

ROSE CREEK WATERSHED HYDROLOGIC, HYDRAULIC, SEDIMENT TRANSPORT, AND GEOMORPHIC ANALYSES

TASK 1 – EXISTING DATA AND INFORMATION SUMMARY REPORT

BACKGROUND

The Rose Creek Watershed (RCW) consists of three planning basins, Rose Canyon, San Clemente Canyon, and Lower Rose Creek, which all flow into the northeast corner of Mission Bay (Figure 1). The Hydrologic, Hydraulic, Sediment Transport, and Geomorphic Analyses (RCW Analysis) is being conducted to build upon the previously completed RCW Opportunities Assessment (Assessment) and associated technical memorandums. Task 1 of the RCW Analysis is to obtain and review relevant existing data and information to establish existing hydrologic, hydraulic, sediment transport, and geomorphologic conditions of the RCW. Examples of relevant data are measurements of precipitation, stream flow, topographic maps, aerial photos, and soil maps. Relevant information consists of prior reports of prior hydrologic, hydraulic, sediment transport, and geomorphic studies conducted for the entire RCW or a localized area of the RCW. This report summarizes existing data and information for the study area. Data gaps and uses of the data in the RCW Analysis will be documented in other tasks. Information presented here will be used for Task 3 (Data Gaps).

SUMMARY OF AVAILABLE DOCUMENTS

Available documents obtained and reviewed relevant to the RCW Analysis included documents specifically listed in the scope of work as well as additional documents found during the completion of this task. The type of documents included watershed assessments, restoration plans, hydrology and hydraulic studies, erosion analyses, and water quality management reports. These documents were then reviewed to determine the type of information collected or analyses conducted as part of the study. A summary of these documents is provided below in chronological order. The use of the data for the RCW Analysis is discussed in the following section.

“San Diego County Municipal Copermittees 2005-2006 Urban Runoff Monitoring Volume 1 – Final Report.” Prepared for County of San Diego. Prepared by Weston Solutions, Inc. January 2007.

Summary of wet weather monitoring in San Diego County conducted in the 2005-2006 reporting period. Monitoring included mass loading stations, receiving water monitoring, bioassessment monitoring, toxic hot spot monitoring in San Diego River, and coastal outfall monitoring. Mass loading stations were located along

Santa Margarita River, San Luis Rey River, Agua Hedion Creek, Escondido Creek, San Dieguito River, Penasquitos Creek, Tecolote Creek, San Diego River, Chollas Creek, Sweetwater River, and Tijuana River.

“Hydraulic and Scour Studies for Rose Creek Bikeway Bridge.” Prepared for T. Y. Lin International. Prepared by Howard H. Chang. August 2005.

Hydraulic assessment of potential bikeway bridge crossing Rose Creek at North Mission Bay Drive about 1,000 ft upstream from Mission Bay. Peak flows were obtained from the FEMA flood insurance study for Rose Canyon Creek. Peak flood water levels and velocities for the 50-year, 100-year, and overtopping floods were determined using HEC-2, a one-dimensional steady-state hydraulic model. The HEC-2 model extended approximately 2,600 ft between Mission Bay and Grand Avenue with cross-sections based on a topographic survey. A general scour analysis was conducted using FLUVIAL-12 to make bridge design recommendations. This general scour analysis included information for a 100-year flood hydrograph and sediment grain size distribution from two locations in the creek (at the creek mouth and 800 ft upstream). Local scour at the proposed bridge pier was also estimated based on an analytical method.

“Rose Creek Watershed Opportunities Assessment.” Prepared by KTU+A. Prepared for San Diego Earthworks. April 2005.

Identifies opportunities in the RCW for restoration projects, enhancement and protection of cultural resources, and public access improvements as well as provides recommendations for implementation. This assessment summarizes watershed conditions and includes extensive spatial watershed data (e.g., land use, soil type, topography, storm drain locations, etc). The geomorphic conditions are summarized based on a historical account of the lower portion of Rose Creek.

“Mission Bay & Coastal La Jolla Watersheds Urban Runoff Management Program – Fiscal Year 2004 Annual Report.” City of San Diego. January 2004.

Annual report for the Mission Bay and coastal La Jolla Watershed Urban Runoff Management Program required for the NPDES Permit. Document contains water quality (indicator bacteria) data and management information.

“Rose and Tecolote Creeks Water Quality Improvement Project Final Planning Report.” Prepared by Rick Engineering Company. Prepared for City of San Diego Storm Water Pollution Prevention Program. August 2003.

The purpose of this planning study was to identify and evaluate locations for water quality treatment control devices (i.e., structural BMPs) within the Rose Creek and Tecolote Creek watersheds to improve the water quality in Mission Bay. The

analysis of locations was done using a GIS-based watershed information management system database. Watershed land use data from the 1995 SANDAG GIS coverage. This study also included total suspended solids (TSS) loading calculations using a spreadsheet-based model for a 0.6-inch rain event based on land use and corresponding BMP treatment removal. The TSS loadings for each land use were taken from the 2000-2001 City of San Diego wet weather stormwater monitoring program report.

“Mission Bay and La Jolla Watersheds Urban Runoff Management Plan.” City of San Diego Water Pollution Prevention Program. January 2003.

This urban runoff management plan covers the management areas of the Mission Bay and coastal La Jolla watersheds. The document provides an assessment of water quality within the watersheds (e.g., 303(d) listed water bodies) and water quality monitoring programs, such as the Mission Bay Water Quality Survey that includes stations along Rose Creek and San Clemente Creek.

“Mission Bay & Coastal La Jolla Watersheds Urban Runoff Management Program – Fiscal Year 2003 Annual Report.” City of San Diego. January 2003.

Annual report for the Mission Bay and coastal La Jolla Watershed Urban Runoff Management Program required for the NPDES Permit. Document contains water quality (indicator bacteria) data and management information.

“Flood Insurance Study San Diego County, California and Incorporated Areas.” Federal Emergency Management Agency. Revised July 2002.

Summarizes channel modifications done by Caltrans and City of San Diego including concrete channels and rock revetments. Peak discharges at various locations along Rose and San Clemente Canyon Creeks for the 10-, 50-, 100-, and 500-year return periods were determined based on hydrology studies conducted by the U.S. Army Corps of Engineers in 1970 and 1972. The hydraulic analysis was based on HEC-2 simulations with cross-section data taken from topographic maps generally made from data collected in the 1970's. Includes channel bed profile and water surface elevation profiles for Rose and San Clemente Canyons between Mission Bay and Interstate 805. There are no records of historical flooding in Rose or San Clemente Canyons.

“Constructed Wetlands in the Rose Creek Watershed.” Prepared by City of San Diego Water Department. August 2001.

This document provides general background information on various kinds of constructed wetlands with associated costs and benefits for specific applications in

the RCW. It appears that analyses referenced in the document are based on a hydrologic study conducted as part of the Mission Bay Park Master Plan Update.

“Planning Level Delineation of Aquatic Resources, Floodplain Mapping, and Functional Assessment of Riparian Ecosystems at Marine Corps Air Station Miramar, San Diego County, California.” Prepared for Marine Corps Air Station, Miramar. Prepared by R. Daniel Smith, USACE WES and Robert Lichvar, USACE CRREL. July 2001.

Summarizes three studies conducted at MCAS Miramar: 1) planning level map of aquatic resources to delineate Waters of the United States and wetlands, 2) 100-year floodplain mapping for major streams on MCAS Miramar, and 3) baseline assessment of riparian ecosystem integrity. The floodplain mapping involved hydrologic and hydraulic analyses. The hydrologic analysis to determine the 100-year flood was based on the National Flood Frequency (NFF) program, a compilation of regression equations based on geographic area by USGA, FHWA, and FEMA. The watershed characteristics were determined from undated, USGS topographic maps. The hydraulic analysis consisted of using HEC-RAS to compute the 100-year water elevation, which was then transcribed to the flood map using the Watershed Model System (WMS). This document also includes general and brief descriptions for climate, regional geomorphology, soils, topography, and watershed ecosystems.

“Urban Runoff Management Program – Storm Water Best Management Practices.” City of San Diego Storm Water Pollution Prevention Program. February 2001.

Specific guidelines for municipal facilities and services regarding storm water runoff to protect and improve water quality.

“Rose Creek Canyon Enhancement Plan.” Prepared by KTU+A. Prepared for The Nature School. June 2000.

This enhancement plan focuses on the Rose Creek flood control channel between the I-5 Bridge and Grand Avenue Bridge, while the watershed description extends upstream through Rose Canyon and downstream to Mission Bay. The enhancement plan includes summaries of existing conditions, opportunities, constraints, and restoration alternatives as well as implementation and management approaches. The existing conditions contain a hydraulic analysis conducted with the HEC-RAS hydraulic model. HEC-RAS was used to determine the 10-, 50-, and 100-year flood water surface elevations along the study area using the peak flows determined in the 1970 USACE study. A brief geomorphic history is also included as part of the description of existing conditions.

“Watershed Erosion/Sedimentation Study – Rose and San Clemente Canyons.” Prepared for City of San Diego Engineering Department. Prepared by Woodward-Clyde Consultants. October 1986.

This study evaluates the annual loading of sediment being transported into Mission Bay via Rose Creek and provides alternatives to mitigate erosion in Rose and San Clemente Canyons. The annual sediment yield from sheet erosion was estimated utilizing an empirical relationship that accounts for watershed characteristics of climate, topography, hydrology, and soil. The sediment contribution from gully and channel erosion was estimated using the USACE field procedure combined with comparative aerial photographic and topographic evaluations. This was then verified based on dredging records of Mission Bay at the mouth of Rose Creek. The sediment analysis required estimation of the 2-year peak flow, which was determined by the San Diego County Hydrology Manual. Sediment grain size distributions at 10 locations along Rose and San Clemente Creeks were also measured.

“Flood Hazard Information Rose Canyon and San Clemente Canyon.” Prepared for County of San Diego. Prepared by U.S. Army Corps of Engineers, Los Angeles District. July 1970.

This report of potential flood hazards was conducted for the County of San Diego Department of Sanitation and Flood Control. The study area includes about 6 miles of Rose Canyon from the Miramar Naval Air Station to the confluence with San Clemente Creek and 6.6 miles of San Clemente Canyon upstream of the confluence. The hydrology analysis was conducted to generate flood maps of the intermediate regional flood (approximately the 100-year flood) and standard project flood. Watershed topography was based on a 1963 aerial photograph. The developed frequencies were based on a comparative analysis of recorded annual peak discharges in hydrologically similar basins since there were no gages in the study area. The intermediate regional flood was developed from flow gage data of San Diego River (1964). The hydraulic analysis included determination of the peak velocities and water surface elevation profiles. This document includes descriptions of flood control structures and bridges within the study area at the time of the analysis and some creek cross sections.

DATA SUMMARY FOR RCW ANALYSIS

A summary of the data from prior studies that could be used for the RCW Analysis is shown in Table 1. In the table, data from reviewed documents or data source are described. The type of analysis (hydrologic, hydraulic, sediment transport, or geomorphic) the data will be used for is also indicated in Table 1.

Previous hydrology studies in the RCW were conducted for various locations along Rose and San Clemente Creeks, as shown in Figure 2. These studies determined peak flows

for a variety of return periods. The earliest study, conducted in 1970 by the USACE, determined the intermediate regional flood and standard project flood at five locations in the upper RCW. Peak discharges for the 10-, 50-, 100-, and 500-year return periods based on the 1970 and 1972 USACE studies are reported by FEMA (2002). A study performed in 2001 determined the 100-year peak flow for the MCAS Miramar property. The 1986 study determined the 2-year peak flood flow at 7 locations along Rose Creek and 3 locations along San Clemente Creek.

There have been several hydraulic analyses conducted for various segments of Rose and San Clemente Creeks, as shown in Figure 3. These hydraulic analyses were based on hydrologic analyses conducted in the early 1970's, thus do not account for land use changes since then. The only hydraulic analysis for the entire RCW was the FEMA study published in 2002. The most recent hydraulic study completed in 2005 provides channel cross-section data for the lower portion of Rose Creek near Mission Bay.

The 2005 Assessment contains a fairly extensive spatial data set representing the major characteristics of the RCW. This data set includes watershed boundaries, land use, soil types, storm drains, and topography.

Two sediment transport analyses for sediment loading were conducted within the RCW. The first was conducted in 1986 and the second in 2003. The 1986 sedimentation analysis included an estimate of the annual sediment loading from the RCW, while the 2003 analysis was used to estimate total suspended solids (TSS) loading to evaluate structural best management practices (BMPs). In addition, a local scour analysis was conducted in 2005 for the lower portion of Rose Creek.

Geomorphologic analyses of Rose and San Clemente Creeks have been limited to general historical descriptions on the movement of the lower portion of Rose Creek. The Assessment Hydrologic Modifications Technical Memorandum contains brief descriptions of aerial photos of the RCW west of MCAS Miramar from 1928, 1945, 1953, 1966, 1977, 1989, and 2000.

Table 1 – Data Summary for RCW Analysis

YEAR	STUDY OR DATA SOURCE	RCW ANALYSIS	DATA DESCRIPTION
--	NOAA	Hydrologic	Meteorological data at San Diego International – Lindbergh Field (CA7740)
2006	Urban Runoff Monitoring Report	Hydrologic	Currently, there are no flow monitoring locations within the RCW
2005	Hydraulic and Scour Studies for Rose Creek Bikeway Bridge	Hydraulic	HEC-2 hydraulic analysis between Mission Bay and Grand Avenue. Provides 15 cross-sections including the Grand Ave Bridge. Determined flood levels and velocities for 50- and 100-year flood events under existing and proposed conditions.
		Sediment Transport	General scour analysis using FLUVIAL-12. Provides a 100-yr hydrograph, two sediment grain size distributions, and initial bed composition.
2005	Rose Creek Watershed Opportunities Assessment	Hydrologic	Watershed data for land use (SANDAG 2002), soil categories, topography (20 ft and 100 ft contour intervals), and storm drain map. 100-year flood map from 1997 FEMA FIS.
	Hydrologic Modifications Technical Memorandum	Hydraulic	Map of hydromodifications in the RCW including reinforced stream banks and concrete channels. Map of railroad and transportation (freeway) network that can be used to identify bridge locations. Site photos of six locations of stream bank protection and five locations of concrete channelization.
		Sediment Transport	Identification of six localized erosion locations due to storm drains. Identification of six locations of stream bank erosion. Identification of six locations of stream bed erosion. Identification of six depositional areas. Identification of six locations of slope failures.
		Geomorphic	Aerial photographs for RCW below MCAS Miramar in 1928, 1945, 1953, 1966, 1977, 1989, and 2000. Field observation comparisons at six locations between 1986 erosion study and 2005 Assessment.
2003	Rose and Tecolote Creeks Water Quality Improvement Project	Hydrologic	Land use data from SANDAG 1995.
		Sediment Transport	TSS loading calculations for 0.6-inch rain event.
2002	Flood Insurance Study San Diego County, California and Incorporated Areas	Hydrologic	Reported peak discharges for 10-, 50-, 100-, and 500-year return periods based on USACE hydrology studies in 1970 and 1972. Peak discharge locations for Rose Creek at mouth, downstream of confluence with San Clemente Creek, upstream of confluence with San Clemente Creek, upstream of State Highway 52, downstream of Genesee Ave, and downstream of Interstate 805. Peak discharge locations for San Clemente Creek upstream of confluence with Rose Creek, upstream of Genesee Ave, and upstream of Interstate 805.

Table 1 Continued – Data Summary for RCW Analysis

YEAR	STUDY OR DATA SOURCE	RCW ANALYSIS	DATA DESCRIPTION
2002	Flood Insurance Study San Diego County, California and Incorporated Areas	Hydraulic	Channel bed profile and water surface elevation profiles using steady-state HEC-2 hydraulic analysis. Identifies flood control and hydromodification structures: 700-ft trapezoidal concrete channel beneath Interstate 5 and State Highway 52 interchange, 1,500-ft trapezoidal concrete channel, 500-ft rock slope protection beneath Interstate 805, 250-ft rock-revetted channel downstream from Genesee Ave and Regents Rd, and triple box culvert with a roadway top elevation of 244 ft NGVD.
2001	Planning Level Delineation of Aquatic Resources, Floodplain Mapping, and Functional Assessment of Riparian Ecosystems at MCAS Miramar	Hydrologic	Hydrologic analysis to determine the 100-year flood peak using the National Flood Frequency (NFF) program. The Watershed Model System (WMS) was used to delineate the watershed boundaries and produce a 100-year flood map based on the hydraulic analysis. The watershed boundaries and 100-year flood map are both available in GIS format.
		Hydraulic	Hydraulic analysis using HEC-RAS to compute the 100-year flood water surface elevation. Topography and cross-section data are not provided with report.
2000	Rose Creek Canyon Enhancement Plan	Hydraulic	Hydraulic analysis using HEC-RAS along Rose Creek between I-5 Bridge and Grand Avenue Bridge for 10-, 50-, and 100-year flood levels. Peak flows are from the USACE 1970 hydrologic analysis.
		Geomorphic	Brief description of geomorphic history.
1986	Watershed Erosion/Sedimentation Study – Rose and San Clemente Canyons	Hydrologic	Hydrologic analysis for 2-year peak flow for seven sub-watersheds using the San Diego County Hydrology Manual.
		Sediment Transport	Sediment load analysis using empirical methods and field observations. Identified localized areas of erosion based on field observations. Sediment grain size distributions at 7 locations along Rose Creek (above confluence, Genesee to I-805, I-5 to Regents, Regents to Genesee, Genesee to I-805, and east of I-805) and 3 along San Clemente Creek (I-5 to Regents, Genesee to I-805, and Regents to Genesee).
		Geomorphic	Identification of erosion locations
1970	Flood Hazard Information Rose Canyon and San Clemente Canyon	Hydrologic	Hydrologic analysis of upper portion of RCW above San Clemente confluence for the intermediate regional flood (~100-year return period) and standard project flood using nearby stream flow data (San Diego River). Peak discharges were determined along Rose Creek upstream from the confluence, at the Interstate 805 crossing, and the upstream study limit. Peak discharges for San Clemente Creek were determined upstream from the confluence, 0.8 miles upstream from Interstate 805, and the upstream study limit. Watershed topography based on 1963 aerial photograph.
		Hydraulic	Hydraulic analysis to determine peak velocity and water surface elevation profiles for the intermediate regional flood and standard project flood. Includes creek bed profiles.

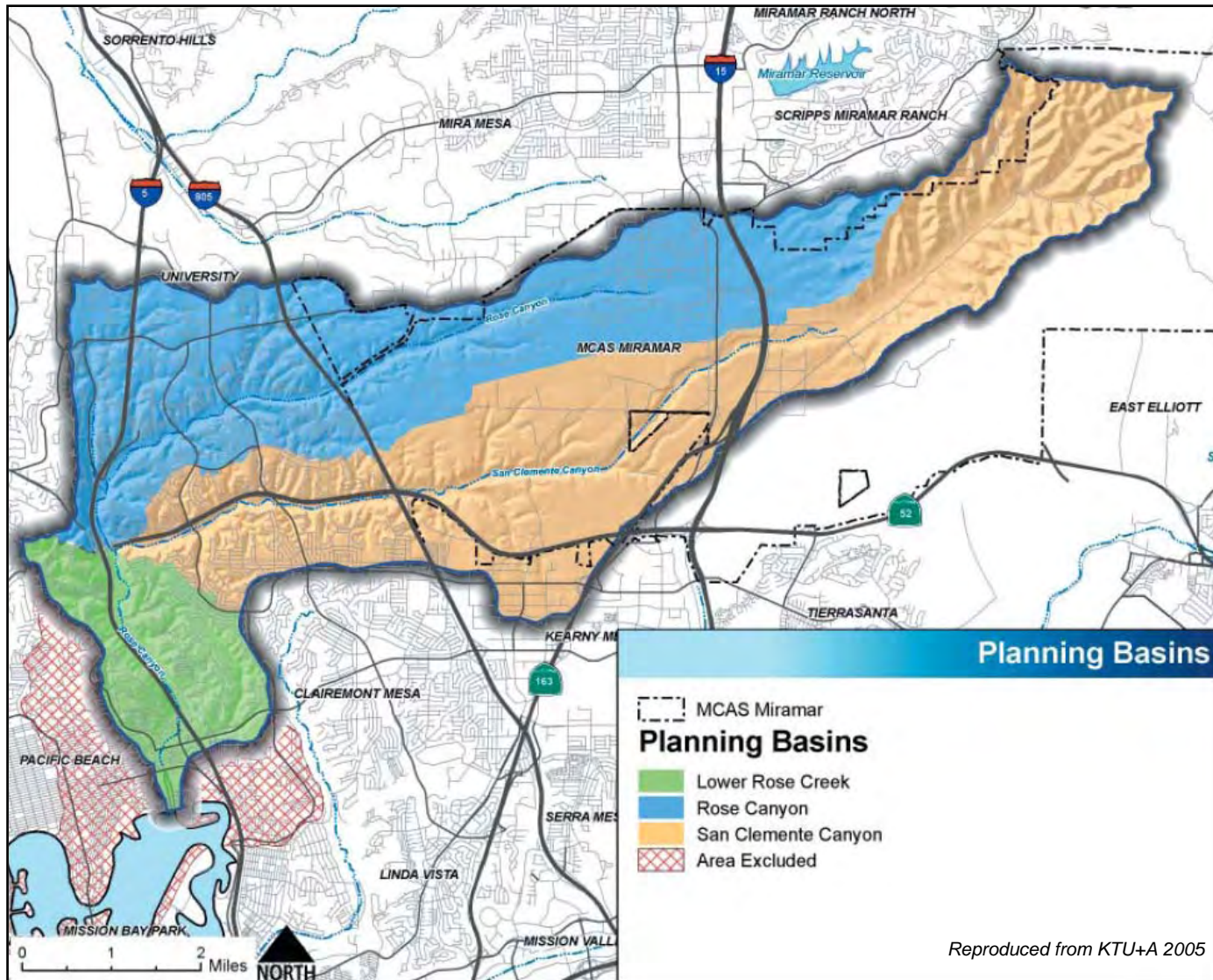


Figure 1 – Rose Creek Watershed

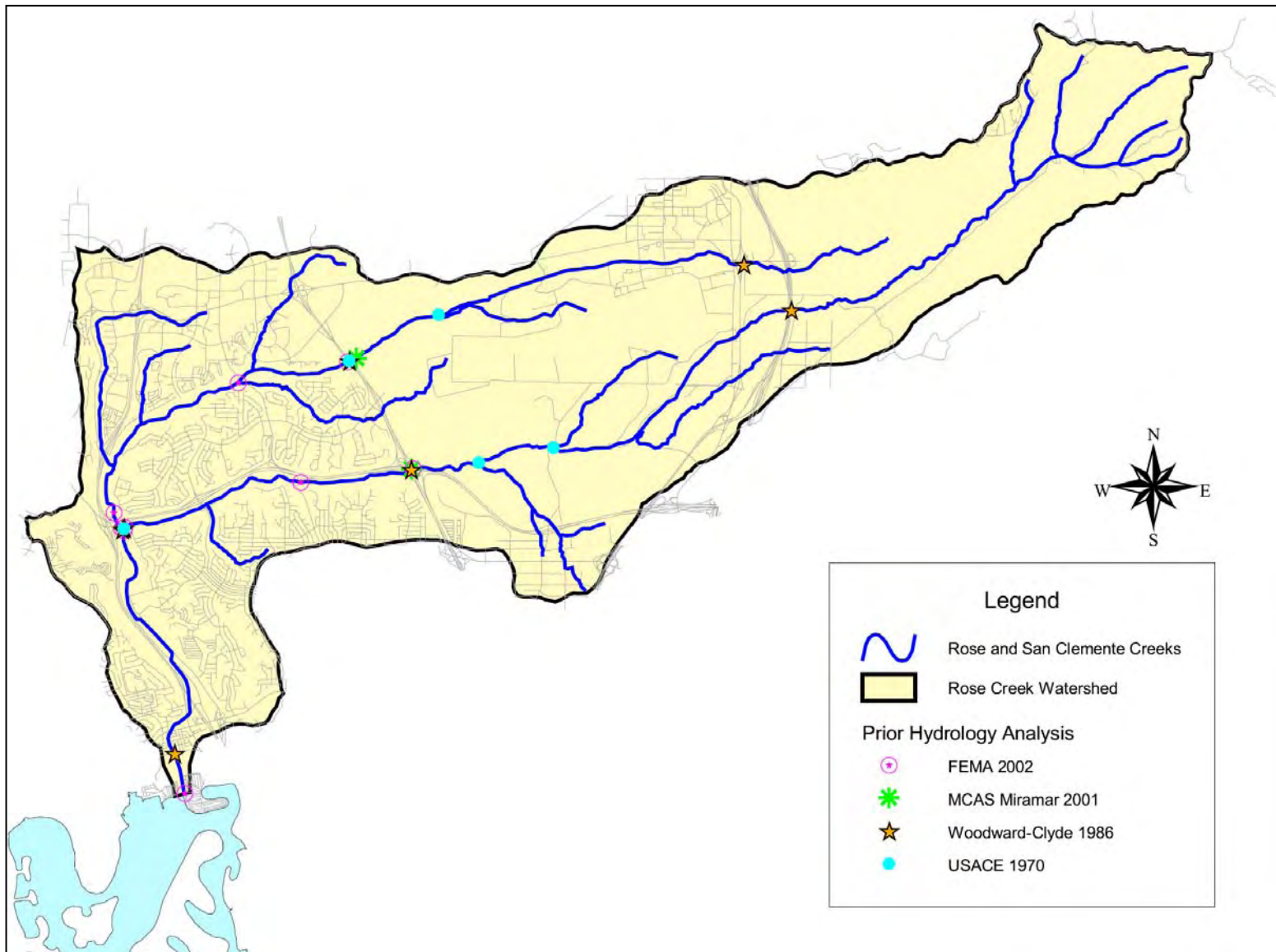


Figure 2 – Locations of Prior Hydrology Analyses

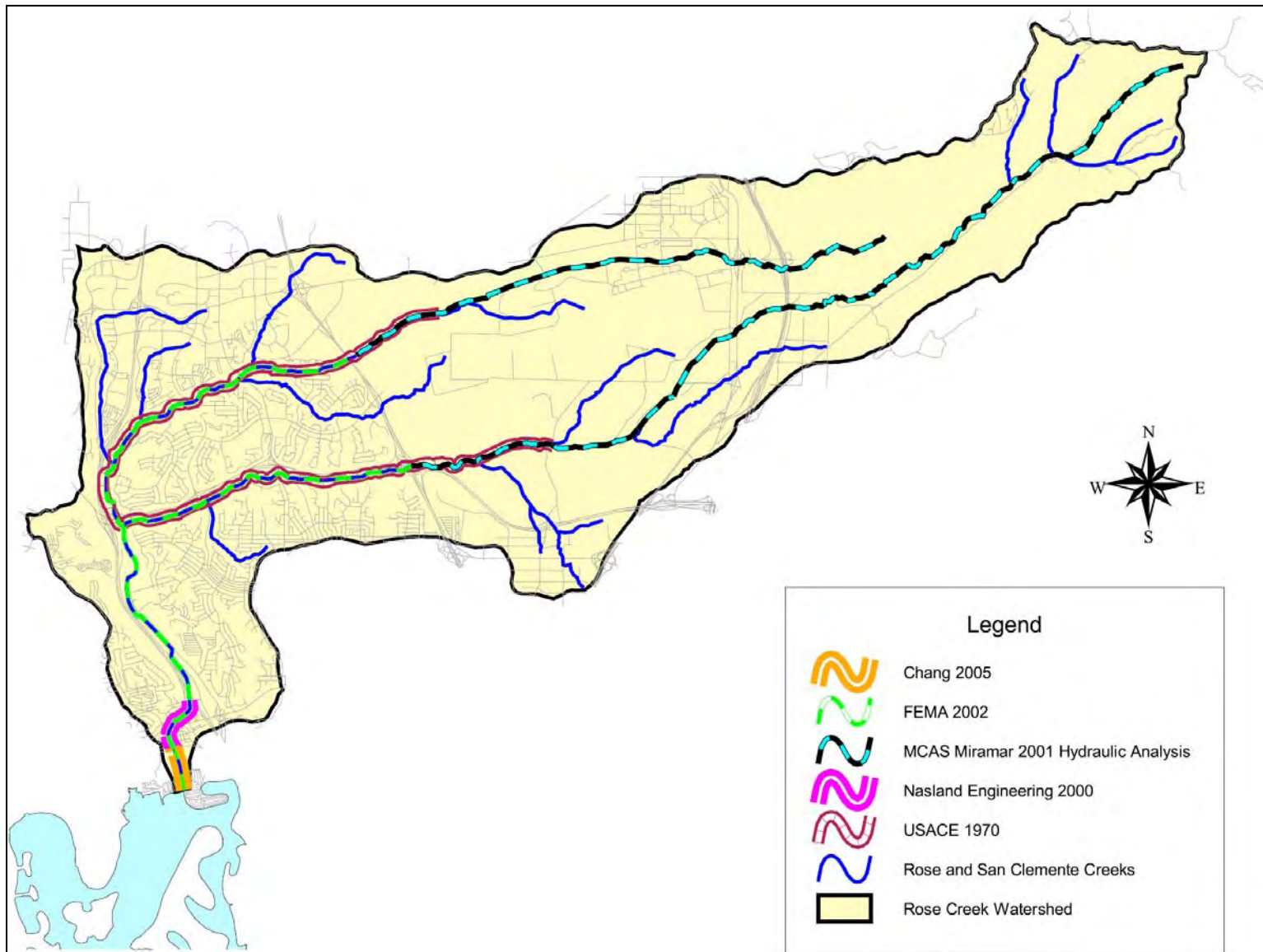


Figure 3 – Locations of Prior Hydraulic Analyses