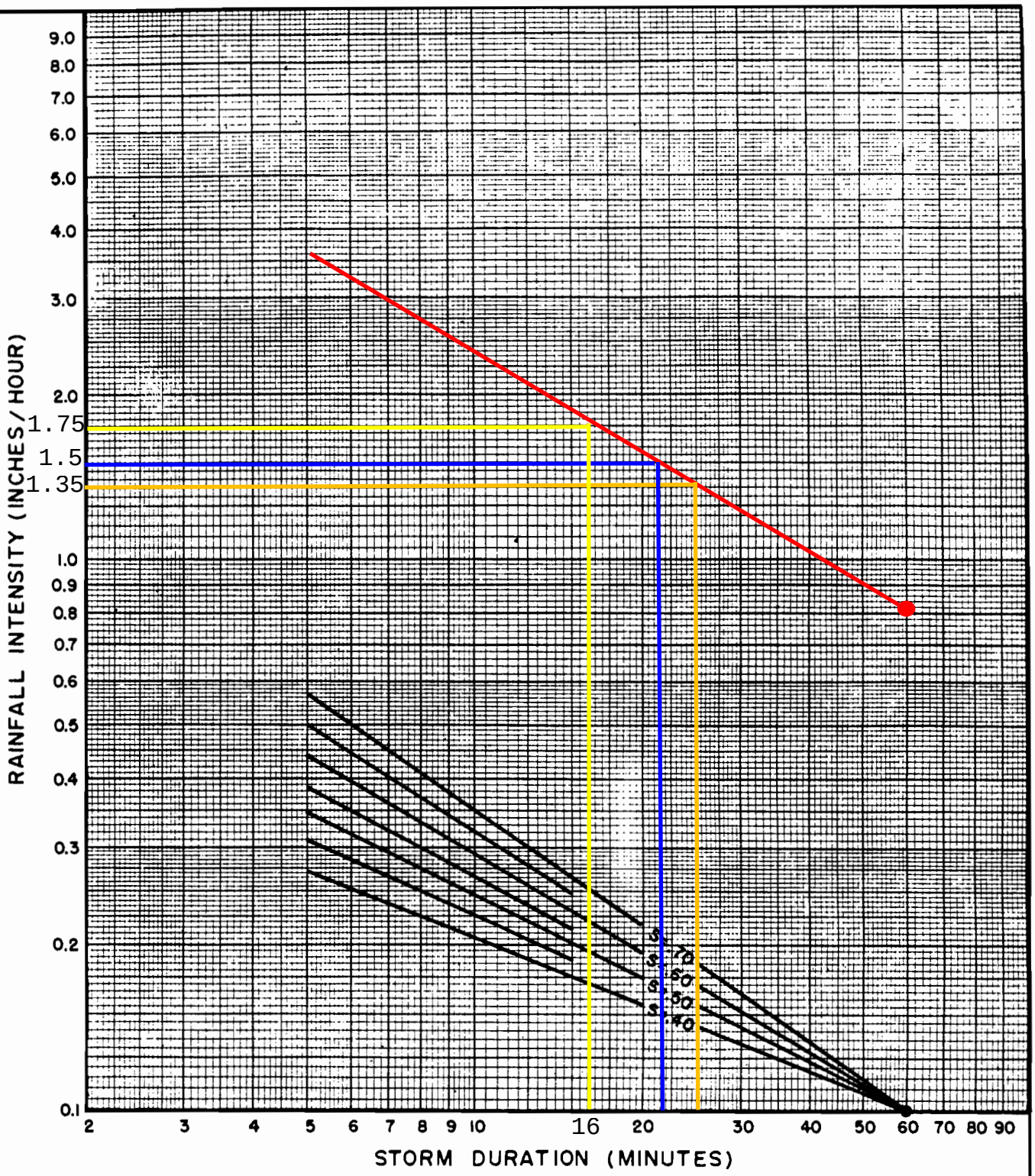
A	Smooth Surfaces	F	Grass, Dense
B	Fallow (No Residue)	G	Grass, Bermuda
C	Cultivated (< 20% Residue)	H	Woods, Light
D	Cultivated (> 20% Residue)	I	Woods, Dense
E	Grass-Range, Short	J	Range, Natural

Shallow Concentrated Surface Codes

P	Paved	U	Unpaved

Channel Flow Roughness Condtion

A	Clean Earth	D	Dense Brush
B	Short Grass	E	Natural Channel
C	Dense Weeds	F	



DESIGN STORM FREQUENCY = 10 YEARS

ONE HOUR POINT RAINFALL = 0.8 INCHES

LOG-LOG SLOPE = 0.6

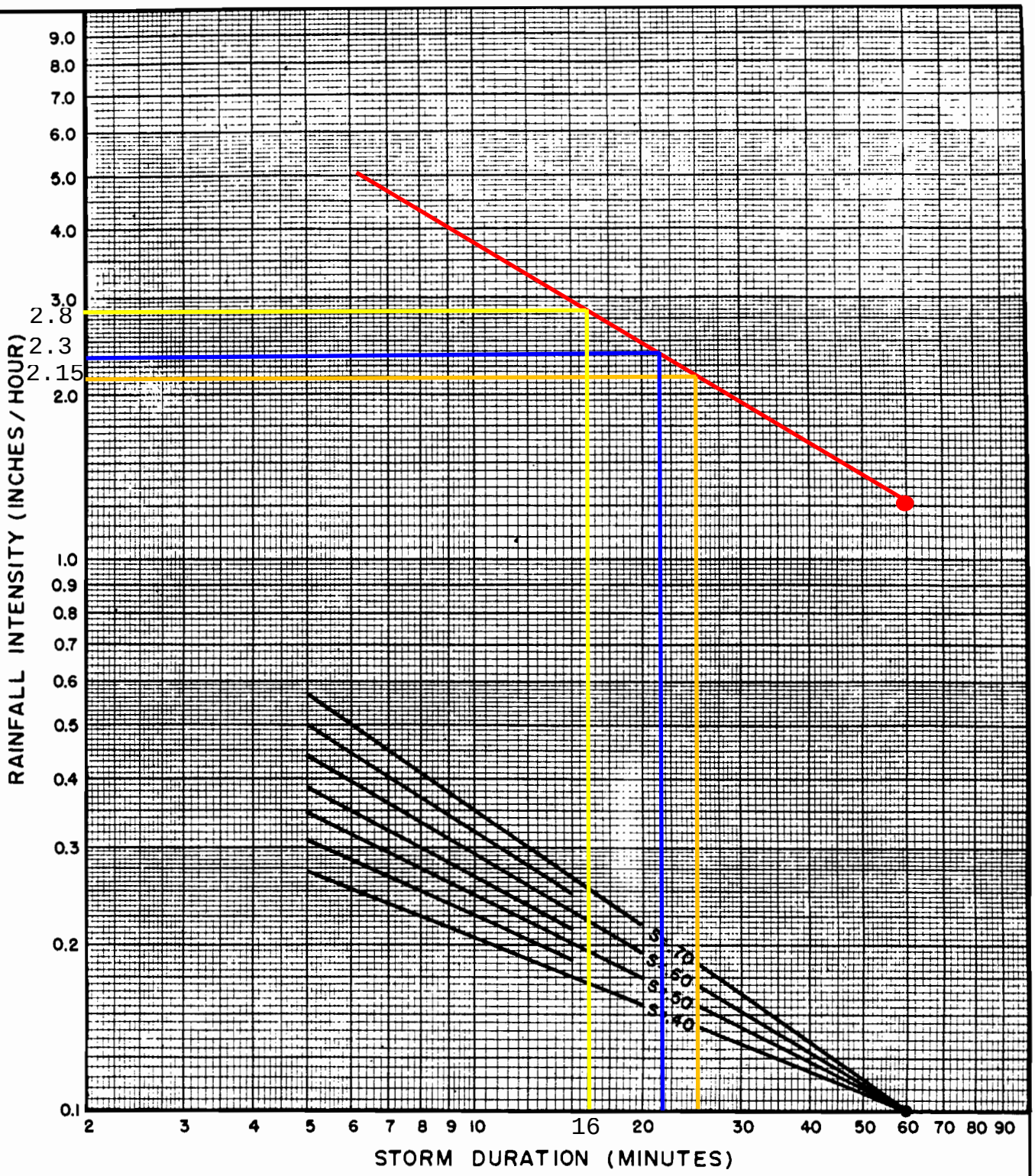
PROJECT LOCATION = Loma Linda

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

INTENSITY - DURATION CURVES CALCULATION SHEET

FIGURE D-3



DESIGN STORM FREQUENCY = 100 YEARS

ONE HOUR POINT RAINFALL = 2.5 INCHES

LOG-LOG SLOPE = 0.6

PROJECT LOCATION = Loma Linda

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

INTENSITY - DURATION CURVES CALCULATION SHEET

FIGURE D-3

HYDROLOGY CALCULATIONS

SITE CHARACTERISTICS

PRECIP	10-YR	100-YR
1-hour	0.8	1.25
Slope	0.6	0.6

EXISTING CONDITIONS

BASIN NUMBER	AREA (acres)	C Value	C*A	Tc (min)	I_{10} (in/hr)	Q_{10} (CFS)	I_{100} (in/hr)	Q_{100} (CFS)
AA	67.70	0.84	56.87	25.4	1.35	76.77	2.15	122.27
AB	4.70	0.84	3.95	21.3	1.50	5.92	2.30	9.08
AC	2.20	0.32	0.70	16.1	1.75	1.23	2.80	1.97
TOTAL	***74.60***	***0.82***	***61.52***			***83.93***		***133.32***

PROPOSED CONDITIONS

BASIN NUMBER	AREA (acres)	C Value	C*A	Tc (min)	I_{10} (in/hr)	Q_{10} (CFS)	I_{100} (in/hr)	Q_{100} (CFS)
BA	67.70	0.84	56.87	25.4	1.35	76.77	2.15	122.27
BB	4.70	0.84	3.95	21.3	1.50	5.92	2.30	9.08
BC	2.20	0.32	0.70	16.1	1.75	1.23	2.80	1.97
TOTAL	***74.60***	***0.82***	***61.52***			***83.93***		***133.32***

APPENDIX B

HYDROLOGY REFERENCE MATERIAL

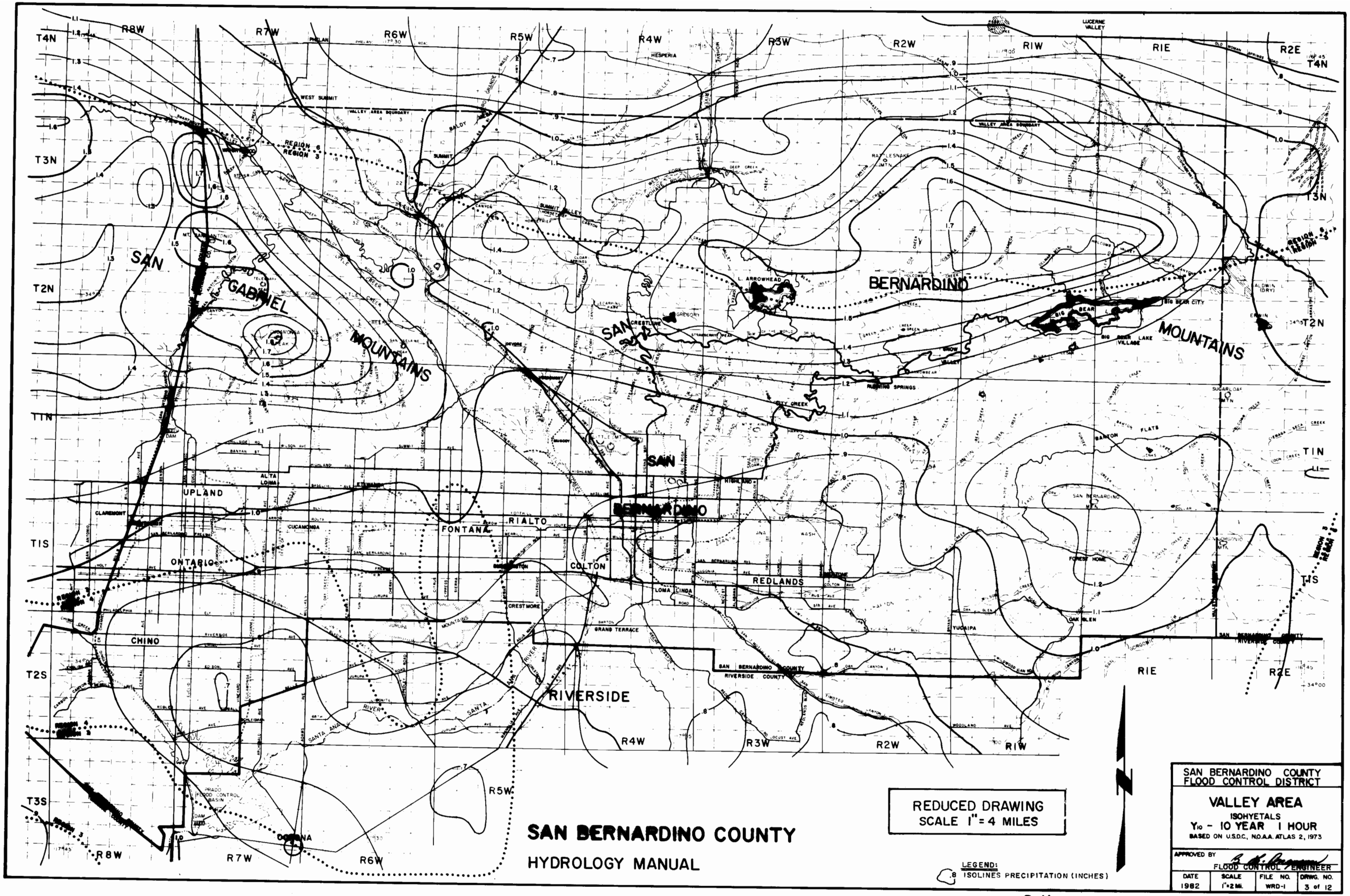

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
.8 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
Y10 - 10 YEAR 1 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE 1982
SCALE 1"=2 Mi.
FILE NO. WRD-1
DRWG. NO. 3 of 12
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO
RIVERSIDE
UPLAND
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
REDLANDS
CORONA
L. ARROWHEAD
BIG BEAR
BIG BEAR CITY
BIG BEAR LAKE VILLAGE
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E

FIGURE B-3

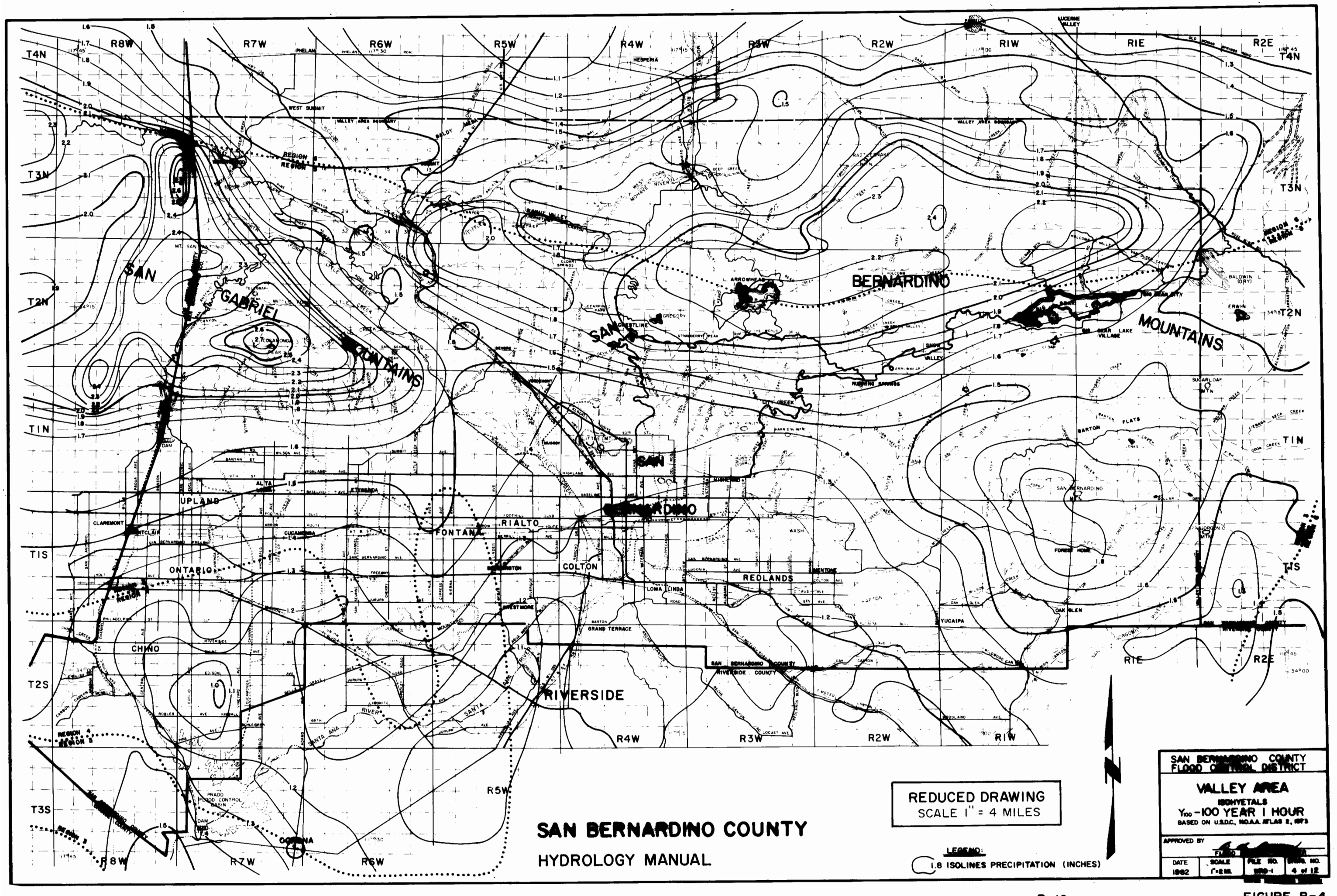
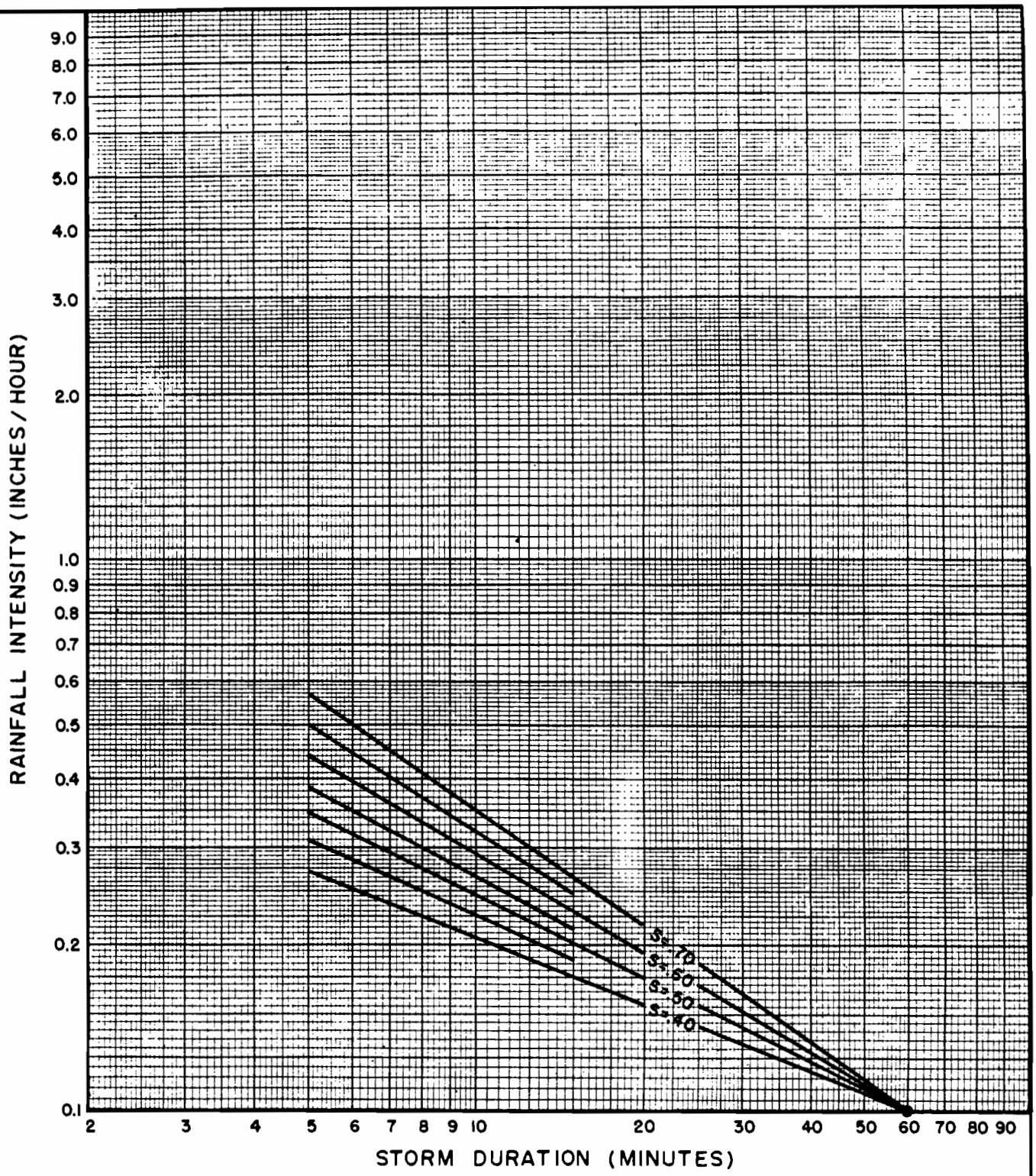

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
1.8 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
Y100 -100 YEAR 1 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
DATE 1982
SCALE 1"=2 MI.
FILE NO. WRD-1
DWG. NO. 4 of 12
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO
RIVERSIDE
UPLAND
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
REDLANDS
CORONA
CLAREMONT
CUCAMONGA
LOMA LINDA
YUCAIPA
OAK GLEN
GRAND TERRACE
BARTON FLATS
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
PRADO FLOOD CONTROL BASIN
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
T4N
T3N
T2N
T1N
T1S
T2S
T3S

FIGURE B-4



DESIGN STORM FREQUENCY = _____ YEARS

ONE HOUR POINT RAINFALL = _____ INCHES

LOG-LOG SLOPE = _____

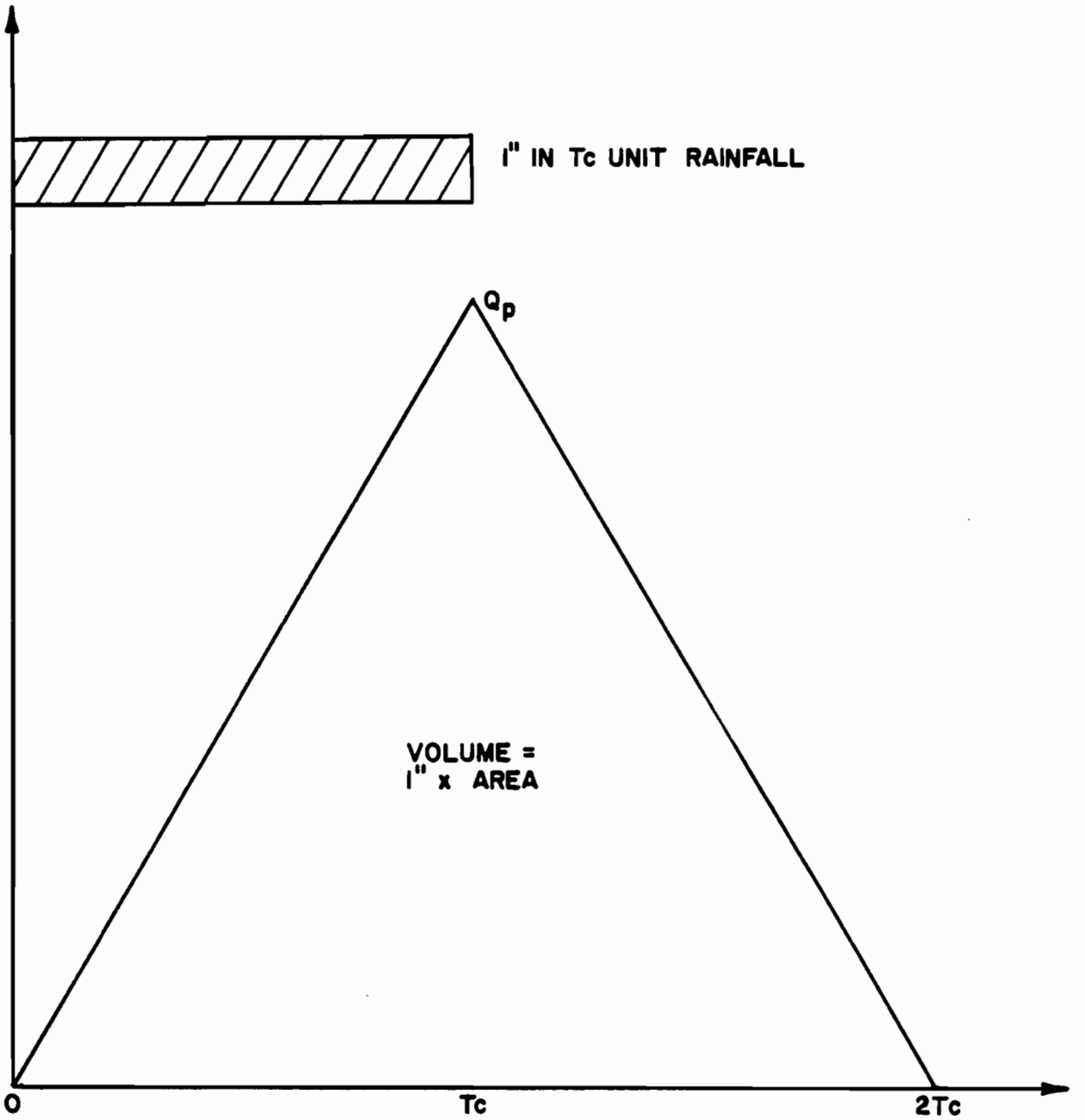
PROJECT LOCATION = _____

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

INTENSITY - DURATION CURVES CALCULATION SHEET

FIGURE D-3



SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

SMALL AREA

UNIT HYDROGRAPH

Figure J-1

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

APPENDIX C

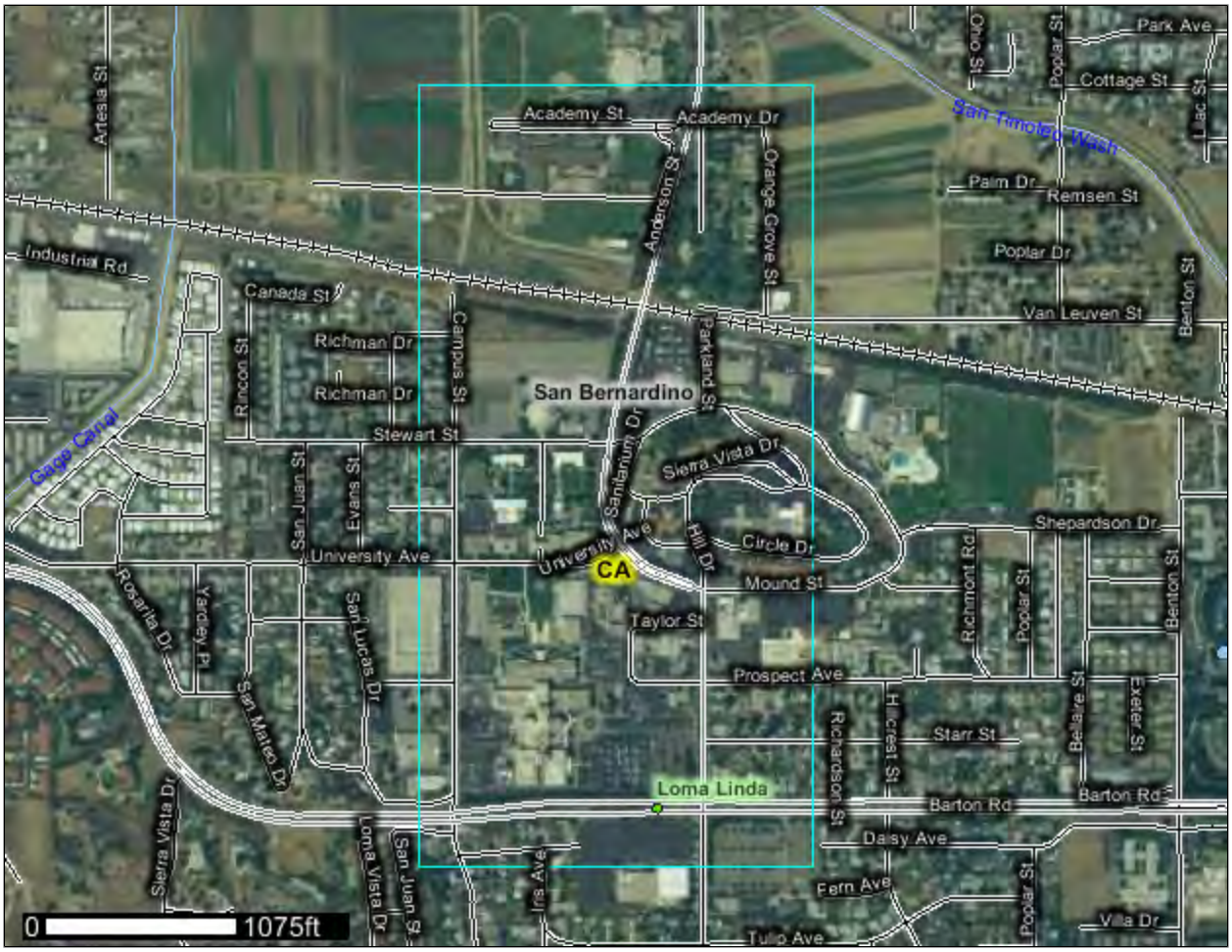
NATIONAL RESOURCE CONSERVATION SERVICE WEB SOIL SURVEY

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for San Bernardino County Southwestern Part, California



March 17, 2013

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface.....2
How Soil Surveys Are Made.....5
Soil Map.....7
Soil Map (Loma Linda University Medical Center).....8
Legend.....9
Map Unit Legend (Loma Linda University Medical Center).....10
Map Unit Descriptions (Loma Linda University Medical Center).....10
San Bernardino County Southwestern Part, California.....12
HaC—HANFORD COARSE SANDY LOAM, 2 TO 9 PERCENT SLOPES.....12
RmD—RAMONA SANDY LOAM, 9 TO 15 PERCENT SLOPES.....13
SbC—SAN EMIGDIO GRAVELLY SANDY LOAM, 2 TO 9 PERCENT SLOPES.....14
ScA—SAN EMIGDIO FINE SANDY LOAM, 0 TO 2 PERCENT SLOPES.....15
ScC—SAN EMIGDIO FINE SANDY LOAM, 2 TO 9 PERCENT SLOPES.....16
References.....18

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Loma Linda University Medical Center)

Map Scale: 1:7,180 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1,000 1,500

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Gully

Short Steep Slope

Other

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:7,180 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 4, Jan 3, 2008

Date(s) aerial images were photographed: 6/18/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Loma Linda University Medical Center)

San Bernardino County Southwestern Part, California (CA677)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
HaC	HANFORD COARSE SANDY LOAM, 2 TO 9 PERCENT SLOPES	44.5	20.4%
RmD	RAMONA SANDY LOAM, 9 TO 15 PERCENT SLOPES	25.2	11.6%
SbC	SAN EMIGDIO GRAVELLY SANDY LOAM, 2 TO 9 PERCENT SLOPES	4.5	2.0%
ScA	SAN EMIGDIO FINE SANDY LOAM, 0 TO 2 PERCENT SLOPES	60.4	27.7%
ScC	SAN EMIGDIO FINE SANDY LOAM, 2 TO 9 PERCENT SLOPES	83.3	38.2%
Totals for Area of Interest		**218.0**	**100.0%**

Map Unit Descriptions (Loma Linda University Medical Center)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been

observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

San Bernardino County Southwestern Part, California

HaC—HANFORD COARSE SANDY LOAM, 2 TO 9 PERCENT SLOPES

Map Unit Setting

Elevation: 150 to 900 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 250 to 280 days

Map Unit Composition

Hanford and similar soils: 85 percent
Minor components: 15 percent

Description of Hanford

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very high (about 20.3 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 3e
Hydrologic Soil Group: B

Typical profile

0 to 12 inches: Sandy loam
12 to 60 inches: Fine sandy loam, sandy loam, coarse sandy loam

Minor Components

Greenfield sandy loam

Percent of map unit: 10 percent

Tujunga loamy sand

Percent of map unit: 5 percent

RmD—RAMONA SANDY LOAM, 9 TO 15 PERCENT SLOPES

Map Unit Setting

Elevation: 250 to 3,500 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 320 days

Map Unit Composition

Ramona and similar soils: 85 percent
Minor components: 15 percent

Description of Ramona

Setting

Landform: Terraces, alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium derived from granite

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 11.9 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 4e
Hydrologic Soil Group: B

Typical profile

0 to 23 inches: Sandy loam
23 to 32 inches: Loam
32 to 54 inches: Sandy clay loam, clay loam
54 to 60 inches: Sandy loam, loam

Minor Components

Greenfield sandy loam

Percent of map unit: 10 percent

Unnamed, gullied

Percent of map unit: 5 percent

SbC—SAN EMIGDIO GRAVELLY SANDY LOAM, 2 TO 9 PERCENT SLOPES

Map Unit Setting

Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 230 to 280 days

Map Unit Composition

San emigdio and similar soils: 85 percent
Minor components: 15 percent

Description of San Emigdio

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 7.5 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 3e
Hydrologic Soil Group: B

Typical profile

0 to 16 inches: Gravelly sandy loam
16 to 60 inches: Stratified sandy loam to loam

Minor Components

Metz coarse sandy loam

Percent of map unit: 5 percent

Hanford coarse sandy loam
Percent of map unit: 5 percent

Unnamed
Percent of map unit: 5 percent

ScA—SAN EMIGDIO FINE SANDY LOAM, 0 TO 2 PERCENT SLOPES

Map Unit Setting
Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 230 to 280 days

Map Unit Composition
San emigdio and similar soils: 85 percent
Minor components: 15 percent

Description of San Emigdio

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very high (about 22.9 inches)

Interpretive groups
Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 1
Land capability (nonirrigated): 3c
Hydrologic Soil Group: B

Typical profile
0 to 8 inches: Fine sandy loam
8 to 60 inches: Fine sandy loam, sandy loam, loam

Minor Components

Metz coarse sandy loam
Percent of map unit: 5 percent

Hanford, cosl
Percent of map unit: 5 percent

Unnamed
Percent of map unit: 5 percent

ScC—SAN EMIGDIO FINE SANDY LOAM, 2 TO 9 PERCENT SLOPES

Map Unit Setting

Elevation: 1,000 to 2,000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 230 to 280 days

Map Unit Composition

San emigdio and similar soils: 85 percent
Minor components: 15 percent

Description of San Emigdio

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very high (about 22.9 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 3e
Hydrologic Soil Group: B

Typical profile

0 to 8 inches: Fine sandy loam

8 to 60 inches: Fine sandy loam, sandy loam, loam

Minor Components

Hanford coarse sandy loam

Percent of map unit: 10 percent

San emigdio sandy loam

Percent of map unit: 5 percent

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://soils.usda.gov/

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://soils.usda.gov/

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://soils.usda.gov/

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

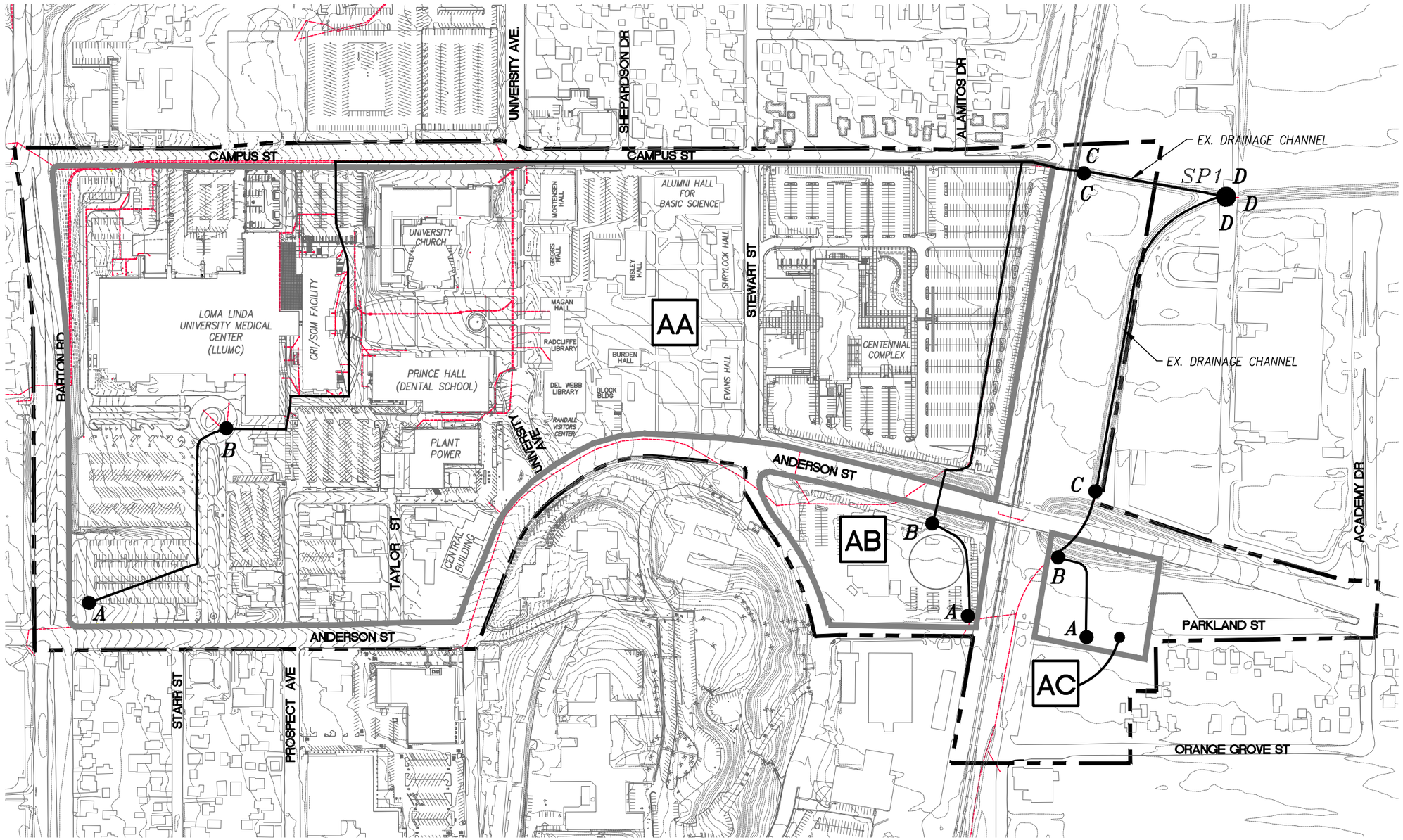
United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://soils.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.glti.nrcs.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://soils.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://soils.usda.gov/

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.



DRAINAGE: PRE-DEVELOPED CONDITION

SCALE: 1"=300'

EXHIBIT 'A'

LOMA LINDA UNIVERSITY MEDICAL CENTER

KETTLER LEWECK ENGINEERING

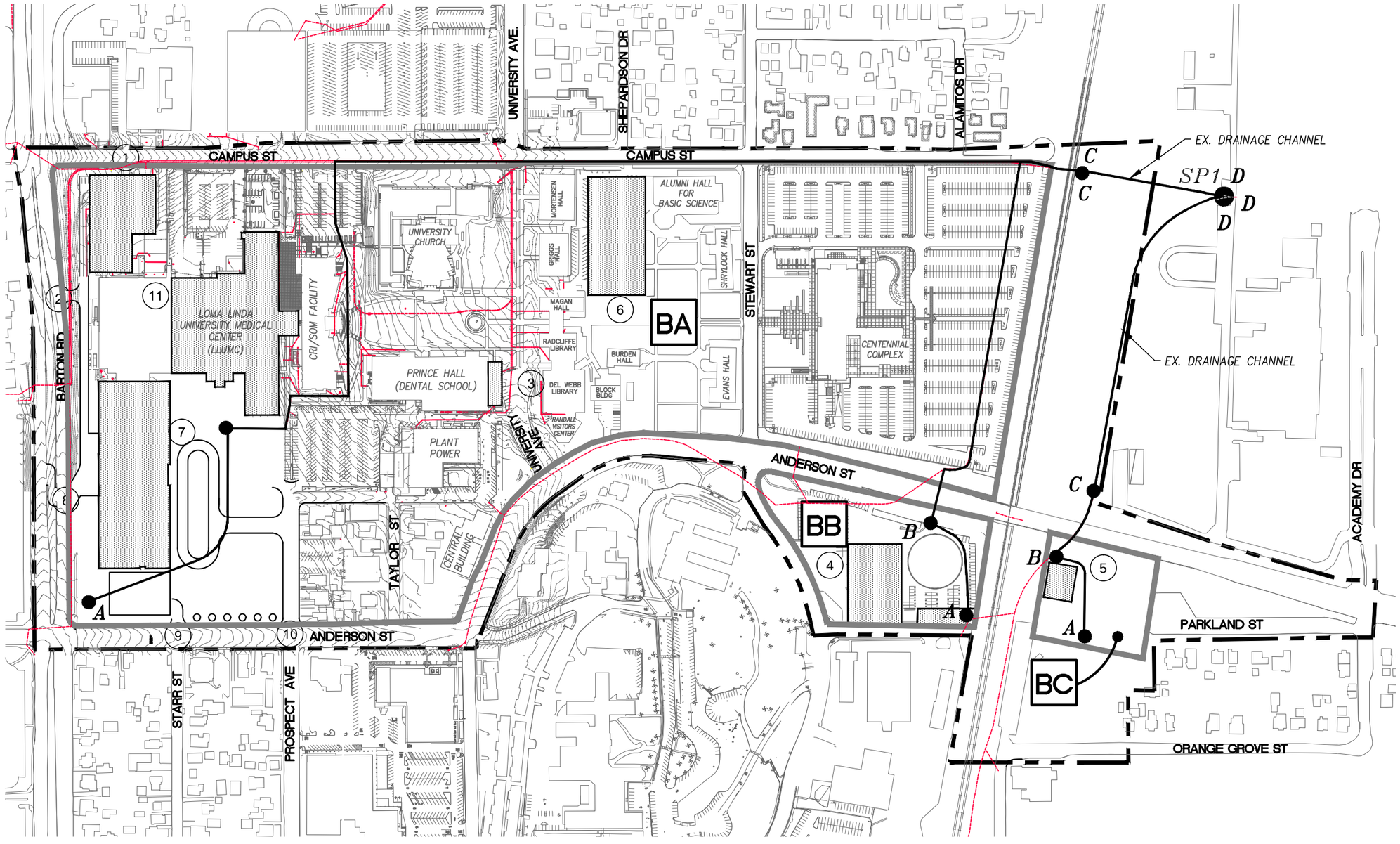
151 W MARKET STREET
SAN DIEGO, CA 92101
PHONE NO. (619) 269-3449

LOMA LINDA UNIVERSITY MEDICAL CENTER

CAMPUS TRANSFORMATION PROJECT

HYDROLOGY STUDY SITE MAP: PRE-DEVELOPED CONDITION

MAY 13, 2103 (REVISED: JULY 22, 2013)



LEGEND

(PROJECT LIMITS)

AND

(EX. STORM DRAIN)

(DRAINAGE BASINS)

AA

(DRAINAGE BASIN ID)

SP1

(DRAINAGE STUDY POINT)

A B

(Tc TRAVEL PATH)

NOTES

1. PARKING STRUCTURE
2. BARTON ACCESS
3. DENTAL SCHOOL ADDITION
4. CENTRAL UTILITY PLANT
5. SCE SUBSTATION
6. RESEARCH BUILDING
7. NEW HOSPTIAL BUILDING
8. AMBULANCE ONLY ENTRANCE AND TURN
9. ED ACCESS AND PARKING
10. PROSPECT ENTRANCE
11. BUILDING REUSE

NORTH

DRAINAGE: DEVELOPED CONDITION

SCALE: 1"=300'

EXHIBIT 'B'

LOMA LINDA UNIVERSITY MEDICAL CENTER

KETTLER LEWECK ENGINEERING

151 W MARKET STREET
SAN DIEGO, CA 92101
PHONE NO. (619) 269-3449

LOMA LINDA UNIVERSITY MEDICAL CENTER

CAMPUS TRANSFORMATION PROJECT

HYDROLOGY STUDY SITE MAP: DEVELOPED CONDITION

MAY 13, 2103 (REVISED: JULY 22, 2013)

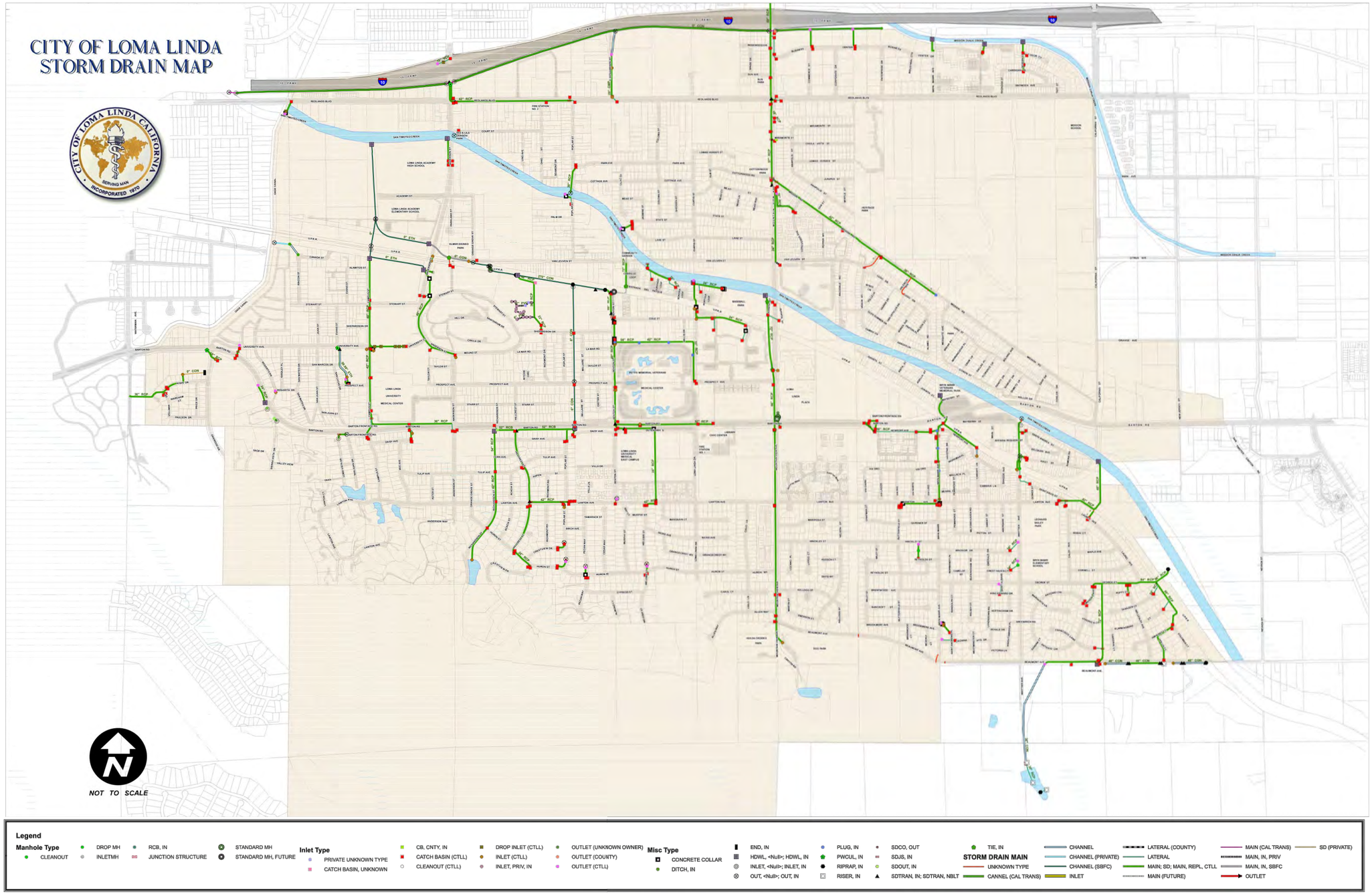
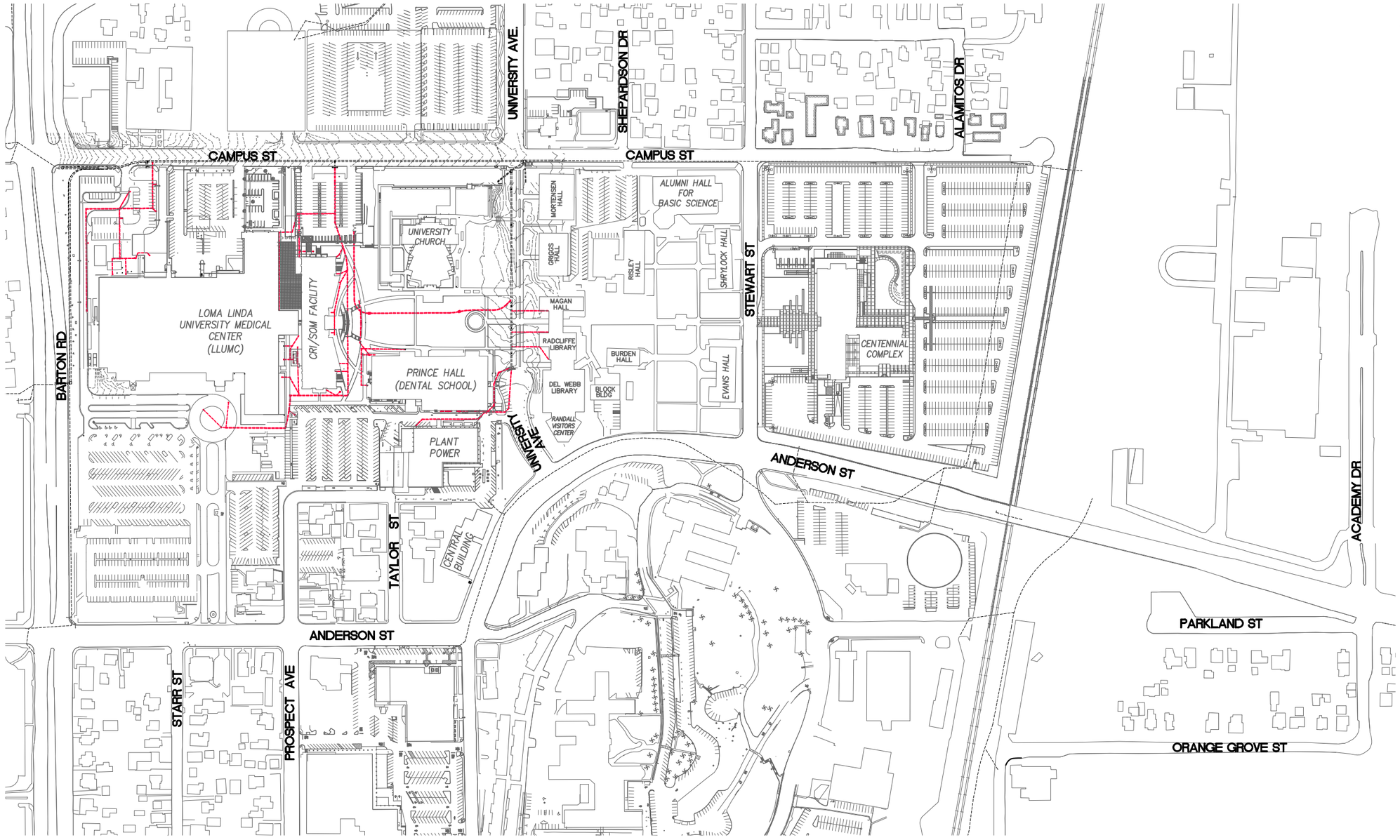


EXHIBIT 'C'

EXISTING PUBLIC STORM DRAIN FACILITIES



LEGEND

AND

(PRIVATE STORM DRAIN)

NOTE: PRIVATE STORM DRAIN BASED ON AS-BUILT DATA AND FIELD SURVEY OF THE SOUTHERN PORTION OF THE LLUMC CAMPUS ONLY

NORTH

PRIVATE STORM DRAIN FACILITES

SCALE: 1"=300'

EXHIBIT 'D'

LOMA LINDA UNIVERSITY MEDICAL CENTER

KETTLER LEWECK ENGINEERING

151 W MARKET STREET
SAN DIEGO, CA 92101
PHONE NO. (619) 269-3449

LOMA LINDA UNIVERSITY MEDICAL CENTER

CAMPUS TRANSFORMATION PROJECT

HYDROLOGY STUDY SITE MAP: PRIVATE STORM DRAIN FACILITIES

MAY 13, 2103 (REVISED: JULY 22, 2013)