Appendix C

City of San Diego Source Water System Historic Context Statement

CITY OF SAN DIEGO SOURCE WATER SYSTEM HISTORIC CONTEXT STATEMENT

Prepared for:

City of San Diego Public Utilities Department
9192 Topaz Way
San Diego, California 92123
Contact: Tiffany Lavan, Associate Planner

Prepared by:

Samantha Murray, MA; Sarah Corder, MFA; Nicole Frank, MSHP; Kate Kaiser, MSHP; Kara R. Dotter, MSHP; and Jessica Colston, MA

DUDEK
605 Third Street
Encinitas, California 92024

JUNE 2020

Printed on 30% post-consumer recycled material.

Table of Contents

APPENDICES

FIGURES

TABLES

Executive Summary

The City retained Dudek to prepare a detailed historic context statement built on extensive archival research on the City of San Diego Public Utilities Department's (PUD's) source water system, with particular focus on 11 major pieces of water infrastructure: Morena, Lower Otay, Upper Otay, Murray, Lake Hodges, Barrett, El Capitan, San Vicente, Sutherland, and Miramar Reservoir Complexes, and the Dulzura Conduit. These elements were subject to intensive-level survey and focused research by qualified architectural historians to facilitate preparation of a historical significance evaluation of the City of San Diego Source Water System and its contributing resources, as well as consideration of each resource's individual significance. Understanding the historical significance of these major elements in consideration of their role in the larger system will assist in analyzing future impacts to these and all other resources identified on the source water system.

The research and analysis conducted as part of this study will provide the City and its consultants with the foundation for assessing the historical significance of infrastructure identified throughout the City of San Diego Source Water System as part of future California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) projects. The significance of individual water infrastructure is best understood within the context of the larger system and within its defined period of significance (1887-1947), relevant themes, and property types. This study is designed to help streamline the regulatory processes of CEQA and Section 106 of the National Historic Preservation Act (NHPA), by consistently evaluating and assessing impacts to individual components in consideration of the larger City of San Diego Source Water System.

As a result of the current study, Dudek finds the City of San Diego Source Water System eligible under National Register of Historic Places/California Register of Historical Resources (NRHP/CRHR) Criterion A/1 and City of San Diego Criteria A and B for its ability to convey important associations with the City's municipal water supply and the development of its critical water infrastructure prior to the importation of water from the Colorado River and State Water Project. While other major pieces of water infrastructure were constructed after 1947, including Sutherland Reservoir (1954) and Miramar Reservoir (1960), these resources were constructed outside the identified period of significance for the City's source water system (1887-1947) and were designed to support ongoing population growth and expansion in the San Diego region following World War II, a trend seen throughout the United States. The system is also eligible under NRHP/CRHR Criterion C/3 and City of San Diego Criteria C and D for embodying the distinctive characteristics of a variety of dam engineering types and methods seen throughout the late 19th and early 20th centuries, and for representing an important facet of the body of work of master water engineers O'Shaughnessy, Savage, Eastwood, Pyle, and Hinds.

Identified contributing resources to the larger system include: the Morena, Lower Otay, Upper Otay, Murray, Lake Hodges, Barrett, El Capitan, and San Vicente Reservoir Complexes, as well as the Dulzura Conduit. It is important to note that not all of these components are eligible under NRHP/Criterion C/3. The San Vicente Reservoir Complex and the Dulzura Conduit were found not eligible under Criterion C/3 and related City Criteria due to extensive alterations that occurred outside the period of significance, However, these two resources still contribute to the significance of the larger water system under NRHP/CRHR Criterion A/1 and City Criteria A and B. In addition to the findings for the larger water system, Dudek also found the following resources individually eligible under NRHP, CRHR, and City designation criteria as part of the current study: the Morena, Lower Otay, Upper Otay, Murray, Lake Hodges, Barrett, El Capitan, and San Vicente Reservoir Complexes. The Dulzura Conduit was found to lack requisite integrity for individual designation and its significance is only understood within the context of the larger water system.

It is recommended that the City facilitate consultation with the State Historic Preservation Officer (SHPO) for concurrence of eligibility findings for the San Diego Source Water System and its contributing resources. With SHPO's concurrence on the period of significance and findings of significance, the City will have a consistent methodology in place for evaluating its source water infrastructure and understanding the specific features that contribute to its historical and engineering significance.

Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AF	Acre-Feet
amsl	Above mean sea level
APE	Area of Potential Effect
CEQA	California Environmental Quality Act
City	City of San Diego
County	County of San Diego
CRHR	California Register of Historical Resources
DSOD	California State Health Department's Division of Safety of Dams
GWPC	Great Western Power Company
MWD	Metropolitan Water District of Southern California
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
PRC	California Public Resources Code
PUD	Public Utilities Department
SDCWA	San Diego County Water Authority
SDHC	San Diego History Center
SHPO	State Historic Preservation Office
SJEC	San Joaquin Electric Company
SCMWC	Southern California Mountain Water Company
UCSD	University of California at San Diego
USGS	United States Geological Survey
WRCA	Water Resources Collection and Archives, held by University of California, Riverside

1 Introduction

1.1 Purpose and Scope of Study

The City of San Diego's (City) Public Utilities Department (PUD) provides drinking water to over 1.36 million customers. The City owns and operates 10 local source water reservoirs with approximately 566,238 acre-feet (AF) of capacity, which are connected directly or indirectly to three water treatment plants. Nearly all of the City's major source water infrastructure is over 50 years old. For this reason, it is important for the City to understand the historical significance of its major water infrastructure within the context of the larger system in order to adequately assess future project-specific impacts/effects on these resources in consideration of the City's obligations under the California Environmental Quality Act (CEQA) and Section 106 of the National Historic Preservation Act (NHPA). In addition to providing an evaluation of the City of San Diego Source Water System and its associated major infrastructure, this study will assist the City with management of its historic water infrastructure, by identifying which components of the system require consideration in future operation and maintenance activities and Capital Improvement Projects, and which do not.

The City retained Dudek to prepare a detailed historic context statement built on the foundation of extensive archival research on PUD's source water system, with particular focus on 11 major pieces of water infrastructure: Morena, Lower Otay, Upper Otay, Murray, Lake Hodges, Barrett, El Capitan, San Vicente, Sutherland, and Miramar Reservoir Complexes, and the Dulzura Conduit. These elements were subject to intensive-level survey and focused research by qualified architectural historians to facilitate preparation of a historical significance evaluation of the City of San Diego Source Water System and its contributors, as well as consideration of each resource's individual significance. Understanding the historical significance of these major elements in consideration of their role in the larger system will assist in analyzing future impacts to these and all other resources identified on the source water system. A complete set of State of California Department of Parks and Recreation Series 523 Forms (DPR forms) for the City of San Diego Source Water System is provided in Appendix A.

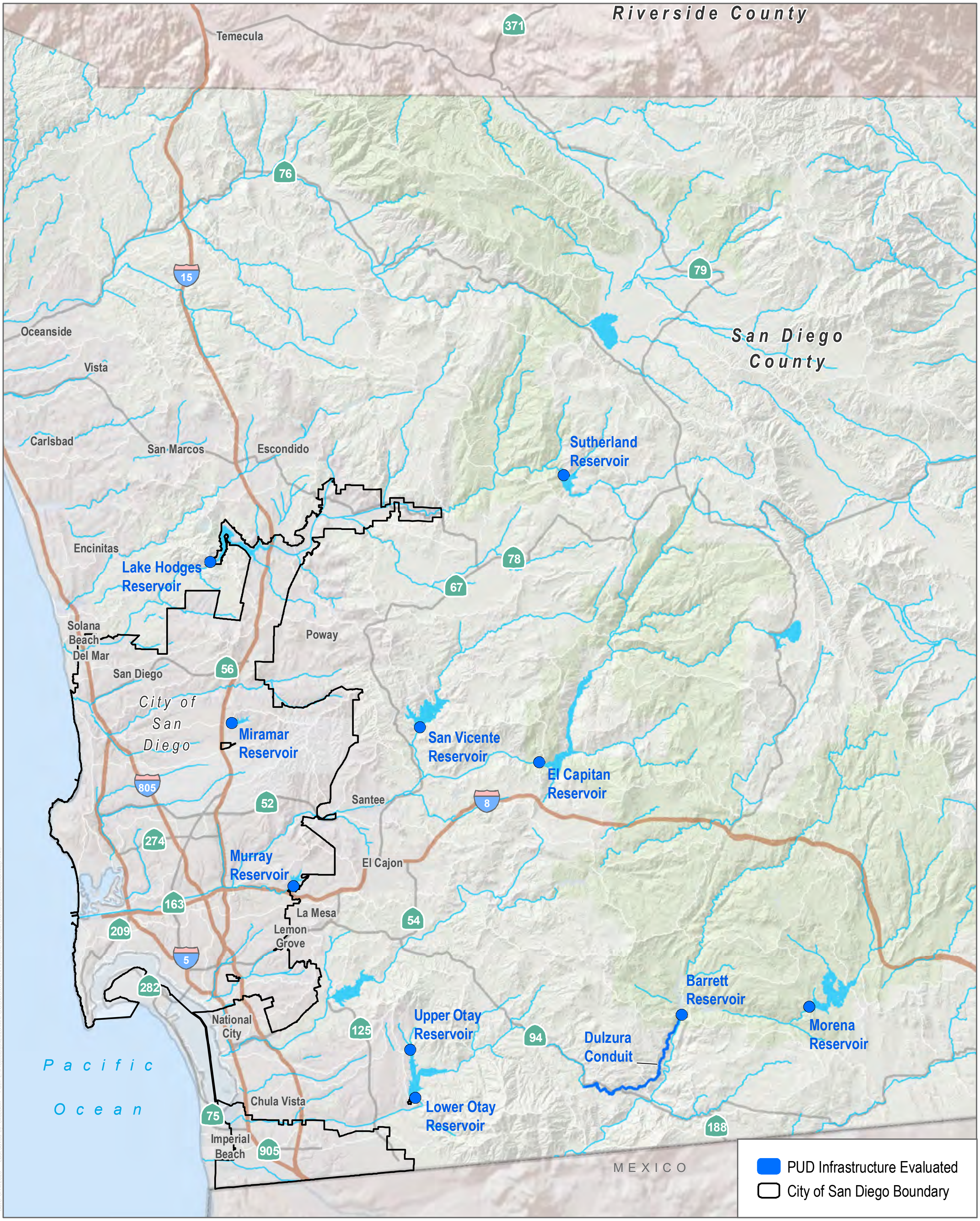
1.2 Purpose of a Historic Context Statement

Historic context statements provide the foundation for identifying and evaluating historical resources and establish a framework for grouping information about resources that share common themes and patterns of historical development. In addition to evaluating the historical significance of 11 major components of the City's source water system, this document provides guidance for future evaluation of other components of the system that were not analyzed as part of this study. The historic context statement will assist with future focused reconnaissance-level surveys; and facilitate the preparation of CEQA and Section 106 of the NHPA compliance documentation. This study provides an overview of important periods, themes, events, people, and property types that can be used as a guide for assessing other elements within the source water system that have the potential for eligibility as a historical resource under a national, state, or local designation program. This context is focused on the historic built environment and does not address pre-history or ethnographic contexts.

1.3 Study Area

The study area encompasses a majority of the San Diego Source Water System, including all City-owned reservoirs and associated infrastructure, comprising ten (10) dams and one (1) conduit throughout the San Diego region (Figure 1). This infrastructure is located throughout several watersheds which drain from the Peninsular and South Coast mountain ranges westward into the Pacific Ocean. Watersheds which drain into the reservoirs include the San Diego River, Cottonwood Creek, Pine Valley Creek, San Dieguito Creek, Santa Ysabel Creek, San Vicente Creek, Sweetwater River, Otay River, and Jamul Creek. While the dams and reservoirs store runoff water from local watersheds, they also impound water from the Colorado River by way of the Colorado River Aqueduct and the California Aqueduct (Figure 2). The following reservoir complexes and all associated infrastructure were included in the study area (Figure 1):

- Morena Reservoir (located in east unincorporated San Diego County directly west of the City of Campo)
- Lower Otay Reservoir (located in unincorporated San Diego County directly east of the City of Chula Vista, approximately 4 miles north of the U.S.-Mexico border)
- Upper Otay Reservoir (located in unincorporated San Diego County directly east of the City of Chula Vista, approximately 4 miles north of the U.S.-Mexico border)
- Barrett Reservoir (located in unincorporated San Diego County approximately 5 miles north of the Barrett Junction)
- Sutherland Reservoir (located in unincorporated San Diego County approximately 2.5 miles northeast of Ramona, CA)
- El Capitan Reservoir (located in unincorporated San Diego County approximately 5 miles east of Lakeside)
- Lake Hodges Reservoir (located in the City of San Diego, just south of Escondido, east of Rancho Santa Fe, and west of the Interstate 15 freeway)
- Murray Reservoir (located in the City of San Diego, directly north of Interstate 8 and
- Dulzura Conduit (located in unincorporated San Diego County between the Barrett Reservoir Complex and Campo Road)
- San Vicente Reservoir (located in unincorporated San Diego County directly north of Lakeside and Santee)
- Miramar Reservoir (located in northern City of San Diego, just east of Interstate 15)



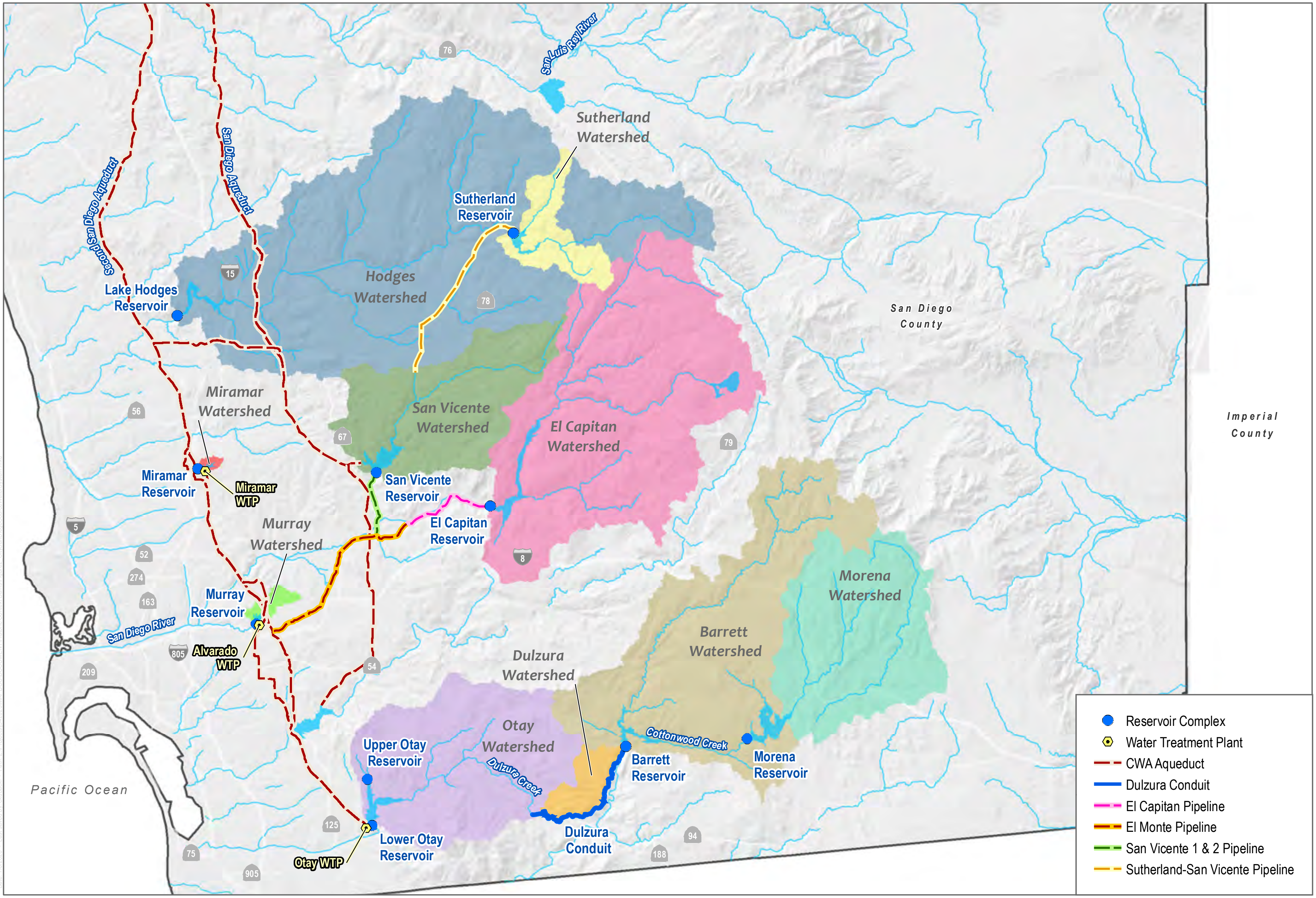
SOURCE: SANGIS 2020

DUDEK

0 4 8 Miles

FIGURE 1

Evaluated Components of the City of San Diego Source Water System



SOURCE: Esri, HERE, Garmin 2020; SanGIS 2014, 2020; SDCWA 2019

DUDEK

FIGURE 2

City of San Diego Source Water System

1.4 Project Personnel

This report and associated property evaluations were prepared by Dudek Architectural Historians Samantha Murray, MA, Sarah Corder, MFA, Nicole Frank, MSHP, and Kate Kaiser, MSHP with contributions by Kara Dotter, MSHP. Fieldwork was completed by Ms. Frank, Ms. Murray, and Dudek Cultural Resources Specialist, Jessica Colston, MA. The report was reviewed for quality assurance/quality control by Dudek Principal Architectural Historian Samantha Murray, MA. All authors and reviewers meet the Secretary of the Interior's Professional Qualification Standards (36 CFR Part 61) for architectural history. Preparer's qualifications are located in Appendix B.

1.5 Regulatory Setting

1.5.1 Federal

National Register of Historic Places

The NRHP is the United States' official list of districts, sites, buildings, structures, and objects worthy of preservation. Overseen by the National Park Service, under the U.S. Department of the Interior, the NRHP was authorized under the National Historic Preservation Act, as amended. Its listings encompass all National Historic Landmarks, as well as historic areas administered by the National Park Service.

NRHP guidelines for the evaluation of historic significance were developed to be flexible and to recognize the accomplishments of all who have made significant contributions to the nation's history and heritage. Its criteria are designed to guide state and local governments, federal agencies, and others in evaluating potential entries in the NRHP. For a property to be listed in or determined eligible for listing, it must be demonstrated to possess integrity and to meet at least one of the following criteria:

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

B. That are associated with the lives of persons significant in our past; or

C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That have yielded, or may be likely to yield, information important in prehistory or history.

Integrity is defined in NRHP guidance, "How to Apply the National Register Criteria," as "the ability of a property to convey its significance. To be listed in the NRHP, a property must not only be shown to be significant under the NRHP criteria, but it also must have integrity" (NPS 1990). NRHP guidance further asserts that properties be completed at least 50 years ago to be considered for eligibility. Properties completed fewer than 50 years before evaluation must be proven to be "exceptionally important" (criteria consideration to be considered for listing.

1.5.2 State

California Register of Historical Resources

In California, the term "historical resource" includes but is not limited to "any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California" (California Public Resources Code Section 5020.1(j)). In 1992, the California legislature established the California Register of Historical Resources (CRHR) "to be used by state and local agencies, private groups, and citizens to identify the state's historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change" (California Public Resources Code Section 5024.1(a)). The criteria for listing resources on the CRHR were expressly developed to be in accordance with previously established criteria developed for listing in the NRHP, enumerated below. According to California Public Resources Code Section 5024.1(c)(1–4), a resource is considered historically significant if it (i) retains "substantial integrity," and (ii) meets at least one of the following criteria:

(1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

(2) Is associated with the lives of persons important in our past.

(3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

(4) Has yielded, or may be likely to yield, information important in prehistory or history.

In order to understand the historic importance of a resource, sufficient time must have passed to obtain a scholarly perspective on the events or individuals associated with the resource. A resource less than 50 years old may be considered for listing in the CRHR if it can be demonstrated that sufficient time has passed to understand its historical importance (see 14 CCR 4852(d)(2)).

The CRHR protects cultural resources by requiring evaluations of the significance of prehistoric and historic resources. The criteria for the CRHR are nearly identical to those for the NRHP, and properties listed or formally designated as eligible for listing in the NRHP are automatically listed in the CRHR, as are the state landmarks and points of interest. The CRHR also includes properties designated under local ordinances or identified through local historical resource surveys.

California Environmental Quality Act

As described further below, the following CEQA statutes and CEQA Guidelines are of relevance to the analysis of archaeological, historic, and tribal cultural resources:

- California Public Resources Code Section 21083.2(g) defines "unique archaeological resource."

- California Public Resources Code Section 21084.1 and CEQA Guidelines Section 15064.5(a) define "historical resources." In addition, CEQA Guidelines Section 15064.5(b) defines the phrase "substantial adverse change in the significance of an historical resource." It also defines the circumstances when a project would materially impair the significance of an historical resource.

- California Public Resources Code Section 21074(a) defines "tribal cultural resources."

- California Public Resources Code Section 5097.98 and CEQA Guidelines Section 15064.5(e) set forth standards and steps to be employed following the accidental discovery of human remains in any location other than a dedicated ceremony.

- California Public Resources Code Sections 21083.2(b)-(c) and CEQA Guidelines Section 15126.4 provide information regarding the mitigation framework for archaeological and historic resources, including examples of preservation-in-place mitigation measures; preservation-in-place is the preferred manner of mitigating impacts to significant archaeological sites because it maintains the relationship between artifacts and the archaeological context and may also help avoid conflict with religious or cultural values of groups associated with the archaeological site(s).

More specifically, under CEQA, a project may have a significant effect on the environment if it may cause "a substantial adverse change in the significance of an historical resource" (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5(b).) If a site is either listed or eligible for listing in the CRHR, or if it is included in a local register of historic resources or identified as significant in a historical resources survey (meeting the requirements of California Public Resources Code Section 5024.1(q)), it is a "historical resource" and is presumed to be historically or culturally significant for purposes of CEQA (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5(a)). The lead agency is not precluded from determining that a resource is a historical resource even if it does not fall within this presumption (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5(a)).

A "substantial adverse change in the significance of an historical resource" reflecting a significant effect under CEQA means "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired" (CEQA Guidelines Section 15064.5(b)(1); California Public Resources Code Section 5020.1(q)). In turn, CEQA Guidelines section 15064.5(b)(2) states the significance of an historical resource is materially impaired when a project:

1. Demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register of Historical Resources; or

2. Demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code or its identification in an historical resources survey meeting the requirements of section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or

3. Demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA.

Pursuant to these sections, the CEQA inquiry begins with evaluating whether a project site contains any "historical resources," then evaluates whether that project will cause a substantial adverse change in the significance of a historical resource such that the resource's historical significance is materially impaired.

If it can be demonstrated that a project will cause damage to a unique archaeological resource, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that they cannot be left undisturbed, mitigation measures are required (California Public Resources Code Section 21083.2[a], [b], and [c]).

California Public Resources Code Section 21083.2(g) defines a unique archaeological resource as an archaeological artifact, object, or site about which it can be clearly demonstrated that without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.

2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.

3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

Impacts to non-unique archaeological resources are generally not considered a significant environmental impact (California Public Resources Code section 21083.2(a); CEQA Guidelines Section 15064.5(c)(4)). However, if a non-unique archaeological resource qualifies as tribal cultural resource (California Public Resources Code Section 21074(c), 21083.2(h)), further consideration of significant impacts is required. CEQA Guidelines Section 15064.5 assigns special importance to human remains and specifies procedures to be used when Native American remains are discovered. As described below, these procedures are detailed in California Public Resources Code Section 5097.98.

1.5.3 Local

City of San Diego Progress Guide and General Plan

The Historic Preservation Element offers a general guide for preserving, protecting, restoring, and rehabilitating historical and cultural resources within the City in order to maintain and encourage appreciation of its history and culture, improve the quality of the City's built environment, maintain the character and identity of its communities, and enhance the local economy through historic preservation. The primary goals of the Historic Preservation Element are outlined below:

A. Identification and Preservation of Historical Resources

- Identification of the historical resources of the City.

- Preservation of the City's important historical resources.
- Integration of historic preservation planning in the larger planning process.

B. Historic Preservation, Education, Benefits, and Incentives

- Public education about the importance of historical resources.
- Provision of incentives supporting historic preservation.
- Cultural heritage tourism promoted to the tourist industry.

The detailed policies associated with items A and B above can be found the Historic Preservation Element (updated 2008), available on the City's website at: http://www.sandiego.gov/planning/genplan/.

City of San Diego Land Development Code

The Designation of Historical Resources Procedures found in the Land Development Code (Chapter 12, Article 3, Division 2) establishes the City's process to identify and designate for preservation significant historical resources. The decision to designate historical resources rests with the City's Historical Resources Board (HRB) in accordance with the requirements of Chapter 12, Article 3, Division 2 and the Historical Resources Guidelines of the Land Development Manual. A decision by the HRB to designate a resource may be appealed to the City Council. The Historical Resources Regulations of the Land Development Code (Chapter 14, Article 3, Division 2) serve to protect, preserve and, where damaged, restore the historical resources of San Diego. The regulations apply to all proposed development within the City of San Diego when historical resources are present on the premises regardless of the requirement to obtain a Neighborhood Development Permit or Site Development Permit. When any portion of a project area contains historical resources, as defined in the Land Development Code Chapter 11, Article 3, Division 1, the regulations apply to the project area.

City of San Diego Historical Resources Board Designation Criteria

The Historical Resources Guidelines of the City of San Diego's Land Development Manual identifies the criteria under which a resource may be historically designated. Additionally, the "Guidelines for the Application of Historical Resources Board Designation Criteria" (Appendix E, Part 2 of the Historical Resources Guidelines) provide detailed guidance on how to evaluate a property under the City's local designation criteria. The Historical Resources Guidelines state that any improvement, building, structure, sign, interior element and fixture, site, place, district, area, or object may be designated a historical resource by the City of San Diego Historical Resources Board if it meets one or more of the following designation criteria:

a. Exemplifies or reflects special elements of the City's, a community's or a neighborhood's historical, archaeological, cultural, social, economic, political, aesthetic, engineering, landscaping or architectural development;

b. Is identified with persons or events significant in local, state or national history;

c. Embodies distinctive characteristics of a style, type, period or method of construction or is a valuable example of the use of indigenous materials or craftsmanship;

d. Is representative of the notable work of a master builder, designer, architect, engineer, landscape architect, interior designer, artist or craftsman;

e. Is listed or has been determined eligible by National Park Service for listing on the National Register of Historic Places or is listed or has been determined eligible by the State Historical Preservation Office for listing on the State Register of Historical Resources; or

f. Is a finite group of resources related to one another in a clearly distinguishable way or is a geographically definable area or neighborhood containing improvements which have a special character, historical interest or aesthetic value or which represent one or more architectural periods or styles in the history and development of the City.

2 Methods

2.1 Archival Research

2.1.1 City of San Diego Public Utilities Department Archive

Over the course of several visits to the PUD archives conducted in 2018 and 2019, Dudek staff reviewed available historical information the City's reservoirs, dams, and related water infrastructure. This included a review of archival photographs, newspaper clippings, articles, papers, letters, engineers' journals, and bookkeeping documents. Information obtained was used in the preparation of this historic context statement.

2.1.2 UC Riverside – Water Resources Collections and Archives

Throughout July 2018, Dudek staff visited University of California, Riverside, Water Resources Collection and Archives (WRCA) and reviewed relevant archival material, including books, reports, newspapers, photographs, and correspondence associated with the City's dams and reservoirs.

2.1.3 San Diego History Center

On April 10, July 31, and September 17, 2019, Dudek staff reviewed relevant materials associated San Diego-area dams and reservoirs held by the San Diego History Center (SDHC)'s Research Archives. In addition to in-person research, Dudek staff accessed copies of the online-hosted collection of *The Journal of San Diego History* over the course of researching this historic context statement. Dudek also utilized the SDHC's online-hosted photograph collection.

2.1.4 UC San Diego – Special Collections and Archives

On January 21, 2019, Dudek staff met with the archivist in UCSD Special Collections and Archives to review the Ed Fletcher Papers (1872–1955) collection. The collection included photographs and other archival material relevant to the City's dams and reservoirs associated with Ed Fletcher, private water company owner, land developer, and local politician key to the success of several City of San Diego-area reservoirs.

2.1.5 Historic Aerial Photographs

Historic aerial photographs of the subject property were available for the dams and reservoirs covered by the study area from Nationwide Environmental Title Research LLC (NETR) maps for the years 1967, 1982, 1993, 1998, 2002, 2005, 2009, 2010, 2012, 2014, and 2016 and from the University of California, Santa Barbara, FrameFinder Maps for the years 1947, 1953, 1963, 1974, 1975, 1976, 1977, 1980, 1989, 1990, and 1996 (NETR 2018; UCSB 2018).

2.2 Review of Related Studies

Historical Resources Technical Report for the North City Project, San Diego County, California, City Project No. 386038 (Dotter et al. 2018)

Dudek was retained to initiate the processing of a joint Environmental Impact Report/Environmental Impact Statement (EIR/EIS) in preparation for the North City Project, Pure Water San Diego Program (North City Project). As a requirement of the EIR/EIS, an historical resources inventory was conducted for the North City Project's area of potential effects (APE). In accordance with the City's Historical Resources Guidelines, separate technical reports were required for archaeological and built environment resources. Four historic-age resources were identified within the APE, only one of which was found to be an historical resource for the purposes of CEQA: the Scripps Meanly Stables and Ranch Complex. An impacts analysis determined a potential for an adverse impact during construction, particularly to the stone wall. In order to mitigated impacts below a level of significance, prior to the initiation of any construction-related, ground-disturbing activities, a qualified historic preservation specialist shall prepare a Protection and Stabilization Plan for the stone wall associated with the Scripps Meanley Stables and House Complex (HRB 450). One of the study areas for this technical report included the San Vicente Reservoir Complex, though it did not examine or evaluate the dam or any related built environment structures.

Cultural/Historical Resource Technical Report: Morena Reservoir Outlet Tower Replacement Project Lake Morena Village, San Diego County, California Services R-308078 Task Order No. 30 (Murray et al. 2016)

This Cultural/Historical Resource Technical Report was prepared by Dudek in May 2016 for the City of San Diego in support of the Morena Reservoir Outlet Tower Replacement Project. The project proposed to replace the existing outlet tower in order to meet current seismic and State Health Department's Division of Safety of Dams (DSOD) requirements. The study inventoried all archaeological and built-environment resources in the APE and was positive for one historical resource. The Morena Dam and Outlet Tower was found individually eligible under NRHP Criteria A and C, CRHR Criteria 1 and 3, and City of San Diego Criteria A, B, C, and D. Therefore, the Morena Dam and the Outlet Tower are considered historic properties under Section 106 of the NHPA and historical resources under CEQA. This finding received concurrence from SHPO on March 15, 2019 (Consultation Ref: EPA_2019_0215_001). As part of the current 2020 study, Dudek will update the original findings reached on Morena in consideration of the larger context of the City of San Diego Source Water System.

Historic American Engineering Record (HAER) CA-2267 of the San Vicente Dam (Dolan 2004)

According to this HAER record: "San Vicente Dam was first recorded in 1993 during a survey by Ogden Environmental and Energy Services…It was assigned a primary number (P-37-024354) by the SHPO. The dam was given a NRHP status code of 4S2. This indicated that the surveyors thought that it might be eligible for the NRHP but more historical or architectural work needed to be performed. In 2002, EDAW, Inc. (then KEA Environmental, Inc.) was retained to assess the dam due to a proposed project to raise the existing dam by 54 feet to provide 52,100 acre-feet of emergency water storage. During these investigations, EDAW recommended the dam as eligible for the NRHP. In a follow-up data recovery plan, it was recommended that prior to alterations to the dam an Historic American Engineering Record (HAER) be completed. This study is a result of that recommendation".

HAER CA-307 of the Lake Hodges Flume (Carroll Canyon Flume) (Ghabhlain and Schaefer 2002)

According to this HAER record: "The Lake Hodges-San Dieguito Reservoir system, of which the flume is a vital part, is eligible for the California Register and the National Register under criteria "A", "B", and "C". The flume is eligible under criterion "A" on the local and regional levels because it was critical in the agricultural and residential development of the north coastal area from La Jolla to Carlsbad, and as far inland as Rancho Santa Fe. The period of significance is 1917, from the time construction began, until the 1930s when the last major modifications were made after it was purchased by San Diego County… The flume is significant under criterion "B" because it is directly associated with the activities of Colonel Ed Fletcher. Fletcher was a key figure in the inception, location, design, construction, and early management of the Lake Hodges Dam and Flume… The flume is significant under criterion "C" because it "embodies the distinctive characteristics of a type, period, region, or method of construction". The flume represents the application of state-of-the-art construction and design to the problem of water conveyance over hilly terrain".

2.3 Pedestrian Survey

Between May 2018 and November 2018, architectural historians meeting the Secretary of the Interior's Professional Qualification Standards conducted pedestrian surveys of nine (9) reservoir complexes and associated infrastructure (including reservoirs, dams, outlet towers, spillways, boat ramps, access roads, etc.) and one (1) conduit associated with the dams (the Dulzura Conduit). The Morena Reservoir Complex was surveyed as part of a previous study completed by Dudek in 2016 (Murray et al. 2016). The evaluation of the Morena Reservoir Complex was updated to reflect this current study on the larger City of San Diego Source Water System. The historic resources surveys entailed taking detailed notes and photographs of all City PUD reservoir complexes, including documentation of major system components, character defining features, spatial relationships, setting, alterations, and the overall existing condition and historical integrity of each resource. All notes and photographs related to the built environment survey are on file with the Dudek Encinitas office. The following resources were surveyed by Dudek as part of the current project:

- Morena Dam (June 29, 2015)
- Upper Otay Dam (May 15-16, 2018)
- Lower Otay Dam (May 16-17, 2018)
- Barrett Dam (May 18-21, 2018)
- Miramar Dam (June 4-6, 2018)
- Murray Dam (June 4-6, 2018)
- Sutherland Dam (June 7, 2018)
- El Capitan Dam (June 8-11, 2018)
- Hodges Dam (June 11, 2018)
- San Vicente Dam (June 14, 2018)
- Dulzura Conduit (November 19-21, 2018)

3 Significant Periods, Themes and Property Types

This section presents an overview of the major periods of development for the City of San Diego Source Water System and a summary of the significant themes and property types associated with these periods.

3.1 Significant Periods and Themes

The Historic Context Statement divides the history of the City of San Diego Source Water System into chronologically ordered periods of development which also serve as the identified themes:

- Early Water System Development (1887-1916)
- Flood Recovery and Reinvestment (1916-1928)
- Post St. Francis Dam Disaster Development (1928-1947)
- Water Importation and Post-war Development (1947-1960)

3.1.1 Early Water System Development (1887-1916)

The procurement of water has played an instrumental role in the growth and development of the City prior to its official founding in 1850. Given that the region receives very little rainfall, and local mountain streams and groundwater provided only a limited supply of water, as the population grew, the need for reliable water sources became imperative. One of the first major water infrastructure projects in the region was construction of the Mission Dam in 1816, marking a pivotal point in the history of water development in the San Diego region. However, progress on water development did not really begin to accelerate until the 1860s to the 1880s, when important groundwork was laid for the future of San Diego's water infrastructure.

The earliest attempts at water development in San Diego is marked by the formation of the San Diego Water Company in 1873. While still plagued with supply and quality issues, the formation of a formal water company was a turning point for the City that set the stage for the development of reliable water sources in San Diego. Population increases also fueled the need for additional reliable water sources and by the 1880s, private water companies were forming to help meet this need. One of the great engineering achievements during the 1880s was the construction of the Sweetwater Dam by the San Diego Land and Town Company. Simultaneously, the Cuyamaca Dam was constructed on Boulder Creek in the Cuyamaca Mountains in 1887. It is this first completed major piece of water infrastructure that marks the start of the Early Water System Development period.

One of the most notable companies to emerge during this time was the Southern California Mountain Water Company (SCMWC) in 1894. Through the formation of private water companies, multiple water infrastructure projects were undertaken during the late nineteenth and early twentieth century. Such projects included Morena Dam (1895), the original Lower Otay Dam (1897), Upper Otay Dam (1902), and the Dulzura Conduit (1909). Despite the early successes of some of these projects, a catastrophic flood of 1916 devastated the San Diego region and destroyed the original Lower Otay Dam. Because the flood of 1916 essentially wiped out much of the City's early water infrastructure, it serves as the end date for this period of early water development in San Diego.

3.1.2 Flood Recovery and Reinvestment (1916-1928)

The next significant period of water infrastructure development in San Diego is bookended by two catastrophic events in Southern California that had far-reaching effects, the flood of 1916 and the St. Francis Dam Disaster in 1928. Despite the City' efforts, the flood of 1916 led to the collapse of the original Lower Otay Dam and destruction of many elements of the early water system in San Diego. Following this disaster, the City took extensive measures to ensure that these types of disasters were somewhat preventable in the future, by building their own dams versus purchasing dams designed by private water companies.

One of the most notable changes made following the flood of 1916 was the hiring of the City's first Hydraulic Engineer in 1917. In the previous period of development, it was a common occurrence for the private water companies to hire engineers like Michael O'Shaughnessy who were not employed by the City. However, the hiring of Hiram Savage in 1917 forever changed the way the City handled their water system development by having an engineer in-house that oversaw the construction of water infrastructure projects. In response to the flood of 1916, Savage was responsible for implementing numerous safety measures to help prevent infrastructure failures in the future and was in charge of the rebuilding and repairing damaged water infrastructure throughout the City. Despite the fact that Savage was replaced as the City's Hydraulic Engineer during this period of development, it is clear that his role was pivotal for the City's infrastructure development.

This period is notable for being a period of hyper-growth within the City's water infrastructure program. Savage was involved in the reconstruction of Lower Otay Dam, the construction of Barrett Dam (1922), and the repairs to Sweetwater Dam and Morena Dam. Additional dams constructed during this period included Murray Dam (1918) and Hodges Dam (1919).

3.1.3 Post St. Francis Dam Disaster Development (1928-1947)

In 1928 the St. Francis Dam, located in the Santa Clara Valley just outside Los Angeles, failed, killing 430 people, destroying 1,250 buildings and 7,900 acres of farmland, to become one of the greatest dam failure disasters of the 20th century. Between 1929 and 1931, the State engineer examined 827 dams and found near one third of them to require significant repairs according to new safety guidelines. In San Diego, this St. Francis Dam Disaster and subsequent dam study prompted major improvements to several dams including: reservoir capacity and spillway enlargement at Morena Dam; spillway enlargement and a new pipeline and filtration system at Lower Otay Dam; enlargement of reservoir capacity at Chollas Dam; crack monitoring, buttress modification, and spillway retrofit at Lake Hodges Dam; and the height increase and spillway retrofit at Barrett Dam.

Another major event occurred in 1928 in response to the St. Francis Dam Disaster: the City of San Diego re-hired Hiram Newton Savage back into his role as the City's Hydraulic Engineer. After firing him in 1923, the City Council re-hired Savage to complete the State Engineer's recommended changes. In addition to implementing the required repairs ordered by the State engineer, Savage was also the designer and water department lead for El Capitan Dam, until his death in 1934. Fred Pyle, Savage's Assistant, brought the El Capitan Dam to completion in 1935.

The remainder of this period is characterized by preparation for the importation of Colorado River water including the completion of Boulder Dam (later, the Hoover Dam) in 1935, the Colorado River Aqueduct in 1939, the All American Canal in 1941, the San Vicente Dam in 1943, and the construction of the San Diego Aqueduct starting in 1945. The San Diego Aqueduct, when complete, would serve as the eventual link to the City's Colorado River water and end reliance on local reservoirs as San Diego's sole water source.

3.1.4 Water Importation and Post-War Development (1947-1960)

The completion of the San Diego Aqueduct was the culmination of a multi-decade-long project to diversify water sources for the City of San Diego in the event of a flood or other emergency. Importing Colorado River water ended the City's complete dependence on local reservoirs and emergencies during multi-year droughts. When San Diego began incorporating imported water into the City's supply in 1947, it started a new trend in the City's water storage and management. At the time of its completion, the first San Diego Aqueduct added 65,000 acre-feet/year of water and accounted for 70-80% percent of the City's water supply, with the remainder coming from local reservoirs. The San Diego Aqueduct's completion marked a shift in the priorities of the City, and it would continue to rely on the imported water for greater than 90% of the city's total supply well into the 1990s (Fraser 2007; SDCWA 2020, Sholders 2002).

While this period is significant because of the switch to imported water from the Colorado River, this period also saw the completion of Sutherland Dam (1954) and the Miramar Dam (1960). Miramar Dam, the final dam constructed in the City of San Diego's system, was constructed to supply local water to the northern part of the City of San Diego, as well as service the Miramar Naval Air Station, after the area was annexed to the city, expanding the city's population and utilities. While the water system continues to grow and develop after through alterations and additions, no new dams have been added to City of San Diego's system since Miramar was completed.

3.2 Associated Property Types

3.2.1 Primary Property Types

Reservoir complexes are usually comprised of several elements including the water-retaining structure (dam), a water-retention area (reservoir), a water-releasing structure (spillway), a water-conveying structure (conduits and outlet tower), and other essential elements including water treatment plants (Zhang et al 2016). Each of these portions of the reservoir provides an essential function that ensures water will be retained and released safely. Primary property types are distinguished from secondary property types in that each is required for the water system to work effectively and for the reservoir system to continue its intended functions. Primary property types also reflect the elements of a reservoir complex that are required to convey its significance. While pipelines are certainly essential to the transport of water and serve a vital role in the system, they are typically not readily visible components of the water system and are therefore not necessarily required for the reservoir complex to convey its significance.

Dams

The purpose of a dam is to store water and facilitate flood control for human and livestock water supply, irrigation, energy generation, recreation, and pollution control (Figure 3). Typically dams fulfill a combination of these functions. Manmade dams are classified according to their type of construction, materials, slope, seepage control method, and resistance to the forces of water pressure. The materials used to construct modern dams included earth, rocks, concrete, masonry, steel, timber, rubber, and sometimes a combination of these materials. Dams can be classified into five basic types including embankment, concrete, gravity, buttress, and arch, which are discussed in detail in Section 4.3 (ASDSO 2020).

Figure 3. Murray Dam, downstream face, June 4, 2018, IMG_0562

Reservoirs

A reservoir is typically formed by the construction of a dam across a linear water source, such as a river or creek, to create an artificial lake where water is stored (Figure 4). The adjacent dam is responsible for the amount of water that flows out of the reservoir, therefore controlling its water level. The amount of water in a reservoir can also be controlled by natural elements including rainfall, snowfall, and droughts. In conjunction with storing water, reservoirs often become recreation centers for boating and fishing. The water in a reservoir is very still causing sediment to sink to the bottom which over time can reduce the total amount of water in the reservoir (NG 2020).

Figure 4. Hodges Reservoir, upstream face, June 11, 2018, IMG_2365

Spillways

A spillway is a structure used for the control of flood flows and diverting surplus water from a reservoir after it has been filled (Figure 5). The primary purpose of a spillway is to ensure water does not overtop the dam and destroy it. A controlled spillway manages flood water through the use of gates, where an uncontrolled spillway only utilizes the elevation of the spillway crest to control the water. The gates allow small amounts of water to be released to prevent a sudden large discharge of water which could cause the dam fail. There are seven types of spillways including straight drop, ogee, shaft, chute, side channel, siphon, and labyrinth (PE 2019).

Figure 5. Sutherland Spillway, June 11, 2018, IMG_0961

Conduits

A conduit is a closed channel used to convey the discharge through or under the dam (Figure 6). Typically, a conduit is comprised of pipes constructed of steel, concrete, or they may be driven at depth through solid rock (NHDES 2011). Conduits can transport two types of water flow including pressurized and open channel. Pressurized conduits are covered, and the flow occurs because of longitudinal pressure differences along the conduits line. An open channel conduit transports water by gravity with a free surface open to atmospheric pressure, which determines the channel's size, shape, and slope (Erickson et al 2010).

Figure 6. Dulzura Conduit, November 19, 2018, DSC00534

Outlet Towers

The outlet tower is a vertical structure located within the reservoir used for capturing water and conveying it to a hydroelectric or water-treatment plant (Figure 7). The tower sits above an outlet tunnel or pipe used to transport the water out of the reservoir which is controlled by the opening and closing of valves or gates. The value controls are usually located in a room at the top of the outlet tower (BDS 2020).

Figure 7. Barrett Outlet Tower, upstream face, May 18, 2018, JFC_0442

Water Treatment Plants

Water treatment plants are intended to provide safe drinking water to the public (Figure 8). This water is frequently supplied by reservoirs, resulting in the close proximity of water treatment plants to reservoirs. The process of treating water is used to remove contaminants that cause sickness and disease from waterborne germs in drinking water. There are four steps to this process, coagulation and flocculation, sedimentation, filtration, and disinfection. The water treatment plant is responsible for the filtration and disinfection steps of this process to allow water to then be piped to homes and businesses (CDC 2020).

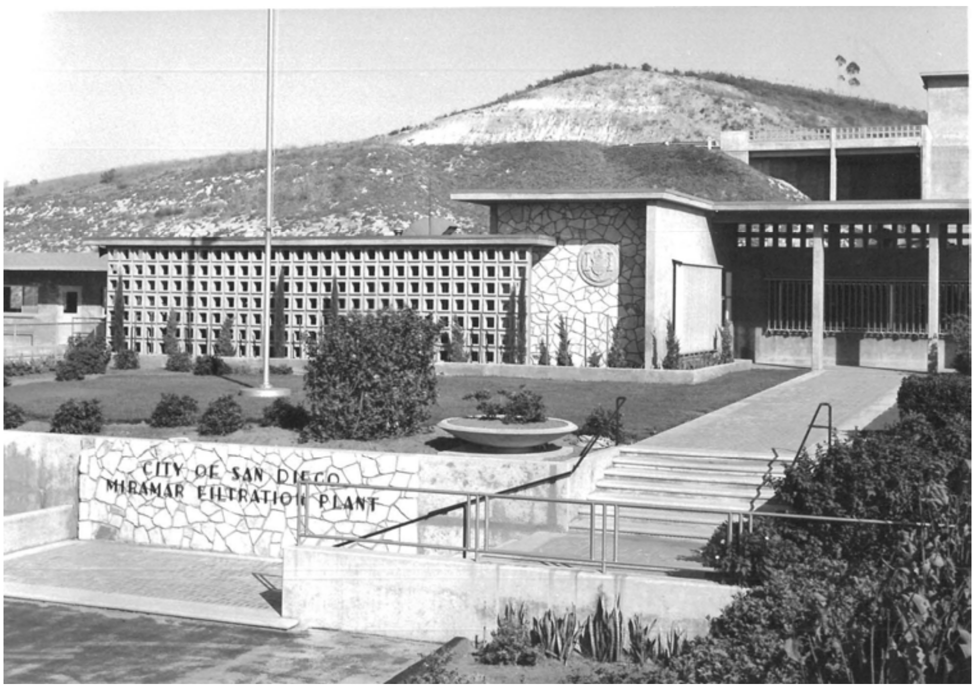


Figure 8. Miramar Filtration Plant, c. 1970, (City of San Diego Public Utilities Department Archives)

Other Primary Property Types

Other property types that help to convey the significance of the larger reservoir complex include flumes and access roads. Flumes are artificial channels for water in the form of an open-topped, declined chute which used gravity to transport water between two points. They are typically used in combination with conduit property types and connect the reservoir properties to other parts of the water system, (e.g., filtration plants). Access roads, within this context, are roadways with the specific purpose of providing access to the reservoir complexes. Access roads may include both historic roads, now closed and modern access roads.

3.2.2 Secondary Property Types

In comparison to the primary property types of dams, reservoirs, spillway, conduits, outlet towers, water treatment plants, flumes, and access roads, secondary property types are not necessarily vital to keeping the reservoir complex running. Although secondary property types range greatly in their design and function, they are frequently associated with City-owned/operated dam and reservoir sites. Examples of secondary property types include Keeper's houses, cisterns and water tanks, pumping stations, wells, vaults, and any other components the San Diego Source Water System built to support the larger reservoir complex.

- Keeper's House: a small purpose-built cottage constructed to house the dam's keeper who moderated water levels in response to drought and heavy rain
- Cistern and Water Tank: an artificial reservoir, tank, or container used for the storing or holding of water on a dam site
- Pumping Station: Building(s) of this type can vary in size, their function is to house machinery that transport water from one site to another.
- Well: An excavation or structure created by digging, driving, or drilling to access water underground

3.2.3 Dam Types

As discussed previously, reservoir complexes are made up of many components. However, the most critical element is the dam. Dams can be classified based on a variety of characteristics, including use, materials, and design. For this overview, they will be discussed based on their design, which typically relies on either their mass/strength or their structural resistance to hold water. Types of massive dams that will be discussed include gravity dams and embankment dams. Types of structural dams that will be discussed include arch dams and buttress (multiple arch) dams.

Massive Dams

Massive dams consist of a mass of material, which by its sheer weight holds back water. Types of massive dams rely on the force of gravity to pull vertically down on the dam and provide resistance against the pressure exerted from the water. Unlike structural dams, which rely on their own design, the philosophy behind massive dams is to accumulate as much material as possible to avoid the dam tipping over, sliding out of position, or being breached. The main types of massive dams that will be discussed are embankment and concrete gravity dams (Billington et al. 2005).

Embankment Dams

Embankment dams are a type of massive dam that is built with natural materials, either rock or earth instead of concrete, leading to the sub-classification of earth-filled embankment dams and rock-filled embankment dams. The basic elements of embankment dams consist of a core, an earth- or rock-filled embankment on both sides, and protection on the upstream face. Embankment dams are trapezoidal in shape and resist the flow of water by both its strength and weight. Embankment dams are able to retain water because they have a low permeability throughout the structure or a layer of low-permeability material (Billington et al. 2005; TCEQ 2018).

Earth-filled Embankment Dams

Earth-filled embankment dams were the first type of dam to be constructed by humans and were first documented in approximately 3,000 BC in the Middle East. In fact, earth-filled embankment dams are still the most prevalent dam-type, and a 2005 report on large federal dams estimated that of the 70,000 dams present in the United States, 85% were earth-filled embankment dams. Many of the dams in the United States were built in the early twentieth century prior to the advent of technology that would have facilitated the construction of structural dams. However, the report goes on to say that throughout the twentieth century, even with the advent of new technology, 65% of the dams built were earth-filled embankment dams. Earth-filled dams are the most prevalent type of dam because they can be built from locally available materials that require minimal processing, saving money on the construction process. The main detraction from earth-filled dams is that they are subject to the erosive action of water if a sufficient spillway is not provided as part of the dam design (Billington et al. 2005; Bureau of Reclamation 1987). Examples of earth-filled embankment dams in San Diego include:

- 1887, Cuyamaca Dam, earth-filled dam
- 1923, Henshaw Dam, earthen-fill embankment dam
- 1960, Miramar Dam, earth-filled embankment dam

Rock-filled Embankment Dams

The rock-filled embankment dam construction method, implemented either in the form of machine filled or hand-laid cobbles and masonry, originated in California in the 1850s during the California Gold Rush when miners would use drill and blast techniques to create an abundant supply of rock material for construction. By the mid-1800s, the rock-filled method was implemented to construct numerous dams throughout California, including some of the tallest in the world. Upstream-facing materials improved with the use of steel and concrete, created relatively low permeability (Breitenbach 2004).

Rock-filled dams can vary significantly in material types, such as central earth core or sloping earth core with materials including basalt, andesite, sandstone, conglomerate, granite, limestone, and alluvial cobbles. Rock-filled construction is an economical method and particularly suitable when there is no satisfactory earth available, when a plentiful supply of sound rock is at hand, where high rainfall makes earth-filled construction untenable, or where the construction of a concrete dam would be too costly. Like earth-filled embankment dams, rock-filled dams are subject to destruction or damage if there is not a spillway with adequate capacity to prevent overflowing (Leps 1988; Bureau of Reclamation 1987). Examples of rock-filled embankment dams in San Diego include:

- 1897, first Lower Otay Dam, a rock-filled embankment dam (destroyed 1916)
- 1898, original Morena Dam, rock-filled embankment dam (paused, restarted in 1912)
- 1916, Morena Dam, 2nd phase; rock-filled embankment dam
- 1935, El Capitan Dam, hydraulic rock filled embankment dam

Gravity Dams

Gravity dams are comprised of concrete or masonry and rely on the force of gravity pulling vertically down on the dam to retain a volume of water and provide resistance against horizontal (water) reservoir pressures. A gravity dam is designed to create as much material as possible to resist water pressure and to ensure that the dam will not tip over, slide, or rupture. Gravity dams are triangular in cross-section, a design that complements the distribution of water pressure. Deeper water puts more pressure on the horizontal plane. Thus, the maximum amount of pressure is located at the base of the dam, while there is little pressure at the surface of the reservoir. This results in a sturdy structure, which can survive weathering and deterioration. There are several different types of gravity dams, including a straight gravity dam, curved gravity dam, solid gravity dam, and hollow gravity dam. The most common type of concrete gravity dam is a straight, solid gravity dam. Concrete gravity dams are less prevalent than embankment dams because of the high costs associated with their construction (Billington et al. 2005; The Constructor 2017). Curved gravity dams, unlike arch dams, which will be discussed below, do not hold back water simply by the shape of their design. They are considered massive dams and not structural dams because, if straightened out, the cross-section of the dam would still have enough mass to hold back water (Billington et al. 2005). Examples of gravity dams in San Diego include:

- 1919, second Lower Otay Dam, curved gravity dam
- 1922, Barrett Dam, curved gravity dam
- 1943, San Vicente straight axis gravity dam
- 1945, Loveland Dam, curved gravity dam

Structural Dams

Unlike massive dams, structural dams do not rely only on bulk but also on shape to resist hydrostatic pressure. The use of certain forms, such as arches or buttresses, can result in a significant reduction in the bulk of the dam's profile and mass. Because shape and not mass is the most important attribute of these types of dams, the amount of material can be minimized greatly, reducing costs. The main type of structural dam found in the United States is the arch dam. Like massive dams, structural dams have been around for millennia, with the first one being an arch dam constructed by the Ilkahnid Mongols in Persia during the thirteenth and fourteenth centuries; this dam was also the tallest dam in the world for 500 years (Billington et al. 2005).

Arch Dams

Arch dams are made from concrete or masonry and are curved upstream in a way that allows the dam to transfer much of the water load to abutments (a function known as arch action) while also carrying loads vertically to the valley floor (an action known as cantilever behavior). This is the main difference between arch dam and gravity dams, which only act as cantilevers and carry loads vertically. The crucial issue involved with design of arch dams is to determine how much of the water load will be transferred horizontally and how much will be transferred vertically. Safe cantilever behavior requires much more material than safe arch action does. Therefore, the goal for arch dam design is to maximize the amount of arch action in order to minimize the amount of material and, thus, cost (Billington et al. 2005).

Based on the thickness of the concrete, arch dams can be further classified into thin, medium, or thick dams. As previously stated, sometimes a gravity dam is also curved, but gravity dams do not need the arching action for stability and, therefore, cannot be called arch dams. Arch dams are most suitable for narrow canyons or gorges, where the foundation for the abutments is solid rock (Salamon 2012; Bureau of Reclamation 1987).

The Sweetwater Dam in the City is an early example of an arch dam. Designed by Frank E. Brown, it was originally supposed to be much thinner in the cross-section; however, after Brown was replaced by another engineer, the dam was given a much thicker profile. Despite its thicker profile, it still represents an important early demonstration of using this type of dam design (Billington et al. 2005; Hill 2002).

- 1888, Sweetwater Dam, thick arch dam (damaged 1916)
- 1901, Upper Otay Dam, thin arch dam

Multiple Arch Dams

Multiple Arch dams (also called Buttress dams) are made of concrete or masonry and feature buttresses that are built perpendicular to the wall of the dam, which is usually thin. There are two types of buttress dams: flat-slab dams that exhibit a flat surface for the upstream face, and multiple-arch dams, which contain multiple arches between each buttress. Buttress dams, unlike massive dams, are not solid because they contain empty space between adjacent buttresses. These types of dams require much less material than gravity dams, and they do not require narrow canyons with rock faces like arch dams.

- 1917, Murray Dam, multiple arch dam
- 1918, San Dieguito Dam, multiple arch dam
- 1919, Hodges Dam, multiple arch dam
- 1954, Sutherland Dam, multiple arch dam (started 1928, paused, restarted 1952)

4 Historic Context

4.1 Historical Background

4.1.1 Overview of the Historic Period in San Diego (post-AD 1542)

European activity in the region began as early as AD 1542, when Juan Rodríguez Cabrillo landed in what is now San Diego Bay. Sebastián Vizcaíno returned in 1602, and it is possible that there were subsequent contacts that went unrecorded. These brief encounters made the local native people aware of the existence of other cultures that were technologically more complex than their own. Epidemic diseases may also have been introduced into the region, either by direct contact with the infrequent European visitors or through waves of diffusion emanating from native peoples farther east or south (Pourade 1977; Preston 2002; Smythe 1908).

Spanish colonial settlement was initiated in 1769, when multiple expeditions arrived in what is now San Diego by land and sea and then continued northward through the coastal plain toward Monterey. A military presidio and a mission were soon firmly established at San Diego, despite violent resistance to them from a coalition of native communities in 1776. Today, this location is immediately adjacent to "Old Town" San Diego, and lies northwest of modern downtown San Diego. Private ranchos subsequently established by Spanish and Mexican soldiers and other non-native people appropriated much of the remaining coastal or near-coastal locations (Pourade 1960–1967). No land grants were established in the mountains of eastern San Diego County, leaving the local Kumeyaay relatively unaffected by the arrival of Spanish and Mexican immigrants (Pourade 1977; Preston 2002; Smythe 1908).

Mexico's separation from the Spanish empire in 1821 and the secularization of the California missions in the 1830s caused further disruptions to native populations in western San Diego County. Some former mission neophytes were absorbed into the work forces on the ranchos, and others drifted toward the urban centers in San Diego and Los Angeles or moved to the eastern portions of the County where they were able to join still largely autonomous native communities (Pourade 1977; Preston 2002; Smythe 1908).

The United States' conquest and annexation, together with the gold rush in Northern California, brought many additional outsiders into the region. Development during the following decades was fitful, undergoing cycles of boom and bust. After passage of the Homestead Act of 1862, settlers began making claims to land throughout California and, for the first time, in eastern San Diego. Many of the new arrivals laid roots in the mountain valleys, which provided abundant feed for cattle. Cattle ranching was the primary source of income for most families, with many settlers also earning income by raising sheep and pigs, growing citrus, and beekeeping. However, the dry climate and periodic droughts limited the productive capacity of the land (Pourade 1977; Smythe 1908).

The American Period began in 1846 when American military forces occupied the City in July. The town's residents split on their course of action, with many of the town's leaders siding with the Americans, and other prominent families opposing the United States' invasion. In December 1846, a group of Californios under Andres Pico engaged U.S. Army forces under General Stephen Kearney at the Battle of San Pasqual and inflicted many casualties. However, the Californio resistance was defeated in two small battles near Los Angeles and effectively ended the resistance by January 1847. The Americans assumed formal control with the Treaty of Guadalupe-Hidalgo in 1848 and introduced

Anglo culture and society, American political institutions, and American commerce. In 1850, the Americanization of the City began to develop rapidly (Pourade 1977; Smythe 1908).

On February 18, 1850, the California State Legislature formally organized the County of San Diego, with the City named as the county seat. The first elections were held in the City and the community of La Playa on April 1, 1850 for County of San Diego officers. The City grew slowly during the next decade, hindered by a brief bankruptcy in 1852. San Diegans promoted the City's growth through a transcontinental railroad plan and development of a new town closer to the bay. The failure of these plans added to a severe drought that crippled ranching at the onset of the Civil War and left the City as a remote frontier town. These issues led to a drop in the town's population from 650 in 1850 to 539 in 1860. Not until land speculator and developer Alonzo Horton arrived in 1867 did the City begin to develop fully into an active American town (Pourade 1977; Preston 2002; Smythe 1908).

Alonzo Horton's development of a New San Diego (modern downtown) in 1867 began to swing the community's focus away from Old Town and began the urbanization of the City. Expansion of trade brought an increase in the availability of building materials. Wood buildings gradually replaced adobe structures. Some of the earliest buildings erected in the American Period were prefabricated houses that were built on the East Coast of the United States and shipped in sections around Cape Horn and reassembled in the City. Development spread from downtown due to a variety of factors, including the availability of potable water and the expansion of transportation corridors. Factors such as viewsheds and access to public facilities affected land values, which in turn affected the character of neighborhoods that developed. During the Victorian Era of the late 1800s and early 1900s, the areas of Golden Hill, Uptown, Banker's Hill, and Sherman Heights were developed. Examples of the Victorian Era architectural styles remain in these communities and in Little Italy, which developed at the same time. While downtown was beginning to develop, a summer cottage/retreat was established in what are now the Pacific Beach communities and La Jolla area. The early structures in these areas were not of substantial construction, since they were primarily built for temporary vacation housing (Caltrans and JRP Historical Consulting Services 2000; Pourade 1977; Preston 2002; Smythe 1908).

Development also spread to the greater North Park and Mission Hills areas during the early 1900s. These neighborhoods comprise small lots that were developed one at a time and did not experience large tract housing developments. This provided affordable housing outside of the downtown area, which only expanded as transportation improved. Barrio Logan began as a residential area, but because of proximity to rail freight and shipping freight docks, the area became more mixed, with conversion to industrial uses. This area was more suitable to industrial uses because land values were not as high. Topographically, the area is more level and lacks the views seen from areas north of downtown. The affordability of Barrio Logan attracted a diverse population seeking land ownership (Caltrans and JRP Historical Consulting Services 2000).

San Ysidro was developed around the turn of the twentieth century. The early settlers were followers of the Little Landers movement. There, the pattern of development was designed to accommodate small plots of land for each homeowner to farm as part of a farming/residential cooperative community. Nearby Otay Mesa–Nestor began to be developed by farmers of German and Swiss backgrounds. Some of the prime citrus groves in California were in the Otay Mesa–Nestor area. In addition, grape growers of Italian heritage settled in the Otay River Valley and tributary canyons and produced wine for commercial purposes (Pourade 1977; Smythe 1908).

San Diego State University was established in the 1920s, and development of the state college area began, including development of the present-day Navajo Community Plan Area as outgrowth from the college area and from the west. There was farming and ranching in Mission Valley until the middle portion of the twentieth century when the uses were converted to commercial and residential. There were dairy farms and chicken ranches adjacent to the San Diego River where now there are motels, restaurants, office complexes, and regional shopping malls. There was little development north of the San Diego River until Linda Vista was developed as military housing in the 1940s when the federal government improved public facilities and extended water and sewer pipelines to the area. From Linda Vista, development spread north of Mission Valley to the Clairemont Mesa and Kearny Mesa areas. Development in these communities was mixed use and residential on moderately sized lots.

4.1.2 Early Water System Development (1887-1916)

The procurement of water has played an instrumental role in the growth and development of the City since its founding. The region receives very little rainfall, and local mountain streams and groundwater provide only a limited supply of water. Cattle raising and dry-farmed wheat were the predominant forms of agriculture in the 1850s–1880s largely because of the region's water supply limitations. As the San Diego region, and the State of California as a whole, aggressively developed its agricultural industry during the Mission Period and beyond, water became a highly prized and widely disputed topic. Seven principal streams that originate in the Peninsula Range and discharge to the Pacific Ocean provided fresh water sources and, later, ideal locations for dams and reservoirs: Santa Margarita River, San Luis Rey River, San Dieguito River, San Diego River, Sweetwater River, Otay River, and Tijuana River (which consisted of two major reaches). The state's first instances of irrigation came from diverting such streams using riparian rights and lacked a formal water storage system (Caltrans and JRP Historical Consulting Services 2000; Fowler 1953; SWRB 1951).

During the Spanish Period (1769–1821), Franciscan missionaries sought an adequate water supply for irrigation purposes by digging wells near the San Diego River and constructing water conveyance ditches, small dams, and cisterns. Kumeyaay neophytes and laborers worked to build the Old Mission Dam (also called the Old Padre Dam) and an aqueduct to the mission beginning in 1803 and completed it in 1816; portions of both remain intact. During the Mexican and early American Periods, there was no regional coordination to procure and maintain a reliable water supply. At the end of the Mexican Period and the beginning of the American Period, fresh water in San Diego was becoming increasingly difficult to acquire because of ranching practices, aggressive hydraulic gold mining, and American homesteaders throughout the state (Caltrans and JRP Historical Consulting Services 2000; Sholders 2002; SWRB 1951).

In response to the population growth and regional limitations on irrigation from low rainfall and lack of proper storage, multiple areas of Southern California, including the San Diego region, began to develop water storage reservoirs and dams. In the 1860s, this meant acquisition of riparian water rights, which allowed a landowner access to water that abuts or flows through their property. One of the earliest attempts at the development of an organized water system in the County began when F.A. Kimball acquired the riparian rights to water on the lower reaches of the Sweetwater River in 1869. Kimball purchased 27,000 acres of the former Rancho de la Nación in 1868 and selected and surveyed a site for a dam and reservoir. He organized a water company and, in June 1869, acquired land for Kimball Brothers Water Company. Kimball's venture failed without ever producing water for the City and in 1880, Kimball organized the California Southern Railway Company and conveyed his land and riparian rights to the new rail company (Fowler 1953; SWRB 1951).

The first major steps toward organized water infrastructure within the San Diego metropolitan area began in 1873 with the formation of the San Diego Water Company. The corporation began drilling a well near B and Eleventh Streets that supplied the City's first pipe water to a few residences in 1874. Unfortunately, the groundwater was poor in quality, and the supply was low, which led to the origination of the City's former "bad water" reputation. To remedy its supply and quality issues, the San Diego Water Company increased its stock from $10,000 to $250,000 in 1875, which allowed for the drilling of wells in the San Diego River, construction of a new pumping plant, and extension of the distribution system. The wells proved insufficient for the quickly growing City, and soon the City began to turn to privately owned water companies to supply the City (Fowler 1953; Smythe 1908).

The development of reliable water infrastructure throughout the region did not begin in earnest until the 1880s, as a result of a significant population boom and the incoming California Southern Railway which connected the City to the eastern United States. The County's population swelled from 8,600 in 1880 to over 30,000 residents by 1887. Developers and land speculators emerged throughout the region, looking to capitalize on the City's rapid growth. During this period over 50 private water companies formed, all with the same goal of racing to be the first to provide the region with a reliable water supply. These companies worked to design, construct, and implement water conveyance projects as quickly as possible, with some successes and many failures. Out of the original 50, 10 companies emerged with plans to develop water for the City, 6 reached construction, and only 4 managed to deliver water. These four companies were the San Diego Flume Company (1886), the San Diego Land and Town Company (1881), the Otay Water Company (1886), and the Volcan Land and Water Company (1885) (Fowler 1953; Hill 2002; Meixner 1951).

Water system developments were further encouraged by the passage of the Wright Act of 1887, which provided for the organization of irrigation districts, acquisition, and distribution of water for such districts. The irrigation district boards were to have the right to acquire, by purchase or by condemnation, all lands, waters and water rights, and other property for the construction of waterworks (particularly canals and reservoirs). The Wright Act gave irrigation districts the power to settle water right troubles by giving the districts the right of eminent domain and power to condemn riparian rights. After the passage of the Wright Act, 49 irrigation districts were incorporated across the state, six of which were formed in the County. Only one of these districts, the Escondido Irrigation District, actually delivered water in the County, and all eventually succumbed to debt. The Wright Act's shortcomings would be rectified in 1897 when the California Legislature repealed and replaced the Wright Act with the Irrigation District Act (Bridgeford Act) (Fowler 1953; Gidney 1912; SWRB 1951).

One of the great engineering achievements during the 1880s was the construction of the Sweetwater Dam by the San Diego Land and Town Company, designed by engineer James D. Schuyler and constructed from 1886 to 1888 (Figure 9). In 1888, Sweetwater Dam was the tallest masonry arch dam in the United States. Constructed on a part of the former Rancho de la Nación, the arch dam provided the necessary infrastructure to establish the town sites of Chula Vista and National City, which pass along the Sweetwater River (Crawford 2011; Fowler 1953; Schuyler 1909).

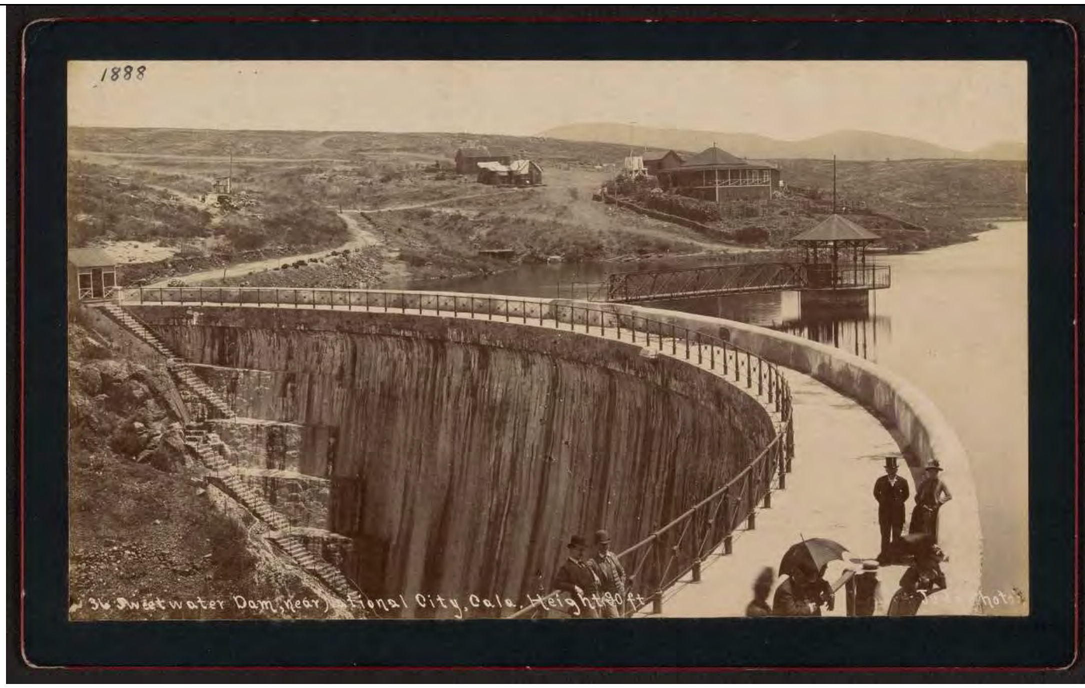


Figure 9. Sweetwater Dam, near National City, Turner and Judd Photo, 1888. (National City Public Library)

Simultaneously, the Cuyamaca Dam was constructed on Boulder Creek in the Cuyamaca Mountains in 1887. It was followed, in 1889, by a 45-mile-long flume constructed on Boulder Creek in the Cuyamaca Mountains. The dam and flume were designed by Theodore S. Van Dyke and constructed by the San Diego Flume Company as a 41-foot-high earth-fill dam with a rock face. Established in 1885, the San Diego Flume Company supplied water to the City through their 35.6-mile-long redwood flume and roughly 10 miles of metal piping. When completed in 1889, the flume proceeded down the Capitan Grande Valley to El Cajon Valley, to the Eucalyptus Reservoir, before being delivered to the La Mesa Reservoir outside San Diego City limits. From there, it proceeded east and south of El Cajon, and from El Cajon, it was brought to the City by Mesa Road (Hill 2002; Lakeside Historical Society 2015; Meixner 1951; San Diego Union 1889; Strathman 2004).

The San Diego Flume Company was successful for several years; however, it began to face a number of issues that slowly led to its failure. Plans to divert the headwaters of the Tijuana, Sweetwater, and San Diego Rivers to storage reservoirs on the San Diego River failed due to high construction costs. As a result, their system was often in short supply during the driest periods of the year. Additionally, the company was losing between one-third and one-half of the water supply during delivery due to evaporation and leakage, which required that the entire flume be relined. To add to these problems, the local demand for water continued to increase with the growing population. A nearly 11-year drought between 1895 and 1905 also dried up the Cuyamaca reservoir, forcing the company to rely on San Diego River water and reinforcing its former reputation for poor water quality (Fowler 1953; Hennessey 1978; Hill 2002).

To address the ongoing water needs, the City entered into agreements with other private water companies, including the Southern California Mountain Water Company (SCMWC). The SCMWC was led by Elisha Spurr Babcock Jr. (1848–1922), a native of Indiana, who gained his fortune in the railroad industry. He purchased property on Coronado Beach, establishing the Coronado Beach Company, which incorporated the Otay Water Company in 1886. John Diedrich Spreckels (1853–1926) of San Francisco was another capitalist whose fortune came from the shipping business and Hawaiian sugar industry. During an 1887 visit to San Diego, Spreckels was impressed by the real estate boom at the time, which led him to invest in the construction of a wharf and coal bunkers at Broadway (at the time known as D Street). The boom ended quickly, but Spreckels continued his interest in the area. He acquired control of Babcock's Coronado Beach Company, then the *San Diego Union* newspaper in 1890, the *San Diego Tribune* in 1891, and the City's street railway system in 1892. Babcock persuaded Spreckels to invest in a number of his other organizations, including Otay Water Company and the Mount Tecarte Land and Water Company. The SCMWC was born from a consolidation of water companies that included the Otay Water Company and the Mount Tecarte Land and Water Company in 1894. Because of these transactions, Spreckels owned nearly half of Babcock's enterprises (Crawford 2011; Fowler 1953; Hennessey 1978; LAT 1896; McGrew 1922; Ormsby 1966; San Diego History Center 2018; Smythe 1908).

Though Babcock's previous Otay Water Company (1886) and Mount Tecarte Land and Water Company (1888) held land interests in Otay Canyon, it was not until the SCMWC incorporated in 1894 and the City engaged the company with a water supply contract that tangible plans for the Lower Otay Dam, Upper Otay Dam, Morena Dam, and the Dulzura Conduit emerged. The planned system would be established along the Otay-Cottonwood watershed, beginning with the construction of the Morena Dam and following downstream with the Upper and Lower Otay Dams. Years later, the Barrett Dam would be added to the watershed. From Lower Otay Dam, water would be piped through the Dulzura Conduit and then distributed throughout the region. The design of the system was described as follows:

> Two [reservoirs] on the upper stream and two on the lower, and known as the Lower Otay, Upper Otay, Barrett, and Moreno [sic] reservoirs, their altitudes being respectively 400, 540, 1,450, and 2,900 feet. Their aggregate storage capacity is 13,600 miner's inches, which can be vastly increased by carrying the two upper dams to a height of 200 feet or more. (San Diego Union 1895).

Babcock ordered the construction of the Lower Otay Dam without consulting the expertise of an engineer, a policy that would lead to future problems for the company. The Lower Otay Dam was constructed under the charge of civil engineer Walter S. Russell. This rock-filled embankment dam with a riveted steel plate and concrete core, was started in 1894 and completed in 1897 (Figure 10). While not part of the original plan, by February of 1896, SCMWC halted construction of the Lower Otay Dam due to the lack of coordination with the city for the overall water system plan for the City of San Diego. The SCMWC hoped to get funding for the completion of the dam from the City to build a city plant and dams for private irrigation needs (LAT 1896). After struggling with the question of investing in water infrastructure for many years, voters passed a City of San Diego bond measure to approve $1,500,000 in funding for the acquisition and construction of a new water system in June 1896. The new water system would bring in 1,000 inches (13 million gallons) of water from the mountains daily (SFC 1896a, SFC 1896b, SFC 1896d).

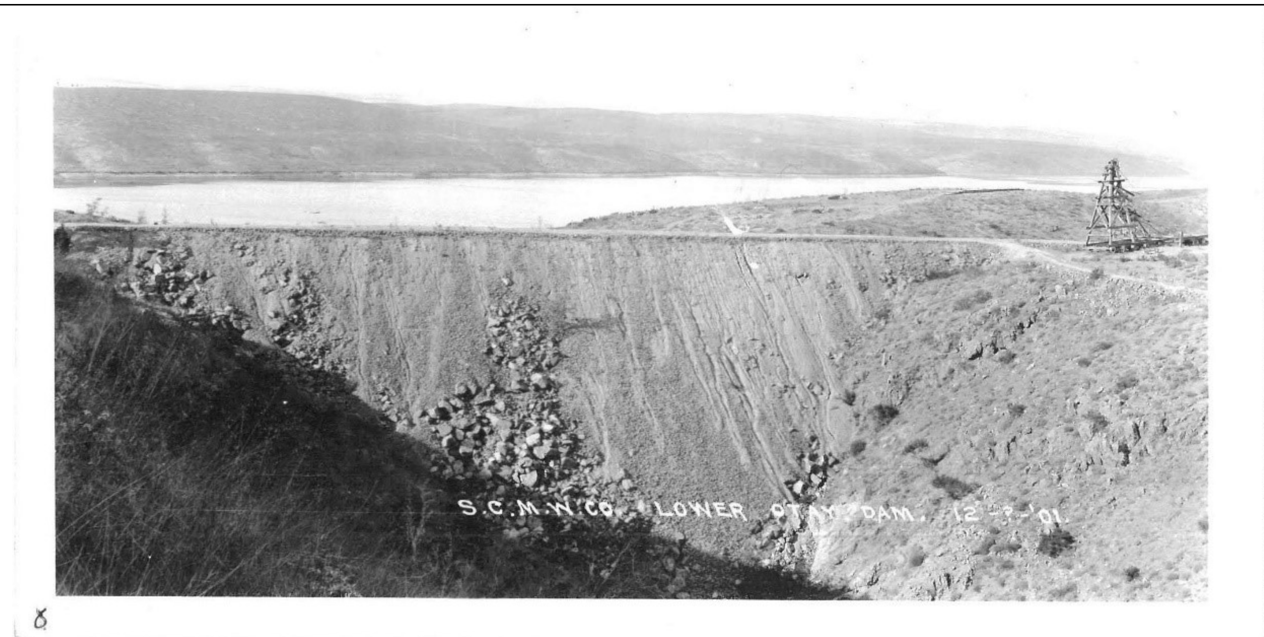


Figure 10. SCMWC photograph of downstream side of Lower Otay Dam, 1901. (City of San Diego Public Utilities Department Archives, Box 10, Folder 63)

The 1894 Lower Otay Dam design was flawed and could only safely discharge a small amount of water compared to the Sweetwater Dam. Drought during the construction years hid this flaw, and the normal runoff was insufficient to fill the reservoir. Despite Lower Otay Dam's issues, the Upper Otay Dam on the western branch of Otay Creek at Proctor Valley was started in 1896, a then-novel, thin-arch dam design intended to reach the lake edge of the Lower Otay Dam if the reservoir were ever full. The location was chosen so that when the Lower Otay Reservoir was full, the water surface would reach the toe of the Upper Otay Dam. The Upper Otay Dam was patterned after the Bear Valley Dam in the San Bernardino Mountains, and was selected by Babcock. The engineers in charge of constructing the dam and reservoir were C. M. Bose and H. N. Savage, who served as consulting engineer for the SCMWC beginning in 1893. After a brief construction delay in 1900, Upper Otay Dam was officially completed January 1, 1902 (Crawford 2011; Fowler 1953; Meixner 1951; Jorgensen 1916; San Diego Union 1900, 1902).

The SCMWC made plans for another dam on the Cottonwood Creek watershed, which would discharge through a conduit to the Otay watershed. These were the Morena Dam and the Dulzura Conduit. Construction of the rock-filled embankment dam, Morena Dam, began in 1896; however, construction halted in 1898 due to serious construction concerns. City Engineer Edwin M. Capps found that the early dam construction had significant holes and cracks, some big enough to fit his limbs through, throughout the dam. Capps also reported that when the wall was tested with 1 to 30 feet of water pressure, it resulted in gushing leaks (the final wall would need to be able to withstand 150 to 185 feet of pressure). Capps concluded his report stating, "I attribute this faulty work, not to a desire of Mr. Babcock to do poor work or to curtail in cement, but solely to a zealous desire to complete the work before the winter rains, and from an over confidence in his own ability and that of his foreman" (Crawford 2011; Fowler 1953; Meixner 1951; Capps 1896).

On October 9, 1897, the City Council voted unanimously to stop all work on the Morena Dam after reviewing Capps report (Los Angeles Times 1897). Original project notes indicate that because of Babcock's deviation from the plans and specifications agreed upon in the contract, and a lack of written agreement to remedy the issues, construction of Morena Dam was officially ordered to be stopped in 1898.

Few of the regional water companies survived the 11-year drought from 1895 to 1905. Mid-drought, the City's population in 1900 was 17,700. In 1901, City voters approved a municipal water supply, and the City purchased the holdings of the San Diego Water Company and the SCMWC within City limits. Such holdings included reservoirs, pumping plants and machinery, pipelines, buildings, and tools. One such property was the Chollas Heights Reservoir. In 1901, the SCMWC constructed the Chollas Heights Reservoir, an earth-fill embankment dam on a tributary to Las Chollas Creek east of the City limits and built to serve as terminal storage for the pipeline extending from the Lower Otay Reservoir. This pipeline delivered water to the Coronado Water Company, which supplied the City of Coronado (Department of Commerce 1930; Fowler 1953; Meixner 1951; Pyle 1935; Smythe 1908).

Even post-drought, the City's water supply was insufficient for its growing population. In 1905, City voters clashed over funding municipal water and were forced to approve more bonds for new works. The City entered a new contract with SCMWC in fall 1905 to purchase water from Upper and Lower Otay Reservoir system for $0.04 per 1,000 gallons. The mayor vetoed the City's proposed SCMWC contract, citing the lack of power afforded to the City in such a contract, but the City Council overrode his veto, and the Bonita Pipeline from Lower Otay Reservoir to Chollas Reservoir and the branch line to the City of Coronado were completed shortly after (Crawford 2011; Smythe 1908).

From 1907 to 1912, SCMWC contracted Michael Maurice O'Shaughnessy to serve as chief engineer for the SCMWC and to oversee completion of the Morena Dam and Dulzura Conduit. O'Shaughnessy (1864–1934) was a civil engineer from Ireland, chiefly engaged in projects in the western United States, and is best recognized for his later role as the City Engineer of San Francisco from 1912 to 1932. O'Shaughnessy was contracted by San Francisco to design and build the Lake Eleanor Dam and O'Shaughnessy Dam, which at the time were contentiously placed water supply projects opposed by John Muir for their boundary with Yosemite National Park. In 1913, he won the James Laurie Prize for his Society of Civil Engineers article, "Construction of the Morena Rockfill Dam" (1911), in which the dam was noted arguably as the largest rock fill embankment dam in the world at the time (Fowler 1953; SNAC Cooperative 2018).

O'Shaughnessy began work on the Dulzura Conduit in August 1907. The conduit was already partially complete and consisted of a tunnel around the future Barrett Dam site. O'Shaughnessy designed and oversaw the building of 17 unlined tunnels, an open ditch section, and a short length of wooden flume for the remaining 13 miles of the Dulzura Conduit. O'Shaughnessy chose to terminate the conduit at the head of Dulzura Creek, which was a tributary to Otay Creek and would eventually make its way to the Upper and Lower Otay Reservoirs. The Dulzura Conduit was intended to be a major piece of water infrastructure that would connect Barrett Reservoir with Dulzura Creek, preventing water runoff from flowing into the Tijuana River in Mexico. Constructing the conduit would increase the water supply of San Diego twelve-fold, with the daily capacity reaching 50,000,000 gallons and costs in excess $375,000 upon completion. The length of the conduit was approximately 13 miles including 10,000 feet of tunnel, two miles through solid granite; a mile and a quarter of wooden flume lines; and nine miles of open canals. The canals were lined with solid concrete, the thickness depending on the nature of the material through which the ditch passed. A majority of the conduit was lined with about four inches of concrete; where there was loose gravel or decomposed granite, six- to twelve-inch thick concrete was required; and where there was solid granite, no concrete lining was necessary. It was completed in 1909 (Fowler 1953; LAT 1909; San Diego Union 1908a).

Under O'Shaughnessy's work as chief engineer for the SCMWC, he was given the task of completing the Morena Dam in spring 1909, which had stopped construction in 1896 after being fraught with issues.. O'Shaughnessy altered the original design of the dam to change the upstream slope to a steeper granite and concrete mortared construction and the downstream slope to an un-coursed rubble rock face. O'Shaughnessy also added his original designs for the outlet tower, spillway, and outlet tunnel. The top of the dam was 16 feet wide and capped with a 3-foot thick concrete coping to provide for wave wash. To provide for future extensions in raising the dam, the back slope was changed to 1.5 horizontal to 1 vertical with a berm of 21 feet at the 100-foot contour. This berm was created by altering the face slopes, which was originally designed to have a flatter water slope. Furthermore, a large part of the old fill located behind the toe wall was torn out, and all objectionable materials placed during the initial construction period were removed and replaced with clean, well-placed rockfill. A small slot measuring 1 foot wide by 5 feet deep was left in the original toe wall to support new reinforced concrete facing. The new dam materials provided a water-tight skin for the face of the dam, which kept the rock-fill clear of any soil or silt that could cause leaks. Construction was completed in 1912 (Fowler 1953; O'Shaughnessy 1913; San Diego Union 1912).

Later in 1913, the City purchased the Barrett-Morena-Otay portion of the SCMWC for $2,500,000, including dams and reservoirs, and in 1914, the pipeline that connected Otay Valley with the SCMWC's Lower Otay Reservoir was purchased by the Coronado Water Company. As the major portions of the SCMWC had already been purchased by the City, Morena Dam was also agreed to be purchased at a fixed price following a 10-year lease. Thus, by 1914, all portions of the SCMWC were owned by the City (Fowler 1953).

For the time being, it seemed that the City had addressed its immediate and long-term water problems. Population growth had more than doubled from 17,700 in 1900 to over 39,500 in 1910, and water was relatively plentiful. However, beginning in 1912, a drought struck the City, which continued through 1915. Since most of the water stored in the region's dams was replenished by captured rainfall, the reserves diminished quickly. The City's solution to their drought problem was Charles Mallory Hatfield (1875–1958), a native of Kansas who was a former sewing machine salesman, and a self-proclaimed "moisture accelerator." As a young boy, his family moved to the City, and in later years, he accredited his dedication to rainmaking to the terrible years of drought near the end of the nineteenth century. Hatfield's technique involved the mixing of liquid chemicals and then dispersing them into the open air, which he claimed attracted rain (Figure 11). Between 1899 and 1912, Hatfield traveled to Alaska and throughout central California to provide his rainmaking services (Crawford 2011; Department of Commerce 1930; Hill 2002; Patterson 1970; Tuthill 1954).

Figure 11. Rainmaker Charles Hatfield mixing "rainmaking" chemicals in San Diego prior to the flood of 1916, 1916. (California Border Region Digitization Project: 1870–1939, San Diego History Center)

On December 8, 1915, the City's Common Council received a letter from Hatfield, who offered to produce at least 40 inches of rain in the vicinity of the Morena Reservoir: "By June 1, [I will] produce 40 inches of rain (at Morena Reservoir) free gratis, I to be compensated from the 40th to the 50th inch by $1,000 per inch" (Patterson 1970). The next day, Hatfield submitted another letter to the Common Council offering to fill the Morena Reservoir by December 20, 1916, or to cause a rainfall of 50 inches by June 1, 1916, again asking for $1,000 for each inch over 40 inches. Following receipt of his letter, the City hired Hatfield for $10,000 to address the severe drought and, more specifically, to fill the Morena Dam. To begin the rainmaking process, Hatfield and his brother Paul built a tower at Morena Reservoir with a square basin on a wooden platform measuring approximately 12 feet high on a slope alongside the road leading to the dam. After this initial display, there was a period of inactivity, and the Hatfield name began to vanish from local newspapers (Crawford 2011; Patterson 1970; Tuthill 1954).

4.1.3 Flood Recovery and Reinvestment (1916-1928)

On January 5, 1916, a good rain was reported at Morena Reservoir, and 48.5 million gallons had been impounded since December 27. The rain fell again on January 10, 1916 and continued until January 18 in the City and the surrounding area. On January 27, a second storm hit, bursting open the Lower Otay Dam and flooding the Tijuana River Valley. The storms caused the San Diego River to overflow its banks and spread across Mission Valley. Nearby infrastructure, including rail lines and bridges, were destroyed, and local trains were stopped for more than one month. Highways and the telegraph and telephone lines were also cut off, wherein the only means of transportation was through the sea. Three days later, the Sweetwater Dam was overtopped by more than 3 feet, and the canyon side walls began eroding away. Although the dam itself was undamaged, its abutments had been breached, and it was unable to retain water. The waters behind Morena Dam rose within 18 inches of the top of the parapet wall, or 18 inches above the crest of the dam. Debris that had been washed into the reservoir accumulated on the trash racks in front of the spillway and choked the flow of water (Crawford 2011; McGlashan and Ebert 1918; Patterson 1970; Tuthill 1954).

SCMWC's 1894 Lower Otay Dam was a complete loss. The floods left scars on mountains and hills and washed out river channels down to bedrock. The saturated hillsides gave way and resulted in mudslides. In addition, the pumping plants of the Coronado Water Company were destroyed, cutting off supplies from the Otay Valley. Nevertheless, water service was maintained through the City's pipeline under the bay with water from the Cuyamaca Water Company (formerly the San Diego Flume Company) system (Crawford 2011; Fowler 1953; McGlashan and Ebert 1918).

The Hatfield brothers remained in the Morena area until a few days after the second storm. They deconstructed the tower before leaving the site in early February. Hatfield then attempted to collect his fee from the City. In the wake of crippling damages across the City and County, the City refused to compensate him for his rainmaking services, and Hatfield filed a suit against the City the next December, which was eventually dismissed by the State Supreme Court. Although the controversy and litigation continued for many years, it did not hurt Hatfield's career. Eventually, the Depression forced him to leave the rainmaking practice and go back to his original trade of selling sewing machines (Crawford 2011; Patterson 1970; Tuthill 1954).

In the years immediately following the flood of 1916, a number of new water infrastructure projects were completed throughout the City to replace what was destroyed and to accommodate the constantly increasing needs. These dams were built by the City and by private water companies hoping to be bought by the City or to get a City water contract.

The Cuyamaca Water Company, owned by Ed Fletcher and James A. Murray, began to plan the Murray Dam in 1916, just after the flood. Fletcher (1872–1955) was born in Massachusetts and moved to the City as a young man. Fletcher, known for his persistence and bravado, became knowledgeable about the watersheds surrounding the City through his time spent exploring them and eventually leveraged this knowledge to find work as an intermediary on important infrastructure projects in the San Diego region. Murray (1840–1921) was an Irish immigrant and a prominent real estate, mining company, and business owner in Montana before moving to California in 1904. Fletcher and Murray met through a mutual acquaintance and acquired the bankrupt San Diego Flume Company in 1910, renaming it the Cuyamaca Water Company (Farley 2016; Fowler 1953; Jackson 2009; Meixner 1951).

The Cuyamaca Water Company hired engineer John S. Eastwood (1857–1924) to design the Murray Dam. Once considered to be the largest dam in Southern California, the Murray Dam featured a 990-foot-wide, 117-foot-tall multiple arch dam, with the upstream side comprised of a series of cylindrical arches supported on buttresses (Figure 12). The Murray Dam subsumed the earthen La Mesa Dam, a much smaller embankment dam already at that location. Murray Dam featured a siphon spillway, a unique feature with 5 barrel shaped arches, arranged in a semi-circle with the crest placed at the same level as the top of the dam. Approval of the plan for Murray Dam occurred with almost no delay because of the Cuyamaca Water Company's familiarity with the engineer's work, and the dam was completed in March 1918. John S. Eastwood designed the world's first concrete multiple arch dam at Hume Lake, California, in 1908, and had subsequently designed 17 multiple arch dams in California, Idaho, Arizona, British Columbia, and Mexico despite some opposition from the professional engineering community against multiple arch dam designs. Before designing Hodges Dam, Eastwood's multiple arch dam designs were strongly and publicly criticized by fellow engineer John R. Freeman. Eastwood was replaced at the Big Meadows Dam project in 1913 as a result. However, recognizing the economic savings of multiple arch dams, and despite the design's criticisms, Fletcher embraced Eastwood's designs for Murray Dam. Under Fletcher, Eastwood would design four dams in the County, including Murray Dam in 1918 and Hodges Dam, completed in 1919 (Farley 2016; Fletcher 1919; Fowler 1953; Jackson 2009; Meixner 1951; San Diego Union 1918).

Figure 12. Murray Dam, upstream face showing arches, photographed by Lee Passmore, ca. 1920. (California Border Region Digitization Project: 1870–1939, San Diego History Center)

In 1917, the San Dieguito Water Company (formerly the Volcan Land and Water Company), owned by William Henshaw and Fletcher and financed by the Santa Fe Railroad Company, announced plans to build three dams: Hodges Dam, San Dieguito Dam, and San Elijo Dam. The ambitious project would irrigate more land than the holdings of the Cuyamaca, Sweetwater, and Escondido systems combined. In 1917, Eastwood designed Hodges Dam, a concrete, multiple arch dam, roughly 30 miles north of the City on the San Dieguito River watershed. Hodges Dam was completed in 1919 and was eventually purchased by the City in 1925. In comparison to other public utility projects, construction of the Hodges Dam was relatively quick. The actual pouring and placing of concrete took only twelve months, from November 1917 to November 1918. In March 1918, as the dam neared the 60% completion mark, a severe flood overtopped the dam. The dam was undamaged by the overtopping, a credit to Eastwood's design. Hodges Dam consisted of 23 hollow 24-foot wide, 24-inch thick reinforced concrete arches, supported with buttresses of mass concrete. It was 550 feet long and 137 feet high. The San Dieguito Dam was also completed in 1918, another hollow, multiple arch dam also designed by Eastwood completed in just four months. The dam was also on the San Dieguito River watershed, receiving water from Lake Hodges through the Carroll Conduit. San Elijo Dam was proposed but never fully realized (Fletcher 1919; Fowler 1953; Meixner 1951; Jackson 2009; San Diego Union 1918a; Eastwood 1916; San Diego Evening Tribune 1918, 1919).

From 1917 to 1919, the City replaced the Lower Otay Dam with a new concrete curved gravity dam, named Savage Dam in honor of hydraulic engineer Hiram Newton Savage. Savage (1861–1934), who was hired June 4, 1917 to assist with repairing the damaged water infrastructure, was an engineer with expertise in infrastructure, working in railroad, mining, and water industries throughout the United States. He arrived in the City in the 1890s and was employed by the San Diego Land and Town Company of National City. He was hired to work on the construction of the Sweetwater Dam and distribution system and the associated City plan and rail lines. He also served as a consulting engineer for the SCMWC in 1895, where he assisted with the construction of the Upper and Lower Otay Dams. From 1903 to 1915, Savage worked for the U.S. Reclamation Service designing and managing a number of important water projects throughout the west. Following the floods, Savage returned to the City and took the role of consulting and supervising engineer for the Sweetwater Company of California. During that time, he was engaged in the reconstruction and enlargement of the Sweetwater Dam, spillway, and abutments, which were damaged during the floods. Savage designed a 145-foot-high curved gravity dam for the Lower Otay Dam (Figure 13), which would encapsulate the old masonry dam remains that were partially destroyed in the flood of 1916. Despite sound design, the building period was fraught with issues, including suspension of the City's contract with James Kennedy, the main contractor, citing "delinquency." As a result, the Lower Otay Dam was finished by day labor forces in 1919 (City of San Diego 1919; Fowler 1953; Sholders 2002; Meixner 1951; San Diego Evening Tribune 1917; San Diego Union 1919; SNAC 2018).

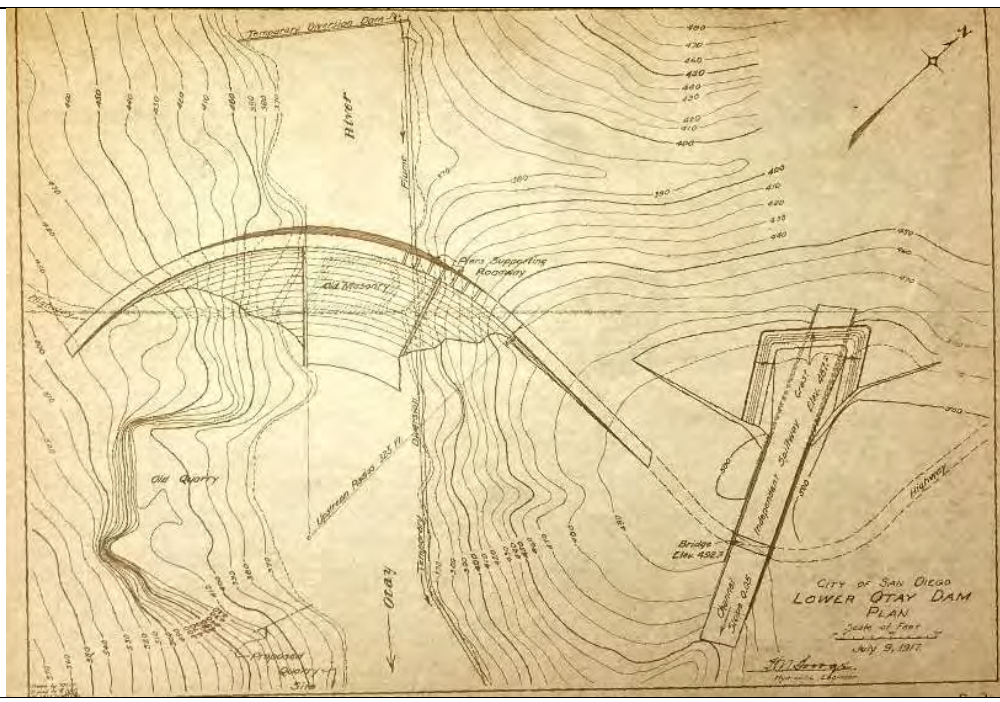


Figure 13. Lower Otay Dam sheet set, plan, by Hiram N. Savage, 1916. (City of San Diego Public Utilities Department Archives, Lower Otay Feature History Volume 1, page 5–3)

After completing construction at the Lower Otay Dam, the City began construction on Barrett Dam in 1919 at the location originally chosen by the SCMWC, just downstream of Morena Dam. This location was avoided during the construction of the Dulzura Conduit, which had accounted for the location of the future dam. The City transferred laborers, tools, and leftover materials from the newly completed Lower Otay Dam to the Barrett Dam site. Like Lower Otay Dam, Savage designed Barrett Dam as a curved gravity dam (Figure 14). Construction costs were estimated at $881,270. Initially the Mayor of San Diego, Louis J. Wilde, sought to pay for the dam out of existing water funds. However, in November 1919, voters authorized Resolution 70, which released $1 million in water bonds to be used for the construction of Barrett Dam. During construction, the Barrett Dam met with issues of overtopping during a spring 1922 rainstorm. Water came within several feet of overtopping the lowest constructed height of the dam at that time, which was at elevation 1543, or gauge 99. Continued spring rains in 1922 kept the water level at Barrett Reservoir high as construction drew towards its completion. By April, over 800 million gallons of water had been discharged from the reservoir via the Dulzura Conduit, but crews still had to work two shifts to prevent the dam from overtopping. Barrett Dam was completed and dedicated in summer 1922. The final height of Barrett Dam was 215 feet, resulting in an 862-acre reservoir fed by a 130 square mile drainage area (City of San Diego 1919, 1923; San Diego Evening Tribune 1922a; Fowler 1953).

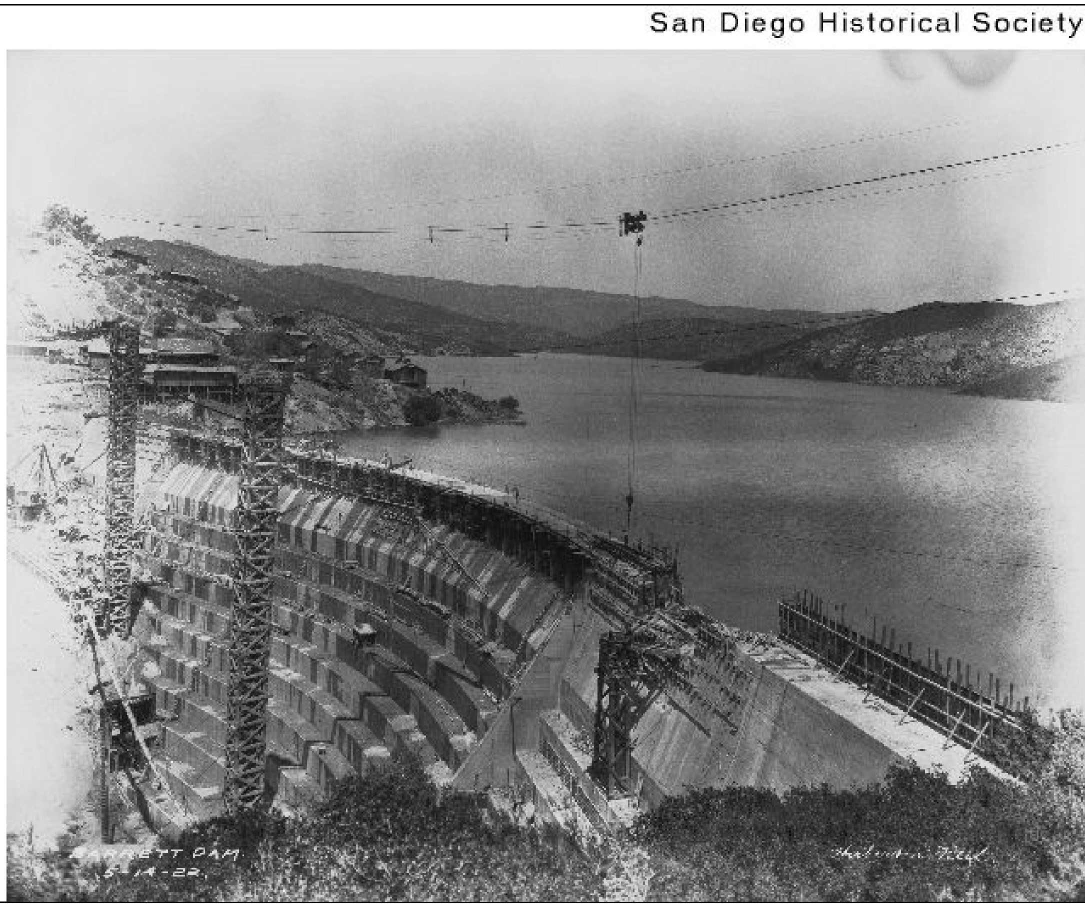


Figure 14. Barrett Dam under construction, with reservoir semi-full in background, 1922 (California Border Region Digitization Project: 1870–1939, San Diego History Center)

While working in his capacity as City Water Engineer, Savage made several unfavorable reports to the City Common Council during the course of Barrett Dam construction. In February 1922, Savage reported that the City had no right to water in the Barrett Drainage basin and that Spreckels' water permit was non-transferable. He was accused of holding the Barrett Dam project hostage while demanding more funding to complete the dam. In addition, Savage opposed enlarging the Morena spillway, which was required by the state, and purchasing the Cuyamaca Water System. Savage openly opposed developing the El Capitan Dam site, favoring instead the Mission Gorge Dam site, which was an expensive alternative. The City selected the dam location at El Capitan and hired an outside consultant engineer, Freeman, to oppose Savage's opinion as they had for Eastwood's dam designs. The water commission was split over retaining Savage while still being held responsible for the lack of water supply by voters and the mayor. The final straw in the Council's decision was the report of leaking at Lower Otay Dam, further threatening the water supply of the City. After the completion of the Barrett Dam, Savage was fired from his job as City Engineer. The Common Council of San Diego unanimously voted to repeal the ordinance that employed Savage and denied an appeal to retain Savage as City Engineer. At the urging of Council Member Heilbron, Freeman was retained in Savage's place (City of San Diego 1921; San Diego Sun 1922a, 1922b, 1922c, 1922d, 1923; San Diego Evening Tribune 1923a, 1923b).

The City's population grew from 39,578 in 1910 to 74,361 by 1920; however, there were few significant developments in the local water infrastructure. One dam was constructed in the early 1920s: Henshaw Dam, owned by the San Dieguito Water Company, an earthen-fill embankment dam completed in 1923. The early 1920s were instead characterized by the legal battle for water of the San Diego River, Imperial Valley, and the Colorado River. Legal issues arose around the San Diego River watershed under the control of the Cuyamaca Water Company. In 1921, the City went the court to validate their paramount claim to the water against the La Mesa, Lemon Grove, and Spring Valley Irrigation District (1913), which had an ongoing contract with Cuyamaca Water Company. In 1926, the courts sided with the City, confirming the water rights initially established by the City's pueblo water rights. While the City sued for their water, in 1921, California and other states bordering the Colorado River had been exploring the possibility of exploiting the great watershed. It would take over 20 years for Colorado River water to flow into the City. The City initiated studies and agreements to bring Colorado River water west, through construction of the Colorado River Aqueduct (1939), the All-American Canal (1942), and the Boulder Dam (1935). Surveys in Imperial Valley for the All-American Canal began in 1919, 15 years before construction of the canal began (Department of Commerce 1930; Fowler 1953; Pourade 1977; Schaefer and O'Neill 2001).

4.1.4 Post-St. Francis Dam Disaster Development (1928-1947)

The business of water production changed dramatically after the failure of the St. Francis Dam in 1928. Located in the Santa Clara Valley, the St. Francis Dam was built in 1926 and designed by Los Angeles Water Engineer William F. Mulholland. Constructed for the City of Los Angeles, the dam was designed to contain one year's water supply for the City of Los Angeles. The dam was designed as a curved concrete gravity dam with a height of 205 feet and was reportedly the second largest reservoir in Southern California at the time it was completed. The dam survived more floods in 1927, but the dam caretaker repeatedly reported issues to the City of Los Angeles about small leaks in the dam. At approximately midnight on March 12, 1928, a massive landslide occurred along the dam's left abutment, pushing a 140-foot wall of water down the canyon. As a result of the flooding, 7,900 acres of farmland were lost, 1,250 buildings were destroyed, and 430 people lost their lives, making it one of the worst recorded dam failures in U.S. history. The disaster rocked the engineering world in Southern California, triggering a State-wide interest in dam safety (Elrick and the Friends of the Los Angeles River 2007; Roderick 2001).

Following the St. Francis Dam disaster, more than a dozen panels convened to investigate the failure. Because of the findings, California passed increased safety legislation, giving the State Engineer authority to review non-federal dams over 25 feet in height. Additionally, the State Engineer was tasked to examine dams in the state. Between August 1929 and November 1931, the State Engineer inspected 827 dams. Approximately one-third were found to require significant repairs, particularly needing increases to the spillway capacity. In the City of San Diego, there were significant public concerns about the safety of the largest dams, including the Barrett, Lower and Upper Otay, and Morena Dams. A number of improvements were completed to the City's dams following the St. Francis Dam disaster, which included: a reservoir capacity and spillway enlargement at Morena Dam; a spillway enlargement and new pipeline and filtration system at Lower Otay Dam; enlargement of reservoir capacity at Chollas Dam; and height increase and spillway enlargement at Barrett Dam . Another result of the safety survey was identification of structural issues at Hodges Dam (Figure 15). Cracks were recorded at Hodges Dam, and the California state engineering surveyors recommended a strengthening project to resolve the cracked buttresses. After some study, the State Engineer determined that the cracks were not caused by loading stress and recommended that the cracks be monitored with a pins system (City of San Diego 1928; San Diego Union 1930; Savage 1929; Wueste 1933).

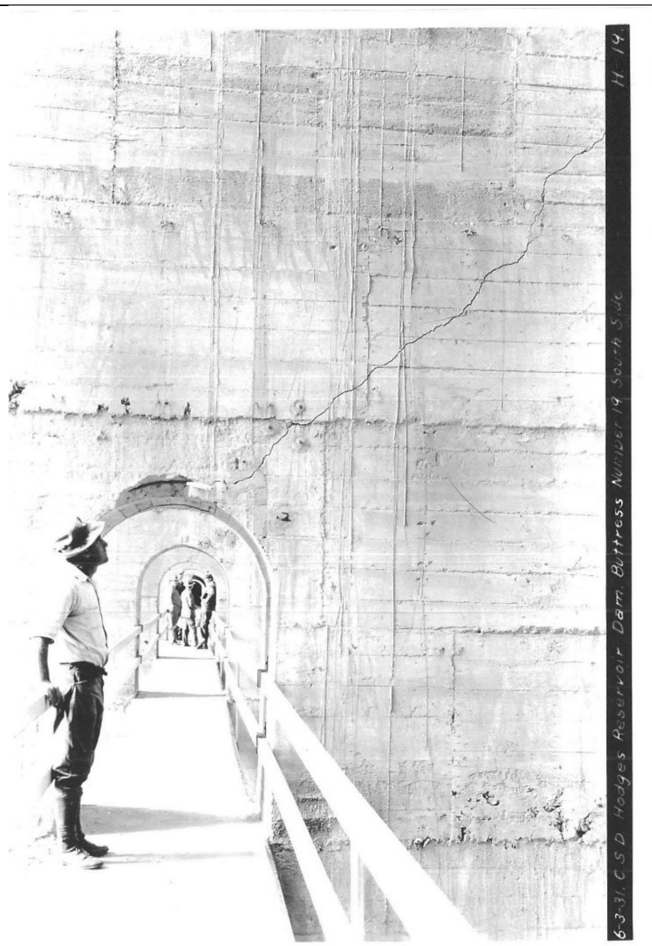


Figure 15. Hodges Dam, buttress No. 19, showing cracks, spalling, 1931. (City of San Diego Public Utilities Department Archives, Box 5, Folder 35)

An unintended victim of the St. Francis Dam disaster was Sutherland Dam. Construction of Sutherland Dam was urged at City Council's request in 1925, and a short drought increased the City and public's desire for another dam. Construction on Sutherland Dam in the San Dieguito River watershed began in 1927. Almost immediately, the project encountered problems. The supervising engineer, J.W. Williams, took issue with the undesirable foundation conditions of the dam. Because of diminished confidence in dams, the next year, voters denied bond funding for water projects, including Sutherland Dam. The Sutherland Dam project had to be moved upstream to a new location, and the cost of the project was staggering. In 1928, the Common Council turned to the engineer they had fired in 1923, Savage. Savage was immediately critical of the multiple arch design, favoring instead the curved gravity dam design, like the designs of his Lower Otay and Barrett Dams. Savage spent the following year attempting to convince the City to fund the Sutherland Dam project, but after a wildfire, the project was abandoned and the previous voter-approved water bond money was funneled instead toward the El Capitan Dam project. The City would not revisit the Sutherland Dam project until 1949 (Crawford 2011; San Diego Evening Tribune 1925, 1928, 1933; Fowler 1953).

The population of the City continued to grow at an alarming rate. In 1921, the population had been 74,361. By 1930, the population had doubled again to 147,995. Anxious to accommodate its growing population, the City began the El Capitan Dam construction in 1932 (Figure 16). For nearly 2 decades prior to its completion, the El Capitan Dam site had been held by the Cuyamaca Water Company and was sold piecemeal to the City from 1923 to 1926. In 1928, the City began to siphon money from the Sutherland Dam project to the El Capitan Dam project in an attempt to use the money from the water bond. Recently rehired for the El Capitan project, Savage designed a hydraulic rock filled embankment dam, an update to the 1923 design by his former rival and replacement, Freeman. The City and Savage continued a tense relationship, appointing a water council member to be Savage's "official watchdog" (San Diego Progress 1931). Savage's obstinate reputation and the expense of his large dam projects were met with open derision. The *San Diego Herald* accused Savage of having killed the Sutherland Dam project for personal benefit and openly and repeatedly called for his firing again. However, Savage's rock-fill dam plans were approved by the state, and ground was broken later in 1931. Despite moving forward with El Capitan Dam, public opinion and the City Council did not favor Savage. Multiple attempts to silence or curb the authority of Savage were made successfully. The new City manager and the water council were at odds over retaining Savage. By all accounts, Savage seemed to continue his work at El Capitan Dam quietly. In May 1933, approximately one year before his death, Savage wrote a letter to the Common Council stating that he wished to resign as the City's Hydraulic Engineer after his contract expired in July 1933. Details of the plans for the El Capitan dam were captured in an article from the WCN in 1932 and were as follows (Crawford 2011; LAT 1934; San Diego Herald 1931; San Diego Progress 1931; San Diego Sun 1931, 1932, 1933; San Diego Union 1931a, 1931b, 1932):

> El Capitan reservoir dam is to be a hydraulic fill-rock embankment structure. It will be 1160 ft. long on top and 1240 ft. thick at the base and will provide storage to elev. 750 ft. The foundation will be about 25 ft. below streambed and the spillway crest 197 ft. above streambed, the parapet crest rising 20 ft. above the spillway lip, or to elev. 770 ft. Clear width on the crest will be 20 ft. A vertical reinforced-concrete flexible core-wall 18 in. thick at the bottom and 16 in. at the top will extend from the base of the cutoff trench to elev. 770 ft. Enclosing the concrete wall will be a puddle core of fine, impervious material 30 ft. thick at the top and 125 ft. at the base (WCN 1932).

Figure 16. El Capitan Dam, looking downstream in empty reservoir, 1934. (City of San Diego Public Utilities Department Archives, Box 4, Folder 4)

Savage's former assistant Fred Pyle picked up where Savage left off. As with Lower Otay Dam, the City clashed with the contractor H.W. Rohl and T.E. Connolly over non-payment issues at the dam. In addition, the Indians of the Capitan Grande Reservation opposed the dam's construction on the grounds of having to disinter their graveyard established at the dam's proposed location. As the disagreement continued into 1934, the Bureau of Indian Affairs interceded and moved the reservation and their graveyard to Viejas Valley. The dam struggled with these issues but it was eventually completed in 1935 (City of San Diego 1935; Crawford 2011; Department of Commerce 1930; Meixner 1951; San Diego Union 1935; Thorne 2010; WCN 1932).

There was little development of the water system during the remainder of the 1930s, other than to secure water from the Colorado River. The Boulder Dam (later, the Hoover Dam) was completed in 1935, and the All American Canal was completed from 1934 to 1941. Floods in 1937 filled the reservoirs instead of destroying them, and small damages to pipelines were the only notable issue. The population growth of the City finally slowed, only growing from 147,995 to 203,321. However, with the start of World War II in 1941, the population in the City again expanded to approximately 276,000, mainly as growth of the military bases and populations. Two dam projects took place during the war years. From 1941 to 1943, the City built the San Vicente Dam, a straight axis gravity dam on the San Vicente Creek (Figure 17). While dam construction was delayed by material shortages during World War II, its construction was continued to provide safety and additional water supply for the city and military bases around San Diego. The dam was dedicated with a wooden plaque, due to metal rationing during World War II. From 1943 to 1945, the California Water and Telephone Company constructed the Loveland Dam on the Sweetwater River watershed. The Loveland Dam was a curved gravity dam (Dolan 2004; Fowler 1953; San Diego Union 1943).

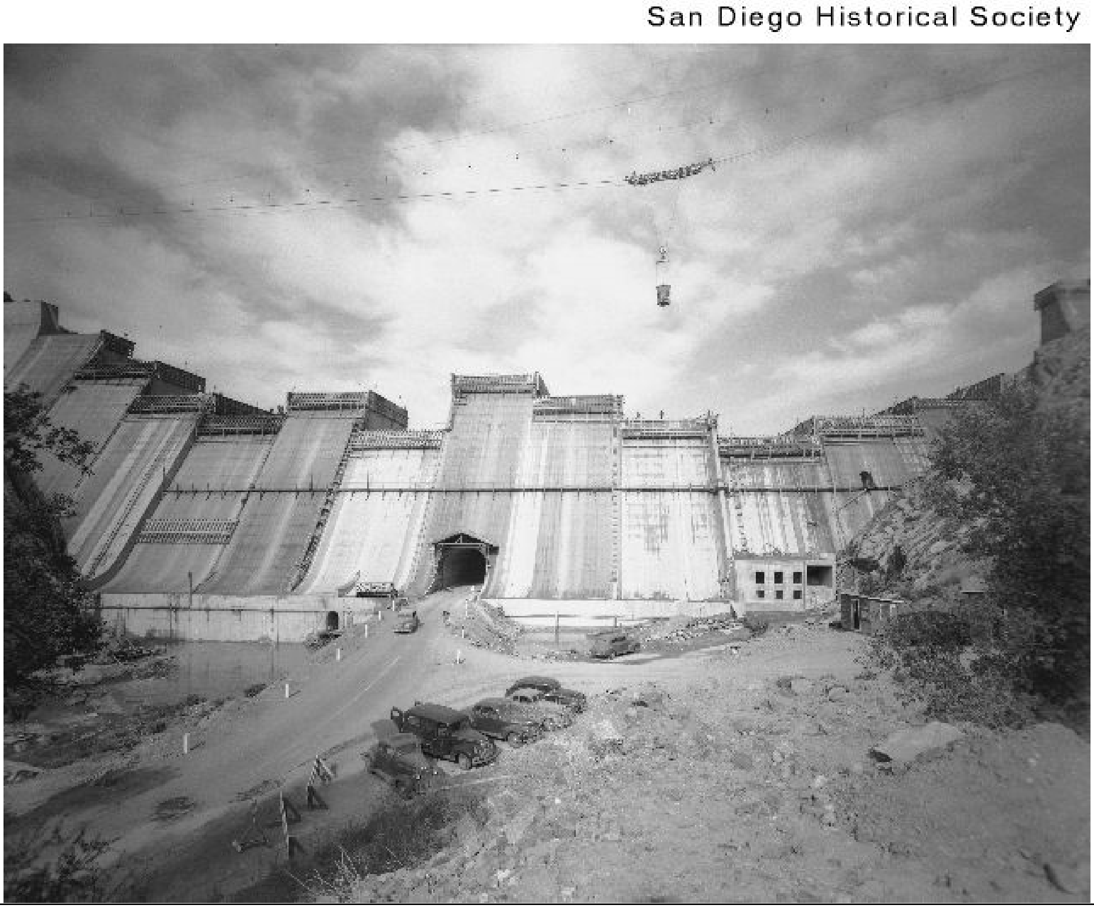


Figure 17. San Vicente Dam under construction, Photographer Guy Sensor, 1943–1944. (California Border Region Digitization Project: 1870–1939, San Diego History Center)

4.1.5 Water Importation and Post-War Development (1947-1960)

The San Diego County Water Authority, consisting of five cities, three irrigation districts, and one public utility district, was organized June 9, 1944, under the County Water Authority Act. The water authority focused on arranging the import of water to the County rather than on building new reservoirs. The next stage was to fulfill the City's contract with the United States Bureau of Reclamation and bring Colorado River water to San Diego. As the population of San Diego ballooned from 300,000 in 1940 to over 600,000 in 1944, even the new local water projects like San Vicente Dam were not sufficient to meet the demand. In 1945, construction finally began on the San Diego Aqueduct, which would bring Metropolitan Water District (MWD) water from the Colorado River Aqueduct at the San Jacinto Tunnel to the San Vicente Reservoir. The United States' involvement in World War II limited the City's ability to get adequate amounts of steel and concrete to make a new pipeline or aqueduct, so it opted to branch off of the existing MWD Colorado River Aqueduct, which had been completed in 1939. To facilitate this, in 1944, the City of San Diego eventually ceded its rights to Colorado River water and control of the San Diego County Water Authority to the MWD, thereby becoming entitled to water from the MWD system (City of San Diego 2018; Crawford 2010, 2011; San Diego Union 1944; Fowler 1953; Pourade 1977; USBR 2020).

After the San Diego Aqueduct route was inspected, contracts were awarded and W.E. Callahan Construction Company and Gunther & Shirley Company of Los Angeles began work on the project. Given that miners and steel could not be spared under the War Manpower restrictions in effect until January 1946, concrete was chosen as the primary aqueduct material out of necessity. In the fall of 1946, the City contract reassigned the Colorado River water point of delivery from Imperial Dam to Parker Dam and assigned its Colorado River water rights to the MWD (Figure 18) (San Diego Union 1945a, 1945b; USBR 2020).

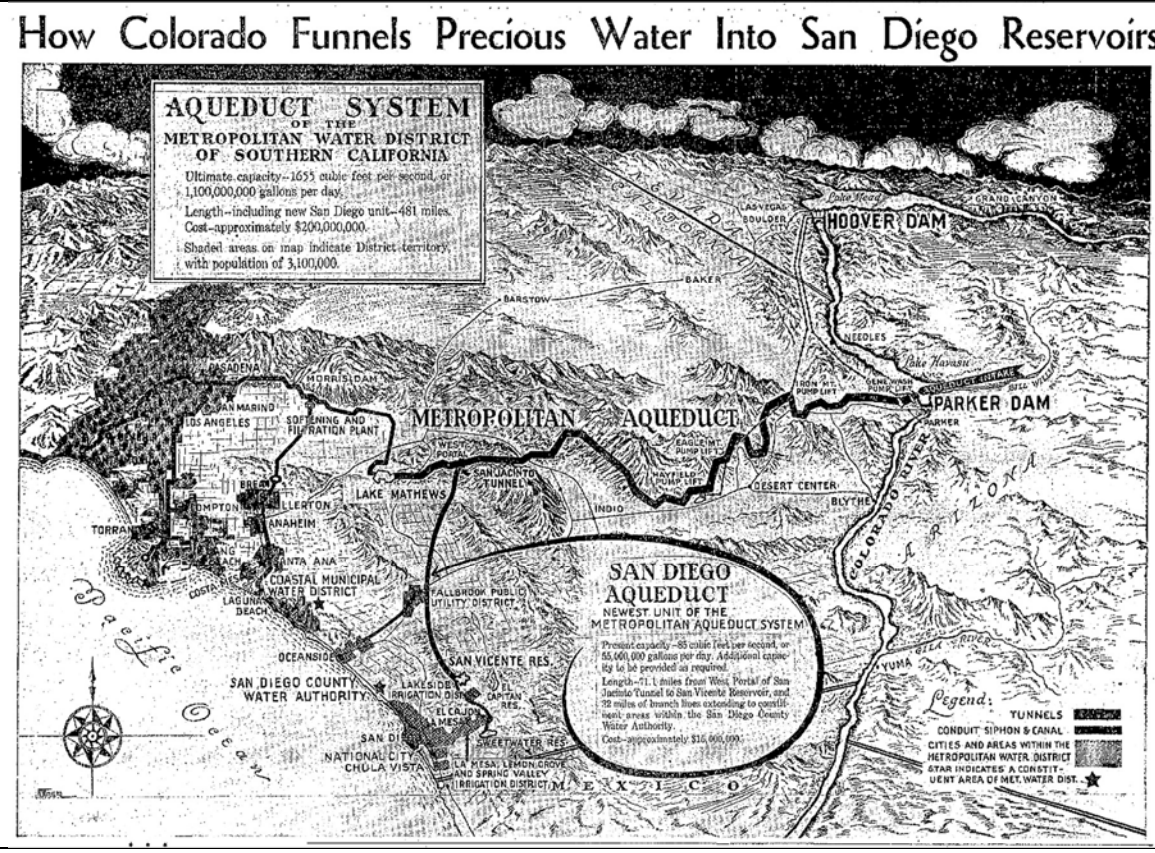
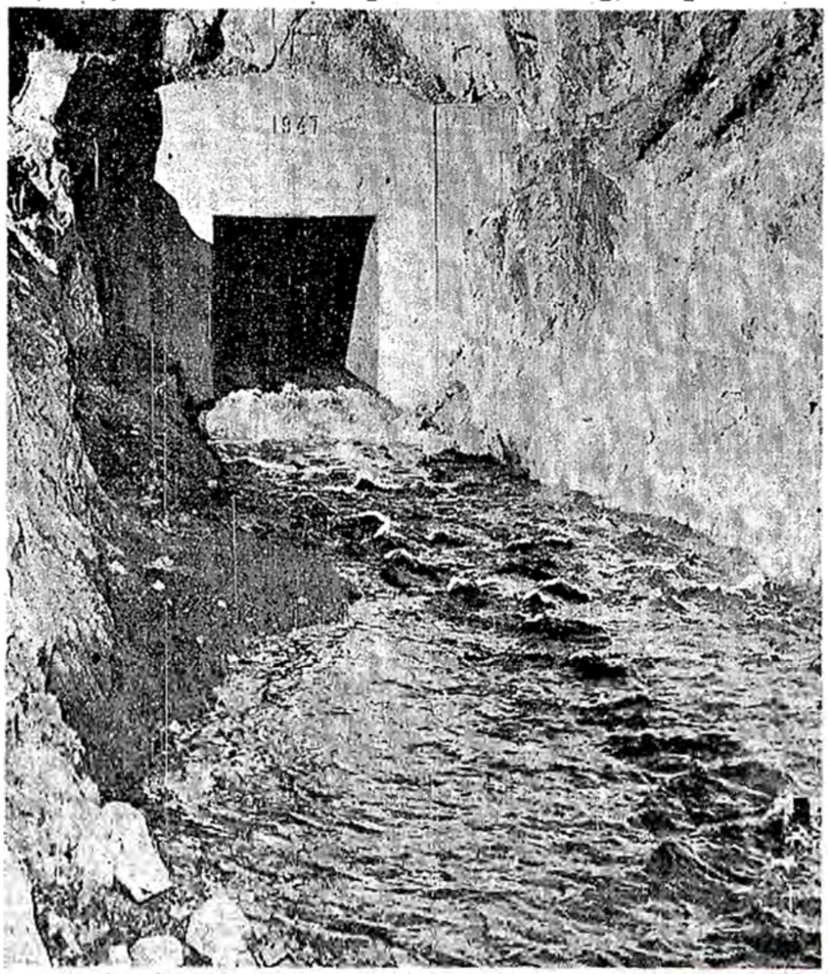


Figure 18. San Diego Aqueduct route. (San Diego Union 1947d)

The San Diego Aqueduct was delayed by a worker's strike in 1946 and again in early 1947. Delays from steel production also set the project back by several months. Despite issues and delays, the project was completed in November 1947 under budget at only $14.1 million versus the $17 million estimated for the project. Water from the Colorado River flowed into San Vicente Reservoir for the first time in late November 1947 (Figure 19). The San Diego Aqueduct was dedicated in December of 1947; the San Diego County Water Authority was formally annexed by the MWD and became legally entitled to Colorado River water from the MWD system. The San Vicente Dam was the first dam in the County to receive Colorado River Water (Crawford 2010; San Diego Union 1946, 1947a, 1947b, 1947c, 1947d).

City Has Been Waiting for This for Long, Long Time



A stream that will swell to a torrent soon, first Colorado River water poured from San Diego Aqueduct into San Vicente Reservoir yesterday. Flow for test purposes was held to 11 million gallons a day. Load will be stepped up gradually to rated 50 millions a day. Formal dedication of Aqueduct is Dec. 11.

Figure 19. Colorado River water entering the San Vicente reservoir for the first time, November 1947. (San Diego Union 1947c)

Forever catching up to its population growth, the City again expanded its water supply in 1950. The population in the City was now 334,387 and 556,808 in the County. In 1950, the City bought the Murray Reservoir from Cuyamaca Water Company. The City also commissioned the Alvarado Filtration plant in 1951, building it beside Murray Reservoir, and decommissioning and demolishing the University Heights Filtration Plant in 1952. Also in 1952, the City finally revisited the once-promising Sutherland Dam project. The San Diego Water Committee determined that having the water supply was necessary and passed water bonds to fund the project in 1952 for $6.5 million. The dam used Eastwood's originally proposed multiple arch dam design (Figure 20). The largest modification from the 1927 dam design was the addition of reinforced concrete diaphragms, additional struts between buttresses in certain bays, and the omission of struts in other bays. The purpose of these changes was to provide increased seismic stability in the direction of the dam's axis and conform to current practices and requirements of the State Department of Water Resources, Division of Dams. Through dividing the dam into rigidly connected groups of buttresses, diaphragms, struts, and arches, separated by more flexible arches in the bays where bracing was omitted, the dam could adapt to higher seismic forces (WDCSD 1957). Upon completion in

1954, the dam measured 1,020 feet wide for the dam proper and 1,240 feet including the spillway. Its maximum height from streambed to the top of the parapet wall measured 161 feet (Crawford 2011; Fowler 1953; Hennessey 2002; San Diego Union 1954; WDCSD 1957).

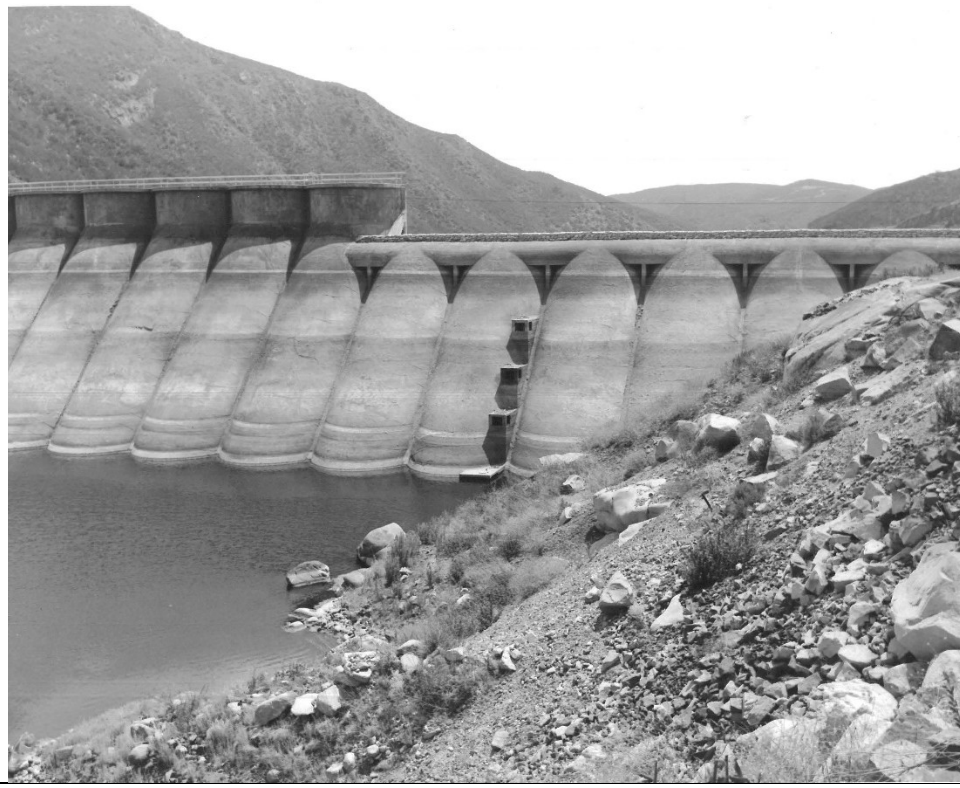


Figure 20. Sutherland Dam, upstream face showing multiple arch type of construction, 1954. (City of San Diego Public Utilities Department Archives, Box 10, Folder 103)

When San Diego began incorporating imported water into the City's supply in 1947, it started a new trend in the City's water storage and management. At the time of its completion, the first San Diego Aqueduct added 65,000 acre-feet/year of water and accounted for 70-80% percent of the City's water supply, with the remainder coming from local reservoirs. A second barrel was added to the San Diego Aqueduct in 1954, adding another 65,000 acre-feet/year of water (Durfor and Becker 1964; Fraser 2007).

In 1958, the City started the Second San Diego Aqueduct project, which also called for the construction of Miramar Dam and Miramar Water Treatment Plant in the Scripps Ranch region. Reservoir water originates from both the Colorado River Aqueduct and the California Aqueduct. On September 15, 1960, Miramar Dam, an earth-filled embankment dam, and the Miramar Filtration plant were dedicated. When the Second San Diego Aqueduct was completed in 1961, it added 200,000 acre feet/year, but during dry years, the ratio of imported water increased. In 1961, after two drought years, imported Colorado River Water accounted for 92-94% of the city's water supply (City of San Diego 2018; Crawford 2011; Durfor and Becker 1964; Fraser 2007; Pourade 1977; San Diego Union 1960).

The California Aqueduct, part of the State Water Project which captured water from the Feather River in Northern California, was approved by voters in 1959 and brought water to the Bay Area (1962) the San Joaquin Valley (1968) and finally Southern California and San Diego (1972). At the time of construction, the California Aqueduct added 325,000 acre-feet/year of water to San Diego's water supply. Today, roughly 17% of San Diego's water supply comes from the State Water Project (Center for Biological Diversity 2020, SDCWA 2020).

In 1968, the Parks Department took over reservoir recreation from the PUD. Recreation at dams including fishing, boating, watersport, and picnicking on the reservoir shores became common occurrences as the Parks Department encouraged the public to utilize the reservoirs' park-like settings. In 1969, the City sold San Dieguito Dam to the San Dieguito and Santa Fe Irrigation District. All dams and reservoirs performed admirably in the floods of 1978 and 1980, preventing considerable flood damage in the City (City of San Diego 2018; Crawford 2011; Pourade 1977; San Diego County Water Authority 2016).

As the local San Diego population swelled in the late 1970s and 1980s, the region's water use also increased. By 1991, imported water accounted for 95% of the City's supply, leaving the city vulnerable to water supply cuts. A severe drought from 1991-1992 caused the MWD to drastically cut water sent to San Diego and other member cities. As a result, in 1992 the City legislature passed a multi-decade plan to diversify the City's water supply and reduce reliance on MWD water. This plan involved rehabilitating reservoirs, adding desalinization plants, reviving groundwater projects, and purchasing imported water from other water companies. While still in progress, this plan intended to provide a more sustainable water solution for the city and end over-reliance on a single source.

The last few decades have seen a few improvements to the source water infrastructure throughout the greater San Diego region. In 2003, Olivenhain Dam was the first major new dam built in the County of San Diego in more than 50 years. This was followed in 2008 by the Twin Oaks Valley Water Treatment Plant, which went into service near San Marcos. In 2014, a multi-year, dam raise project was completed at San Vicente Dam, increasing the reservoir capacity by greater than 150,000 acre-feet. Most recently in 2015, the Carlsbad Desalination Plant, the largest seawater desalination project in North America, went into service. Today, there are 54 dams in San Diego County, ten of which remain under City of San Diego's ownership. The City's residents continue to rely on imported water for 75% to 95% of its total supply, depending on if there is a drought year or not, but the City's Public Utility Department continues to explore diversification of water sources, including rehabilitating some older reservoirs in order to meet demand (SDCWA 2020, Sholders 2002; WNW 2019).

4.2 Notable Engineers

Research was conducted on all engineers associated with the dams presented in this context as well as important engineers associated with the history of the City of San Diego Source Water System as a whole. Archival research, including review of historic newspapers, personal accounts, archival collections for specific engineers, engineering magazines, and other publications, was conducted for each engineer to include biographical information, create a works list, and gauge their importance within a context of other dam engineers. Typically, to be considered a notable engineer for the purposes of this report, a candidate engineer had to have made a locally important impact with the design of their dam, because of safety features, breaking size or capacity records, or for innovative engineering and design. The following engineers are all considered important to the development of the local, San Diego water system either for pioneering dam engineering in the San Diego region (i.e., Babcock), introducing new dam designs (i.e., Eastwood), guiding the development and designs of the city's water department (i.e., Savage or Pyle), or because they are master engineers in consideration of their larger body of work (i,e., O'Shaughnessy, Davis, or Hinds).

4.2.1 Michael Maurice O'Shaughnessy (1864-1934)

M.M. O'Shaughnessy was born in Limerick, Ireland, the son of Patrick and Margaret (O'Donnell) O'Shaughnessy. One of nine children, he was educated in the public schools in Ireland, and attended Queen's College, Cork, and then in Galway. On October 21, 1885, he graduated with a Bachelor of Engineering degree from the Royal University of Dublin. On March 8, 1885, O'Shaughnessy left for America and ten days later reached New York City. He then proceeded on to San Francisco, arriving on March 30, 1885. He began his career working as an Assistant Engineer, first for the Sierra Valley and Mohawk Railroad (1885-1886) and later for Southern Pacific Railroad (1886-1888), at various locations throughout California. In 1890, he married Mary Spottiswood in San Francisco and later they had five children together: Helen, Elizabeth, Francis, Margaret, and Mary (Boden 1934; OAC 2005).

He began private consulting as a civil engineer in August 1888 and undertook the surveying and engineering of land developments in California, laying out a number of small towns throughout the state, including Niles, Tracy, and Stanger. From 1890 to 1898, he was in general engineering practice in California, with an office in San Francisco. He served as Chief Engineer of the 1893 California Midwinter International Exposition held in Golden Gate Park. At the Exposition's close he was selected to become Chief Engineer for the Mountain Copper Company, where he built 12 miles of narrow-gauge railroad in Shasta, California, in 1895 and completed projects for several corporations, including the Spring Valley Water Company (Boden 1934; OAC 2005).

From 1899 to 1906, O'Shaughnessy was employed to design and construct four large irrigation and hydraulic projects on about 20 sugar plantations in the Hawaiian Islands, including Olokele, Koolau, Keanaiemaui, and Kohola. Shortly after the 1906 earthquake and fire in San Francisco, O'Shaughnessy returned to California. From 1907 to 1912, he served as both Chief Engineer and Consulting Engineer for John D. and Adolph Spreckels' SCMWC in San Diego and completed the Dulzura Conduit and Morena Dam (Boden 1934; OAC 2005).

In 1912, O'Shaughnessy was appointed City Engineer of San Francisco by Mayor James Rolph and was placed in full charge of the Hetch Hetchy project, handling the financial responsibilities as well as the engineering details. He held the position of City Engineer for 20 years, until January 8, 1932, when a new City Charter was adopted that separated the ordinary work of the City Engineer from that of its public utilities, including the municipal water supply. On February 8, 1932, the newly formed Public Utilities Commission appointed O'Shaughnessy Consulting Engineer for Hetch Hetchy Water Supply, a position that he held until his death in 1934, just 16 days before the opening of the Hetch Hetchy Reservoir in Yosemite. In July 1923, the dam at Hetch Hetchy Valley was dedicated in his honor, and officially given the name O'Shaughnessy Dam. (Boden 1934; OAC 2005).

O'Shaughnessy's career as an engineer spanned 49 years, from 1885 until his death in 1934. A small sample of his work is included below (Boden 1934; OAC 2005):

- California Midwinter International Exposition Chief Engineer, San Francisco County (1890-1894)
- Olokele Aqueduct, Kauai (1902-1903)
- Koolau Aqueduct, Maui (1903-1904)
- Kohola Aqueduct, Hawaii (1905-1906).
- Dulzura Conduit, San Diego County (1907-1909)
- Morena Dam, San Diego County (1909-1912)

- Mile Rock Sewer Tunnel, San Francisco County (1914-1915)
- O'Shaughnessy Dam, Tuolumne County (1919-1923)
- Municipal Railway System, San Francisco County (1915-1927)
- Twin Peaks Tunnel, San Francisco County (1918)
- Ocean Beach Esplanade, San Francisco County (1928)

4.2.2 Hiram Newton Savage (1861-1934)

Hiram Newton Savage (Oct 6, 1861-June 24, 1934) was born in Lancaster, New Hampshire, to farmer Hazen Nelson Savage and Laura Ann Savage (née Newton). In 1887, he graduated with a Bachelor's in Science (B.S.) from New Hampshire College of Agriculture and Mechanical Arts, following that degree in 1891 with a Civil Engineering degree from Thayer School of Engineering at Dartmouth College. After graduating, Savage immediately began seeking engineering work (WRCA 2005).

While completing his degree at Dartmouth, Savage began his engineering career in Tennessee, where he was hired as assistant engineer by the East Tennessee and Georgia Railway, the Nashville and Tellico Railway, and the Athens (Tennessee) Improvement Company in 1888. In 1889 he was an Assistant Engineer for the Hydraulic Mining and Irrigation Company in the San Pedro Mining District of New Mexico, and later that same year he served as Chief Engineer at the Rio Grande Water Company in New Mexico. In 1891, Savage relocated to Southern California, where the San Diego Land and Town Company in National City, California, hired him as chief engineer; he worked there until 1903. His biggest achievement at San Diego Land and Town Company was the enlargement of the Sweetwater Dam, raising the dam to 110 feet tall and resulting in a total storage capacity greater than 26,000 acre-feet. Completed in 1911, the work entailed addition of a 20-foot-tall parapet along the top of the dam; addition of concrete to the downstream side of the dam to compensate for the extra pressure from the increased water storage; inserting a two-chute overflow weir on left side of the dam; and raising the height of the outlet tower (Reynolds 2008, WRCA 2005).

While with the San Diego Land and Town Company, Savage also took outside consultant work. He took consulting jobs with several San Diego-area railroads: the San Diego and Cuyamaca Railway, the San Diego and La Jolla Railway Company, and the Cuyamaca Beach Railway Company. He also consulted for water-related engineering projects with the Cuyamaca Water Company, including the Zuninga Shoals Jetty Project for the City of San Diego. In 1895, the SCMWC hired Savage as a Consulting Engineer in connection with the Morena, Upper Otay, and Lower Otay Dams, and the water-conveyance system to the City (WRCA 2005).

In 1903, Savage was appointed Consulting Engineer for the United States Reclamation Service (a predecessor to the Bureau of Reclamation). In 1905, Savage was promoted to the Supervising Engineer of the Northern Division of the Reclamation Service in Montana, North Dakota, and Wyoming, where he oversaw several Reclamation Service dam projects, such as: the Milk River Project and Sun River Dam Project in Montana, the Williston Dam project in North Dakota, and the Shoshone Dam Project in Wyoming, which was at the time of its construction the highest dam in the world. Savage also consulted on other Reclamation Service projects for other regional divisions, including the Southern Division's Salt River Valley and Roosevelt Dam projects in Arizona. During his time with the Reclamation Service, New Hampshire State College awarded Savage with an honorary Doctor of Science in Engineering degree in 1913. His engagement at the federal level lasted from 1905 until 1915, before he resigned and returned to Southern California. In 1916, the Sweetwater Water Company of California hired Savage as a Consulting Engineer and later as a Supervising Engineer for the enlargement of the Sweetwater Dam, which had been damaged in the 1916 floods (Bureau of Reclamation 2018; WRCA 2005).

Savage was officially hired by the City of San Diego as the city's Hydraulic Engineer on June 4, 1917. The position had not previously existed for the city and came with the authority to direct the water department, design infrastructure, and make recommendations There he continued the water infrastructure recovery from the 1916 floods. The flood of 1916 had destroyed Lower Otay dam, a structural failure that flooded Otay Valley and caused 22 drowning deaths. Savage's role in the reconstruction of Lower Otay Dam, the construction of Barrett Dam, and the repairs to Sweetwater Dam and Morena Dam, solidified the important role that he played in San Diego's water system. The acquisition of Savage was seen as an immeasurable triumph, the results of which would put the City of San Diego ahead both technologically and financially (McGlashan and Ebert 1918; San Diego Evening Tribune 1917; San Diego Union 1918c; Scientific American 1923; WRCA 2005).

In addition to Savage's successful dam projects, he also submitted several reports on the City's future needs for new water resources and infrastructure development. Savage also brokered several deals to secure water rights for the City in several cases. These reports and legal issues contributed to the deterioration of Savage's relationship and rapport with the City Council. Savage's employment as City Hydraulic Engineer for the City of San Diego lasted until 1923, when he was summarily dismissed after multiple disputes with the City Council and consulting hydraulic engineers J. B Lippincott and John R. Freeman (LAT 1922; San Diego Evening Tribune 1923b; San Diego Sun 1923; WRCA 2005).

After his dismissal from the City's employment, Savage embarked on two world tours from 1923 to 1925, studying foreign engineering projects at the Aswan Dam in Egypt, water supply projects in England, and irrigation projects in Brazil, before returning to the United States and offering hydraulic engineering consulting services. Savage's work during this period is unknown (WRCA 2005).

Meanwhile, by 1928, the City of San Diego's water infrastructure development suffered without Savage's leadership, culminating in the ultimate failure and abandonment of the Sutherland Dam project. The City invited Savage to return as Hydraulic Engineer, heading the Municipal Bureau of Water Development, Operations, and Maintenance. Savage returned to San Diego in 1928, with the condition that he be allowed to work independently of political interference. This was not to be. The City Council resumed their antagonistic relationship with Savage almost immediately, undercutting his authority by hiring consulting engineers who publicly dissented with Savage's ideas and publicly criticizing Savage's reports. Savage, for his part, resumed securing water rights for the City and began the El Capitan Dam project in 1928. His re-employment with the city of San Diego lasted until 1933 when Savage resigned, but he remained a consultant until the dam was completed. Shortly after Savage's resignation, he succumbed to a longstanding sickness and died in 1934 from heart failure (Savage 1932; San Diego Evening Tribune 1934; San Diego Sun 1932, 1933; San Diego Union 1932a, 1934a; WRCA 2005).

Savage's career as an engineer extended 46 years, from 1888 to his death in 1934. A sample of his known work includes:

- Sweetwater Dam and Distribution System, San Diego, California, 1891
- Sweetwater Park and Race Track, National City, California 1891
- Zuniga Jetty, San Diego, 1904

- Lower Yellowstone Project, Montana 1904
- Huntley Project, Montana, 1907
- Williston Project, North Dakota, 1907
- Buford-Trenton Project, North Dakota, 1907
- Sun River Project, Montana, 1908
- Flathead Irrigation Project, Montana, 1908
- Shoshone Project, Wyoming, 1908-1910
- Milk River Project, Montana, 1910
- St. Mary Diversion Dam, Montana, 1915
- Sweetwater Dam Enlargement Project, San Diego County, California, 1917
- Lower Otay Dam (Savage Dam), San Diego County, California, 1919
- Morena Dam Enlargement Project, San Diego County, California, 1923
- Barrett Dam, San Diego County, California, 1922
- El Capitan Dam, San Diego County, California, 1932-1934

4.2.3 John Samuel Eastwood (1857-1924)

John Samuel Eastwood was born in rural Minnesota to Dutch immigrants, near Minneapolis in in 1857. Eastwood "Americanized" his Dutch surname name from Oosterhout in 1878 in anticipation of entering the commercial and professional world. He graduated from University of Minnesota with a B.S. in Engineering in 1879 and emigrated west in 1880 to work on the Northern Pacific Railroad. In 1883, Eastwood moved on from railroad work to the San Joaquin Valley in central California, where he began working on water infrastructure. In 1885, after the incorporation of Fresno as a city, Eastwood was appointed City Engineer. After just one year in this position, Eastwood left, preferring to work for local private logging and hydroelectric engineering projects in the Fresno region of the Sierra Nevada Mountains (Jackson 1979, 1999, 2005, 2009; Whitney 1969).

From 1895 to 1896, he worked as chief engineer for the Fresno-based San Joaquin Electric Company (SJEC) and developed their hydroelectric power system. The system, which relied on the natural flow of the San Joaquin River, eventually failed in the drought conditions of the late 1890s. The failure of design served an important lesson for Eastwood, as he realized the importance of long-term water storage and provided for this in his future California water infrastructure projects (Jackson 1999, 2005; Whitney 1969).

Eastwood designed his first multiple arch dam for Henry Huntington's Pacific Light & Power Corporation, at what was then known as the Big Creek system. Eastwood's innovative dam design promised a strong, but not a material-intensive structure that could be cheaply constructed. In 1906, Eastwood first developed multiple arch designs for Big Creek that required significantly less concrete to build than conventional concrete gravity dams, therefore saving clients' money. The dam never came to fruition due to the Financial Panic of 1907, however, in 1908 Eastwood was hired by the Hume-Bennet Logging Company and used his design for the Hume Lake Dam, completed in 1909 (Jackson 1999, 2005; Whitney 1969).

After the initial success of Hume Lake Dam, Eastwood continued to use and promote his economical and strong multiple arch dam design. In 1910, Eastwood moved on again, this time to design another multiple arch dam and serve as chief engineer for the Big Bear Dam in the San Bernardino Mountains. In 1911, he moved to Oakland to work with the Great Western Power Company (GWPC) in northern California. GWPC planned a large storage dam at Big Meadows as part of the Feather River hydroelectric power system. Here, Eastwood came into conflict with another engineer, John R. Freeman, who promoted a concrete gravity dam design. Though Eastwood's design was initially selected, and construction of a multiple arch dam began at the Big Meadows site, changes in GWPC leadership and the influence of Freeman ultimately led the GWPC to abandon construction of Eastwood's dam in 1913. Surprisingly, the reasons for abandoning the project were not due to any failure of design or miscalculation by Eastwood, but rather with the "psychological disquiet" such a design would inspire in the general public. After the Big Meadows Dam, Eastwood found himself professionally ostracized by the international engineering community. Rather than abandoning the multiple arch design, Eastwood doubled down on his promotion of inexpensive and structurally sound designs (Jackson 1999, 2005, 2009; Whitney 1969).

For a few years, Eastwood was commissioned for small dam projects at Los Verjels Dam and Kennedy Dam before being sought for the Mountain Dell Dam near Salt Lake City, Utah. Shortly afterward, Eastwood was sought by San Diego developer Colonel Ed Fletcher to bring his economical designs to San Diego County. Eastwood designed four dams for Fletcher from 1917 to 1918: Lake Hodges, San Dieguito, Murray, and Eagle's Nest Dams. Though he did not build any other dams in San Diego County after this, Eastwood maintained a warm relationship with Fletcher and it eventually led to a connection to the City of Phoenix, who engaged him to design Cave Creek Dam in the early 1920s (Jackson 1979, 1999, 2005; Whitney 1969).

While working with Fletcher in 1924 on new dam designs, Eastwood spent time at Fletcher's ranch along the King's River. There, he suffered a heart attack while swimming and passed away. The ranch is now covered by the Pine Flat Reservoir, which was dammed in 1954 by a concrete gravity dam (Jackson 1999).

Eastwood's career as an engineer extended 44 years, from 1883 until his death in 1924. A small sample of his work is included below (Jackson 1979, 1999, 2005, 2009; Whitney 1969):

- Hume Lake Dam, Fresno County, California (1908)
- Big Bear Lake Dam, San Bernardino County, California (1912)
- Los Verjels Dam, Yuba County, California (1914)
- Kennedy Dam, Amador County, California (1914)
- Mountain Dell Dam, Salt Lake County, Utah (1916-1925)
- Murray Dam, San Diego County, California (1917)
- Lake Hodges Dam, San Diego County, California (1919)
- Fish Creek Dam, Carey, Idaho (1919)
- San Dieguito Dam, San Diego County, California (1919)
- Cave Creek Dam, Maricopa County, Arizona (1923)
- Anyox Hydroelectric Dam, British Columbia, Canada (1924)

4.2.4 Fred Dale Pyle (1882-1950)

Fred Dale Pyle (Oct 8, 1882-July 21. 1950) was born in Perry Township, Pennsylvania. He graduated in 1903 from Utah Agricultural College with a B.S. degree in Civil Engineering. Upon graduating, he took on various jobs, including at Utah Agricultural College conducting crop irrigation experiments, then as a surveyor for the Bureau of Reclamation (then called U.S. Reclamation Service) where he surveyed Bear Lake and Utah Lake. During the latter half of 1904, he conducted groundwater surveys for the U.S Geographic Survey at Utah Lake and Jordan Valleys. In 1905, he briefly worked for fellow classmate W.W. McLaughlin's engineering practice in Utah. Immediately following that, from 1905-1912, he took on several different roles while working on the U.S. Reclamation Service's North Platte Irrigation Project in Nebraska, where he worked in various roles such as Junior Engineer, Instrumentman, and Superintendent of Operation and Maintenance, before finishing his tenure there as the "Irrigation Manager in charge of all operations and maintenance work". From 1913 to 1920, Pyle continued to work on various U.S Reclamation Service irrigation projects including the Belle Fourche Project, Grand Valley Project, and Uncompahgre Project in Colorado and South Dakota (Merrill et al. 1918, Pyle 1949, San Diego Union 1950, WRCA 1999).

Pyle arrived in California in 1922, where he initially took the position of Business Manager at Imperial Irrigation District in Calexico, California. While in that position, he organized the take over and operation, as well as the Rules and Regulations of 14 Mutual Water Companies, which until November 1st, 1922 handled all water deliveries in Imperial County. After the dissolution of these water companies, he became the Irrigation Engineer at a different Imperial Irrigation District office in Imperial, California. There, Pyle was in charge of operations, collection, and maintenance of "1720 miles of canals, laterals, and waste ditches which delivered water to 3200 water users" (Pyle 1949). He remained in that position until April 1925. From 1925 until his hire by the City of San Diego in 1928, he inspected several water supply projects in San Diego and Yakima, Washington. From 1926 until October 1928, he was employed by Vista Irrigation District in Vista California, as the Engineer-Manager (Dowd 1956, Pyle 1949).

In October 1928, Pyle was hired by the City of San Diego as Assistant Hydraulic Engineer, working on the Otay Pipeline Plans, under City Hydraulic Engineer Hiram Savage. After the Savages' death in 1934, City Manager Fred Lockwood appointed Pyle as Chief Hydraulic Engineer for the City of San Diego. Pyle saw the completion El Capitan Dam and was instrumental in the development and building of San Vicente Dam (1941) and the San Diego Aqueduct. He was also responsible for the strengthening of Hodges Dam, the Morena Dam enlargement, San Dieguito Dam strengthening, and conduit work (Pyle 1949; San Diego Union 1928a, 1928b 1932, 1938, 1939a, 1939b, 1940a, 1940b, 1950).

Pyle's career as an engineer extended 45 years, from 1905 until his death in 1950. His work history includes:

- Instrumentman with Reclamation Service (July 1903-February 1904)
- Experiment Station at Logan, Utah (April-September 1904)
- U.S. Geographic Survey (October-December 1904)
- W.W. McLaughlin (January-April 1905)
- North Platte Project Junior Engineer (May 1905-March 1910)
- North Platte Project Irrigation Manager (March 1910-August 1912)

- Belle Fourche, North Platte, Grand Valley and Uncompahgre projects Operation and Maintenance Inspector (August 1912-March 1913)
- Uncompahgre Valley Project Irrigation Manager (March 1913-October 1913)
- Uncompahgre Project Project Manager (October 1913-June 1920)
- Colombia Irrigation District Secretary and Manager (August 1920-March 1922)
- Imperial Irrigation District Business Manager (March 1922-Novmeber 1922)
- Imperial Irrigation District Irrigation Engineer (November 1922-April 1925)
- Vista Irrigation District Engineer-Manager (February 1925-October 1928)
- City of San Diego Assistant Hydraulic Engineer (October1928-June 1932)
- City of San Diego Chief Hydraulic Engineer (June 1934-July 1950)

4.2.5 Arthur Powell Davis (1861-1933)

Arthur Powell Davis was born in 1861 in Decatur, Illinois, but was raised near Junction City, Kansas. Davis was the nephew of John Wesley Powell, one of the foremost explorers of the Western United States. Davis went into engineering, graduating from George Washington University in 1882 and finding work with the United States Geological Survey (USGS). He left the USGS and worked as a Hydrographer beginning in 1894. From 1897-1901 he was Hydrographer in Charge of Examination of Hydrologic Work for Interoceanic Canals in Nicaragua and Panama (SNAC Cooperative 2019).

In 1902, Davis joined a new branch of the U.S. Department of the Interior, the Reclamation Service as Assistant Chief Engineer. Just five years later, Davis was promoted to chief engineer of the Reclamation Service. In 1914, Davis again was promoted, this time to the Director of the Reclamation Service, effectively leading the department branch. During his tenure from 1914 to 1923, Davis worked on or approved many significant early dam infrastructure projects throughout the western United States, including the Roosevelt, Shoshone and Boulder (Hoover) Dams, and the All-American Canal. Davis was instrumental in outlining the development of the Colorado River from 1902 when he first surveyed Black Canyon to his presentation before Congress in 1922. However, the expected expenditure of the Boulder Dam, several scandals within the department, mounting dissention from private power companies, and the then-current political climate led to the reorganization of the Reclamation Service into the Bureau of Reclamation in 1923 and the dismissal of Davis from his director role (Gressley 1968; SNAC Cooperative 2019).

After the Reclamation Service, Davis became the Chief Engineer and General Manager of the East Bay Municipal Utility District in Oakland, California and occasionally consulted on western dam projects like Sutherland Dam. In 1929, Davis left Oakland for the U.S.S.R, to work as chief consulting engineer for irrigation in Turkestan and Transcaucasia until 1931. Davis returned to the United States in 1931. In an interesting turn of events, Davis resumed work on a project he had helped shape a decade before with the Reclamation Service—working as Consulting Engineer for the Boulder (Hoover) Dam project in 1933. Just a few months after this appointment Davis died in Oakland, California (SNAC Cooperative 2019).

4.2.6 Elisha Spurr Babcock Jr. (1848-1922)

Elisha Spurr Babcock Jr. was raised in Evansville, Indiana, and graduated from Evansville High School. After high school he began working for the Evansville and Terre Haute Railroad Company and quickly worked his way up to the position of general freight agent of the road by age 24. He left the railroad industry in order to help develop the Cumberland Telegraph and Telephone Company, a Bell subsidiary, which controlled a large territory from Evansville to New Orleans, while at the same time having sole ownership of the Eugene Ice Company. At this point in his life, Babcock had enough wealth to purchase five large houses and a number of agencies, in addition to being a partner in the firm of E.S. Babcock & Son. He married Isabella Graham (1850-1932), a native of Cincinnati, Ohio, and had two children, Arnold and Graham Babcock.

In 1884, Babcock retired to San Diego for his health, where he continued to advance his enterprises. In 1885, he and Hampton Story, purchased the property known as Coronado Beach, a tract of over 4,000 acres across the bay from the City of San Diego. The men organized the Coronado Beach Company, of which Babcock was president and active manager. The company soon laid out the City of Coronado, selling $2,750,000 worth of the area's property and with the profits from the land sale built the Hotel del Coronado. In 1886, Babcock created the San Diego and Coronado Ferry Company to accommodate the growing number of visitors to Coronado Island. Babcock and his three associates also built the water works for both Coronado and San Diego, the street railway lines, a railroad twenty-two miles long around San Diego Bay, an electric light plant, a shipyard, and many other enterprises (Coronado Historical Association 2020).

Bringing water to San Diego and Coronado was a high priority for Babcock, who persuaded John D. Spreckels to invest in a number of his organizations, including the SCMWC in 1895 (Smythe 1908). John D. Spreckels and A.B. Spreckels, sons of the sugar king Claus Spreckels, were also highly influential businessmen in the San Diego area. The three men became the sole owners of several enterprises developed by Babcock, and Spreckels eventually owned nearly half of Babcock's enterprises, yet he retained Babcock as his business manager (Hennessey 1978). In 1912, after completion of the Morena Dam, Babcock sold his interests to the Spreckels companies. Later, the City of San Diego took over the water system and continued its development (San Diego Union 1922).

As an engineer, the Upper Otay Dam is the only existing structure Babcock designed. Despite being patterned after the Bear Valley Dam engineered by John Eastwood, Babcock is given recognition with the dam constructed at the Upper Otay as his own creation (Jackson 1999). The rock fill Lower Otay Dam, also designed by Babcock, was destroyed in the 1916 flood. For the majority of his career Babcock functioned as an organizer or controller of corporations, which included the Cuyamaca Railway, the Los Angeles and San Diego Beach Railway (otherwise known as the La Jolla Line), the Western Salt Works, and the South San Diego Investment Company (San Diego Evening Tribune 1922b). Babcock died of a stroke in his office on October 8, 1922, at the age of 73.

Short list of Babcocks known engineering works:

- Upper Otay Dam, San Diego, 1896
- Original Lower Otay Dam, San Diego, 1894 (destroyed 1916)

4.2.7 Julian B. Hinds (1881-1977)

Julian Hinds was born in Warrenton, Alabama in 1881 and graduated from the University of Texas in 1908 with a B.S. in Civil Engineering. After briefly working as a draftsman for the railroad industry, Hinds worked for the United States Bureau of Reclamation from 1910 to 1926 and moved through the grades from surveyor to engineer, to chief draftsman, and “assistant chief designing engineer” (Chi Epsilon 2020). In a few short years, Hinds primarily worked on irrigation projects such as the Yakima Sunnyside Project in Washington, before transitioning to dam project, such as Elephant Butte Dam and Reservoir in New Mexico. By 1915, Hinds transferred to the Bureau’s new central engineering office in Denver, Colorado, where he served as designer, chief draftsman, and assistant chief designing engineer on a wide variety of assignments. From 1926 to 1929, Hinds briefly worked for the J.G. White Engineering Corporation in Mexico on the Calles Project in Aguascalientes. Hinds then briefly consulted for the Rio Conchos Project and the Don Martin Dam, also in Mexico (Chi Epsilon 2020; Smithsonian Institute 2020).

In 1929, Hinds returned to the United States to work on the Colorado River Aqueduct, first for the Los Angeles Department of Water and Power, then for the MWD, after it was founded. As chief designing engineer for MWD, Hinds prepared numerous designs for all of the dams, reservoirs, pumping plants, tunnels, and over 300 miles of aqueduct between Boulder Dam and Lake Matthews. During the construction period of the Colorado River Aqueduct from 1933 to 1941, Hinds served as assistant chief engineer and handled nearly all of the administrative work on the Colorado River Aqueduct, including cataloging its progress, writing reports, and speaking engagements with various city officials from MWD, member cities, and agencies. From 1941 until his retirement from MWD in 1951, Hinds was the general manager and chief engineer at MWD. Post retirement (1951- 1971), Hinds worked on various engineering projects, consulting with the Bechtel Corporation, Department of the Army, United States Bureau of Reclamation, and the World Bank. It is estimated that he was employed on 150 dam projects on the Columbia and Colorado Rivers, in Mexico, and in the states of Montana, Utah, Colorado, New Mexico (Chi Epsilon 2020; Smithsonian Institute 2020).

5 Significance Evaluations

5.1 City of San Diego Source Water System (1887-1947)

5.1.1 Statement of Significance

The City of San Diego's Source Water System includes ten (10) impounding reservoir complexes owned/operated by the City that function as part of the City's municipal water-supply system. These resources and their related infrastructure (e.g., dams, outlet towers, conduits, flumes, and pipelines [Figure 2]) are significant for their role in the City's source water system, starting with the earliest efforts to establish privatized water in the 1880s followed by construction of the earliest reservoirs, Lake Cuyamaca (1887) and Sweetwater Reservoir (1888). The period of significance ends with construction of the San Diego Aqueduct, and the importation of Colorado River Water for the first time into the San Vicente Reservoir (1947) which forever changed the composition of City's source water supply.

Taken as a whole, the City's system of reservoirs, dams, conduits, pipelines and other related infrastructure, is significant under NRHP/CRHR Criterion A/1 and City of San Diego Criteria A and B for its ability to convey important associations with the City's municipal water supply and the development of its critical water infrastructure prior to the importation of water from the Colorado River and State Water Project. While other major pieces of water infrastructure were constructed after 1947, including Sutherland Reservoir (1954) and Miramar Reservoir (1960), these resources were constructed outside the identified period of significance for the City's source water system (1887-1947) and were designed to support ongoing population growth and expansion in the San Diego region following World War II, a trend seen throughout the United States.

The system is also eligible under NRHP/CRHR Criterion C/3 and City of San Diego Criteria C and D for embodying the distinctive characteristics of a variety of dam engineering types and methods seen throughout the late 19th and early 20th centuries, and for representing an important facet of the body of work of master water engineers O'Shaughnessy, Savage, Eastwood, Pyle, and Hinds.

Although the City of San Diego Source Water System is associated with countless important individuals, none of these associations can be connected to the larger system in a meaningful way. Therefore, the system is not eligible under NRHP/CRHR Criterion B/2 or City of San Diego Criteria B for associations with important persons. At this time, there is no indication that the system has the potential to yield additional information. Therefore, it is not eligible under NRHP/CRHR Criterion D/4

5.1.2 Registration Requirements

Designation Criteria

The purpose of this section is to provide guidance to facilitate the evaluation of contributing and non-contributing elements of the City of San Diego Source Water System. Table 1 considers the essential elements of the system's significance necessary in consideration of national, state, and local designation criteria. Future evaluations of historical significance on source water infrastructure should also consider whether or not the resource in question meets any of the registration requirements outlined below in order to be eligible as a contributing resource to the larger water system. These registration requirements apply to the primary and secondary property types discussed in Section 3.2

Table 1. Significance Requirements for Contributing Resources to the City of San Diego Source Water System

NRHP/CRHR Criteria	City of San Diego Criteria	Type of Significance	Resource Registration Requirements
A/1	A, B, F	Association with Events, Patterns of Development; Special Elements of the City	• Constructed during the period of significance for source water infrastructure (1887-1947). • Associated with one of the three significant themes of San Diego water development. • Associated with source water storage, distribution, or treatment. • Associated with a significant component of the system (i.e., a contributing reservoir)
B/2	B	Association with People	• Constructed during the period of significance for source water infrastructure (1887-1947). • Directly associated with prominent land developers or historical figures in the history of San Diego. The property must be directly tied to the important person and the place where the individual conducted or produced the work for which he or she is known.
C/3	C, D, F	Engineering; Design; Notable Work	• Constructed during the period of significance for source water infrastructure (1887-1947). • Exemplifies nineteenth and/or twentieth century engineering practices • Serves as an intact representation of a recognizable and notable engineering type in San Diego • Exemplifies and represents the work of notable engineers working in San Diego during the late nineteenth and early twentieth centuries

Table 1. Significance Requirements for Contributing Resources to the City of San Diego Source Water System

NRHP/CRHR Criteria	City of San Diego Criteria	Type of Significance	Resource Registration Requirements
			• Exemplifies and represents innovative design, materials, and/or construction methodologies related to source water infrastructure

Integrity Requirements

In addition to meeting one or more of the designation criteria identified above, an eligible resource must retain integrity, which is expressed in seven aspects: location, design, setting, workmanship, materials, feeling, and association. Table 2 considers the essential elements of the system's integrity necessary in consideration of national, state, and local designation criteria. As stated in the NRHP Bulletin 15, How *to Apply the National Register Criteria for Evaluation*, "All properties change over time. It is not necessary for a property to retain all its historic physical features or characteristics. The property must retain, however, the essential physical features that enable it to convey its historic identity. The essential physical features are those features that define both why a property is significant (Applicable Criteria and Areas of Significance) and when it was significant (Periods of Significance)" (NPS 1995:46).

Table 2. Integrity Requirements for Contributing Resources to the City of San Diego Source Water System

NRHP/CRHR Criteria	City of San Diego Criteria	Type of Significance	Integrity Requirements
A/1 and B/2	A, B, F	Association with Events, People, Patterns of Development; Special Elements of the City	Retains the following physical attributes as they relate to the integrity of location, setting, feeling, and association: • Maintains original alignment/location from its period of significance. • Continues to maintain its historic function as part of the larger water system

Table 2. Integrity Requirements for Contributing Resources to the City of San Diego Source Water System

NRHP/CRHR Criteria	City of San Diego Criteria	Type of Significance	Integrity Requirements
C/3	C, D, F	Engineering; Design; Notable Work	Retains the following physical attributes as they relate to the integrity of workmanship, materials, design, location, setting, feeling, and association: • Exhibits most construction methods and engineering details associated with the resource's period of significance. Buildings and other non-engineering structures should retain the essential character-defining features from their period of significance. • Retains original alignment/location from its period of significance. • Continues to retain its historic function as part of a larger water system.

5.1.3 Findings of Significance

The infrastructure evaluated as part of the current study includes all 10 dams owned/operated by the City as well as the Dulzura Conduit, which connects Barrett Reservoir with Dulzura Creek. These constitute most of the major pieces of infrastructure within the City's source water system. Of the 11 resources evaluated for historical significance, nine (9) were found to be eligible as a contributing resource to the larger City of San Diego Source Water System; two (2) were found to be non-contributing resources as they were constructed outside the period of significance for the system. Of the 9 resources identified as contributors to the larger system, eight (8) were found to also be individually eligible for designation. Table 3 identifies the resources evaluated for historical significance as part of the current study and includes the resource name, its associated dam type (if applicable), engineer, built date, evaluation findings and applicable California Historical Resource Status Code (CHRSC), and associated periods of significance under NRHP/CRHR Criteria and the City's comparable criteria. Detailed DPR forms for all evaluated infrastructure is provided in Appendix A.

Table 3. Findings of Significance for all Evaluated Components of the City of San Diego Source Water System

Resource Name	Dam Type	Engineer	Built Date	Evaluation Findings	Period(s) of Significance
Morena Reservoir Complex	Rock-filled Embankment	Babcock/Harris (original) O'Shaughnessy (current)	1895 (original) 1912 (current)	NRHP/CRHR: A/1, C/3 City: A, B, C, D, E, F CHRSC: 3B; 3CB, 5B (previously concurred individually eligible by SHPO)	A: 1887-1916 C: 1912
Lower Otay Reservoir Complex	Curved Gravity	Russell (original); Savage (current)	1895 (original) 1919 (current)	NRHP/CRHR: A/1, C/3 City: A, B, C, D, F CHRSC: 3B; 3CB, 5B	A: 1887-1928 C: 1895; 1919
Upper Otay Reservoir Complex	Arch	Babcock	1902	NRHP/CRHR: A/1, B/2, C/3 City: A, B, C, D, F CHRSC: 3B; 3CB, 5B	A: 1887-1916 B: 1896-1922 C: 1902
Dulzura Conduit	n/a	O'Shaughnessy	1909	NRHP/CRHR: A/1 City: A, B, F CHRSC: 3D; 3CD, 5D3	A: 1887-1916
Murray Reservoir Complex	Multiple Arch	Eastwood and Pyle	1918	NRHP/CRHR: A/1, C/3 City: A, B, C, D, F CHRSC: 3B; 3CB, 5B	A: 1916-1928 C: 1918
Lake Hodges Reservoir Complex	Multiple Arch	Eastwood	1919	NRHP/CRHR: A/1, C/3 City: A, B, C, D, F CHRSC: 3B; 3CB, 5B	A: 1916-1928 C: 1919
Barrett Reservoir Complex	Curved Gravity	Savage	1922	NRHP/CRHR: A/1, C/3 City: A, B, C, D, F CHRSC: 3B; 3CB, 5B	A: 1916-1928 C: 1922
El Capitan Reservoir Complex	Hydraulic Rock-filled Embankment	Savage	1935	NRHP/CRHR: A/1, C/3 City: A, B, C, D, F CHRSC: 3B; 3CB, 5B	A: 1928-1947 C: 1935
San Vicente Reservoir Complex	Straight Axis Gravity	Hinds and Pyle	1943	NRHP/CRHR: A/1 City: A, B, F CHRSC: 3B; 3CB, 5B	A: 1928-1947
Sutherland Reservoir Complex	Multiple Arch	Davis	1954	Not eligible CHRSC: 6Z	n/a
Miramar Reservoir Complex	Earth-filled Embankment	City Engineers	1960	Not eligible CHRSC: 6Z	n/a

3B Appears eligible for NRHP both individually and as a contributor to a NRHP eligible multicomponent resource like a district through survey evaluation.

3D Appears eligible for NRHP as a contributor to a NRHP eligible multi-component resource through survey evaluation.

3CB Appears eligible for CRHR both individually and as a contributor to a CRHR eligible multicomponent resource through survey evaluation.

3CD Appears eligible for CRHR as a contributor to a CRHR eligible multi-component resource through survey evaluation.

5B Locally significant both individually (listed, eligible, or appears eligible) and as contributor to a multi-component resource like a district that is locally listed, designated, determined eligible, or appears eligible through survey evaluation

5D3 Appears to be a contributor to a multi-component resource that appears eligible for local listing or designation.

6Z Found ineligible for NRHP, CRHR or local designation through survey evaluation.

6 Findings and Conclusions

6.1 Summary of Findings

Dudek evaluated 11 components of the City of San Diego Source Water System in consideration of each resource's potential to contribute to the eligibility of the larger water system, as well each resource's individual findings of significance (Table 3). The completion of extension research at PUD's water archives, development of a thorough historic context statement, identification of key periods and themes significant in San Diego's water history, and the evaluation of the 11 most critical and visible components of the system allowed for eligibility to findings to be reached on larger system (Figure 2).

As a result of the current study, Dudek finds the City of San Diego Source Water System eligible under NRHP/CRHR Criterion A/1 and City of San Diego Criteria A and B for its ability to convey important associations with the City's municipal water supply and the development of its critical water infrastructure prior to the importation of water from the Colorado River and State Water Project. While other major pieces of water infrastructure were constructed after 1947, including Sutherland Reservoir (1954) and Miramar Reservoir (1960), these resources were constructed outside the identified period of significance for the City's source water system (1887-1947) and were designed to support ongoing population growth and expansion in the San Diego region following World War II, a trend seen throughout the United States. The system is also eligible under NRHP/CRHR Criterion C/3 and City of San Diego Criteria C and D for embodying the distinctive characteristics of a variety of dam engineering types and methods seen throughout the late 19th and early 20th centuries, and for representing an important facet of the body of work of master water engineers O'Shaughnessy, Savage, Eastwood, Pyle, and Hinds.

Identified contributing resources to the larger system include: the Morena, Lower Otay, Upper Otay, Murray, Lake Hodges, Barrett, El Capitan, and San Vicente Reservoir Complexes, as well as the Dulzura Conduit. It is important to note that not all of these components are eligible under NRHP/Criterion C/3. The San Vicente Reservoir Complex and the Dulzura Conduit were found not eligible under Criterion C/3 and related City Criteria due to extensive alterations that occurred outside the period of significance, However, these two resources still contribute to the significance of the larger water system under NRHP/CRHR Criterion A/1 and City Criteria A and B.

In addition to the findings for the larger water system, Dudek also found the following resources individually eligible under NRHP, CRHR, and City designation criteria as part of the current study: the Morena, Lower Otay, Upper Otay, Murray, Lake Hodges, Barrett, El Capitan, and San Vicente Reservoir Complexes. The Dulzura Conduit was found to lack requisite integrity for individual designation and its significance is only understood within the context of the larger water system.

6.2 Management Recommendations

The purpose of this document is to address this historical significance of the San Diego Source Water System and 11 of its major pieces of infrastructure. The research and analysis conducted as part of this study will provide the City and its consultants with the foundation for assessing the historical significance of infrastructure identified throughout the City of San Diego Source Water System as part of future CEQA and NEPA projects. The significance of individual water infrastructure is best understood within the context of the larger system and within its defined period of significance (1887-1947), relevant themes, and property types. This study is designed to help streamline the regulatory processes of CEQA and Section 106 of the NHPA, by consistently evaluating and assessing impacts to individual components in consideration of the larger City of San Diego Source Water System.

Consultation with SHPO for Concurrence of Findings

It is recommended that the City facilitate consultation with the SHPO for concurrence of eligibility findings for the San Diego Source Water System and its contributing resources. With SHPO's concurrence on the period of significance and findings of significance, the City will have a consistent methodology in place for evaluating its source water infrastructure and understanding the specific features that contribute to its historical and engineering significance. These findings can then be considered with respect to future project planning and implementation. Generally speaking, source water infrastructure constructed after 1947 will not be eligible as a contributing resource to the City of San Diego Source Water System under NRHP/CRHR Criterion A/1 as the post-1947 period represents a new phase of the City's water supply in which it began to rely heavily on imported water (a trend seen throughout California). Further, a post-1947 component of the system will not be eligible as a contributing resource under NRHP/CRHR Criterion C/3 for its engineering merits with respect to the development of the source water system and the master engineers associated with its design and construction.

Future Evaluations

Although most of the major individual components of the City of San Diego Source Water System were evaluated as part of the current study, it is recommended that the City continue to assess other pre-1947 components of the system as specific project work on these components arises. This includes the water treatment plants and various pipelines, conduits, flumes, etc. The registration requirements outlined in Section 5.1.2 are designed to assist with future evaluations of post-1947 infrastructure as identified through project work over time.

7 Bibliography

36 CFR 60. National Register of Historic Places.

36 CFR 800.1–800.16 and Appendix A. Protection of Historic Properties.

16 USC 470–470x-6. National Historic Preservation Act of 1966, as amended.

Andrus, Patrick, and Rebecca Shrimpton. 2002. *How to Apply the National Register Criteria for Evaluation*. National Register Bulletin 15. Accessed June 2018. https://www.nps.gov/nr/publications/bulletins/pdfs/nrb15.pdf.

Association of State Dam Safety Officials. 2020. "Dams 101." Accessed June 12, 2020. https://www.damsafety.org/dams101#Return%20to%20Top.

Billington, David P., Donald C. Jackson, and Martin V. Melosi. 2005. "The History of Large Federal Dams: Planning, Design and Construction in the Era of Big Dams." Denver, Colorado: U.S. Department of the Interior, Bureau of Reclamation.Boden, Charles R. Dec. 1934. "Michael Maurice O'Shaughnessy Obituary." California Historical Society Quarterly. California: University of California Press. Vol. 13, No. 4 (Dec., 19, 1934), pp. 415-416. Accessed November 16, 2018. http://www.jstor.org/stable/25160549

Breitenback, A.J. 2004. "Part 2 – History of Rockfill Dam Construction." Geoengineer Newsletter, Berkeley, California. March 2005.

British Dam Society. 2020. "Dam Information: Spillways and Outlets." Accessed June 12, 2020. https://britishdams.org/about-dams/dam-information/.

Bureau of Reclamation. 1987. *Design of Small Dams*, 3rd edition. Water Resources Technical Publication. Denver, Colorado: U.S. Department of the Interior, Bureau of Reclamation. Denver, Colorado. Accessed June 2018. https://www.usbr.gov/tsc/techreferences/mands/mands-pdfs/SmallDams.pdf.

Bureau of Reclamation. 2018. "Projects and Facilities." Reclamation: Managing Water in the West. Accessed July 12, 2018. https://www.usbr.gov/projects/facilities.php?type=Project

Caltrans (California Department of Transportation) and JRP Historical Consulting Services. 2000. *Water Conveyance Systems in California: Historic Context Development and Evaluation Procedures*. Sacramento, California: California Department of Transportation. Accessed June 2018. http://www.dot.ca.gov/ser/downloads/cultural/CanalsDitches.pdf.

Capps, Edwin M. 1896. "Engineer Capps' Report." San Diego, California. On file with the City of San Diego Public Utilities Department.

Center for Biological Diversity. 2020. "Chronology of the State Water Project, Its Monterey Contract Amendments, and the Kern Water Bank (1929-2010)." Webpage. Accessed June 11, 2020.

https://www.biologicaldiversity.org/campaigns/monterey_plus_amendments/pdfs/Monterey%20Plus%20Amendments%20Chronology.pdf

Centers for Disease Control and Prevention. 2020. "Community Water Treatment." Accessed June 12, 2020. https://www.cdc.gov/healthywater/drinking/public/water_treatment.html.

Chi Epsilon. 2020. "Biography: Julian Hinds." Chi Epsilon Civil Engineering Honor Society: Conception, Design, Construction. Webpage. Accessed May 21, 2020. https://www.chi-epsilon.org/XEWebGeneral2/About/NHMBio.aspx?MemberId=13

City of San Diego. 1919. Feature History Lower Otay Dam, Volumes 1–4. Report. San Diego, California: City of San Diego. On file at the City of San Diego Public Utilities Department Archives, Book Box 3.

City of San Diego. 1921. Morena Dam Spillway Enlargement, Raising of Dam and Outlet Tower. Drawings and Specifications. City of San Diego, California. On file with the City of San Diego Public Utilities Department.

City of San Diego. 1923. Feature History Barrett Dam, Volume 3. Report. San Diego, California: City of San Diego. On file at the City of San Diego Public Utilities Department Archives, Gray Box 3.

City of San Diego. 1928. Morena Reservoir Dam and Spillway and Safe Duty Enlargement. City of San Diego, California. On file at the City of San Diego Public Utilities Department.

City of San Diego. 1935. Feature History El Capitan Dam, Volumes 1–6. Report. San Diego, California: City of San Diego. On file at the City of San Diego Public Utilities Department Archives, Book Box 2.

City of San Diego. 2018. "City of San Diego Water History." Accessed June 2018. https://www.sandiego.gov/water/gen-info/overview/history.

Cooper. 1968. *Aqueduct Empire: A Guide to Water in California, its Turbulent History and its Management Today.* A. H. Clark Co., California.

Coronado Historical Association. 2020. "Coronado's Unique History." Coronado Historic Association and Coronado Museum. Accessed May 5, 2020. http://coronadohistory.org/historic-coronado/.

Crawford, Richard. 2010. "The San Diego Aqueduct." *San Diego Yesterday.* Published August 19, 2010. Accessed May 21, 2020. http://www.sandiegoyesterday.com/wp-content/uploads/2010/08/San-Diego-Aqueduct.pdf

Crawford, Richard. 2011. *The Way We Were in San Diego*. Charleston, South Carolina: History Press.

CSP (California State Parks). 2009. "Preservation Matters." The Newsletter of the California Office of Historic Preservation 2(3):3–21.

Department of Commerce (Department of Commerce, Bureau of the Census). 1930. *California: Number and Distribution of Inhabitants.* Population Bulletin First Series: 15th Census of the United States 1930. On file at the City of San Diego Public Utilities Department Archives, Box 20, folder 6.

Dolan, Chris C.V. 2004. San Vincente Dam, HAER CA-2267. EDAW, Inc. San Diego, CA. September 2004. https://www.loc.gov/item/ca3630/.

Dowd, M.J. 1956. "IID: The First 40 Years." Accessed March 29, 2019. https://www.iid.com/home/showdocument?id=6000

Dudek 2016. Cultural/Historical Resource Technical Report: Morena Reservoir Outlet Tower Replacement Project, Lake Morena Village, San Diego County, California Services R-308078 Task Order No. 30. Prepared for City of San Diego Public Works Department. May 2016.

Durfor, Charles, and Edith Becker. 1964. *Public Water Supplies of the 100 largest Cities in the United Sttes, 1962*. Geological Survey Water Supply Paper 1812. Washington DC: United States Department of the Interior, U.S. Geological Survey.

DWR (Division of Water Resources). 1949. "San Dieguito and San Diego Rivers Investigation." Bulletin No. 55. Sacramento, California State of California, Department of Public Works, Division of Water Resources. http://wdl.water.ca.gov/waterdatalibrary/docs/historic/ Bulletins/Bulletin_55/Bulletin_55__1949.pdf

Eastwood, John S. 1916. Letter to William G. Henshaw. June 2, 1916. John S. Eastwood Papers Collection, Water Resources Collections and Archives, University of California, Riverside.Elrick, Ted, and the Friends of the Los Angeles River. 2007. *Images of America: Los Angeles River.* Charleston, South Carolina: Arcadia Publishing. Erickson, A.J., J.S. Gulliver, R.M. Hozalski, O. Mohseni, J.L. Nieber, B.N. Wilson, and P.T. Weiss. 2010. "Flow in Conduits." Accessed June 12, 2020. http://stormwaterbook.safl.umn.edu/water-budget-measurement/flow-conduits.

Fages, P. 1937. *A Historical, Political, and Natural Description of California (1775)*. Translated by Herbert Ingram Priestly. Berkeley, California: University of California Press.

Farley, Bill. 2016. "The Cuyamaca Water Company Partnership: New Scenes from San Diego's Water History." *The Journal of San Diego History,* Spring 2016, 62(2). Accessed June 2018. http://www.sandiegohistory.org/journal/2016/april/cuyamaca-water-company-partnership-new-scenes-san-diegos-water-history/.

Fletcher, Ed. 1919. "Notice of Completion and Acceptance of Work." February 1919. On file at the City of San Diego Public Utilities Department Archives.

Fowler, L. 1953. "A History of the Dams and Water Supply of Western San Diego County." Thesis; University of California. On file at the City of San Diego Water Utilities Department Archives.

Fraser, Scott Alexander. 2007. "The Need for Water: The Federal Government and the Growth of San Diego, 1940-1955." *The Journal of San Diego History*. Volume 53, 2001, Nos. 1-2. Accessed June 11, 2020 https://sandiegohistory.org/journal/v53-1/pdf/2007-1_water.pdf

Gidney, Ray M. 1912. "The Wright Irrigation Act in California." Accessed June 2018. https://ia800202.us.archive.org/6/items/wrightirrigation00gidnrich/wrightirrigation00gidnrich.pdf.

Gressley, Gene M. 1968. "Arthur Powell Davis, Reclamation, and the West." Agricultural History Volume 24, No. 3 (July 1968). Pgs. 241-257. Accessed July 11, 2019. https://www.jstor.org/stable/3741701

Hennessey, Gregg. R. 1978. "The Politics of Water in San Diego 1895–1897." *The Journal of San Diego History,* Summer 1978, 24(3). Accessed June 2018. http://www.sandiegohistory.org/journal/1978/july/water/.

Hill, Joseph. 2002. "Dry Rivers, Dammed Rivers and Floods: An Early History of the Struggle Between Droughts and Floods in San Diego" *The Journal of San Diego History,* Winter, 2002, 48. Accessed June 2018. https://sandiegohistory.org/journal/2002/january/hill-2/.

Jackson, Donald C. 1979. "John S. Eastwood and the Mountain Dell Dam." *IA. The Journal of the Society for Industrial Archeology*. Vol. 5, No. 1 (1979), pp. 33-48. Accessed July 25, 2018. https://www.jstor.org/stable/40967975

Jackson. 1999. "Biographical Information." John S. Eastwood Papers. Water Resources Collections and Archives. Special Collections & University Archives, University of California, Riverside. Accessed August 6, 2018. http://pdf.oac.cdlib.org/pdf/ucr/wrca/eastwood.pdf

Jackson. 2005. *Building the Ultimate Dam: John S. Eastwood and the Control of Water in the West.* Norman, OK: University of Oklahoma Press.

Jackson. 2009. "Structural Art: John S. Eastwood and the Multiple Arch Dam." *Engineering History and Heritage*. 162. Issue EH3. August 2009. Pgs. 136-147. Accessed August 6, 2018. https://dspace.lafayette.edu/bitstream/handle/10385/880/jackson-proceedingsoftheice-vol162-no3-2009.pdf?sequence=1

Jorgensen, L. 1916. "Stress in Arch Dams." *Engineering News.* V. 75, No. 10. February 10, 1916. Accessed November 5, 2018.

Lakeside Historical Society. 2015. The Flume. Accessed July 2018. http://www.lakesidehistory.org/Flume/flume.

LAT (Los Angeles Times). 1896. "San Diego County: Election to Vote Water Bonds." Newspapers.com: *Los Angeles Times* (Los Angeles, California). May 9, 1896, 12.

LAT. 1909. "Celebration Abandoned." Newspapers.com: *Los Angeles Times* (Los Angeles, CA), May 27, 1909. Pg. 25.

LAT. 1922. "City to Employ Special Engineer." Los Angeles Times. May 30, 1922. On file at the San Diego Public Utilities Department Archive.

LAT. 1934. "Savage Rites Set for Today." *The Los Angeles Times*. Newspapers.com *Los Angeles Times* (Los Angeles, California). June 26, 1934, 4.

Leps, Thomas. 1988. "Rockfill Dam Design and Analysis" in Advanced Dam Engineering for Design, Construction and Rehabilitation. New York, New York: Springer Publishing.

Los Angeles Herald. 1910. "Southern California Mountain Water Company Expends Millions for Dams." Los Angeles Herald: Sunday Morning, August 14, 1910. 4.

Los Angeles Times. 1897. "Work Stopped on the Dam: San Diego Brevities." Los Angeles Times (1886–1922); October 10, 1897; ProQuest Historical Newspaper; Los Angeles Times. 33.

McGlashan, H.D., and F.C. Ebert. 1918. "Southern California Floods of 1916." *Water Supply Paper* 426. U.S. Department of the Interior. Accessed June 2018. http://pubs.usgs.gov/wsp/0426/report.pdf.

McGrew, Clarence Alan. 1922. "City of San Diego and San Diego County: The Birthplace of California," Volume II. Chicago, Illinois, and New York, New York: The American Historical Society. Accessed June 2018. https://ia800200.us.archive.org/8/items/cityofsandiegosa01mcgr/cityofsandiegosa01mcgr.pdf. Meighan, C.W. 1959. "California Cultures and the Concept of an Archaic Stage." *American Antiquity* 24:289–305.

Meixner, G. Donald. 1951. "Historical Development of Water Utilization." Draft. On file at the San Diego Public Utilities Department Archive.

Merrill, M.C., O.W. Israelsen, and Byron Alder. 1918. "A Day at the Utah Agricultural Experiment Station." Circulation No. 39. Logan, Utah: Utah Agricultural College. NETR (National Environmental Title Research). 2018. Address search for multiple dam sites, San Diego County. Accessed June 2018. https://www.historicaerials.com/viewer.

National Geographic. 2020. "Resource Library Encyclopedia Entry: Reservoir." Accessed June 12, 2020. https://www.nationalgeographic.org/encyclopedia/reservoir/.

(NPS) National Park Service. National Register Bulletin #15. *How to Apply the National Register Criteria for Evaluation.* Washington, D.C.: National Parks Service, 1995.

NPS. National Register Bulletin #16A. *How to Complete the National Register Registration Form.* Washington, D.C.: National Parks Service, 1997.

NPS. National Register Bulletin #16B. *How to Complete the National Register Multiple Property Documentation Form*. Washington, D.C.: National Parks Service, 1999.

NPS. National Register Bulletin #24. *Guidelines for Local Surveys: A Basis for Preservation Planning.* Washington, D.C.: National Parks Service, 1985.

New Hampshire Department of Environmental Services. 2011. "Basic Terms of Dam Characteristics." Accessed June 12, 2020. https://www.des.nh.gov/organization/commissioner/pip/factsheets/db/documents/db-1.pdf

OAC (Online Archive of California). 2005. "Finding Aid to the M.M. (Michael Maurice) O'Shaughnessy papers." Biographical Information. Accessed November 16, 2018. https://oac.cdlib.org/findaid/ark:/13030/hb5d5nb6sr/entire_text/.

O'Shaughnessy, M.M. 1913. "The Morena Rock-Fill Dam, California." *Engineering News* 69(24): 1220–1225. Accessed June 26, 2018.

Ormsby, Burke. 1966. “The Lady Who Lives by the Sea.” *The Journal of San Diego History* 12(1). Accessed June 2018. http://sandiegohistory.org/journal/1966/january/ladybysea/.

Patterson, Thomas W. 1970. “Hatfield the Rainmaker.” *Journal of San Diego History,* Winter 1970, 16(4). Accessed June 2018. http://www.sandiegohistory.org/journal/1970/january/hatfield/.

Pourade, Richard F. 1977. *The History of San Diego,* Volumes 1–7. San Diego History Center. Accessed June 2018. http://www.sandiegohistory.org/archives/books/risingtide/ch3/. Preston, W.L., 2002. “Portents of Plague from California’s Protohistoric Period.” *Ethnohistory* 49(1):69–121.

Practical Engineering. 2019. “Spillways.” May 28, 2019. Accessed June 12, 2020. https://practical.engineering/blog/2019/5/28/how-do-spillways-work.

Pyle, Fred D. 1935. “City of San Diego Municipal Water Supply, Reservoir Dams.” Draft. September 3, 1935. On file at the City of San Diego Public Utilities Department Archives, Box 38, folder 87.

Pyle, Fred. 1949. "Experience Statement." Fred D. Pyle Papers, Water Resources Collections and Archives, University of California, Riverside).

Reynolds, Richard A. 2008. Sweetwater Dam: Then and Now. Accessed August 24, 2018. http://history.sandiego.edu/gen/local/docs/doc238.pdf

Roderick, Kevin. 2001. *San Fernando Valley: America’s Suburb*. Los Angeles, California: Los Angeles Times Book.

Salamon, Jerzy W. 2012. “Design of Double-Curvature Arch Dams Planning.” Draft. Denver, Colorado: Department of the Interior, Bureau of Reclamation. Accessed June 2018. https://www.usbr.gov/tsc/techreferences/mands/mands-pdfs/Arch_Dam_EM_36_10-19-2012_Final%20Draft.pdf.

San Diego County Water Authority. 2016. “Water Authority Makes History at San Vicente Dam.” Accessed June 2018. https://www.sdcwa.org/water-authority-makes-history-san-vicente-dam. San Diego Evening Tribune. 1917. “Quick Action On Otay Dam is Assured.” Genealogybank.com: *The Evening Tribune* (San Diego, CA), June 5, 1917, pg. 2.

San Diego Evening Tribune. 1918. “Heavy Rains to be Followed By Frost.” Genealogybank.com: *The Evening Tribune* (San Diego, CA), March 13, pg. 11.

San Diego Evening Tribune. 1919. “Lake Hodges Dam Completed; Has Immense Storage Capacity.” Genealogybank.com: *The Evening Tribune* (San Diego, CA), February 5, 1919, pg. 4.

San Diego Evening Tribune. 1922a. “Hundreds Attend Dedication of Barrett Dam; Big Program.” *Evening News* July 25, 1922. On file at the City of San Diego Water Utilities Department Archives.

San Diego Evening Tribune. 1922b. “Elisha Spurr Babcock, Pioneer San Diegan, Stricken in Office.” Newspapers.com: Evening Tribune (San Diego, CA), September 9, 1922, pg. 16.San Diego Evening Tribune. 1923a. “Water Board is Removed Today By Mayor.” *The Evening Tribune*. January 3, 1923. On file at the San Diego Public Utilities Department Archives.

San Diego Evening Tribune. 1923b. "Discharge of Savage by City Manager Has Approval of Council." *San Diego Evening Tribune*. June 18, 1923. On file at the San Diego Public Utilities Department Archives.

San Diego Evening Tribune. 1925. "Construction of Dam at Sutherland Site Urged Before Council." *San Diego Evening Tribune*. December 4, 1925. On file at the City of San Diego Public Utilities Department Archive.

San Diego Evening Tribune. 1928. "Conference Requested on Diversion of Water Funds to Dam Project." *San Diego Evening Tribune*. March 16, 1928. On file at the City of San Diego Public Utilities Department Archive.

San Diego Evening Tribune. 1933. "Savage Opinion On Dam Fund Use Sought." *San Diego Evening Tribune*. April 6, 1933. On file at the City of San Diego Public Utilities Department Archive.

San Diego Evening Tribune. 1934. "Savage Still at Work in Interest of City When Heart Ends Task" The Evening Tribune. June 25, 1934. Accessed July 11, 2018 from geneologybank.com.

San Diego Herald. 1931. "Savage Spends $1,200,000 in Running Office Four Years; Doesn't Get One Drop of Water." *San Diego Herald*. August 27, 1931. On file at the San Diego Public Utilities Department Archives.

San Diego History Center. 2018. "Biography: John D. Spreckels (1853–1926)." Accessed June 2018. http://www.sandiegohistory.org/archives/biographysubject/spreckels/.

San Diego Progress. 1931. "Attempt to Oust Savage is Made When Engineer Defies Council Mandate." *San Diego Progress*. January 22, 1931.

San Diego Sun. 1922a. "Barrett Dam Funds Needed." *The San Diego Sun*. February 1, 1922. On file at the San Diego Public Utilities Department Archives.

San Diego Sun. 1922b. "Urges River Development." *The San Diego Sun*. May 11, 1922. On file at the San Diego Public Utilities Department Archives.

San Diego Sun. 1922c. "Fire Savage, is Stewart's Council Plan." *The San Diego Sun*. May 29, 1922. On file at the San Diego Public Utilities Department Archives.

San Diego Sun. 1922d. "Oppose City Engineer on Water Plans." *The San Diego Sun*. November 29, 1922. On file at the San Diego Public Utilities Department Archives.

San Diego Sun. 1923. "Leaks Found in Lower Otay Dam; City Water Engineer Savage Fired." *The San Diego Sun*. November 29, 1922. On file at the San Diego Public Utilities Department Archives.

San Diego Sun. 1931. "Mayor turns First Earth at Dam Site. *The San Diego Sun*. December 23, 1931. On file at the San Diego Public Utilities Department Archives.

San Diego Sun. 1932. "Council Backs H.N. Savage; Unanimous Move Made to Twart Goeddel's Program." *The San Diego Sun.* August 15, 1932. On file at the San Diego Public Utilities Department Archives.

San Diego Sun. 1933. “Savage to Quit Engineer’s Posit in Row over Capitan.” *The San Diego Sun.* May 15, 1933. On file at the San Diego Public Utilities Department Archives.

San Diego Union. 1889. “Here Comes the Flume.” *San Diego Union-Tribune* archive. February 22, 1889. 1. Accessed June 2018. http://www.sandiegouniontribune.com/news/150-years/sd-me-150-years-february-22-htmlstory.html.

San Diego Union. 1895. “Water, the Great Essential.” Genealogybank.com: *San Diego Union* (San Diego, CA), January 1, 1895, pg 2.

San Diego Union. 1900. “Work on Upper Otay.” Genealogybank.com: *San Diego Union* (San Diego, CA), November 29, 1900, pg. 3.

San Diego Union. 1902. “Construction Work on Gigantic Water System.” Genealogybank.com: *San Diego Union* (San Diego, CA), January 1, 1902. Pg. 14.

San Diego Union. 1908. “Mammoth Dulzura Conduit will be ready for Water January 1.” Genealogybank.com*: San Diego Union* (San Diego, CA), June 28, 1908, pg. 9-11.

San Diego Union. 1912. “Water for Two Million People.” Geneaologybank.com: *San Diego Union* (San Diego, California) January 1, 1912. Pg. 101.

San Diego Union. 1918a. “Council Visits Dam.” Genealogybank.com: *San Diego Union* (San Diego, CA), March 7, 1918. Pg. 3.

San Diego Union. 1918b. “Many Thousands of Acres to be Made Productive.” *San Diego Union.* January 1, 1918. On file at the San Diego Public Utilities Department Archives.

San Diego Union. 1918c. “H.N. Savage Holds Brilliant Record for Past Work.” San Diego Union. January 1, 1918. On file at the San Diego Public Utilities Department Archive.

San Diego Union. 1919. "Otay Dam is Dedicated as Link in San Diego’s Extended Water System." San Diego Union (San Diego, CA), September 2, 1919. On file at the City of San Diego Public Utilities Department Archives.

San Diego Union. 1922. “Pioneer Citizen of San Diego Called by Death.” Genealogybank.com: San Diego Union (San Diego, CA), September 9, 1922, pg. 5.

San Diego Union. 1928a. “City Hall Notes.” Genealogybank.com: *San Diego Union*. October 1, 1928.

San Diego Union. 1928b. “Council Names Otay Engineer.” Genealogybank.com: *San Diego Union*. October 9, 1928.

San Diego Union. 1930. “City Making Forward Strides to Provide for Future Growth.” San Diego Union. February 16, 1930. On file at the San Diego Public Utilities Department Archives.

San Diego Union. 1931a. “Engineer Savage Retains Position By 3 To 2 Vote of City Council.” San Diego Union. October 27, 1931. On file at the San Diego Public Utilities Department Archives.

San Diego Union. 1931b. "El Capitan Informally Accepted: Rockfill Type Given Preference." San Diego Union. December 6, 1931. On file at the San Diego Public Utilities Department Archives. San Diego Union. 1932. "Easing Him Out." San Diego Union. August 10, 1932. On file at the San Diego Public Utilities Department Archives.

San Diego Union. 1932b. "City Hall Notes" Genealogybank.com: *San Diego Union*. June 9, 1932.

San Diego Union. 1934a. "H.N. Savage, City Dam Builder, Dies on Duty In San Diego Service" Genealogybank.com: *San Diego Union* (San Diego, CA). June 25, 1934

San Diego Union. 1935a. "City Pays for Dam; Litigation Ends." *San Diego Union*, January 13, 1935. On file at the City of San Diego Public Utilities Department Archive.

San Diego Union. 1935b. "El Capitan Dedicated with Ceremony." Genealogybank.com: *San Diego Union* (San Diego, CA), February 22, 1935. Pg. 1.

San Diego Union. 1937. "Pipelines Hit By Flood; Loss to City $10,000." *San Diego Union*, February 12, 1937. On file at the City of San Diego Public Utilities Department Archive.

San Diego Union. 1938. "Pyle Named Emissary in Flood Control Parleys" Genealogybank.com: *San Diego Union.* August 3, 1038. Accessed July 23, 2018 from genealogybank.com.

San Diego Union 1939a. "Dam Foundation Test To Continue 2 Weeks" San Diego Union. September 30, 1938.

San Diego Union. 1939b. "San Diego River Flood Control Plan Approved" Genealogybank.com: *San Diego Union*. Dec 20, 1939.

San Diego Union. 1940a. "Pasqual Survey Asked for City Water Projects" Genealogybank.com: *San Diego Union*. February 4, 1940. Accessed July 23, 2018 from genealogybank.com

San Diego Union. 1940b. "Vicente Project Request Proposed." San Diego Union. March 10, 1940.

San Diego Union. 1943. "New San Vicente Reservoir Added to San Diego System." Geneaologybank.com: *San Diego Union* (San Diego, CA). March 17, 1943, pg. 1.

San Diego Union. 1945a. "Officials Inspect Route for New S.D. Aqueduct." Geneaologybank.com: San Diego Union (San Diego, CA). January 8, 1945, pg. 9.

San Diego Union. 1945b. "First Contract on Aqueduct let." Geneaologybank.com: San Diego Union (San Diego, CA). May 21, 1945, pg. 7

San Diego Union. 1946. "Voters to Wield Magic Key at Polls on Nov. 5." Geneaologybank.com: San Diego Union (San Diego, CA). October 27, 1945, pg. 19.

San Diego Union. 1947a. "Aqueduct Strike Tie Up Spreads." Geneaologybank.com: San Diego Union (San Diego, CA). January 30, 1947, pg. 1.

San Diego Union. 1947b. "Vast Aqueduct Insures New Growth for Cities of Southern California." Geneaologybank.com: San Diego Union (San Diego, CA). February 16, 1947, pg. 37.

San Diego Union. 1947c. "Colorado River Water Pouring into Reservoir." Geneaologybank.com: San Diego Union (San Diego, CA). November 27, 1947, pg. 1.

San Diego Union. 1947d. "How Colorado Funnels Precious Water into San Diego Reservoirs." Geneaologybank.com: San Diego Union (San Diego, CA). December 12, 1947, pg. 3

San Diego Union. 1950. "Fred D. Pyle Mourned." Genealogybank.com: *San Diego Union*. July 22, 1950.

San Diego Union. 1954. "Sutherland Dam, Lying Dormant for 24 Years, Finished, Dedicated." Genealogybank.com: *San Diego Union* (San Diego, CA), June 6, 1954. Pg. 44.

San Diego Union. 1960. "Miramar Dam Water Turned on at Rites." Genealogybank.com: *San Diego Union* (San Diego, CA), September 16, 1960. Pg. 21.

San Francisco Chronicle. 1896a. "Water for San Diego; Voters of the Southern Town to Ballot Upon the Proposed Purchase of a Complete System." Thursday, March 17, 1896, pg 4.

San Francisco Chronicle. 1896b. "San Diego Gains a Water System." Sunday, June 28, 1896, pg 6.

San Francisco Chronicle. 1896c. "San Diego Ballots Counted; City Fathers Announce a Majority for the Bond Issue-Work on the Water System." Tuesday, June 30, 1896, pg 4.

Savage, Hiram N. 1929. "Barret Dam Projected Heightening, Material for Construction, Sand Investigation." Letter to J.Y. Jewett. On file at the San Diego Public Utilities Department Archives, Box 13, Folder 26.

Scientific American. 1923. "A Rush Job In Dam Construction." *Scientific American*. April 1923. On file at the San Diego Public Utilities Department Archive.

Schaefer, Jerry, and Collin O'Neill. 2001. "The All-American Canal: An Historic Properties Inventory and Evaluation." Prepared for the Imperial Irrigation District. Encinitas, California: ASM Affiliates.

Schuyler, James Dix. 1909. *Reservoirs for Irrigation, Water Power, and Domestic Water Supply*. New York: New York. Accessed July 17, 2015. https://archive.org/download/reservoirsforirr00schu_0/reservoirsforirr00schu_0.pdf

SDCWA (San Diego County Water Authority). 2020. "History." Accessed June 11, 2020 https://www.sdcwa.org/history

SDCWA (San Diego County Water Authority). 2018. "San Vicente Dam Raise." Fact Sheet, February 2018. https://www.sdcwa.org/san-vicente-dam-raise

Sholders, Mike. 2002. "Water Supply Development in San Diego and a Review of Related Outstanding Projects." *The Journal of San Diego History*, Winter 2002, 48(1). Accessed June 2018. http://sandiegohistory.org/journal/2002/january/sholders/.

Smithsonian Institute. 2020. "Julian Hinds Collection." Finding Aid. Held at the National Museum of American history, Archives Center. Accessed May 21, 2020. https://sova.si.edu/record/NMAH.AC.0287

Smythe, William Ellsworth. 1908. "History of San Diego (1542–1908)." In *An Account of the Rise and Progress of the Pioneer Settlement on the Pacific Coast of the United States,* Volume II, *The Modern City*. San Diego, California: The History Company. Accessed June 2018. https://ia902300.us.archive.org/26/items/historyofsandieg02smyt/historyofsandieg02smyt.pdf.

SNAC (Social Networks and Archival Context) Cooperative. 2018. "O'Shaughnessy, M.M. (Michael Maurice), 1864–1934". Biographical Notes. Accessed June 2018. http://snaccooperative.org/ark:/99166/w69k4n70.

SNAC Cooperative. 2019. "Arthur Powell Davis, 1861-1933." Accessed July 11, 2019. https://snaccooperative.org/view/74546757https://snaccooperative.org/view/74546757

Strathman, Theodore. 2004. "Lan Water and real Estate: Ed Fletcher and the Cuyamaca Water Company 1910–1926." *Journal of San Diego History* 50(3). Accessed June 25, 2018. http://www.sandiegohistory.org/journal/v50-3/cuyamaca.pdf.

SWRB (State Water Resources Board). 1951. "Water Resources of California." Bulletin No 1. Accessed June 2018. https://ia800608.us.archive.org/31/items/waterresourcesof01cali/waterresourcesof01cali.pdf.

TCEQ (Texas Commission on Environmental Quality). 2018. "Guidelines for Operation and Maintenance of Dams in Texas." Accessed June 2018. https://www.tceq.texas.gov/publications/gi/gi_357.

The Constructor. 2018. "Classification (Types) of Dams." Accessed June 2018. https://theconstructor.org/water-resources/classification-types-of-dams/4439/.

Tuthill, Barbara. 1954. "Hatfield the Rainmaker." *Western Folklore* 13(2): 107–112. Berkeley, California: University of California Press. On file at the City of San Diego Public Utilities Department Archives, Box 31, folder 30.

UCSB (University of California, Santa Barbra). 2018. Historic Aerial Photographs of various dams and reservoirs in San Diego County, CA dating from 1947, 1953, 1963, 1974, 1975, 1976, 1977, 1980, 1989, 1990, and 1996. Map & Imagery Laboratory (MIL) UCSB Library. http://mil.library.ucsb.edu/ap_indexes/FrameFinder.

USBR. 2020. "San Diego Project: History." Accessed May 20, 2020. https://www.usbr.gov/projects/index.php?id=389

Water Department City of San Diego California (WDCSD). 1957. Feature History: Sutherland Dam, Volume 1. On file at the San Diego Public Utilities Department Archive. December 1957.

Water Power Chronicle. 1913. Volume II. Index of Principal Articles, July to December 1913. The Water Power Chronicle Company Inc. Wayne County Savings Bank Building. Detroit, Michigan. Google Books. Accessed August 7, 2015.

WCN (Western Construction News). 1932. "El Capitan Water-Supply Dam for San Diego." *Western Construction News*. March 25, 1932, 158–163. On file at the City of San Diego Public Utilities Department Archive.Whitney, Charles Allen. 1969. "John Eastwood: Unsung Genius of the Drawing Board." *Montana: The Magazine of Western History*. Vol. 19, No. 3 (Summer, 1969), pp. 38-49 Accessed August 6, 2018. https://www.jstor.org/stable/4517382

WNW (Water News Network). 2019. "Water Authority Celebrates 75 Years of Service to San Diego County." Published June 27, 2019, Accessed June 20, 2020. https://www.waternewsnetwork.com/water-authority-celebrates-75-years-service-san-diego-county/

WRCA (Water Resources Collections and Archives). 1999. "Inventory of the Fred D. Pyle Papers, 1926-1947." Finding aid. Water Resources Collections and Archives, University of California, Riverside. http://pdf.oac.cdlib.org/pdf/ucr/wrca/pylefrdd.pdf

WRCA. 2005. "Biographical Summary: Hiram Newton Savage, M. Am. Soc. C. E." Hiram N. Savage papers collection, Water Resources Collections and Archives, University of California, Riverside. Accessed July 12, 2018. http://pdf.oac.cdlib.org/pdf/ucr/wrca/savagehn.pdf

Wueste, R.C. 1933. "Leaks at Morena Barrett and Lower Otay Leaks." Letter to Hydraulic Engineer. On file at the City of San Diego Public Utilities Department Archive.

Zhang, Limin, Ming Peng, Dongsheng Chang, and Yao Xu. 2016. "Dams and Their Components: Dam Failure Mechanisms and Risk Assessment." June 3, 2016. Accessed June 12, 2020. https://onlinelibrary.wiley.com/doi/abs/10.1002/9781118558522.ch1.

Appendix A

DPR 523 Forms

City of San Diego Source Water System
Morena Reservoir Complex
Lower Otay Reservoir Complex
Upper Otay Reservoir Complex
Dulzura Conduit
Murray Reservoir Complex
Lake Hodges Reservoir Complex
Barrett Reservoir Complex
El Capitan Reservoir Complex
San Vicente Reservoir Complex
Sutherland Reservoir Complex
Miramar Reservoir Complex

***NRHP Status Code** 3D; 3CD; 5B

***Resource Name or # (Assigned by recorder)**

D1. Historic Name: City of San Diego Source Water System

D2. Common Name:

***D3. Detailed Description** (Discuss overall coherence of the district, its setting, visual characteristics, and minor features. List all elements of district.):

The City of San Diego Source Water System includes all City-owned reservoirs and associated infrastructure, comprising ten (10) dams and one (1) conduit throughout the San Diego region. This infrastructure includes: Morena, Lower Otay, Upper Otay, Murray, Lake Hodges, Barrett, El Capitan, San Vicente, Sutherland, and Miramar Reservoir Complexes, and the Dulzura Conduit.

***D4. Boundary Description** (Describe limits of district and attach map showing boundary and district elements.):

The City of San Diego Source Water System is located throughout several watersheds which drain from the Peninsular and South Coast mountain ranges westward into the Pacific Ocean. Watersheds which drain into the reservoirs include the San Diego River, Cottonwood Creek, Pine Valley Creek, San Dieguito Creek, Santa Ysabel Creek, San Vicente Creek, Sweetwater River, Otay River, and Jamul Creek. While the dams and reservoirs store runoff water from local watersheds, they also impound water from the Colorado River by way of the Colorado River Aqueduct and the California Aqueduct (see Figure 1).

***D5. Boundary Justification:**

Extent of the City of San Diego's Source Water System development throughout the San Diego region (see Figure 1).

D6. Significance: Theme City of San Diego Source Water System Development

Area San Diego **Period of Significance** 1887-1947

Applicable Criteria NRHP/CRHR A/1, C3; City A, B, C, D, E, F

(Discuss district's importance in terms of its historical context as defined by theme, period of significance, and geographic scope. Also address the integrity of the district as a whole.)

Statement of Significance

The City of San Diego's Source Water System includes ten (10) impounding reservoir complexes owned/operated by the City that function as part of the City's municipal water-supply system. These resources and their related infrastructure (e.g., dams, outlet towers, conduits, flumes, and pipelines [Figure 2]) are significant for their role in the City's source water system, starting with the earliest efforts to establish privatized water in the 1880s followed by construction of the earliest reservoirs, Lake Cuyamaca (1887) and Sweetwater Reservoir (1888). The period of significance ends with construction of the San Diego Aqueduct, and the importation of Colorado River Water for the first time into the San Vicente Reservoir (1947) which forever changed the composition of City's source water supply.

Taken as a whole, the City's system of reservoirs, dams, conduits, pipelines and other related infrastructure, is significant under NRHP/CRHR Criterion A/1 and City of San Diego Criteria A and B for its ability to convey important associations with the City's municipal water supply and the development of its critical water infrastructure prior to the importation of water from the Colorado River and State Water Project. While other major pieces of water infrastructure were constructed after 1947, including Sutherland Reservoir (1954) and Miramar Reservoir (1960), these resources were constructed outside the identified period of significance for the City's source water system (1887-1947) and were designed to support ongoing population growth and expansion in the San Diego region

***NRHP Status Code** 3D; 3CD; 5B

***Resource Name or # (Assigned by recorder)**

D1. Historic Name: City of San Diego Source Water System

D2. Common Name:

following World War II, a trend seen throughout the United States.

The system is also eligible under NRHP/CRHR Criterion C/3 and City of San Diego Criteria C and D for embodying the distinctive characteristics of a variety of dam engineering types and methods seen throughout the late 19th and early 20th centuries, and for representing an important facet of the body of work of master water engineers O'Shaughnessy, Savage, Eastwood, Pyle, and Hinds.

Although the City of San Diego Source Water System is associated with countless important individuals, none of these associations can be connected to the larger system in a meaningful way. Therefore, the system is not eligible under NRHP/CRHR Criterion B/2 or City of San Diego Criteria B for associations with important persons. At this time, there is no indication that the system has the potential to yield additional information. Therefore, it is not eligible under NRHP/CRHR Criterion D/4

The infrastructure evaluated as part of the current study includes all 10 dams owned/operated by the City as well as the Dulzura Conduit, which connects Barrett Reservoir with Dulzura Creek. These constitute most of the major pieces of infrastructure within the City's source water system. Of the 11 resources evaluated for historical significance, nine (9) were found to be eligible as a contributing resource to the larger City of San Diego Source Water System; two (2) were found to be non-contributing resources as they were constructed outside the period of significance for the system. Of the 9 resources identified as contributors to the larger system, eight (8) were found to also be individually eligible for designation. Table 1 identifies the resources evaluated for historical significance as part of the current study and includes the resource name, its associated dam type (if applicable), engineer, built date, evaluation findings and applicable California Historical Resource Status Code (CHRSC), and associated periods of significance under NRHP/CRHR Criteria and the City's comparable criteria. Detailed DPR forms for all evaluated infrastructure follows.

***NRHP Status Code** 3D; 3CD; 5B

***Resource Name or # (Assigned by recorder)**

D1. Historic Name: City of San Diego Source Water System

D2. Common Name:

Table 1. Findings of Significance for all Evaluated Components of the City of San Diego Source Water System

Resource Name	Dam Type	Engineer	Built Date	Evaluation Findings	Period(s) of Significance
Morena Reservoir Complex	Rock-filled Embankment	Babcock/Harris (original) O'Shaughnessy (current)	1895 (original) 1912 (current)	NRHP/CRHR: A/1, C/3 City: A, B, C, D, E, F CHRSC: 3B; 3CB, 5B (previously concurred individually eligible by SHPO)	A: 1887-1916 C: 1912
Lower Otay Reservoir Complex	Curved Gravity	Russell (original); Savage (current)	1895 (original) 1919 (current)	NRHP/CRHR: A/1, C/3 City: A, B, C, D, F CHRSC: 3B; 3CB, 5B	A: 1887-1928 C: 1895; 1919
Upper Otay Reservoir Complex	Arch	Babcock	1902	NRHP/CRHR: A/1, B/2, C/3 City: A, B, C, D, F CHRSC: 3B; 3CB, 5B	A: 1887-1916 B: 1896-1922 C: 1902
Dulzura Conduit	n/a	O'Shaughnessy	1909	NRHP/CRHR: A/1 City: A, B, F CHRSC: 3D; 3CD, 5D3	A: 1887-1916
Murray Reservoir Complex	Multiple Arch	Eastwood and Pyle	1918	NRHP/CRHR: A/1, C/3 City: A, B, C, D, F CHRSC: 3B; 3CB, 5B	A: 1916-1928 C: 1918
Lake Hodges Reservoir Complex	Multiple Arch	Eastwood	1919	NRHP/CRHR: A/1, C/3 City: A, B, C, D, F CHRSC: 3B; 3CB, 5B	A: 1916-1928 C: 1919
Barrett Reservoir Complex	Curved Gravity	Savage	1922	NRHP/CRHR: A/1, C/3 City: A, B, C, D, F CHRSC: 3B; 3CB, 5B	A: 1916-1928 C: 1922
El Capitan Reservoir Complex	Hydraulic Rock-filled Embankment	Savage	1935	NRHP/CRHR: A/1, C/3 City: A, B, C, D, F CHRSC: 3B; 3CB, 5B	A: 1928-1947 C: 1935
San Vicente Reservoir Complex	Straight Axis Gravity	Hinds and Pyle	1943	NRHP/CRHR: A/1 City: A, B, F CHRSC: 3B; 3CB, 5B	A: 1928-1947
Sutherland Reservoir Complex	Multiple Arch	Davis	1954	Not eligible CHRSC: 6Z	n/a
Miramar Reservoir Complex	Earth-filled Embankment	City Engineers	1960	Not eligible CHRSC: 6Z	n/a

3B Appears eligible for NRHP both individually and as a contributor to a NRHP eligible multicomponent resource like a district through survey evaluation.

3D Appears eligible for NRHP as a contributor to a NRHP eligible multi-component resource through survey evaluation.

3CB Appears eligible for CRHR both individually and as a contributor to a CRHR eligible multicomponent resource through survey evaluation.

3CD Appears eligible for CRHR as a contributor to a CRHR eligible multi-component resource through survey evaluation.

5B Locally significant both individually (listed, eligible, or appears eligible) and as contributor to a multi-component resource like a district that is locally listed, designated, determined eligible, or appears eligible through survey evaluation

5D3 Appears to be a contributor to a multi-component resource that appears eligible for local listing or designation.

6Z Found ineligible for NRHP, CRHR or local designation through survey evaluation.

Page 4 of 4 ***NRHP Status Code** 3D; 3CD; 5B

***Resource Name or # (Assigned by recorder)**

D1. Historic Name: City of San Diego Source Water System

D2. Common Name:

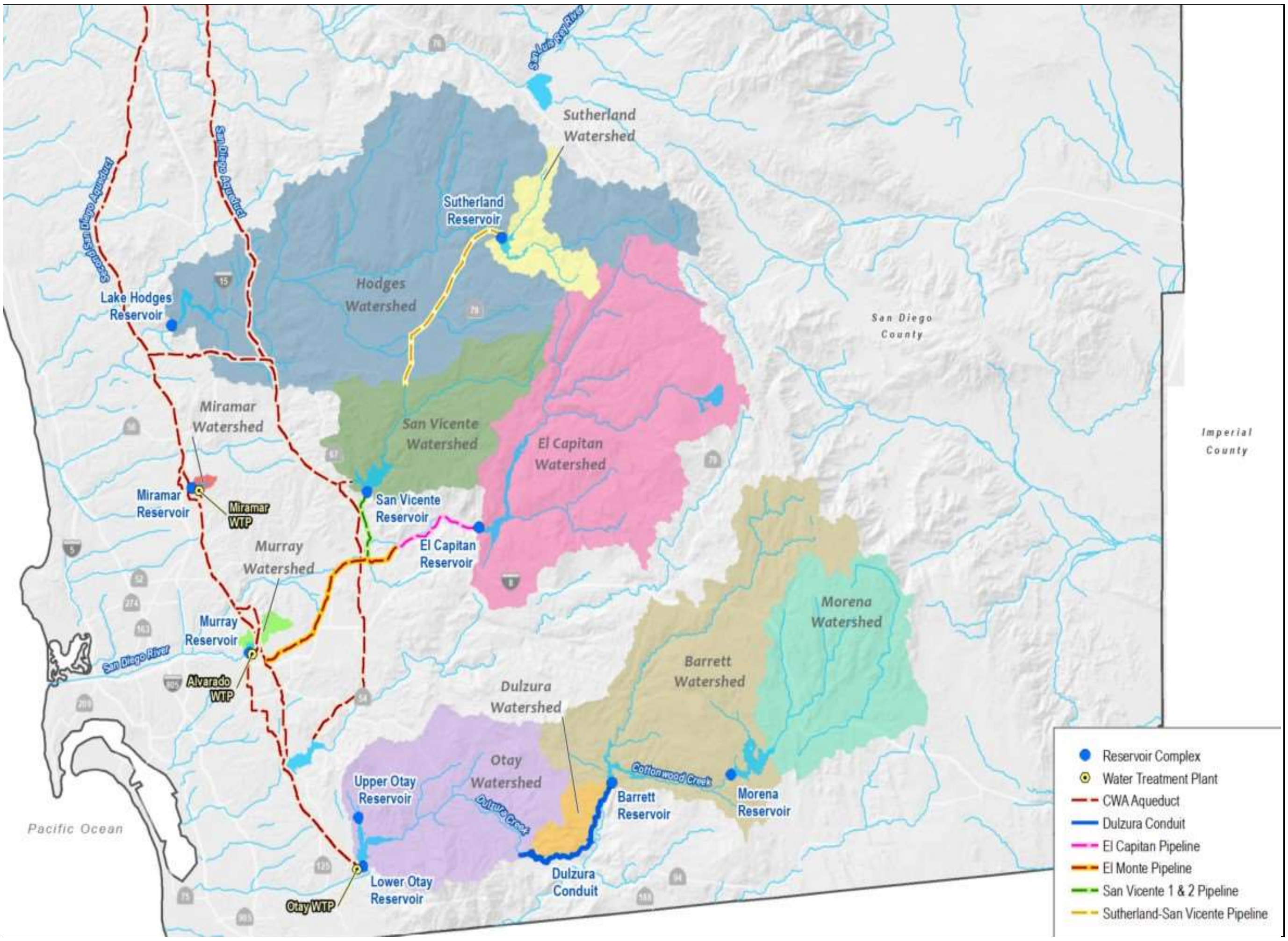


Figure 1. City of San Diego Source Water System Overview Map

***D7. References** (Give full citations including the names and addresses of any informants, where possible.):

***D8. Evaluator:** Sam Murray, MA Dudek **Date:** June 2020

Affiliation and Address:
Dudek, 605 Third Street, Encinitas, CA 92024

State of California ♁ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3B; 3CB, 5B

Other Listings
Review Code Reviewer Date

Page 1 **of** 19 ***Resource Name or #:** (Assigned by recorder) Morena Reservoir Complex
P1. Other Identifier:

***P2. Location:** ☐ **Not for Publication** ■ **Unrestricted**
***a. County** San Diego County **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad** Morena Reservoir **Date** 1960 P.R. 1982 **T** 4 E; NW ¼ ;**R** NE ¼ **Sec** 23; S.B. **B.M.**
c. Address City Zip
d. UTM: (Give more than one for large and/or linear resources) Zone 11S , 542431.45 mE/ 542431.45 mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
Elevation: 3001-3053 feet above mean sea level. APN: 6030800600. The subject property is located in the Morena Reservoir in unincorporated San Diego County in the Morena Village community of Campo, just north of Morena Butte and Houser Canyon.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

The Morena Reservoir Complex consists of the Morena Dam, spillway, and outlet tower located in a canyon 80 feet wide, with side slopes in the solid granite rising at a 45-degree angle. **(See Continuation Sheet).**

***P3b. Resource Attributes:** (List attributes and codes) HP21-dam; HP22-reservoir; HP11-engineering structure

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)

***P4. Resources Present:** ☐ Building ■ Structure ☐ Object ☐ Site ☐ District ■ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #) Overview of Morena Dam, Outlet Tower and spillway; view to west; 6/29/15; IMG 4919

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
1912 (San Diego Public Utilities Department)

***P7. Owner and Address:**
Public Utilities Dept.
City of San Diego
9192 Topaz Way
San Diego, CA 92123

***P8. Recorded by:** (Name, affiliation, and address)
Sam Murray, Dudek
605 Third Street
Encinitas, CA 92024

***P9. Date Recorded:** 6/29/2015

***P10. Survey Type:** (Describe) Pedestrian

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") Dudek 2020. City of San Diego Source Water System Historic Context Statement.

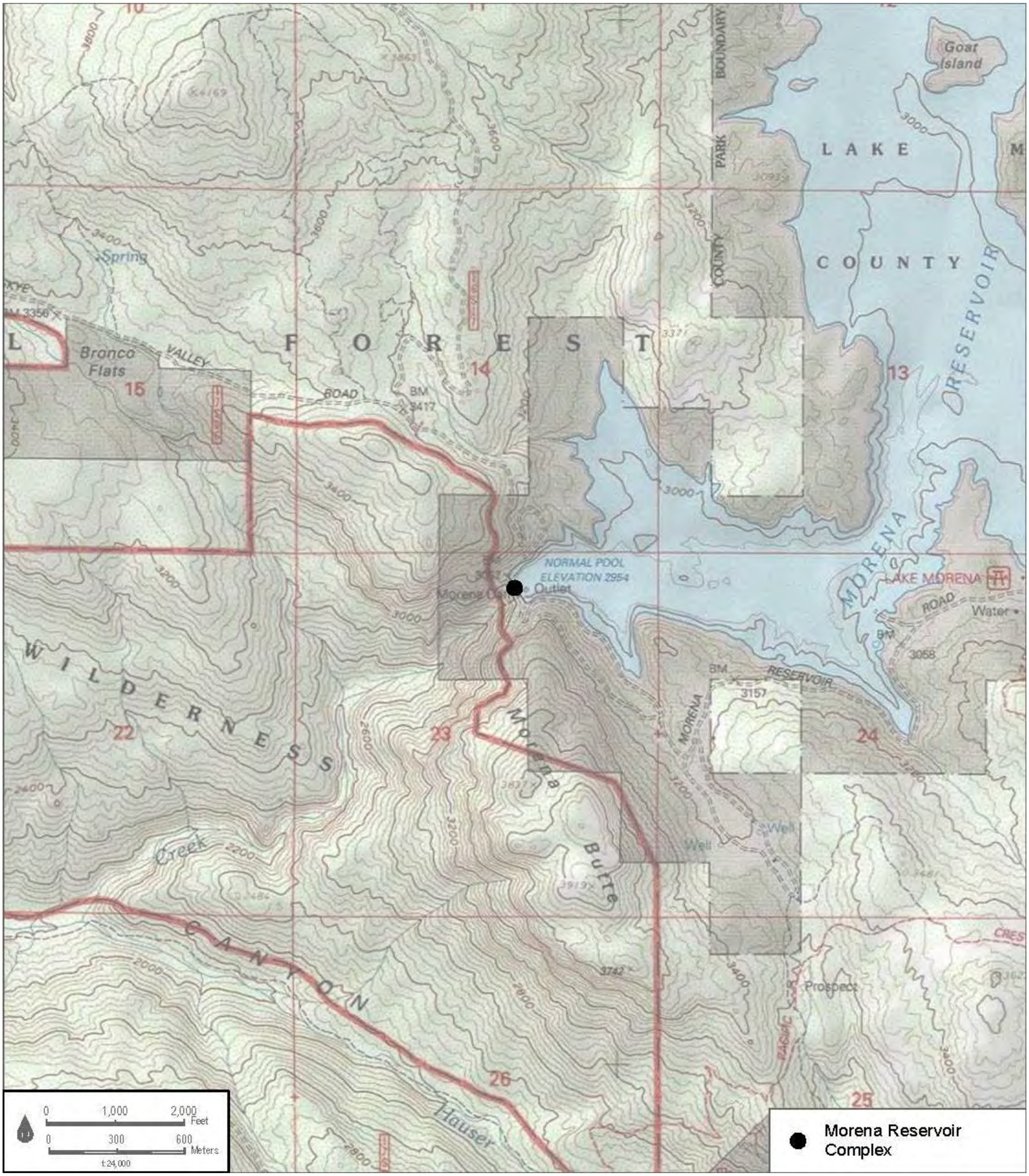
***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California ♁ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 19 ***Resource Name or #** (Assigned by recorder) Morena Reservoir Complex

***Map Name:** Morena Reservoir, 7.5' USGS Quadrangle ***Scale:** 1:24,000 ***Date of map:** 1996



DPR 523J (Rev. 1/1995)(Word 9/2013) *Required information

State of California ♺ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

Primary#
HRI #
Trinomial

CONTINUATION SHEET

Property Name: Morena Reservoir Complex

B1. Historic Name: Morena Dam and Reservoir
B2. Common Name:
B3. Original Use: Municipal water source B4. Present Use: Municipal water source
***B5. Architectural Style:** Rock-filled Embankment Dam
***B6. Construction History:** (Construction date, alterations, and date of alterations)

Construction of the Morena Dam occurred in two phases (1896-1898 and 1909-1912) with construction of both the dam and outlet tower reaching completion in 1912. Documented alterations to the dam face include raising the crest 5 feet in 1917, raising the crest an additional 10 feet in 1923 by placing a 15-foot-thick layer of loose rock on the downstream face from the berm to the crest, and raising the dam another 4 feet in 1930 by adding a 6-foot thickness to the downstream face from the berm to the crest and raising the parapet wall vertically. Documented alterations to the dam spillway include removing the original gate structures and trash racks in 1917; raising the spillway crest and increasing its length in 1923; installing 22 automatic gates and lengthening the channel to 312 feet in 1930; and enlarging the spillway, raising the crest an additional 2 feet, and removing the gate structures in 1946. Documented alterations to the exterior of the outlet tower include removal of the original steel pedestrian footbridge that accessed the outlet tower from the south side of the reservoir (exact date unknown, but post-1948), and addition of the cupola, including an exterior staircase with pipe railings (1930).

***B7. Moved?** ☒No ☐Yes ☐Unknown **Date:** **Original Location:**
***B8. Related Features:**
B9a. Architect: Michael Maurice O'Shaughnessy (engineer) b. Builder:
***B10. Significance: Theme** Early Water System Development **Area** San Diego
Period of Significance A/1: 1887-1916; C/3: 1912 **Property Type** Dam **Applicable Criteria** NRHP/CRHR A/1 and C3; City A, B, C, D, F (Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Historic Context Statement

(See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)

***B12. References: (See Continuation Sheet)**

B13. Remarks:

***B14. Evaluator:** Kate Kaiser, MSHP

***Date of Evaluation:** June 30, 2020

(This space reserved for official comments.)

(Sketch Map with north arrow required.)

P3a Site Description (continued):

The dam is a rock-filled embankment dam with a concrete masonry water face (Figure 1). The crest measures 550 feet wide with a 20-foot-thickness at the coping. The dam sits 171 feet above the streambed (to the top of the parapet wall). The existing parapet wall is approximately 4 feet high (above the crest) and contains a series of evenly spaced wide concrete block columns that span the top of the wall (Figure 2). The parapet wall (constructed in 1930) is reinforced with metal spacer bars and wall anchors.

Figure 1. Overview of Morena Dam face (view to north)

Figure 2. Overview of Morena Dam parapet wall (view to north)

The upstream face of the dam is composed of 6- to 10-ton blocks of rubble granite set in concrete mortar, and is constructed on a slope of 9 horizontal to 10 vertical. Reinforced concrete slabs (approximately 1.5 feet thick) are attached to the solid masonry with iron rods and make up the upper water face of the dam. The rock fill portion of the dam (the lower 120 feet) consists of hand-placed derrick and crevices chinked with small stones. A concrete cut-off wall extends 112.5 feet below the streambed, making the total height of the dam (including the portion below the streambed) 283.5 feet. Documented alterations to the dam face include raising the crest 5 feet in 1917, raising the crest an additional 10 feet in 1923 by placing a 15-foot-thick layer of loose rock on the downstream face from the berm to the crest, and raising the dam another 4 feet in 1930 by adding a 6-foot thickness to the downstream face from the berm to the crest and raising the parapet wall vertically .

The dam's concrete spillway (Figure 3) is an ungated ogee crest type located on the north side of the dam. The spillway has a capacity of 25,000 cubic feet per second at the dam crest. The crest of the concrete spillway is 155 feet above the streambed, extends 312 feet upstream from the north section of the dam, and discharges through a channel. The length of the spillway channel is 317 feet. Documented alterations to the spillway include removing the original gate structures and trash racks in 1917; raising the spillway crest and increasing its length in 1923; installing 22 automatic gates and lengthening the channel to 312 feet in 1930; and enlarging the spillway, raising the crest an additional 2 feet, and removing the gate structures in 1946.

Figure 3. Overview of Morena Dam spillway crest (view to northeast)

The cylindrical Morena Outlet Tower measures 15.5 feet in external diameter with walls varying in thickness from 20 to 36 inches and a maximum height of 172 feet (Figure 4). The top of the concrete tower features a reinforced concrete operating deck that regulates the outer gates, and a steel-reinforced cupola with an exterior staircase with pipe railing at the very top. The gates were manufactured by the Coffin Valve Company and were of sluice type with vertical stems controlled by guides. Each gate contains a screen cover to keep trash and other debris from entering into the 24-inch-diameter circular cast-iron pipes. The pipes run through the walls of the tower and connect with a 30-inch-diameter vertical down-pipe that discharges into the tunnel. The tunnel, measuring 387 feet long, 8 feet wide, and 7.5 feet high, was built through the solid bedrock on the south side of the dam at a 30-foot contour. It is lined with concrete and connects to the base of the outlet tower. The tunnel draws water from the reservoir by means of the reinforced concrete outlet tower structure (O'Shaughnessy 1913). Documented alterations to the exterior of the outlet tower include removal of the original steel pedestrian footbridge that accessed the outlet tower from the south side of the reservoir (exact date unknown, but post-1948), and addition of the cupola, including an exterior staircase with pipe railings (1930). It is also known that various internal alterations have occurred, likely associated with routine maintenance of the tower and its equipment (specifics unknown).

Figure 4. Overview of Morena Outlet Tower; note the concrete footings from the pedestrian footbridge (no longer extant) in the lower right corner (view to northeast)

***B10. Significance (Continued):**

After struggling with the question of water for many months, the City of San Diego reached a unanimous decision on March 16, 1896, to adopt a resolution that would approve the SCMWC's proposition to construct the Morena Dam and its associated system. The agreement included construction of the dam, a conduit to the City, and a distribution system for a cost of $1.5 million. However, the measure had to meet the approval of San Diego voters (San Francisco Call 1896a). Three months later, more than two-thirds of voters approved building the new water system, which would bring in 1,000 inches (13 million gallons) of water from the mountains daily. SCMWC president E.S. Babcock and partners John D. Spreckels and Adolph B. Spreckels (the Spreckels Brothers) received celebratory cheers from a "howling mob" when the election results were announced on June

27, 1896. At the Hotel del Coronado, which Babcock and J.D. Spreckels helped build, employees carried Babcock on their shoulders while fireworks, bonfires, and brass bands on the plaza led a large crowd to the beach to join in the celebration. After a 4-year battle with the San Diego Flume Company (the owner of the City's water system at the time), including numerous allegations of corruption, the City finally found itself free from a monopoly and gained sole ownership of a new water system. "The citizens generally regard this as the turning point in San Diego's career and are simply beside themselves" (San Francisco Call 1896b).

Phase I Dam Construction (1896–1898)

Preparation for the Morena Dam project began on June 29, 1896. Babcock consulted with his engineers at the Hotel del Coronado and issued orders for two corps of engineers to head into the field that week. Bids were called to freight the tons of cement, lumber, machinery, and other materials required for construction to the dam site, and the SCMWC asked for use of 400 horses and 100 wagons. With high expectations that voters would approve the bonds for the new water system, Babcock had already ordered a complete Ledgerwood cable and trolley system to haul large quantities of rock (San Francisco Call 1896c). Roads had to be cut through the Laguna Mountains to reach the Morena Dam site. Construction was also underway on both the Lower Otay and Barrett Dams, two other projects overseen by Babcock (San Francisco Call 1896d). The system's total drainage area consisted of 375 square miles, including 119 miles for Lower Otay, 121 miles for Barrett, and 135 miles for Morena. The Lower Otay Reservoir would impound 13,766,328,500 gallons, Barrett 15,630,000,000 gallons, and Morena Dam 15,227,000,000 gallons. All three dams were to be constructed by a rock-fill pattern. This was found to be preferable to solid masonry structures in consideration of earthquakes. Rockfill dams were more likely to settle than collapse in response to an earthquake.

Water for the Morena Reservoir would be supplied by Cottonwood Creek, fed by the Metaguaguat Creek, Laguna Creek, and other creeks. Cottonwood Creek flowed past the dam site as an ice-cold stream supplied by snow melt from the high-range Laguna Mountains. The water quality was said to be "as pure as can be obtained from nature" (San Francisco Call 1896e).

The Morena Dam site was located in a narrow gorge between two 3,000-foot-high granite precipices. Camps of men worked to clear ground and build roads amidst a mass of huge granite boulders. Babcock and then Chief Engineer Lew B. Harris explored the narrow 60-foot-deep cave at the dam site, which was surrounded by immovable, exposed bedrock boulders. This natural formation of solid bedrock at the site of where the dam was to be constructed was seen as a great advantage to the engineer. The plan was to use dynamite to blow up the mass of boulders, allow the broken pieces of bedrock to settle into the dam site, and fill in the spaces between the rocks with concrete (San Francisco Call 1896e). On December 26, 1896, 100,000 pounds of black and giant powder were used all at once to successfully blast 150,000 tons of rock into the gorge below the heel of the dam (San Francisco Call 1896f). More blasts were completed in March and August 1897 to complete the job of displacing the enormous granite boulders.

A masonry wall extending 30 feet above the stream bed was the only portion of the dam constructed during the first phase, which began in 1896. Upon suspension of the project, out of a total of 306,000 cubic yards required to complete the dam to the prescribed plan, only approximately 120,000 cubic yards of rock fill had been placed (Engineering News 1913). Original handwritten project notes on file with the City of San Diego Public Utilities Department indicate that the dam's masonry toe wall was constructed in just 18 days using amateur builders and without the services of an engineer.

A report written by City Engineer Edwin M. Capps (December 3, 1896) following an inspection of the toe wall in November reported the following: "The upper thirty-five (35) feet of this wall is, in my opinion, very defective. This portion of the wall was constructed without the supervision of a civil engineer or a competent person, and was determined to be defective" (Capps 1896). The report goes on to state that the toe wall was found to have a number of serious leaks and numerous seams consisting of decomposed granite with patches of earth and rotting vegetation. Patches of gunny sack had been found rammed into the seams either to prevent water from coming through or to conceal the bad seams. Capps also reported that when the wall was tested with 1 to 30 feet of water pressure, it resulted in gushing leaks (the final wall would need to be able to withstand 150 to 185 feet of pressure). Capps concluded his report stating, "I attribute this faulty work, not to a desire of Mr. Babcock to do poor work or to curtail in cement, but solely to a zealous desire to complete the work before the winter rains, and from an over confidence in his own ability and that of his foreman" (Capps 1896).

A newspaper article published just 1 month later titled "Capps is Satisfied" quoted Capps as saying "when I left Morena, yesterday morning, the condition of the dam and the work being done there was entirely satisfactory, so far as I am concerned. If the work continues according to specifications, I have nothing further to say" (San Diego Union 1897).

A second inspection conducted in 1897 revealed that Capps did indeed have more to say. Specifically, that he was not at all satisfied with the work being conducted on the Morena Dam. In a follow-up report (dated September 30, 1897), Capps stated that nothing had been done to address the leaks in the toe wall, although Babcock had corrected some of the more serious defects in the seams at great expense. Excavations along the end of the masonry toe wall revealed that it was not resting on solid bedrock in some portions. The report goes on to discuss numerous deviations from the original plan specifications. It also stated that the SCMWC should provide a complete set of plans and specifications that reflect all of the proposed changes and deviations from the original plans. Capps also cited a major safety issue relating to the placing of loose stones that back the wall and are meant to be completely rigid to prevent the wall from moving. Capps expressed concern that if not placed properly, these stones could create instability in the entire dam and result in a wash-out or other disaster. Capps concluded his report by advising the City Council not to accept any portion of the work until after the dam is complete and passes a test under a full reservoir head of water (Capps 1897).

On October 9, 1897, the City Council voted unanimously to stop all work on the Morena Dam after reviewing Capps report (Los Angeles Times 1897). Original project notes on file with the City of San Diego Public Utilities Department indicate that because of Babcock's deviation from the plans and specifications agreed upon in the contract, and a lack of written agreement to remedy the issues, construction of Morena Dam was officially ordered to be stopped in 1898.

Phase II Dam Construction (1909–1916)

Construction of the Morena Dam resumed in May 1909, under the supervision of civil engineer Michael Maurice O'Shaughnessy. O'Shaughnessy was noted to be "one of the foremost engineers in the west" had been hired as chief engineer on the Morena Dam by the SCMWC (Los Angeles Herald 1910). J.S. Maloney served as the resident engineer and superintendent, assisted by R. Wueste and R.P. McIntosh (Fowler 1953; O'Shaughnessy 1913). Approximately 95 men were employed during the second phase of construction, and the work was noted to be "peculiarly" free from accidents due to the much-improved level of supervision on site (O'Shaughnessy 1913:111). The first phase of dam construction had several accidents, some of which resulted in serious injury and even death.

The second phase of construction involved the use of two Ledgerwood (sometimes called Lidgerwood) cableways, which were operated from towers hovering 300 feet above the streambed. The lower slope of the dam was serviced by a 1,350-foot-long fixed cable, and the water slope of the dam was serviced by a second cable measuring 1,100 feet long and mounted to moveable trucks. Each cable was capable of handling loads of up to 12 tons. The track trolley cable could be moved into a new position in a couple hours, allowing for a solution for moving stone from the quarries directly to the dam site where it was re-handled by derricks for completion of face-masonry and back-filling.

Under O'Shaughnessy's direction, design of the Morena Dam took a new direction. On August 30, 1909, another powder blast was exploded electrically to displace approximately 180,000 tons of granite rock to make way for the new dam work. O'Shaughnessy decided to change the dam's upper slope, from the top of the completed toe wall up to the 120-foot contour, to nine horizontal to 10 vertical, and make it, from the 120-foot contour to the top of the dam (150 feet) 1.2 horizontal to 1 vertical. Additionally, the character of the work done during the initial phase was altered by placing large masonry blocks of roughly dressed granite, from 5 to 10 tons selected from the rock piles, on the upstream face of the dam. These rocks were set in a mortar composed of cement and sand. To provide consistent support for the roughly 7-foot masonry skin, smaller stones were placed by hand and derrick for approximately 50 feet back from the face. Numerous men were employed to complete this work on the face of the dam, instructed to remove the sharp edges of the flat stones and chink in the cavities with broken rock.

The top of the dam was 16 feet wide and was capped with a 3-foot thick concrete coping to provide for wave wash. To provide for future extensions in raising the dam, the back slope was changed to 1.5 horizontal to 1 vertical with a berm of 21 feet at the 100-foot contour. This berm was created by altering the face slopes, which was originally designed to have a flatter water slope. Furthermore, a large part of the old fill located behind the toe wall was torn out, and all objectionable materials placed during the initial construction period were removed and replaced with clean, well-placed rock fill. A small slot measuring 1 foot wide by 5 feet deep was left in the original toe wall to support new reinforced concrete facing. The new dam materials provided a water-tight skin for the face of the dam, which kept the rock-fill clear of any soil or silt that could cause leaks (O'Shaughnessy 1913).

The Morena Dam spillway was cut out of the north side of the granite canyon wall and constructed with a 60-foot-wide channel measuring 5 feet deep with a 120-foot-wide entrance. Excavation for the Morena Dam was planned so that materials from the spillway excavation could be incorporated into the dam structure. The entrance to the spillway was controlled by 12 radial gates measuring 8.5 feet wide by 6 feet high. These gates were later removed from the spillway following the 1916 floods.

The Morena Outlet Tower was completed during the second construction phase in 1912 over the upstream portal of the outlet tunnel (Fowler 1953). The tower measures 15.5 feet in external diameter with walls varying in thickness from 20 to 36 inches and a height of 155.5 feet. The top of the concrete tower features a reinforced concrete operating deck that regulates the outer gates. Including the concrete rim at the top, the tower measured 160.5 feet when first built. A steel cupola was added at a later date. The gates were manufactured by the Coffin Valve Company and were of sluice type with vertical stems controlled by guides. The base of the tower connects to a tunnel that was built through the solid bedrock on the south side of the dam at a 30-foot contour (O'Shaughnessy 1913).

A historical reference concerning the design and construction of dams (Wegmann 1908) reveals that in typical dam construction, the outlet from the reservoir is controlled by sluice gates, valves, or stop-planks placed in a gate house, valve tower, or, in the case of Morena Dam, a circular outlet tower. Dams with a masonry toe-wall, like Morena, typically construct the outlet tower at the up-stream face of the wall. If the dam is constructed of earthen rocks, the outlet tower is placed near the toe of the inner slope and access to it is obtained by means of a foot bridge. For reservoirs with considerable water depth, the outlet tower is constructed of masonry. In cases such as the Morena Outlet Tower, the inlet openings consist of pipes embedded in the masonry and controlled by stop-cocks, sluice gates, flap valves, or poppet valves operated from the top of the tower.

Historic photographs of the outlet tower indicate that it also had a pedestrian footbridge leading from the southern side of the canyon to a ladder on the south side of the tower. This bridge is known to have been in place from 1912 to at least 1948. It is not known when the bridge was removed. The concrete footings of the bridge are still in place on the southern side of the canyon. There was also a boat dock located in the reservoir near the face of the dam just north of the outlet tower. No additional information was uncovered concerning the boat dock.

Subsequent Alterations (1916–1946)

To meet the changing needs of water capacity, the Morena Dam and its associated infrastructure have been subject to various alterations over the years. Following the scare of the 1916 floods, the crest of the Morena Dam was raised 5 feet in 1917, and the gate structures and trash racks were removed from the spillway (Fowler 1953).

In 1923, the Morena Dam received additional alterations under supervision of the City's Hydraulic Engineer H.N. Savage. The dam was raised an additional 10 feet (to a maximum height of 166 feet) in 1923 by placing a 15-foot-thick layer of loose rock on the downstream face from the berm to the crest. The spillway crest was also raised and its length increased (Fowler 1953).

In 1930, the dam, spillway, and safe duty were upsized, with H.N. Savage once again functioning as the engineer in charge. The dam was raised an additional 4 feet by adding a 6-foot thickness to the downstream face from the berm to the crest and raising the parapet wall vertically (City of San Diego 2013; Fowler 1953). Also, 22 automatic gates were installed on the side channel spillway, lengthening the spillway to 312.5 feet (City of San Diego 1928; Fowler 1953). The outlet tower cupola was also added at this time. Originally, the maximum height of the tower was 160.5 feet. A steel cupola was added that included an exterior staircase and pipe railings at the very top, increasing the tower's total height to 172 feet.

In 1946, the spillway was enlarged under supervision of hydraulic engineer Fred D. Pyle. This included raising the spillway crest an additional 2 feet to 3,039.4 feet above sea level (City of San Diego 2013). Also in 1946, the gate structures were removed to allow the free passage of flood flows (Fowler 1953).

Recreation at Morena Reservoir (1970–Present)

In 1970, through a desire to increase the recreational opportunities for San Diego residents, the County and City of San Diego entered into an agreement in which the County of San Diego purchased the Lake Morena Reservoir site from the City. The City owned

Morena Reservoir, composed of 3,250 acres of land and extensive water rights in the basin, draining into Morena Reservoir as impounding water to supply the City's need. As part of the contract, the County of San Diego agreed to construct, operate, and maintain a fishing area, park, and recreation area at Morena Reservoir (City of San Diego 1970, 1976). The City's goal was to transfer recording issues such as weather, water level, and flow; fire prevention; security; and maintenance of the roads to the dam to the County of San Diego (City of San Diego 1970). A newspaper article (source and date unknown) on file with the City's Public Utilities Department suggests that the 1970 agreement did not include the dam site.

Engineer: Michael Maurice O'Shaughnessy (1864-1934)

M.M. O'Shaughnessy was born in Limerick, Ireland, the son of Patrick and Margaret (O'Donnell) O'Shaughnessy. One of nine children, he was educated in the public schools in Ireland, and attended Queen's College, Cork, and then in Galway. On October 21, 1885, he graduated with a Bachelor of Engineering degree from the Royal University of Dublin. On March 8, 1885, O'Shaughnessy left for America and ten days later reached New York City. He then proceeded on to San Francisco, arriving on March 30, 1885. He began his career working as an Assistant Engineer, first for the Sierra Valley and Mohawk Railroad (1885-1886) and later for Southern Pacific Railroad (1886-1888), at various locations throughout California. In 1890, he married Mary Spottiswood in San Francisco and later they had five children together: Helen, Elizabeth, Francis, Margaret, and Mary (Boden 1934; OAC 2005).

He began private consulting as a civil engineer in August 1888 and undertook the surveying and engineering of land developments in California, laying out a number of small towns throughout the state, including Niles, Tracy, and Stanger. From 1890 to 1898, he was in general engineering practice in California, with an office in San Francisco. He served as Chief Engineer of the 1893 California Midwinter International Exposition held in Golden Gate Park. At the Exposition's close he was selected to become Chief Engineer for the Mountain Copper Company, where he built 12 miles of narrow-gauge railroad in Shasta, California, in 1895 and completed projects for several corporations, including the Spring Valley Water Company (Boden 1934; OAC 2005).

From 1899 to 1906, O'Shaughnessy was employed to design and construct four large irrigation and hydraulic projects on about 20 sugar plantations in the Hawaiian Islands, including Olokele, Koolau, Keanaiemaui, and Kohola. Shortly after the 1906 earthquake and fire in San Francisco, O'Shaughnessy returned to California. From 1907 to 1912, he served as both Chief Engineer and Consulting Engineer for John D. and Adolph Spreckels' SCMWC in San Diego, and completed the Dulzura Conduit and Morena Dam (Boden 1934; OAC 2005).

In 1912, O'Shaughnessy was appointed City Engineer of San Francisco by Mayor James Rolph and was placed in full charge of the Hetch Hetchy project, handling the financial responsibilities as well as the engineering details. He held the position of City Engineer for 20 years, until January 8, 1932, when a new City Charter was adopted that separated the ordinary work of the City Engineer from that of its public utilities, including the municipal water supply. On February 8, 1932, the newly formed Public Utilities Commission appointed O'Shaughnessy Consulting Engineer for Hetch Hetchy Water Supply, a position that he held until his death in 1934, just 16 days before the opening of the Hetch Hetchy Reservoir in Yosemite. In July 1923, the dam at Hetch Hetchy Valley was dedicated in his honor, and officially given the name O'Shaughnessy Dam. (Boden 1934; OAC 2005).
O'Shaughnessy's career as an engineer spanned 49 years, from 1885 until his death in 1934. A small sample of his work is included below (Boden 1934; OAC 2005):

- California Midwinter International Exposition Chief Engineer, San Francisco County (1890-1894)
- Olokele Aqueduct, Kauai (1902-1903)
- Koolau Aqueduct, Maui (1903-1904)
- Kohola Aqueduct, Hawaii (1905-1906).
- Dulzura Conduit, San Diego County (1907-1909)
- Morena Dam, San Diego County (1909-1912)
- Mile Rock Sewer Tunnel, San Francisco County (1914-1915)
- O'Shaughnessy Dam, Tuolumne County (1919-1923)
- Municipal Railway System, San Francisco County (1915-1927)
- Twin Peaks Tunnel, San Francisco County (1918)
- Ocean Beach Esplanade, San Francisco County (1928)

NRHP/CRHR Statement of Significance

NRHP Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.

CRHR Criterion 1: Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

The Morena Reservoir Complex's construction began in 1895 with the original failed dam which haulted construction in 1898. Work on the Morena Dam did not resume until 1909 with the hiring of M.M. O'Shaughnessy to re-design and construct the new dam. The construction of the Morena Reservoir Complex occurred during a significant period in San Diego source water development history: the Early Water System Development period (1887-1916). While still plagued with supply and quality issues, the formation of the San Diego Water Company in 1873 was a turning point for the City that set the stage for the development of reliable water sources in San Diego. Population increases also fueled the need for additional reliable water sources and by the 1880s, private water companies were forming to help meet this need. One of the great engineering achievements during the 1880s was the construction of the Sweetwater Dam by the San Diego Land and Town Company. Simultaneously, the Cuyamaca Dam was constructed on Boulder Creek in the Cuyamaca Mountains in 1887. It is this first completed major piece of water infrastructure that marks the start of the Early Water System Development period. One of the most notable companies to emerge during this time was the Southern California Mountain Water Company (SCMWC) in 1894. Through the formation of private water companies, multiple water infrastructure projects were undertaken during the late nineteenth and early twentieth century. Such projects included Morena Dam (1895), the original Lower Otay Dam (1897), Upper Otay Dam (1902), and the Dulzura Conduit (1909). Despite the early successes of some of these projects, a catastrophic flood of 1916 devastated the San Diego region and destroyed the original Lower Otay Dam. Because the flood of 1916 essentially wiped out much of the City's early water infrastructure, it serves as the end date for this period of early water development in San Diego.

The Morena Reservoir Complex is directly associated with events that have made a significant contribution to the history of source water development in San Diego. The complex is significant under Criterion A/1, for its association with San Diego's water infrastructure, which was essential to the stability of the region. When construction began in the 1890s, the Morena Dam was heralded as the solution to the City's persistent water problems, as it would have the largest capacity of any local dam. Although its construction did not succeed in alleviating the City's entire water shortfall, its completion in 1912 was a critical milestone in advancing the City's infrastructure. The

Morena Dam was part of the Otay-Cottonwood watershed, which would ultimately become the primary supplier of water to San Diego. In summary, the subject property is directly associated with important events related to water development in the San Diego region, namely with the City gaining source water independence and being a critical component to the water infrastructure that supported the City’s growth and development. Therefore, the Morena Reservoir Complex appears eligible under NRHP/CRHR Criteria A/1 as both a contrinuting element of the City of San Diego Source Water System and as an individual property.

NRHP Criterion B: Associated with the lives of significant persons in our past.

CRHR Criterion 2: Associated with the lives of persons important in our past.

The subject property does have connections to noted individuals, including E.S. Babcock, the Spreckels brothers, and Charles Hatfield. Despite these associations, the subject property is not connected with any of these individuals in a way that demonstrates their contributions were demonstrably important within a local, State, or national historic context. Therefore, the subject property does not appear eligible under NRHP/CRHR Criteria B/2.

NRHP Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

CRHR Criterion 3: Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

The Morena Reservoir Complex has the second oldest dam in San Diego County (after Sweetwater, 1888) and is the oldest dam owned and operated by the City of San Diego. At the time of its construction, the Morena Dam was said to be the largest rockfill dam in the world (SNAC 2015). It is important as a rare example of early rockfill-type construction. The Morena Dam embodies the distinctive characteristics of a rockfill dam, a type of construction that originated in California in the 1850s during the Gold Rush when miners would use drill and blast techniques to create an abundant supply of rock material for construction. Early rockfill dams (the first major milestone in rockfill dam construction) were small and composed of loosely dumped rockfill with an upstream timber face to slow water seepage. In the early 1900s, rockfill dams reached a new milestone, with heights exceeding 100 feet. Upstream-facing materials improved with the use of steel and concrete, creating relatively low permeability (Breitenbach 2004).

The Morena Dam also stands apart from other dams in the San Diego region (i.e., Sweetwater, Savage, Barrett), which are of concrete gravity-arch type. The original Lower Otay Dam was also a rockfill-type dam, but this dam was destroyed in the 1916 floods and replaced with a gravity-arch type. Cursory research reveals no other examples of rockfill dams in California from the same time period, although there were later examples of rockfill dams in Los Angeles County, including the Cogswell Dam (c. 1935) and Eaton Wash Dam (c. 1937). Therefore, examples of rockfill dams from the second milestone of rockfill dam construction techniques (1910s to the 1940s) are becoming increasingly rare in Southern California, and early examples like Morena Dam are non-existent.

All of the rockfill along the upper half of the dam face was positioned by derrick and hand placement techniques. The crevices of the rockfill were detailed by hand, hammering with a small stone to ensure that sharp edges were removed and to prevent serious settlement. The work required a small army of men to provide intricate handwork and stability to the dam face.

Subsequent improvements to the dam, including increases to the dam crest and spillways, have not altered the character-defining elements of this rockfill construction, which demonstrate the careful workmanship that went into its initial construction. Rather, these improvements correlate with important milestones in the advancement of water infrastructure that were occurring throughout the San Diego region, California, and the United States, and thus, contribute to the dam's significance by reflecting important safety-related building practices occurring in the San Diego region. Important improvements include:

1) Raising the crest of the dam an additional five feet in 1917 in direct response to the 1916 floods. These massive floods tore through the San Diego region, leaving scars on the mountains and hillsides, and destroying important water infrastructure throughout San Diego County, including complete destruction of the Lower Otay Dam. A massive water infrastructure building/improvement campaign took place throughout San Diego in its wake.
2) Raising the crest of the dam an additional four feet in 1930 in direct response to the 1928 St. Francis Dam disaster, which triggered new safety legislation for dams throughout California. In San Diego, the dam disaster led to significant public concerns about the safety of the largest dams in the region, including Barrett, Lower and Upper Otay.

3) Enlarging the dam spillway in 1946 to accommodate the increase in water supply from the Colorado Rivers. San Diego County Water Authority charts demonstrated that, "without Colorado River water, all City of San Diego reservoirs would have been bone dry in September 1949 (Cooper 1968:106)."

The Morena Dam and Outlet Tower also represent the work of master engineer M.M. O'Shaughnessy. O'Shaughnessy had an impressive resume of large-scale engineering structures and municipal projects during the early 20th century, including the Merced River Dam, Throttle Dam, the Twin Peaks Reservoir and Tunnel, the Stockton Street Tunnel, the Municipal Railway System, San Francisco's streetcar system, the Hetch Hetchy Reservoir and Power Project, the Lake Eleanor Dam, and the O'Shaughnessy Dam. O'Shaughnessy was hired for the Morena project in 1909 during the second phase of construction of the dam and its associated outlet tower. After what had turned out to be a disastrous first phase of construction, which included construction of a faulty toe wall and numerous deviations from the original plan specifications, O'Shaughnessy breathed new life into the project. He brought with him a high level of engineering expertise (which had been severely lacking from the project), redesigned the dam to new specifications (which included scrapping much of the original faulty construction), and provided a more professional and safe working environment with appropriate oversight. In 1913, as a regular contributor to the publications of the Society of Civil Engineers, O'Shaughnessy won the James Laurie Prize for his 1911 article, "Construction of the Morena Rockfill Dam" (SNAC 2015). This was also the first James Laurie Prize ever awarded. While O'Shaughnessy developed a long list of impressive engineering structures throughout his career, the Morena Dam represents a particularly noteworthy example of his work for the fact that the dam represents a unique construction technique. Further, at the time of its construction, Morena Dam was said to be the largest rockfill dam in the world (SNAC 2015). This fact alone makes the Morena Dam one of the most important structures ever designed by O'Shaughnessy.

In summary, the Morena Dam is the oldest dam owned by the City, and represents an engineering achievement that embodies the distinctive characteristics of a rockfill dam (an increasingly rare dam type in California from this time period), embodying improvements that correlate to important building periods in state and local water infrastructure development, and represents a notable work of master engineer M.M. O'Shaughnessy. Therefore, the subject property appears eligible under NRHP/CRHR Criteria C/3 as both a contributing element of the City of San Diego Source Water System, and as an individual property.

NRHP Criterion D: Have yielded, or may be likely to yield, information important in history or prehistory.

CRHR Criterion 4: Has yielded, or may be likely to yield, information important in prehistory or history.

Archaeological survey was not conducted for this project. At this time there is no indication that the Morena Reservoir Complex has the potential to yield information important to state or local history. Therefore, the property appears not eligible under NRHP/CRHR Criterion D/4.

City of San Diego Significance Evaluation

Criterion A: Exemplifies or reflects special elements of the City's, a community's, or a neighborhood's historical, archaeological, cultural, social, economic, political, aesthetic, engineering, landscaping, or architectural development.

The Morena Reservoir Complex reflects special elements of San Diego's historical development. Construction of the dam made a significant contribution to the history of water development in the San Diego region and was a milestone in the City's quest to achieve source water independence.

The Morena Reservoir Complex also reflect special elements of San Diego's engineering development. The Morena Dam embodies the distinctive characteristics of a rockfill dam, a type of construction that originated in California in the 1850s during the Gold Rush era when miners would use drill and blast techniques to create an abundant supply of rock material for construction. Early rockfill dams (the first major milestone in rockfill dam construction) were small and composed of loosely dumped rockfill with an upstream timber face to slow water seepage. In the early 1900s, rockfill dams reached a new milestone, with heights exceeding 100 feet. Upstream-facing materials improved with the use of steel and concrete, creating relatively low permeability (Breitenbach 2004). The Morena Dam falls into this second milestone of rockfill dam construction techniques, which is evident in California between the 1910s and 1940s.

The Morena Dam is the second oldest dam in San Diego County (after Sweetwater, 1888) and is the oldest dam owned and operated by the City of San Diego. It aslo stands apart from other dams in the San Diego region (i.e., Sweetwater, Savage, Barrett), which are of concrete gravity-arch type. The original Lower Otay Dam was also a rockfill type dam, but this dam was destroyed in the 1916 floods and replaced with a gravity-arch type. Cursory research reveals no other examples of rockfill dams in California from the same time period. Although there are slightly later examples of rockfill dams in Los Angeles County, including the Cogswell Dam (c. 1935) and Eaton Wash Dam (c. 1937), early examples like Morena Dam are non-existent. Examples of rockfill dams from the second milestone of rockfill dam construction techniques (1910s to the 1940s) are becoming increasingly rare in Southern California, and the Morena Dam represents a special element of the City's water infrastructure and engineering development. Therefore, the subject property appears eligible under City Criterion A.

Criterion B: Is identified with persons or events significant in local, state, or national history.

Persons: Although the subject property does have connections to noted individuals, including E.S. Babcock, the Spreckels brothers, and Charles Hatfield who hold importance within the history of San Diego, the subject property is not connected with any of these individuals in a way that directly represents their contributions within the local historic context.

Events: As described in the evaluation of NRHP/CRHR A/1 (see full discussion above), the Morena Reservoir Complex is associated with events significant in local, state, and national history. Construction of the Morena water project was a major undertaking in a remote part of San Diego that required significant planning and coordination. It was a major undertaking in a remote part of San Diego which required significant planning and coordination and was an important event at the time construction began. The Morena Dam was part of the Otay-Cottonwood watershed, which would ultimately become the primary supplier of water to San Diego. The subject property is directly associated with important events related to water development in the San Diego region, namely with the City gaining source water independence and being a critical component to the water infrastructure that supported the City's growth and development until the end of World War II. Therefore, the subject property appears eligible under City Criterion B.

Criterion C: Embodies distinctive characteristics of a style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship.

As described under NRHP/CRHR Criteria C/3 (see full discussion above), the Morena Dam is the second oldest dam in San Diego County (after Sweetwater, 1888) and is the oldest dam owned and operated by the City of San Diego. At the time of its construction, the Morena Dam was considered the tallest rockfill dam in the United States. It is important as a rare example of early rockfill-type construction. Further, its initial construction from 1886 until 1912 was an important milestone in the development of municipal dams in California and is recognized for its considerable size, construction techniques and workmanship that were all significant for this period. In addition, subsequent improvements to the dam (post-1912 through 1946), including increases to the dam crest and spillways, have not altered the character-defining elements of this rockfill construction, which demonstrate the careful workmanship that went into its initial construction. Rather, these improvements correlate with important milestones in the advancement of water infrastructure that were occurring throughout the San Diego region, California, and the United States, and thus, contribute to the dam's significance by reflecting important safety-related building practices occurring in the San Diego region. The rockfill dam, its associated concrete crest/parapet improvements, associated outlet tower, spillways and sluice gates are all contributing elements, which reflect the importance of the function and significance of the dam. Therefore, the subject property appears eligible under City Criterion C.

Criterion D: Is representative of the notable work or a master builder, designer, architect, engineer, landscape architect, interior designer, artist, or craftsman.

As described under NRHP/CRHR Criteria C/3 (see full discussion above), the Morena Reservoir Complex represents a notable work of master engineer M.M. O'Shaughnessy. O'Shaughnessy was hired for the Morena project in 1909 during the second phase of construction of the dam and its associated outlet tower. While O'Shaughnessy developed a long list of impressive engineering structures throughout his career, the Morena Dam represents a particularly noteworthy example of his work for the fact that the dam represents a unique construction technique. Further, at the time of its construction, Morena Dam was said to be the largest rockfill dam in the world (SNAC 2015). This fact alone makes the Morena Dam one of the most important structures ever designed by O'Shaughnessy. Therefore, the subject property appears eligible under City Criterion D.

Criterion E: Is listed or has been determined eligible by the National Park Service for listing on the National Register of Historic Places or is listed or has been determined eligible by the State Historical Preservation Office for listing on the State Register of Historical Resources.

In 2016, Dudek evaluated the Morena Dam and Outlet Tower for the City of San Diego in support of the Morena Reservoir Outlet Tower Replacement Project. The Morena Dam and Outlet Tower was found individually eligible under NRHP Criteria A and C, CRHR Criteria 1 and 3, and City of San Diego Criteria A, B, C, and D. This finding received concurrence from SHPO on March 15, 2019 (Consultation Ref: EPA_2019_0215_001). This evaluation updates the original findings reached on Morena in consideration of the larger context of the City of San Diego Source Water System.

Criterion F: Is a finite group of resources related to one another in a clearly distinguishable way or is a geographically definable area or neighborhood containing improvements which have a special character, historical interest, or aesthetic value, or which represent one or more architectural periods or styles in the history and development of the City.

As described under NRHP/CRHR Criteria A/1 and C/3 (see full discussion above),the Morena Reservoir Complex is significant for it role, function, and design within the larger City of San Diego Source Water System, of which it is a contributing resource to. The City of San Diego Source Water System includes ten (10) impounding reservoir complexes owned/operated by the City that function as part of the City's municipal water-supply system. These resources and their related infrastructure (e.g., dams, outlet towers, conduits, flumes, and pipelines) constitute a finite group of resources related to one another in a clear way, steeped in historical interest and representative of significant engineering achievements. Taken as a whole, these resources (including the Morena Reservoir Complex) are significant for their role in the City's source water system, starting with the earliest efforts to establish privatized water in the 1880s soon followed by construction of the earliest reservoirs, Lake Cuyamaca (1887) and Sweetwater Reservoir (1888). The period of significance ends with construction of the San Diego Aqueduct, and the importation of Colorado River Water for the first time into the San Vicente Reservoir (1947), which forever changed the composition of City's source water supply. Therefore, the Morena Reservoir Complex appears eligible under City Criterion F.

B12. References (Continued):

Breitenback, A.J. 2004. "Part 2 – History of Rockfill Dam Construction." Geoengineer Newsletter, Berkeley, California. March 2005.

Capps, Edwin M. 1896. "Engineer Capps' Report." San Diego, California. On file with the City of San Diego Public Utilities Department.

Capps, Edwin M. 1897. "Engineer Capps' Report." San Diego, California. On file with the City of San Diego Public Utilities Department.

CONTINUATION SHEET

Property Name: Morena Reservoir Complex

City of San Diego. 1928. Morena Reservoir Dam and Spillway and Safe Duty Enlargement. City of San Diego, California. On file with the City of San Diego Public Utilities Department.

City of San Diego. 1970. "Morena Reservoir-Original Agreement". On file with the City of San Diego Public Utilities Department.

City of San Diego. 1976. "Continued Operation of Lake Morena Regional Park by the County of San Diego." Public Facilities and Recreation, City of San Diego, California. On file with the City of San Diego Public Utilities Department.

City of San Diego. 2013. Public Utilities Department. "Morena Reservoir". Accessed June 29, 2015. http://s3.documentcloud.org/documents/1006251/morena-reservoir-7-13.pdf.

Engineering News. 1913. A Journal of Civil, Mechanical, Mining, and Electrical Engineering. Vol 69.January–June 1913. Hill Publishing Company, New York. Google books. Accessed July 17, 2015.

Fowler, L. 1953. "A History of the Dams and Water Supply of Western San Diego County." Thesis. University of California. On file with the City of San Diego Water Utilities Department.

Los Angeles Herald. 1910. "Southern California Mountain Water Company Expends Millions for Dams." Los Angeles Herald: Sunday Morning, August 14, 1910. Pg.4.

Los Angeles Times. 1897. "Work Stopped on the Dam: San Diego Brevities." Los Angeles Times (1886–1922); Oct 10, 1897; ProQuest Historical Newspaper; Los Angeles Times. Pg. 33.

San Diego Union. 1897. "Caps is Satisfied: He Now Says Morena Dam is All Right." January 3, 1897. From: Scrap Book "B" page 143. On file with the San Diego Public Utilities Department.

San Francisco Call. 1896a. "Water for San Diego; Voters of the Southern Town to Ballot Upon the Proposed Purchase of a Complete System." Thursday, March 17, 1896. Pg 4.

San Francisco Call. 1896b. "San Diego Gains a Water System." Sunday, June 28, 1896. Pg 6.

State of California ♨ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3B; 3CB, 5B

Other Listings
Review Code ____ Reviewer ____ Date ____

Page 1 **of** 32 ***Resource Name or #:** (Assigned by recorder) Lower Otay Reservoir Complex
P1. Other Identifier: Savage Dam

***P2. Location:** ☐ **Not for Publication** ■ **Unrestricted**
***a. County** San Diego **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad** Otay Mesa **Date** 1996 **T** 18S; **R** 1E; ___ ☐ **of** ___ ☐ **of Sec** 18; San Bernardino **B.M.**
c. Address 2292 Wueste Road City Chula Vista Zip 91915
d. UTM: (Give more than one for large and/or linear resources) Zone 11S, 506855 mE/ 3608053mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
Lat/Long: 32.609989, -116.926934. APNs: 647-130-01-00, 644-100-08-00, 760-229-03-00

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
The Lower Otay Reservoir Complex, also known as the Savage Dam, is located in a canyon 400 feet wide, with side slopes in solid igneous stone with upper sections of sedimentary stone, rising at a 45-degree angle. The dam is a board-formed concrete structure with a concrete masonry water face (Figure 1). **(See Continuation Sheet)**

***P3b.Resource Attributes:** (List attributes and codes) HP11. Engineering structure; HP21. Dam; HP22. Reservoir
***P4.Resources Present:** ☐ Building ■ Structure ☐ Object ☐ Site ☐ District ■ Element of District ☐ Other (Isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)

P5b. Description of Photo: (view, date, accession #) Downstream side of Dam, with remnant of original dam in foreground, May 16, 2018 (JFC 0406)

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
1895 (Original), 1919 (Current): (City of San Diego 1919; SDU 1919a)

***P7. Owner and Address:**
Public Utilities Dept.
City of San Diego
9192 Topaz Way
San Diego, CA 92123

***P8. Recorded by:** (Name, affiliation, and address) Kate Kaiser, MSHP
Dudek
605 Third Street
Encinitas, CA 92024

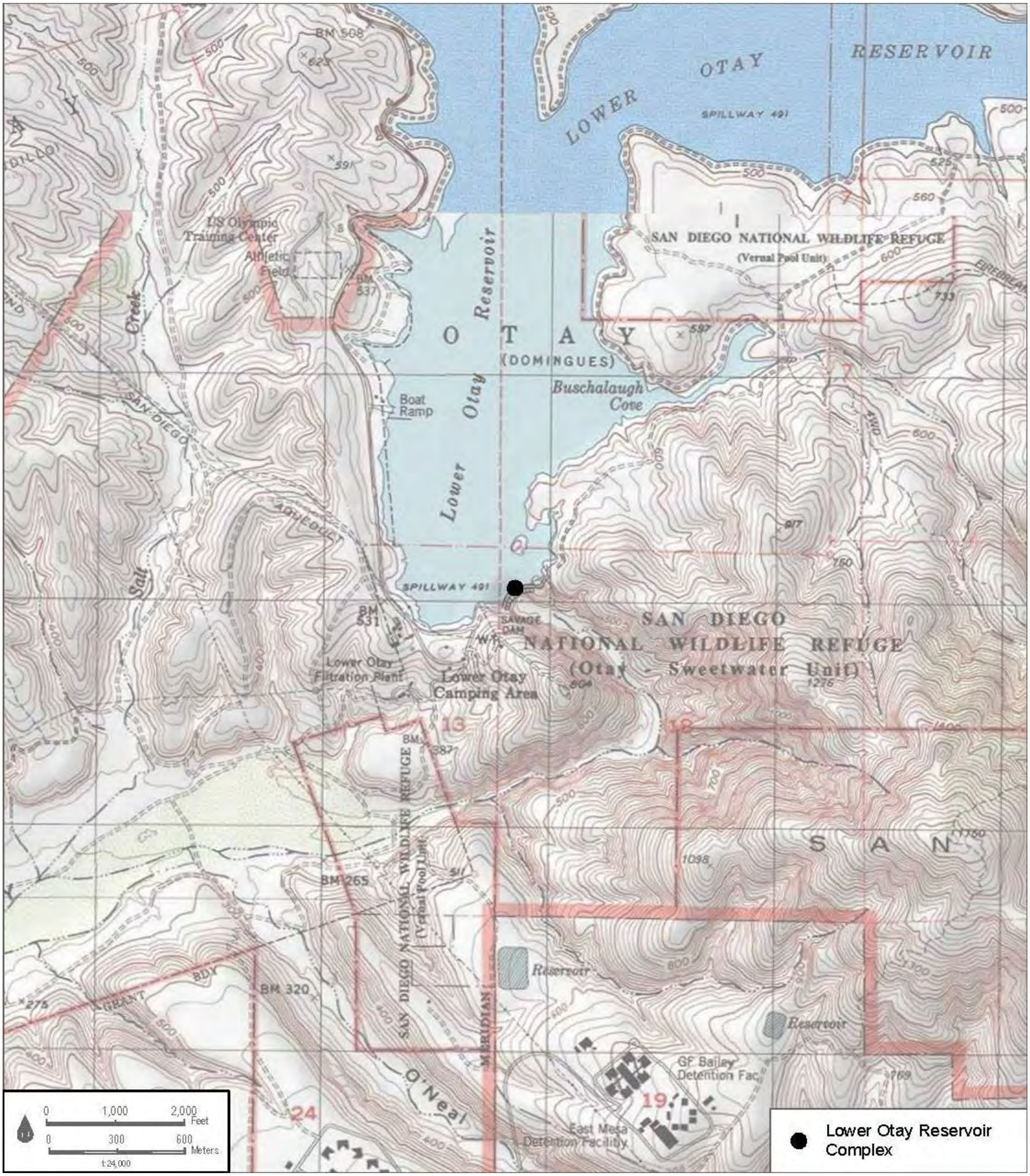
***P9. Date Recorded:** 5/16/2018

***P10. Survey Type:** (Describe) Pedestrian

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")
Dudek. 2020. City of San Diego Source Water System Historic Context Statement.

***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

Page 2 **of** 32 ***Resource Name or #** (Assigned by recorder) Lower Otay Reservoir Complex
***Map Name:** Otay Mesa, USGS 7.5' Quad ***Scale:** 1:24,000 ***Date of map:** 1996



BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) Lower Otay Reservoir Complex ***NRHP Status Code** 3B,3CB, 5B

B1. Historic Name: Lower Otay Dam and Reservoir; Savage Dam Site
B2. Common Name:
B3. Original Use: Municipal water source B4. Present Use: Municipal water source
***B5. Architectural Style:** Curved gravity dam
***B6. Construction History:** (Construction date, alterations, and date of alterations)
First Lower Otay Dam: 1895. Lower Otay (Savage) Dam: 1919. No readily identifiable alterations.
***B7. Moved?** ■No ☐Yes ☐Unknown **Date:** **Original Location:**
***B8. Related Features:**

B9a. Architect: Hiram Newton Savage (engineer) b. Builder:
***B10. Significance: Theme** Early Water System Development and Flood Recovery and Reinvestment **Area** San Diego
Period of Significance A: 1887-1928; C: 1895, 1919 **Property Type** Dam
Applicable Criteria NRHP/CRHR: A/1, C/3; City: A, B, C, D, F (Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Historic Context

(See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)
***B12. References: (See Continuation Sheet)**

B13. Remarks:

***B14. Evaluator:** S. Corder, MFA, and K. Kaiser, MSHP
***Date of Evaluation:** June 30, 2020

(This space reserved for official comments.)

***P3a. Description: (continued)**

Figure 1. Overview of Lower Otay Dam, and incorporated spillway downstream face (view to north)

The east and west ends of the dam flare toward the upstream side, creating a subtle 'W' shape in the bird's eye view. The eastern flare connects to the spillway, while the western flare ends as part of the restricted access maintenance roadway. Below the walkway are 18 radial spillway gates that can be reeled up with a rolling crank cart, which is still present at the eastern end of the walkway and original to construction (Figure 2). The gates let water out into the smooth, inclined concrete spillway on the downstream side of the dam.

Figure 2. Overview of Lower Otay Dam rail wall with outlet tower (view to west)

Remnants of the first Lower Otay dam are evident on the western slope on the downstream (south) side of the present dam, and on the eastern slope on the upstream (north) side. The poured concrete of the original wall sandwiches steel sheets that are currently exposed. Three poured concrete footings exist immediately south of the remnants of the first dam. The first is approximately 4 feet square at the base and tapers upward to approximately 3.5 feet square, and stands 4 feet tall. To the south of this footing are two embedded parallel concrete footings. Accurate length and width measurements were not possible due to partial burial; however, they were at least 5 feet long and at least 8 inches wide, and spaced 4 feet apart.

A powder magazine, or dynamite containment structure, was built into the western rock face for construction of the second Lower Otay Dam (Figure 3). Due to safety concerns, this location was not hiked to for inspection. The inner concourse of the dam was also not available for survey due to resident bats and the required confined space training and safety measures. However, the entrance to the inner portion of the dam is located on the downstream face, on the western side of the dam. There is a balcony approximately 100 feet below and east of the upper entryway.

Figure 3. Powder magazine location as viewed looking southwest from the spillway, entrance highlighted by black circle.

The dam's concrete auxiliary spillway is a gated ogee crest type located on the east side of the dam (Figure 4). The length of the spillway channel is 325 feet. Concrete stairs lead up from the western side of the spillway to a parking area with possibly original oaken posts set into the ground as guard rails. These posts were damaged in a fire within the last decade but are still present. The fire exposed the necks of some historic era bolts, which have a domed head on top of a square neck and a tapering cylindrical body. The domed head is approximately 1.25 inches in diameter.

Figure 4. Overview of Lower Otay Dam auxiliary spillway crest (view to northeast)

The octagonal Lower Otay Outlet Tower measures approximately 30 feet in external diameter (Figure 5). The top of the concrete tower features a reinforced concrete operating deck that regulates the outer gates. Each gate contains a screen cover to keep fish, trash, and other debris from entering into the 24-inch-diameter circular pipes. The pipes run through the walls of the tower and connect with a vertical down-pipe that discharges into the tunnel. The tunnel was built through solid bedrock on the west side of the dam. It is lined with concrete and connects to the base of the outlet tower. The tunnel draws water from the reservoir by means of the reinforced concrete outlet tower structure, with one or more of the pipes open at a time, depending on discharge requirements and the level of the reservoir.

Figure 5. Overview of Lower Otay Outlet Tower (view to southwest)

Current outbuildings in the area include a small (5 feet by 6 feet) cinder block building with a concrete pad foundation on the western extension of the dam, and about 70 feet further to the west from that is a chain-link structure with a corrugated sheet metal roof covering an electric pump. These structures are a more recent addition and are not historic in age. The pump had an exposed 3-inch galvanized metal pipe that led down to the shoreline adjacent to the main inlet pipe. Other possibly historic pipes were exposed in a small area near these outbuildings. Lengths of curved poured concrete curbs were visible beneath the brush and are likely associated with a curved road that extended down to a previously exposed beach during a particularly low water line in the 1960s, as seen on historic aerials (Figure 6). While of historic age, these features are not contemporaneous with construction of the Savage Dam and therefore are not contributing features to Savage Dam.

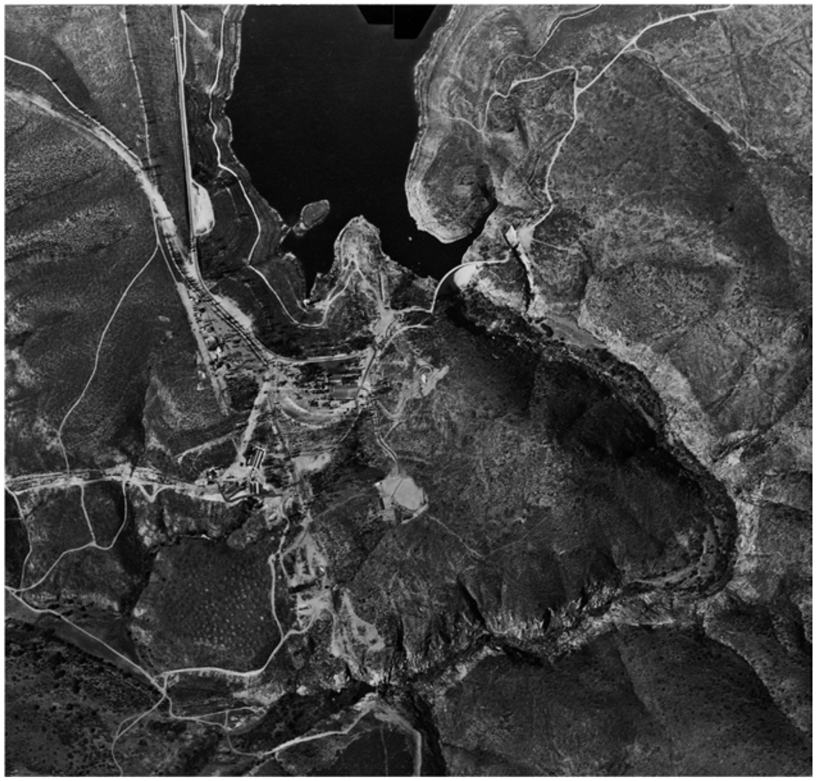


Figure 6. 1964 aerial showing the low water line and the roads leading northward along a southern fingerlet into the reservoir basin (UCSB 2018)

***B10. Significance: (continued)**

Phase 1: Original Lower Otay Dam Construction (1894 – 1916)

One of the early projects taken on by the SCMWC was the construction of the Lower Otay Dam under the charge of civil engineer Walter S. Russell (Figure 7) (SDU 1897). Originally, the dam and reservoir was intended as a means of irrigation for the surrounding lands and was not originally conceived as part of the City's overall water supply system. Babcock's planned system would be established along the Otay-Cottonwood watershed, beginning with the construction of the Morena Dam and following downstream with the Upper and Lower Otay Dams and Barrett Dam. From Lower Otay Dam, water was to be piped through the Dulzura Conduit and then distributed throughout the region (Fowler 1953; SFC 1895). The design of the system was described as follows:

> Two [reservoirs] on the upper stream and two on the lower, and known as the Lower Otay, Upper Otay, Barrett, and Moreno reservoirs, their altitudes being respectively 400, 540, 1,450, and 2,900 feet. Their aggregate storage capacity is 13,600 miner's inches, which can be vastly increased by carrying the two upper dams to a height of 200 feet or more. (SDU 1895a)

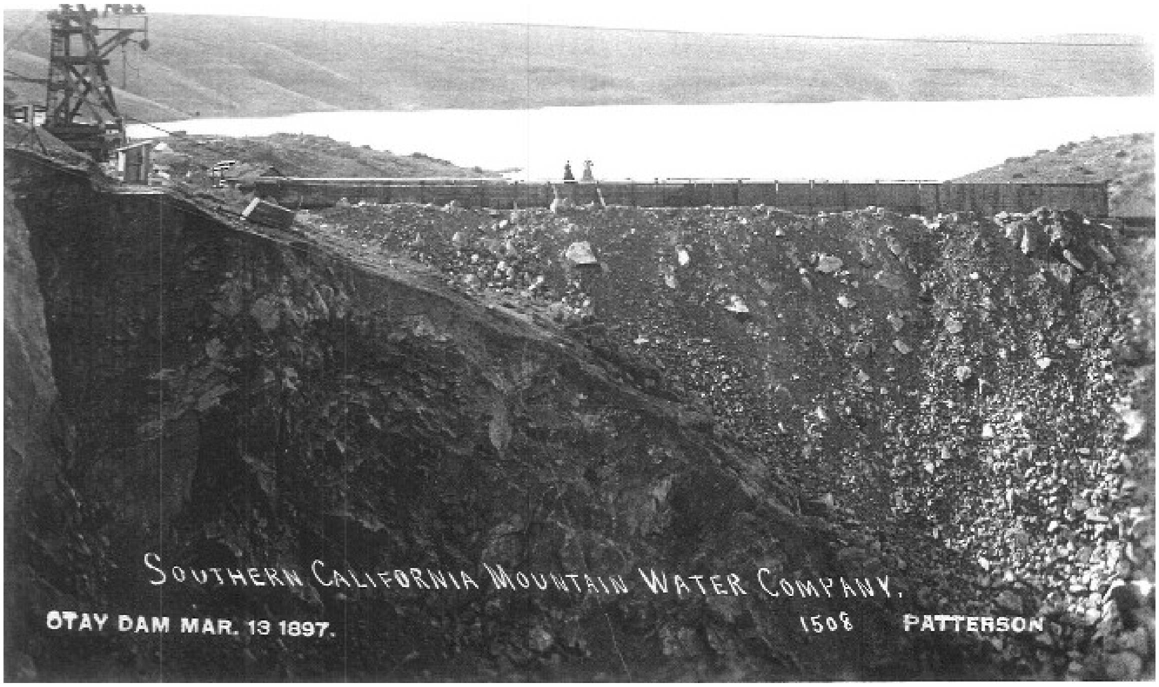


Figure 7. Original Lower Otay Dam, March 13, 1897 (San Diego History Center 2018b)

Blasting activities to prepare the land for the Lower Otay Dam construction began in October of 1894. The intention of the explosions was to generate enough material to build the dam and create a hole that "will be 100 feet square, running 100 feet into the hill" (SDU 1894). The article further goes on to invite the public to the blasting activities (SDU 1894).

A visit by the joint water committee and city officials to the Lower Otay Dam while it was under construction in 1895 reported the progress as follows:

> The committee next visited lower Otay reservoir and dam, where they were surprised to find a force of sixty men at work with the finest of machinery, and handling 600 tons of rock per dam. The dam is rapidly assuming shape and its massive proportions much impressed the committee. While the lower Otay is not included in the proposition offered to the city, the committee remarked that the great amount of money being expended by the by the Mt. Tecarte company was an indication of its faith in its system and its ability to develop it.
>
> Engineer Walter Russell is in charge of work at the dam, and under his direction rapid advancement is apparent. The dam is being constructed 130 feet in height, and will be of rock-filled pattern proved in mining countries to be the most substantial that can be made. A boiler-steel core is placed in the center riveted and caulked to withstand a pressure of 200 pounds to the square inch. The pressure of water at the 130-foot level will be 56 pounds per square inch. The core is treated to a coat of asphaltum applied at a temperature of 300 degrees, then with a cover of burlap, which is in turn covered with a coat of boiling hot asphaltum. The core absolutely presents any breakage through the dam. On either side of the steel will be 12 inches of concrete to prevent indentation. Small rock is being dumped above the center, and large rock, some many tons in weight, below, with enough small rock to fill interstices. The total thickness of the dam at the base will be 400 feet. The steel core is anchored at the ends by 1

> 1/8 anchor bolts set in solid rock with leaded ends in masonry 25 feet wide and 35 feet thick. The core rests in a trench cut in solid rock filled with concrete. The steel is so placed that it bears no strain, simply service to prevent seepage…The outlet tunnel from the reservoir is 48 feet above the base of the dam, and will be 1,150 feet in length. (SDU 1895b)

Over the course of 1895 the SCMWC continued to make progress on the dam, but by August a two-week shutdown on the project was required to facilitate alterations to the trolley and cable system that carried the rock from the blast zone to its place in the dam. These necessary repairs and alterations were in preparation for additional blasting activities planned for September of 1895 that was intended to provide an additional 150,000 tons of rock for the dam construction (SDU 1895b, SDU 1895c).

While not part of the original plan, by February of 1896, construction of the Lower Otay Dam was halted by the SCMWC due to the lack of involvement with the overall water system plan for the City of San Diego. The SCMWC hoped to get funding for the completion of the dam from the City to build a city plant and also build dams for private irrigation needs (LAT 1896). After struggling with the question of investing in water infrastructure for many years, voters passed a City of San Diego bond measure to approve $1,500,000 in funding for the acquisition and construction of a new water system in June 1896. The new water system would bring in 1,000 inches (13 million gallons) of water from the mountains daily (SFC 1896a, SFC 1896b, SFC 1896d).

SCMWC president E.S. Babcock and the Spreckels brothers were celebrated by a “howling mob” when the election results were announced on June 27, 1896. At the Hotel del Coronado, employees carried Babcock on their shoulders while fireworks, bonfires, and brass bands on the plaza led a large crowd to the beach to join in the celebration. After a four-year battle with the San Diego Flume Company, including numerous allegations of corruption and bribery, the City finally found itself free from a monopoly and gained sole ownership of a new water system. “The citizens generally regard this as the turning point in San Diego’s career and are simply beside themselves” (San Francisco Call 1896b).

Shortly after the bond measure passage, Babcock was quickly tackling logistics for the new water system. His focus was finishing the work at the Lower Otay Dam, while ramping up preliminary construction tasks at the Morena Dam Site. The newly approved system would be able to provide enough water for up to 100,000 inhabitants and help to irrigate lands outside of the city (SFC 1896c, SFC 1896e).

By 1905, most of San Diego’s water companies disappeared, having failed to survive the drought of 1895-1904. Realizing the need to gain better control of its infrastructure, the City began purchasing the holdings of the San Diego Water Company and the SCMWC that were within the City limits. Such holdings included reservoirs, pumping plants and machinery, pipelines, buildings, and tools (Fowler 1953). The city also began constructing its own facilities and infrastructure to keep up with increasing demand. To ensure a continuous supply of water, the City entered into a contract with the SCMWC in the summer of 1906, replacing the San Diego Flume Company as chief water supplier (Smythe 1908).

Drought conditions began to settle over San Diego County again in 1912. In response, in 1913 the City purchased the Otay portion of the SCMWC, and in 1914 the pipeline that connected Otay Valley with the Lower Otay Reservoir was purchased by the Coronado Water Company from the SCMWC. As the major portions of the company had already been purchased by the City, Morena Dam was also agreed to be purchased at a fixed price following a 10-year lease. Thus, by 1914, all portions of the SCMWC were owned by the City of San Diego (Fowler 1953).

The specific details of Lower Otay Reservoir Complex at the time of the City's purchase from the SCMWC are included in a purchase inventory from August 15, 1912. In the inventory, the Lower Otay Reservoir was reported to have a capacity of 13,000,000,000 gallons and an altitude of 400'. The Lower Otay Reservoir Complex was inventoried to include a Main House, Keeper's House, Bunk House, Annex House, Barn, Prospect Barn, and a Pump House (Water Department Inventory 1912).

For the time being, it seemed that the City had addressed its immediate and long-term water problems. Population growth continued and water in storage was plentiful. However, the drought that started in 1912 had significantly worsened by 1915. Since most of the water stored in the region's dams was replenished by captured rainfall, the reserves diminished quickly (Hill 2012). The City's solution to their drought problem was Charles Hatfield. Hatfield (1875–1958) was a native of Kansas and transplant to Southern California who was a self-proclaimed "moisture accelerator." He dedicated himself to rainmaking, inspired by the terrible years of drought near the end of the nineteenth century. His technique involved the mixing of a secret chemical compound, which he claimed attracted/extracted rain. Between 1899 and 1912, Hatfield traveled to Alaska and throughout Central California for rainmaking activities (Perry 2015; Tuthill 1954).

On January 5, 1916, a good rain was reported at Morena Reservoir, and 48.5 million gallons of water impounded since December 27 (Patterson 1970). The rain fell again beginning on January 10, 1916, and continued until January 18 in San Diego and the surrounding area (Patterson 1970). On January 27, a second storm hit, bursting open the Lower Otay Dam and flooding the Otay Valley. The storms caused the San Diego River to overrun its banks and spread across Mission Valley. Nearby infrastructure, including rail lines and bridges, was also destroyed and local trains were stopped for more than a month. Highways and the telegraph and telephone lines were also cut off, and the only means of transportation and communication was by sea. Three days later, the Sweetwater Dam was overtopped by more than three feet and the canyon side walls began eroding away. Although the dam itself was undamaged, its abutments were breached and it was unable to retain water (Crawford 2011; Fowler 1953; McGlashan and Ebert 1918; Patterson 1970; Reynolds 2008; Tuthill 1954).

As a result of the 1916 floods, the Lower Otay Dam was a complete loss (Figure 8). The floods left scars on the mountains and hills of San Diego County, and washed out river channels down to bedrock. The hillsides were saturated with water and the soil gave way, resulting in mudslides. In addition, the pumping plants of the Coronado Water Company were destroyed, cutting off all supplies from the Otay Valley. Nevertheless, water service was maintained through the City's pipeline under the bay with water from the system of the Cuyamaca Water Company (Fowler 1953).

Figure 8. Remains of the Original Dam Following the Collapse in 1916 (City of San Diego 1919)

Phase 2: Construction of Second Lower Otay (Savage) Dam (1916 – 1919)

In the years immediately following the flood of 1916, a number of new water infrastructure projects were completed throughout San Diego. One such project was the replacement of the Lower Otay Dam. From 1916 to 1919, the City replaced the Lower Otay Dam with a new concrete gravity arch dam designed by the newly hired City hydraulic engineer Hiram Newton Savage (City of San Diego 1919; Fowler 1953; WRCA 2005).

Savage (1861–1934), a civil engineer who had expertise in infrastructure, had worked in the railroad, mining, and water industries throughout the United States. He arrived in the City in the 1890s and was employed by the San Diego Land and Town Company of National City. He was brought on to work on the construction of the Sweetwater Dam and distribution system and the associated City plan and rail lines. He also served as a consulting engineer for the SCMWC in 1895, where he assisted with the construction of the original Upper and Lower Otay Dams. From 1903 to 1915, Savage worked for the U.S. Reclamation Service (now the Bureau of Reclamation) designing and managing a number of important water projects throughout the west. Following the 1916 floods, Savage returned to the City and took the role of consulting and supervising engineer for the Sweetwater Company of California. During that time, he was engaged in the reconstruction and enlargement of the Sweetwater Dam, spillway, and abutments, which were damaged during the floods. Savage designed a 145-foot-high gravity arch dam for the Lower Otay Dam (Figure 9), which would encapsulate the old masonry dam remains that were partially destroyed in the 1916 flood (City of San Diego

1919; Fowler 1953; Sholders 2002; Meixner 1951; SNAC 2018).

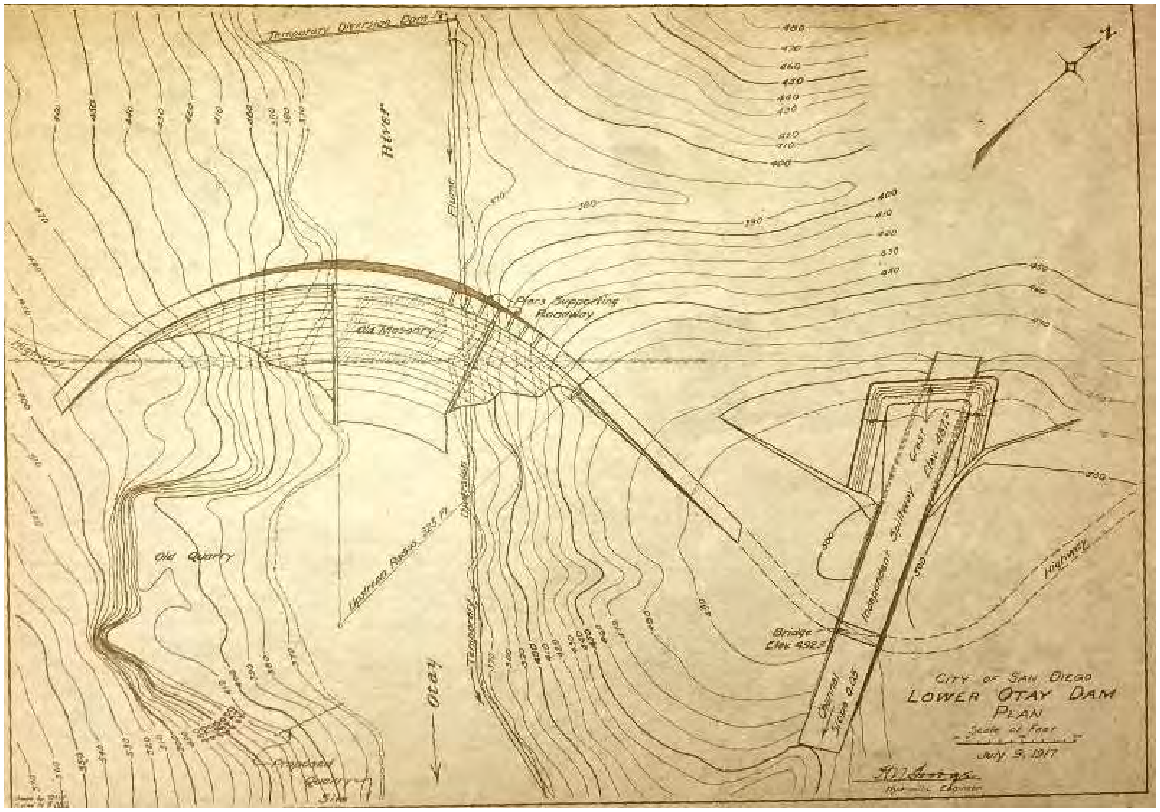


Figure 9. Lower Otay Dam plan map by Hiram N. Savage, 1916. (City of San Diego 1919)

Despite Savage's experience, numerous challenges plagued the early years of the project. One of the most significant early changes to the project was that the city employed Michael Maurice O'Shaughnessy as a consulting engineer who had encouraged the development at Lower Otay, but ultimately awarded the position of Hydraulic Engineer to Savage in June 1917. O'Shaughnessy was originally hired by the City to prepare project plans in May of 1916; however, Ordinance No. 7042 was passed in June 1917 creating the position of Hydraulic Engineer. The water commissioners chose to replace O'Shaughnessy with Savage. The slight resulted in a lasting enmity between the two engineers for the rest of their lives. Other issues that slowed the early progress of the dam construction included the following: a failed bond measure in 1916; award and rejection of bond measure funding by Spitzer Rorick; bid refusals by Wurster Construction Company; and an injunction filing in September of 1917 citing an intention to defraud the City (SDS 1917a, 1917b; SDU 1917a, 1917b). Despite the early project delays, work continued at Lower Otay Dam throughout 1917 with an estimated completion date of late 1918 (SDU 1917a, 1917b). Despite the forward progress of the dam construction in from 1917 into the Fall of 1919 (Figure 10), the project continued to encounter challenges (City of San Diego 1919; Fowler 1953; Meixner 1951; SDS 1919; Sholders 2002; SNAC 2018).

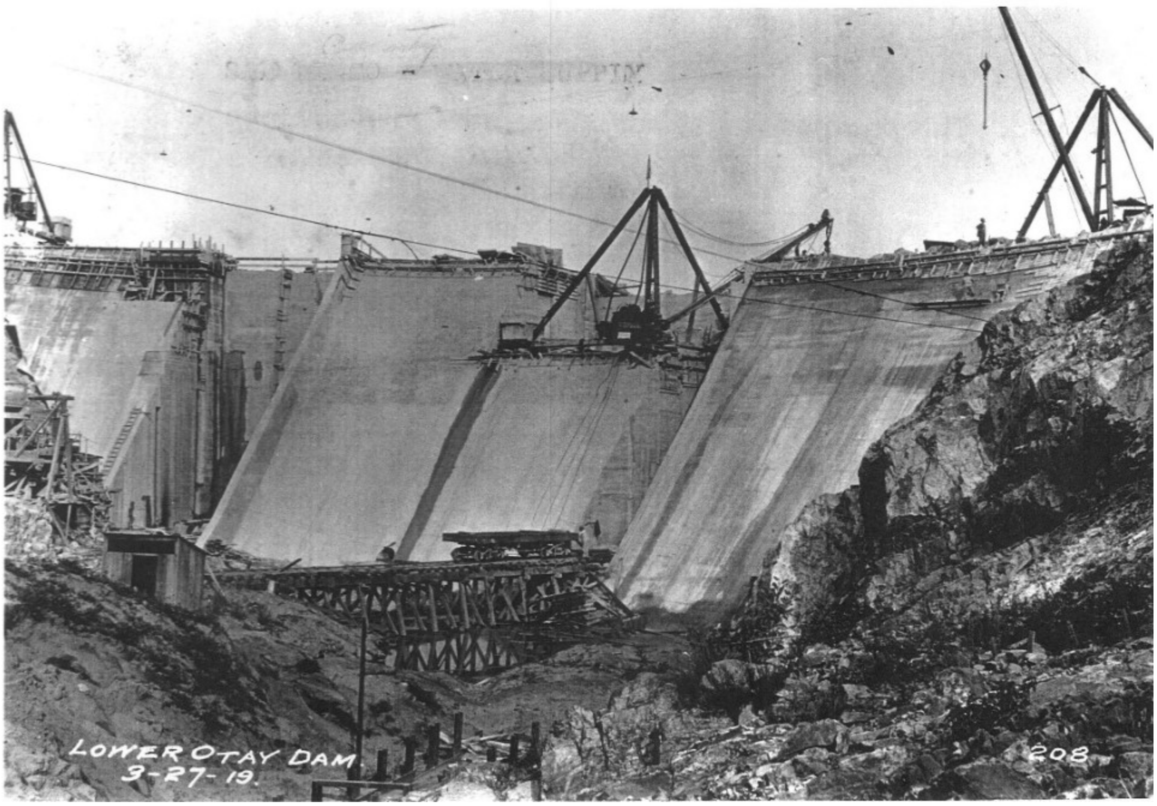


Figure 10. Second Lower Otay Dam Under Construction, March 27, 1919 (San Diego History Center Collection 2018b)

Some of the most significant challenges were related to the construction processes, procedures, and costing measures. Many of these issues were attributed to the main contractor James Kennedy. In 1919, the challenges brought to the project by Kennedy were summarized as follows:

> All early estimates of cost were soon seen to be impossible. Struggling with untoward conditions and with no knowledge of his subject, technical or practical, Contractor Kennedy, the successful bidder for the work, soon began to float in a morass of difficulties with labor, material and morale, without chart, compass, rudder or even steam in the boiler, until finally it became obvious to even his friends, that something must be done if the city’s interests were to be protected at all, and so the thing was fought through a council, a majority of whom were undertaking to represent the contractor rather than the city, and it was decided to proceed with the building of the dam, by the city itself, with Mr. Savage as hydraulic engineer and chief in charge…The wretchedly incomplete and inadequate plant of Mr. Kennedy, even covered by claims or credits as it was, was soon found to be in even worse condition than was supposed, and for a time, even public opinion was none too friendly to the undertraining, but finally, those of us who knew that the very life of the city depended upon our ability to proceed with the work, succeeded in getting together and going ahead. (SDS 1919)

The City also shared concerns from the beginning of the project with Kennedy and his crew's abilities and qualifications. On August 30, 1918, Kennedy's contract with the City was suspended for reasons of "delinquency." Following the suspension of Kennedy's contract, the City seized ownership of his construction plant on the site and by September 20, 1918, the mayor of San Diego approved completion of the dam by City labor forces working under the direction of Savage. The City labor forces and Savage continued work on the dam and finished by September 1919 (City of San Diego 1919; Fowler 1953; SDS 1919a, SDS 1919b; SDU 1919a, SDU 1919b).

In addition to the political, social, and economic challenges and struggles previously discussed, the location and history of the Lower Otay Dam was also a factor in how construction of the second dam site took place. Early in the project, Savage realized that the Lower Otay site was remote and far enough removed from City that he would need to create a construction camp on the site to house the laborers and administrative staff for the project. Once the administrative and labor concerns were dealt with, Savage moved onto the design elements. Working from the site of the failed dam, Savage took it upon himself to reuse whatever possible from the original dam. For instance, the foundations of the old dam and the quarry were still predominately intact, so he worked with those elements in his new design. He also took into consideration the placement of original site features like the outlet tower and chose to rebuild the outlet tower on the site of the original one. Another important factor in the design of the new dam was the original spillway, which was a likely factor in the collapse of the first dam. Savage chose to design a new spillway as a gated overflow system with additional channels to avoid future issues experienced in the 1916 flood. In addition to reusing materials and modifying designs, Savage built Lower Otay Dam with an additional 84,000 cubic yards of concrete during the construction of the second dam (Martin 2017).

In September of 1919, the dam was completed and a dedication ceremony was held at the Lower Otay Reservoir Complex (Figure 11). During the dedication speeches, Savage was recognized for his designs and the beauty of the dam, as well as his ability to bring the dam to completion with $25,000 to spare. Attendees for the dedication ceremony were treated to tours of the dam's interior inspection tunnel and some were permitted to drive their automobiles over the crest of the dam. Details of the christening portion of the dedication included:

> A pretty feature introduced into the ceremonies after the speech making was the christening of the dam by breaking a bottle of water from the Otay river on the crest of the dam, the ceremony being performed by Mrs. C.H. Lawrence, who "adopted" Mr. Savage 20 years ago, and Eugene Williams, purchasing agent for the City of San Diego. (SDU 1919b)

Figure 11. Hiram Newton Savage at the Lower Otay Dam dedication, September 1919 (City of San Diego 1919)

During the ceremony, which was presided over by Chairman Johnson, the speeches remarked on the importance of Otay, its role in the San Diego water system, and its ability to provide prosperity to the City and its residents. The speeches also turned to the future of the San Diego Water System with notes about the impending completion of Barrett Dam within the next year (SDU 1919a, SDU 1919b).

Alterations and Post-construction Developments (1919-2018)

Archival research revealed that there were few alterations to the Lower Otay Reservoir Complex and associated features after the complex's construction, and almost no alterations to the dam itself. After the dam was completed in 1919, H.N. Savage transported the physical plant from Lower Otay to the new City of San Diego dam project at Barrett Dam

(Concrete 1922). In 1920, Lower Otay Lake and Lake Hodges reservoirs were opened to recreation, with both reservoirs being stocked with fish and opened for fall hunting.

In 1922, at the recommendation of the city hydraulic engineer, H.N. Savage, new flash gates were installed to increase the Lower Otay reservoir capacity, after the dam spilled over that winter season. Savage also recommended and designed a new Lower Otay Conduit, linking Lower Otay to the Bonita Wye and eventually University Heights Reservoir in 1922. Savage's issues with the City Council came to a head in 1923, when a reporter called for Savage's firing after a leak was discovered at Lower Otay Dam. The City Manager and numerous engineers claimed that the leak was insignificant and that small leaks are to be expected at dams, but the City removed Savage as the hydraulic engineer all the same (Evening Tribune 1923; SDS 1923; SDU 1922, 1933; Savage 1922).

There were minor additions to the dam after this. A comfort station was designed and added to the Lower Otay recreation area in 1925. All of the buildings were also rewired to meet new safety code requirements in 1925 (City of San Diego 1925; Evening Tribune 1925).

In February 1927, a catastrophic flood, the largest since the 1916 flood, struck in San Diego County. As a result of the flood Lower Otay spilled over, but did not seem to sustain any damage. This was confirmed by a board of engineers directed by the state engineer to evaluate San Diego County dams for post-flood damage in 1928, and Lower Otay was deemed the safest of the City's reservoirs. Barrett Dam also did not sustain damage, but the Sweetwater, Chollas, and Morena reservoirs all required repairs after the flood. In 1930, water bond funds were approved to increase the reservoir capacity at Chollas Reservoir, raise the height of Morena Dam, and replace the old Otay pipeline with a new, 16-mile pipeline to University Heights Reservoir (Evening Tribune 1928; SDU 1930).

The significance of the early development of the San Diego Water System was clearly recognized as early as 1930:

> …the construction of these dams has meant the security of water supplies to cities and the reclamation of thousands of acres of arid land for agricultural purposes. They mean an annual income of many millions of dollars to the communities in which they are built… (LAT 1930).

In 1934, Lower Otay Dam was renamed Savage Dam, to commemorate the passing of the former City Hydraulic Engineer, who died in June of that year. There were no new improvements to the dam itself after this point. Rather, improvements to the lands immediately surrounding the reservoir and dam or to buildings associated with the dam categorize the period from the 1930s through the 1990s. In 1944, due to the population increase in light of World War II, the city added a new Lower Otay pumping plant, which was designed to increase capacity from 17.5 million gallons to 25.5 million gallons daily. In 1945, a new recreation center was proposed at the Lower Otay Reservoir Complex. In 1957, the City began leasing a tract of land south of Savage Dam to the San Diego County park system. The next year the second pipeline of the San Diego Aqueduct reached Lower Otay Reservoir from Hemet, in Riverside County, some 97 miles away. The San Diego County Parks eventually purchased the city land, creating Otay Lakes County Park in 1969 (City of San Diego 1957, 1969; LAT 1989; Pyle 1944; Pyle 1945; SDU 1934, 1944).

In 1989, the city of Chula Vista sought state funding to build the Chula Vista Olympic Training Center on 154 acres on the west side of Lower Otay Reservoir. A nonprofit accepted a donation of land from the Eastlake Company, and construction of the center spanned from 1990 to 1995. The training center interfered with the fishing and hunting recreation at Lower Otay Lake, effectively giving the reservoir over as a training site for track and field, rowing, and Olympic bicycling events (LAT 1989; The Star-News 1995).

Engineer: Hiram Newton Savage (1861-1934)

Hiram Newton Savage (Oct 6, 1861-June 24, 1934) was born in Lancaster, New Hampshire, to farmer Hazen Nelson Savage and Laura Ann Savage (née Newton). In 1887, he graduated with a Bachelor's in Science (B.S.) from New Hampshire College of Agriculture and Mechanical Arts, following that degree in 1891 with a Civil Engineering degree from Thayer School of Engineering at Dartmouth College. After graduating, Savage immediately began seeking engineering work (WRCA 2005).

While completing his degree at Dartmouth, Savage began his engineering career in Tennessee, where he was hired as assistant engineer by the East Tennessee and Georgia Railway, the Nashville and Tellico Railway, and the Athens (Tennessee) Improvement Company in 1888. In 1889 he was an Assistant Engineer for the Hydraulic Mining and Irrigation Company in the San Pedro Mining District of New Mexico, and later that same year he served as Chief Engineer at the Rio Grande Water Company in New Mexico. In 1891, Savage relocated to Southern California, where the San Diego Land and Town Company in National City, California, hired him as chief engineer; he worked there until 1903. His biggest achievement at San Diego Land and Town Company was the enlargement of the Sweetwater Dam, raising the dam to 110 feet tall and resulting in a total storage capacity greater than 26,000 acre-feet. Completed in 1911, the work entailed addition of a 20-foot-tall parapet along the top of the dam; addition of concrete to the downstream side of the dam to compensate for the extra pressure from the increased water storage; inserting a two-chute overflow weir on left side of the dam; and raising the height of the outlet tower (Reynolds 2008, WRCA 2005).

While with the San Diego Land and Town Company, Savage also took outside consultant work. He took consulting jobs with several San Diego-area railroads: the San Diego and Cuyamaca Railway, the San Diego and La Jolla Railway Company, and the Cuyamaca Beach Railway Company. He also consulted for water-related engineering projects with the Cuyamaca Water Company, including the Zuninga Shoals Jetty Project for the City of San Diego. In 1895, the SCMWC hired Savage as a Consulting Engineer in connection with the Morena, Upper Otay, and Lower Otay Dams, and the water-conveyance system to the City (WRCA 2005).

In 1903, Savage was appointed Consulting Engineer for the United States Reclamation Service (a predecessor to the Bureau of Reclamation). In 1905, Savage was promoted to the Supervising Engineer of the Northern Division of the Reclamation Service in Montana, North Dakota, and Wyoming, where he oversaw several Reclamation Service dam projects, such as: the Milk River Project and Sun River Dam Project in Montana, the Williston Dam project in North Dakota, and the Shoshone Dam Project in Wyoming, which was at the time of its construction the highest dam in the world. Savage also consulted on other Reclamation Service projects for other regional divisions, including the Southern Division's Salt River Valley and Roosevelt Dam projects in Arizona. During his time with the Reclamation Service, New Hampshire State College awarded Savage with an honorary Doctor of Science in Engineering degree in 1913. His engagement at the federal level lasted from 1905 until 1915, before he resigned and returned to Southern California. In 1916, the Sweetwater Water Company of California hired Savage as a Consulting Engineer and later as a Supervising Engineer for the enlargement of the Sweetwater Dam, which had been damaged in the 1916 floods (Bureau of Reclamation 2018; WRCA 2005).

Savage was officially hired by the City of San Diego as the city's Hydraulic Engineer on June 4, 1917. The position had not previously existed for the city, and came with the authority to direct the water department, design infrastructure, and make recommendations

There he continued the water infrastructure recovery from the 1916 floods. The flood of 1916 had destroyed Lower Otay dam, a structural failure that flooded Otay Valley and caused 22 drowning deaths. Savage's role in the reconstruction of Lower Otay Dam, the construction of Barrett Dam, and the repairs to Sweetwater Dam and Morena Dam, solidified the important role that he played in San Diego's water system. The acquisition of Savage was seen as an immeasurable triumph, the results of which would put the City of San Diego ahead both technologically and financially (McGlashan and Ebert 1918; San Diego Evening Tribune 1917; San Diego Union 1918c; Scientific American 1923; WRCA 2005).

In addition to Savage's successful dam projects, he also submitted several reports on the City's future needs for new water resources and infrastructure development. Savage also brokered several deals to secure water rights for the City in several cases. These reports and legal issues contributed to the deterioration of Savage's relationship and rapport with the City Council. Savage's employment as City Hydraulic Engineer for the City of San Diego lasted until 1923, when he was summarily dismissed after multiple disputes with the City Council and consulting hydraulic engineers J. B Lippincott and John R. Freeman (LAT 1922; San Diego Evening Tribune 1923b; San Diego Sun 1923; WRCA 2005).

After his dismissal from the City's employment, Savage embarked on two world tours from 1923 to 1925, studying foreign engineering projects at the Aswan Dam in Egypt, water supply projects in England, and irrigation projects in Brazil, before returning to the United States and offering hydraulic engineering consulting services. Savage's work during this period is unknown (WRCA 2005).

Meanwhile, by 1928, the City of San Diego's water infrastructure development suffered without Savage's leadership, culminating in the ultimate failure and abandonment of the Sutherland Dam project. The City invited Savage to return as Hydraulic Engineer, heading the Municipal Bureau of Water Development, Operations, and Maintenance. Savage returned to San Diego in 1928, with the condition that he be allowed to work independently of political interference. This was not to be. The City Council resumed their antagonistic relationship with Savage almost immediately, undercutting his authority by hiring consulting engineers who publicly dissented with Savage's ideas and publicly criticizing Savage's reports. Savage, for his part, resumed securing water rights for the City and began the El Capitan Dam project in 1928. His re-employment with the city of San Diego lasted until 1933 when Savage resigned, but he remained a consultant until the dam was completed. Shortly after Savage's resignation, he succumbed to a longstanding sickness and died in 1934 from heart failure (Savage 1932; San Diego Evening Tribune 1934; San Diego Sun 1932, 1933; San Diego Union 1932a, 1934a; WRCA 2005).

Savage's career as an engineer extended 46 years, from 1888 to his death in 1934. A sample of his known work includes:

- Sweetwater Dam and Distribution System, San Diego, California, 1891
- Sweetwater Park and Race Track, National City, California 1891
- Zuniga Jetty, San Diego, 1904
- Lower Yellowstone Project, Montana 1904
- Huntley Project, Montana, 1907
- Williston Project, North Dakota, 1907
- Buford-Trenton Project, North Dakota, 1907
- Sun River Project, Montana, 1908
- Flathead Irrigation Project, Montana, 1908
- Shoshone Project, Wyoming, 1908-1910
- Milk River Project, Montana, 1910

- St. Mary Diversion Dam, Montana, 1915
- Sweetwater Dam Enlargement Project, San Diego County, California, 1917
- Lower Otay Dam (Savage Dam), San Diego County, California, 1919
- Morena Dam Enlargement Project, San Diego County, California, 1923
- Barrett Dam, San Diego County, California, 1922
- El Capitan Dam, San Diego County, California, 1932-1934

NRHP and CRHR Significance Evaluation

NRHP Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.

CRHR Criterion 1: Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

The Lower Otay Reservoir Complex was constructed in 1895 and 1919 and spans two separate periods of significance for water infrastructure development in San Diego. The first period of significance is the Early Water System Development period (1887-1916). While still plagued with supply and quality issues, the formation of the San Diego Water Company in 1873 was a turning point for the City that set the stage for the development of reliable water sources in San Diego. Population increases also fueled the need for additional reliable water sources and by the 1880s, private water companies were forming to help meet this need. One of the great engineering achievements during the 1880s was the construction of the Sweetwater Dam by the San Diego Land and Town Company. Simultaneously, the Cuyamaca Dam was constructed on Boulder Creek in the Cuyamaca Mountains in 1887. It is this first completed major piece of water infrastructure that marks the start of the Early Water System Development period. One of the most notable companies to emerge during this time was the Southern California Mountain Water Company (SCMWC) in 1894. Through the formation of private water companies, multiple water infrastructure projects were undertaken during the late nineteenth and early twentieth century. Such projects included Morena Dam (1895), the original Lower Otay Dam (1897), Upper Otay Dam (1902), and the Dulzura Conduit (1909). Despite the early successes of some of these projects, a catastrophic flood of 1916 devastated the San Diego region and destroyed the original Lower Otay Dam. Because the flood of 1916 essentially wiped out much of the City's early water infrastructure, it serves as the end date for this period of early water development in San Diego.

The second period of significance for the Lower Otay Reservoir Complex is the Flood Recovery and Reinvestment period (1916-1928) and is clearly defined by two catastrophic events in Southern California that had far-reaching effects, the flood in 1916 and the St. Francis Dam Disaster in 1928. Despite the City' efforts, the flood of 1916 led to the collapse of the original Lower Otay Dam and destruction of many elements of the early water system in San Diego. Following this disaster, the City took extensive measures to ensure that these types of disasters were somewhat preventable in the future, by building their own dams versus purchasing dams designed by private water companies.

One of the most notable changes made following the flood of 1916 was the hiring of the City's first Hydraulic Engineer in 1917. In the previous period of development, it was the common occurrence for the private water companies to hire engineers like Michael O'Shaughnessy who were not employed by the City. However, the hiring of Hiram Savage in 1917 forever changed the way the City handled their water system development by having an engineer in house that oversaw the construction of water infrastructure projects. In response to the 1916 flood, Savage was responsible for implementing numerous safety measures to help prevent infrastructure failures in the future and was in charge of the rebuilding and repairing of damaged water infrastructure throughout the City. Despite the fact that Savage was replaced as the City's Hydraulic Engineer during this period of development, it is clear that his role was pivotal for the City's infrastructure development, as further evidenced by his eventual rehiring in 1928.

The original Lower Otay Dam, constructed in 1895, was destroyed when it was overtopped by flood waters on January 27, 1916. The vast wall of water rushed down the Otay Valley, destroying farms, crops, livestock, businesses, and railroads on its way to the San Diego bay. When constructing the new Lower Otay Dam, Savage specifically chose the same site as the first dam. As a result, the two ends of the original dam remain in situ, the western end on the downstream side and the eastern end on the upstream side. The surviving dam ends consist of riveted steel plates encased in poured-in-place concrete, and retain their ragged, broken appearance. There are also several rusted steel sheets from the original dam laying crumpled nearby on the lower valley slopes just downstream from the Lower Otay (Savage) Dam. The two ends of the original Lower Otay Dam and the related rusted steel sheets still resting within the valley appear eligible under NRHP/CRHR Criteria A/1 for their association with the 1916 flood and its catastrophic results, and for their association with early water development history in San Diego.

While the original Lower Otay Dam was a key component in early water development history in San Diego, construction of the second Lower Otay (Savage) Dam has a much stronger connection and association with the second period of development, the period of Flood Recovery and Reinvestment from 1916-1928. Following the collapse of the original dam during the Flood of 1916, the City entered into a new era of water resource management. The 1916 Flood was a key turning point in the history of water development and it inspired a critical water infrastructure boom for the City. The infrastructure construction boom was motivated not only by the destruction caused by the flood, but also by the loss of infrastructure after a severe drought that almost ran water resources dry and by the potential loss of seasonal rainfall. The City also began to view potential rainfall loses from more of a financial standpoint at this time, in that missed opportunities for capturing rainfall could be directly tied to financial loses for the City. Therefore, the City entered into a period of hyper-growth and development of existing and new water infrastructure starting in 1916. Lower Otay was one of the sites that was included in the early replacement boom and also served as an important example of Savage's expertise.

While other elements of the City's water infrastructure were constructed at this time, the Lower Otay (Savage) Dam remains a significant resource from the period and now bears the name of the City's first Hydraulic Engineer, as it was named in his honor and is now referred to as Savage Dam.

In summary, the Lower Otay Reservoir Complex, comprised of the original Lower Otay Dam remains and of the Savage Dam and its associated features, is a significant water resource that serves as a monument to the 1916 Flood and the City's history of twentieth century water resource development. The Lower Otay Reservoir Complex is directly associated with important events related to the periods of Early Water System Development (1887-1916) and Flood Recovery and Reinvestment (1916-1928). The Complex stands today as a critical component of the San Diego Source Water System that supported the City's growth and development. Therefore, Lower Otay Reservoir Complex appears eligible under NRHP/CRHR Criterion A/1 as both a contributing element of the City of San Diego Source Water System, and as an individual property.

NRHP Criterion B: Associated with the lives of significant persons in our past.

CRHR Criterion 2: Associated with the lives of persons important in our past.

The original Lower Otay Dam had connections to noted individuals, including E.S. Babcock and the Spreckels brothers, early developers of the City of San Diego. Despite these associations, the remains of the original dam designed by Babcock's SCMWC were visually separated by the construction of the existing Lower Otay Reservoir Complex, leaving no tangible connection between the current complex and these historical figures. The current complex is not connected with any of these individuals in a way that demonstrates their contributions were important within a local, State, or national historic context. Therefore, the Lower Otay Reservoir Complex does not appear eligible under NRHP/CRHR Criterion B/2.

NRHP Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

CRHR Criterion 3: Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

The Lower Otay Reservoir Complex appears eligible under NRHP/CRHR Criterion C/3. The dam embodies distinctive characteristics of the curved gravity dam construction type, used and promoted by hydraulic engineer Hiram N. Savage. The Lower Otay Reservoir Complex has two periods of significance: 1895 (to account the original dam remains) and 1919 (when the second dam was completed).

In addition to important associations with the development of San Diego's Source Water System, the Lower Otay (Savage) Dam is also important because of its embodiment of a curved gravity design. Concrete gravity dams and curved gravity dams, in particular, were popular in the American West from the early twentieth century. Several grand-scale arched gravity dams exist in the United States, including the O'Shaughnessy Dam (1919-1923), Hoover Dam (1931-1936), Shasta Dam (1937-1945), and Glen Canyon Dam (1956-1966). Gravity dams are constructed of concrete or stone masonry and designed to hold back water by the weight of the dam material alone. Gravity dams can have either a straight or a curved axis, and at the Lower Otay (Savage) Dam, Hiram N. Savage implemented the curved axis design, resulting in an curved gravity dam. Lower Otay (Savage) Dam is well preserved insofar as it is one of the five San Diego-area gravity dams, and has not been significantly altered beyond in-kind repairs since its construction. Other gravity dams, such as San Vicente Dam (1943) and Olivenhain Dam (2003), were subsequently raised or had major structural repairs after flooding episodes. Concrete gravity dams were especially promoted by Savage because they were considered more expensive but required less land area and labor to complete than embankment dams. When competing for the design of Lower Otay Dam, Savage fiercely promoted concrete gravity dams against M. M. O'Shaughnessy's expensive embankment dam design and John S. Eastwood's riskier multiple arch dam design. In the end, the promised safety and economic advantages of the curved gravity dam design allowed the City of San Diego to award the position of Hydraulic Engineer and control of the Lower Otay Dam project to Hiram N. Savage.

Savage's career began with the Bureau of Reclamation and ended in San Diego. In San Diego, Savage worked on Sweetwater Dam (repair), Morena Dam (height increase, spillway repair), Lower Otay Dam(design/rebuild), Barrett Dam (design/build), and El Capitan Dam (design/build). Lower Otay Dam is Savage's first designed dam project as the City of San Diego's hydraulic engineer, and is an important milestone in his engineering career. Lower Otay Dam is also intrinsically tied to Savage's career due to the role it played in why the City of San Diego fired him in 1923. Despite Savage's success with the Lower Otay Dam and Barret Dam projects, internal city politics led to the mayor dismissing the entire board of water commissioners in 1923. The board was replaced with enough commissioners to capitulate to poor public image and look for ways to fire Savage. Lower Otay Dam's reputed leak in 1923 gave the new board and city attorney the reason they needed to fire Savage. Therefore, Lower Otay Dam was very important to shaping the overall career of Savage.

In summary, the Lower Otay (Savage) Dam is good example of an curved gravity dam; represents a notable engineering achievement for the City of San Diego; and is a notable work of master engineer Hiram N. Savage. Therefore, the Lower Otay Reservoir Complex appears eligible under NRHP/CRHR Criterion C/3 as both a contributing element of the larger water system, and as an individual property.

NRHP Criterion D: Have yielded, or may be likely to yield, information important in history or prehistory.

CRHR Criterion 4: Has yielded, or may be likely to yield, information important in prehistory or history.

Archaeological survey was not conducted for this project. At this time there is no indication that the Lower Otay Reservoir Complex has the potential to yield information important to state or local history. Therefore, the property is recommended not eligible under NRHP/CRHR Criterion D/4.

City of San Diego Significance Evaluation

Criterion A: Exemplifies or reflects special elements of the City's, a community's, or a neighborhood's historical, archaeological, cultural, social, economic, political, aesthetic, engineering, landscaping, or architectural development.

The Lower Otay Reservoir Complex reflects special elements of San Diego's historical development. Construction of the complex and the subsequent Lower Otay (Savage) Dam made a significant contribution to the history of water development in the San Diego region and was a milestone in the City's quest to achieve source water independence.

The complex also reflects special elements of San Diego's engineering development. The remains of the original Lower Otay Dam provide clues to how the dam was constructed and why it failed during the 1916 floods, a failure that resulted in the loss of property and life along the Otay River Valley. The Lower Otay (Savage) Dam embodies the distinctive characteristics of the curved gravity dam construction type, used and promoted by hydraulic engineer Hiram N. Savage. Gravity dams can have either a straight or a curved axis, and at the Lower Otay (Savage) Dam, Hiram N. Savage implemented the curved axis design, resulting in an arched gravity dam. Lower Otay (Savage) Dam is well preserved insofar as it is one of the five San Diego-area gravity dams, and has not been significantly altered beyond in-kind repairs since its construction. Other gravity dams, such as San Vicente Dam (1943), and Olivenhain Dam (2003), were subsequently altered. The concrete gravity dam design was promoted by hydraulic engineer Hiram N. Savage because, although more expensive, it required less land area and labor to complete than embankment dams. When competing for the design of Lower Otay Dam, Savage fiercely promoted concrete gravity dams against M. M. O'Shaughnessy's expensive embankment dam design and John S. Eastwood's riskier multiple arch dam design. In the end, the promised safety and economic advantages of the curved gravity dam design allowed the City of San Diego to award the position of Hydraulic Engineer and control of the Lower Otay (Savage) Dam project to Hiram N. Savage. Therefore, the subject property appears eligible under City Criterion A.

Criterion B: Is identified with persons or events significant in local, state, or national history.

Persons: Although the subject property does have connections to noted individuals, including E.S. Babcock, the Spreckels brothers, and Charles Hatfield who hold importance within the history of San Diego, the subject property is not connected with any of these individuals in a way that directly represents their contributions within the local historic context.

Events: As described in the NRHP/CRHR A/1 criterion discussion above, the Lower Otay Reservoir Complex is associated with events significant in local, state, and national history. Construction of the Morena-Barrett-Otay water project was a major undertaking in a remote part of San Diego that required significant planning and coordination, and was an important event at the time construction began. The complex is associated with the expansion of the City of San Diego Source Water System. The original Lower Otay Dam and the current Lower Otay (Savage) Dam were part of the Otay-Cottonwood watershed, which would ultimately become the primary supplier of water to San Diego. The subject property is directly associated with important events related to water development in the San Diego region, namely with the City gaining source water independence and being a critical component to the water infrastructure that supported the City's growth and development until the end of World War II. Therefore, the subject property appears eligible under City Criterion B.

Criterion C: Embodies distinctive characteristics of a style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship.

As described under NRHP/CRHR Criterion C/3 (see full discussion above), the Lower Otay (Savage) Dam embodies distinctive characteristics of the curved gravity dam construction type, used and promoted by hydraulic engineer Hiram N. Savage. The associated outlet tower and auxiliary spillway are contributing features to the Lower Otay Reservoir Complex, and the complex's period of significance is limited to its original year of completion in 1895 and the year of completion of the current dam in 1919.

Concrete gravity dams and arched gravity dams, in particular, were popular in the American West from the early twentieth century. Several grand-scale arched gravity dams exist in the United States, including the O'Shaughnessy Dam (1919-1923), Hoover Dam (1931-1936), Shasta Dam (1937-1945), and Glen Canyon Dam (1956-1966). Gravity dams are constructed of concrete or stone masonry and designed to hold back water by the weight of the dam material alone. Gravity dams can have either a straight or a curved axis, and at the Lower Otay (Savage) Dam, Hiram N. Savage implemented the curved axis design, resulting in an arched gravity dam. Lower Otay (Savage) Dam is well preserved insofar as it is one of the five San Diego-area gravity dams, and has not been significantly altered beyond in-kind repairs since its construction. Other gravity dams, such as San Vicente Dam (1943), and Olivenhain Dam (2003), were subsequently altered since their original construction. Therefore, the Lower Otay Reservoir Complex appears eligible under City Criterion C.

Criterion D: Is representative of the notable work or a master builder, designer, architect, engineer, landscape architect, interior designer, artist, or craftsman.

As described under NRHP/CRHR Criterion C/3 (see full discussion above), Barrett Dam represents a notable work of master engineer Hiram Newton Savage. Savage was hired by the City of San Diego in 1917 to work on designing and managing the rebuilding the Lower Otay Dam. After Lower Otay Dam was completed in 1919, Savage designed and managed construction of Barrett Dam. Barrett Dam and Lower Otay Dam are both concrete curved gravity dams, dam designs heavily promoted by Savage as safer, more cost-effective, and capable of greater storage capacity when compared to embankment dams such as earthen dams or rock-fill dams. Lower Otay Dam is an excellent and unaltered example of master engineer Savage’s concrete curved gravity dam design. Therefore, the subject property appears eligible under City Criterion D.

Criterion E: Is listed or has been determined eligible by the National Park Service for listing on the National Register of Historic Places or is listed or has been determined eligible by the State Historical Preservation Office for listing on the State Register of Historical Resources.

The Lower Otay Reservoir Complex is not known to be on any local, state, or national list of significant properties, nor is it known to have been determined eligible for listing on any register. Therefore, at this time the Lower Otay Reservoir Complex does not appear eligible under City Criterion E.

Criterion F: Is a finite group of resources related to one another in a clearly distinguishable way or is a geographically definable area or neighborhood containing improvements which have a special character, historical interest, or aesthetic value, or which represent one or more architectural periods or styles in the history and development of the City.

As described under NRHP/CRHR Criteria A/1 and C/3 (see full discussion above),the Lower Otay Reservoir Complex is significant for it role, function, and design within the larger City of San Diego Source Water System, of which it is a contributing resource to. The City of San Diego Source Water System includes ten (10) impounding reservoir complexes owned/operated by the City that function as part of the City’s municipal water-supply system. These resources and their related infrastructure (e.g., dams, outlet towers, conduits, flumes, and pipelines) constitute a finite group of resources related to one another in a clear way, steeped in historical interest and representative of significant engineering achievements. Taken as a whole, these resources (including the Lower Otay Reservoir Complex) are significant for their role in the City’s source water system, starting with the earliest efforts to establish privatized water in the 1880s soon followed by construction of the earliest reservoirs, Lake Cuyamaca (1887) and Sweetwater Reservoir (1888). The period of significance ends with construction of the San Diego Aqueduct, and the importation of Colorado River Water for the first time into the San Vicente Reservoir (1947), which forever changed the composition of City’s source water supply. Therefore, the Lower Otay Reservoir Complex appears eligible under City Criterion F.

Integrity Assessment

Overall, the Lower Otay Reservoir Complex retains integrity of location, design, materials, workmanship, and association. However, the complex does have a diminished integrity of setting and feeling.

Location: The complex retains integrity of location. The location of the Lower Otay Dam, at the site of the SCMWC's dam that was destroyed in 1916, and its status as the lowest reservoir location on the Morena-Barrett-Lower Otay system has been retained. The complex's location is highly important given the role of the location as the lowest reservoir of three in the Morena-Barrett-Lower Otay System, and therefore the feeder reservoir to the City of San Diego. The dam has never been shifted or relocated, and the complex retains its location relative to other reservoirs in the system.

Setting: The complex's setting has been diminished by subsequent developments along the shores of the reservoir. These developments including a City of San Diego water filtration plant (1970), the developments of a San Diego County parks site near the dam structure (1959), a commercial development at the reservoir head along Jamul Creek, the Chula Vista Olympic Training Center (1995), and the encroaching suburban development of Eastlake neighborhoods in Chula Vista (1994-2005), which has subsequently developed most of the western shore of Lower Otay Reservoir. Therefore, the complex has a diminished integrity of setting.

Design: Lower Otay (Savage) Dam, outlet tower, and auxiliary spillway retain integrity of design. Though there have been minor repairs to all structures, there are no significant alterations or incompatible departures from Savage's design. The dam still operates as intended and originally designed, as an curved gravity dam. Therefore, the complex as a whole retains the requisite integrity of design.

Materials: Similarly, the dam and associated engineering structures retain integrity of materials. No new materials have been introduced to the dam, outlet tower, or auxiliary spillway. All minor repairs have been completed with in-kind materials. The remains of the original Lower Otay Dam, however, no longer retain integrity of materials; although some of the concrete and steel sheets remain, the majority no longer exist and the rockfill overburden is non-existent. While, the original dam materials have been significantly compromised and lost with the construction of the current dam, the current dam retains its integrity of materials.

Workmanship: The Lower Otay Dam and associated engineering structures retain integrity of workmanship. The evidence of the craftsmanship of the workers who built the dam is evident in the still-visible concrete board forms on the dam, auxiliary spillway, and outlet tower. For reasons similar to the materials aspect, the remains of the original Lower Otay Dam no longer retain integrity of workmanship; although some of the concrete and steel sheets remain, the majority no longer exist and the rockfill overburden is non-existent. While, the original dam's workmanship is no longer intact, the current dam retains its integrity of workmanship.

Association: The dam, outlet tower, auxiliary spillway, and associated features and buildings retain integrity of association. They were designed, built, and operated by City employees for the purpose of supplying water to the City of San Diego. The association to the City of San Diego is especially strong insofar that the dam still operates as intended by the City as it did the day it was dedicated in 1919. The remains of the original Lower Otay Dam retain their association with the 1916 flood and the siting of the newer Lower Otay (Savage) Dam. Therefore, the Lower Otay Reservoir Complex retains integrity of association.

Feeling: The Lower Otay Reservoir Complex no longer retains integrity of feeling. The modern development on the shore of the reservoir and within sight of the dam structure reduce the original feeling of an early-twentieth century dam and reservoir operating as an extension of the City of San Diego outside of city limits. With Chula Vista neighborhoods encroaching on the eastern shore and the increasing visual and physical disturbance of modern development, the feeling of a remote site can no longer be conveyed. Therefore, the integrity of feeling is significantly diminished.

***B12. References:**

Andrus, Patrick W. and Rebecca H. Shrimpton. 2002. "How to Apply the National Register Criteria for Evaluation." Bulletin 15. U.S. Department of the Interior, National Park Service. Accessed July 1, 2018. https://www.nps.gov/nr/publications/bulletins/pdfs/nrb15.pdf

BOR (Bureau of Reclamation). 2018. "Projects and Facilities." *Reclamation: Managing Water in the West.* Accessed July 12, 2018. https://www.usbr.gov/projects/facilities.php?type=Project

City of San Diego. 1919. *Feature History Lower Otay Dam*, Volumes 1–4. Report. San Diego, California: City of San Diego. On file at the City of San Diego Public Utilities Department Archives, Book Box 3.

City of San Diego. 1925. "Comfort Station. Lower Otay Reservoir." Drawing set 1651 L. February 1925. On file at the City of San Diego Public Utilities Department Archives.

City of San Diego. 1957. "Lease Agreement." Book 6777, page 591. On file at the City of San Diego Public Utilities Department Archives.

City of San Diego. 1969. "Grant Deed and Option to Purchase Real Property." San Diego, CA: County Recorder. On file at the City of San Diego Public Utilities Department Archives.

Concrete. 1922. "Build Dam Against Rising Water." Clipping on file at the San Diego Public Utilities Department Archive.

Crawford, Richard. 2011. *The Way We Were in San Diego*. Charleston, South Carolina: History Press.

Evening Tribune. 1923. "Leaks in Otay Dam Are Said Trifling." Genealogybank.com: *The Evening Tribune* (San Diego, CA), June 15, 1923, pg. 10.

Evening Tribune. 1925. "Notice." Genealogybank.com: *The Evening Tribune* (San Diego, CA), June 6, 1925, pg. 31.

Evening Tribune. 1928. "S.D. County Dams Safe, Report of Engineers Following Inspection." Genealogybank.com: *The Evening Tribune* (San Diego, CA), May 22, 1928, pg 18.

Evening Tribune. 1934. "City Hall Notes." Genealogybank.com: *The Evening Tribune* (San Diego, CA), April 30, 1934, pg. 6.

Fowler, L. 1953. "A History of the Dams and Water Supply of Western San Diego County." Thesis; University of California. On file at the City of San Diego Water Utilities Department Archives.

Hennessey, Gregg. R. 1978. "The Politics of Water in San Diego 1895-1897." *The Journal of San Diego History,* Summer 1978, 24(3). Accessed June 2018. http://www.sandiegohistory.org/journal/1978/july/water/.

Hill, Joseph. 2002. "Dry Rivers, Dammed Rivers and Floods: An Early History of the Struggle Between Droughts and Floods in San Diego" *The Journal of San Diego History,* Winter, 2002, 48. Accessed June 2018. https://sandiegohistory.org/journal/2002/january/hill-2/.

Los Angeles Times (LAT). 1896. "San Diego County." *Los Angeles Times.* Feb 15, 1896. Page 13. Accessed on May 11, 2018 on Newspapers.com.

LAT. 1922. "City to Employ Special Engineer." *Los Angeles Times*. May 30, 1922. On file at the San Diego Public Utilities Department Archive.

LAT. 1930. "Conservation and Control: The Romance of Dam Building in the Southwest." *Los Angeles Times*. January 1, 1930. Clipping on file at the San Diego Public Utilities Department Archive.

LAT. 1989. "State Funds Sought For Olympic Training Center in Chula Vista." Newspapers.com: *The Los Angeles Times* (Los Angeles, Ca), April 11, 1989, pg 34.

Martin, John. 2017. *Images of America: The Dams of Western San Diego County.* Arcadia Publishing. Charleston, South Carolina. 2017.

McGrew, Clarence Alan. 1922. "City of San Diego and San Diego County: The Birthplace of California," Volume II. Chicago, Illinois, and New York, New York: The American Historical Society. Accessed June 2018. https://ia800200.us.archive.org/8/items/cityofsandiegosa01mcgr/cityofsandiegosa01mcgr.pdf.

Meixner, G. Donald. 1951. "Historical Development of Water Utilization." Draft. On file at the San Diego Public Utilities Department Archive.

Ormsby, Burke. 1966. "The Lady Who Lives by the Sea." *The Journal of San Diego History* 12(1). Accessed June 2018. http://sandiegohistory.org/journal/1966/january/ladybysea/.

Pyle, Fred D. 1944. "Contract Documents Including Notice to Contractors, Instructions to Bidders, Proposal, Contract, Drawings and Specifications: Pumphouse for the Otay Pumping Plant; Cottage and Garage at the Otay Pumping Plant." San Diego, CA: City of San Diego Water Department. On file at the City of San Diego Public Utilities Department Archives.

Pyle, Fred. D. 1945. "Proposed Otay Recreation Center." Drawing. October 1945. On file at the City of San Diego Public Utilities Department Archives.

San Diego History Center. 2018a. "Biography: John D. Spreckels (1853-1926)." Accessed June 2018. http://www.sandiegohistory.org/archives/biographysubject/spreckels/.

San Diego History Center. 2018b. Photograph Collection Accessed In Person 2018.

San Diego Sun (SDS). 1917a. "Otay Dam is Jinx of City." *San Diego Union.* September 20, 1917. On file at the City of San Diego Public Utilities Department Archives.

SDS. 1917b. "Otay Dam Contract Is Cause of Warm Debate Before the Councilman." *San Diego Sun.* September 22, 1917. On file at the City of San Diego Public Utilities Department Archives.

SDS. 1919a. "Otay Dam Is Riding Rapidly: City Water System Plan Told." *San Diego Sun.* March 31, 1919. On file at the City of San Diego Public Utilities Department Archives.

SDS. 1919b. “Water Development Plans in San Diego Are Under Way: Plans Laid to Inspire A Great Supply of Water, To Serve Thousands Here.” *The San Diego Sun,* April 29, 1919. On file at the City of San Diego Public Utilities Department Archives.

SDS. 1923. “Leaks Found in Lower Otay Dam; City Water Engineer Savage Fired.” *The San Diego Sun*, June 15, 1923, pg. 1.

San Diego Union (SDU). 1894. “The Big Explosion.” Genealogybank.com: *San Diego Union* (San Diego, CA), October 11, 1894, pg 5.

San Diego Union (SDU). 1895a. “Water, the Great Essential.” Genealogybank.com: *San Diego Union* (San Diego, CA), January 1, 1895, pg 2.

SDU. 1895b. “Mt. Tecarte Sites. First to be Inspected by the Joint Water Committee.” *San Diego Union.* June 13, 1895.

SDU. 1895c. “Preparations for Next Big Blast-Indications of Gold.” Genealogybank.com: *San Diego Union* (San Diego, CA), August 29, 1895, pg 6.

SDU. 1897. “Russell-Haines.” Genealogybank.com: *San Diego Union* (San Diego, CA), March 1, 1897, pg 5.

SDU. 1917a. “City Authorized to Construct Dam.” *San Diego Union.* August 3, 1917. On file at the City of San Diego Public Utilities Department Archives.

SDU. 1917b. “Terms of Contract Call for Structure Completion by End of 1918.” *San Diego Union.* November 27, 1917. On file at the City of San Diego Public Utilities Department Archives.

SDU.1918. “H.N. Savage Holds Brilliant Record for Past Work.” *San Diego Union.* January 1, 1918. On file at the San Diego Public Utilities Department Archive. .

SDU. 1919a. "Otay Dam is Dedicated as Link in San Diego’s Extended Water System." *San Diego Union* (San Diego, CA), September 2, 1919. On file at the City of San Diego Public Utilities Department Archives.

SDU. 1919b. "Completion of Work Celebrated at Otay Dam." Genealogybank.com: *San Diego Union* (San Diego, CA), September 4, 1919, pg 8.

SDU. 1922. “Rainfall Heavy in Cuyamacas; Light on Levels.” Genealogybank.com: *San Diego Union* (San Diego, CA), December 18, 1922, pg 11.

SDU. 1927. “Mayor, Council to Hold Savage-Session Today.” *San Diego Union.* June 14, 1927. On file at the San Diego Public Utilities Department Archive.

SDU. 1930. “San Diego Moves to Increase its Water Supply.” Genealogybank.com: *San Diego Union* (San Diego, CA), February 16, 1930, pg 1.

SDU. 1933. “In San Deigo Water Supply History Was Otay Dam Hoax Melodrama, Comedy, or $2,610,000 Tax Tragedy?” Genealogybank.com: *San Diego Union* (San Diego, CA), may 22, 1933, pg. 9.

SDU. 1934. “Council Changes Lower Otay Dam’s Name to Honor Hiram Newton Savage.” Genealogybank.com: *San Diego Union* (San Diego, CA), July 10, 1934, pg. 3

SDU. 1934. “H.N. Savage, City Dam Builder, Dies on Duty In San Diego Service” *San Diego Union*. June 25, 1934. Accessed July 11, 2018 from geneologybank.com

SDU. 1944. “New Pumps To Increase San Diego Water Supply.” Genealogybank.com: *San Diego Union* (San Diego, CA), September 26, 1944, pg. 11.

SFC. 1895. “San Diego Improvements.” October 28, 1895. Accessed on May 11, 2018 from newspapers.com.

SFC. 1896a. "Water for San Diego; Voters of the Southern Town to Ballot Upon the Proposed Purchase of a Complete System." Thursday, March 17, 1896. Pg 4.

SFC. 1896b. "San Diego Gains a Water System." Sunday, June 28, 1896. Pg 6.

SFC. 1896c. "Water for San Diego; The Construction of the New System Will Be Commenced at Once." Monday, June 29, 1896. Pg 3.

SFC. 1896d. "San Diego Ballots Counted; City Fathers Announce a Majority for the Bond Issue-Work on the Water System." Tuesday, June 30, 1896. Pg 4.

SFC. 1896e. "San Diego's Great Irrigation Scheme." Sunday, July 19, 1896. Pg 24.

Savage, H. N. 1922. "Otay Reservoir-San Diego Second Main Conduit. Plan to Bonita Wye." Map. December 1922. On file at the City of San Diego Public Utilities Department Archives.

Savage, Hiram N. 1932. "Drawings, El Capitan Reservoir Dam, Spillway, and Outlet Works." City of San Diego, California: Bureau of Water Development. On file at the San Diego Public Utilities Department Archive.

Scientific American. 1923. "A Rush Job In Dam Construction." *Scientific American* April 1923. On file at the San Diego Public Utilities Department Archive.

Sholders, Mike. 2002. "Water Supply Development in San Diego and a Review of Related Outstanding Projects." *The Journal of San Diego History*, Winter 2002, 48(1). Accessed June 2018. http://sandiegohistory.org/journal/2002/january/sholders/.

Smythe, William Ellsworth. 1908. "History of San Diego (1542–1908)." In *An Account of the Rise and Progress of the Pioneer Settlement on the Pacific Coast of the United States*, Volume II, *The Modern City*. San Diego, California: The History Company. Accessed June 2018. https://ia902300.us.archive.org/26/items/historyofsandieg02smyt/historyofsandieg02smyt.pdf.

TET (The Evening Tribune). 1934. "Savage Still at Work in Interest of City When Heart Ends Task" *The Evening Tribune*. June 25, 1934. Accessed July 11, 2018 from geneologybank.com. The Star-News. 1995. "Training Complex Gives Chula Vista Major Olympic Role." Newspapers.com: *The Star-News* (Chula Vista, California), June 14, 1995, pg. A-1.

Tuthill, Barbara. 1954. "Hatfield the Rainmaker." *Western Folklore* 13(2): 107–112. Berkeley, California: University of California Press. On file at the City of San Diego Public Utilities Department Archives, Box 31, folder 30.

UCSB. 2018. Aerial image of Savage Dam and Lower Otay Reservoir. Image ID: cas-sd_5-178, April 7, 1964. Accessed July 16, 2018. http://mil.library.ucsb.edu/ap_indexes/FrameFinder/

USGS (United States Geological Survey). 1918. "Southern California Floods of January 1916." *Water Supply Paper 426*. Washington D.C. Government Printing Office. Accessed July 12, 2018. https://pubs.usgs.gov/wsp/0426/report.pdf

Water Department Inventory. 1912. Inventory of Southern California Mountain Water Company as Purchased By City of San Diego on August 15, 1912. On file at the San Diego Public Utilities Department Archive.

WRCA (Water Resources Collections and Archives). 2005. "Biographical summary: Hiram Newton Savage, M. Am. Soc. C. E." Hiram N. Savage papers collection, Water Resources Collections and Archives, University of California, Riverside. Accessed July 12, 2018. http://pdf.oac.cdlib.org/pdf/ucr/wrca/savagehn.pdf

White, Almira Larkin. *Genealogy of the Descendants of John White of Wenham and*

Lancaster, Massachusetts. Vol. 3, Chase Brothers, Printers, 1900. Accessed July 11, 2018 via https://books.google.com/books?id=gKZbAAAAMAAJ&pg=PA72&dq=Hiram+Newton+Savage&hl=en&sa=X&ved=0ahUKEwjm0fHrm5jcAhWr54MKHdeRCekQ6AEIMTAC#v=onepage&q=Hiram%20Newton%20Savage&f=false

State of California ♁ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3B; 3CB, 5B

Other Listings
Review Code Reviewer Date

Page 1 **of** 27 ***Resource Name or #:** (Assigned by recorder) Upper Otay Reservoir Complex
P1. Other Identifier:

*__P2. Location:__ ☐ **Not for Publication** ■ **Unrestricted**
***a. County** San Diego **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad** Jamul Mountains **Date** 1994 **T** 17S **; R** 1W **;** San Bernardino **B.M.**
c. Address 12161 Otay Lakes Road City Chula Vista Zip 91914
d. UTM: (Give more than one for large and/or linear resources) Zone 11S , 506385 mE/ 3612412 mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
Lat/Long: 32°38'57.5"N 116°55'54.9"W

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
The Upper Otay Reservoir Complex is located on the north side of Otay Lakes Road. Wueste Road goes north from Otay Lakes Road to the western side of the complex. The dam is a board formed poured concrete reinforced-concrete arch type with stepped tiers on the downstream side and a smooth board formed upstream face. The crest measures approximately 260 feet wide with a 6-foot-thickness at the crest walkway. The dam sits approximately 84 feet above the streambed in total height. The dam's thickness contours with the streambed and maintains about a 40-foot height. The dam is constructed at stair-stepped increments. Each step creates a 2-foot lip, making the base of the dam approximately 40 feet wide.
(See Continuation Sheet)

***P3b. Resource Attributes:** (List attributes and codes) HP11. Engineering structure; HP21. Dam; HP22. Reservoir

***P4. Resources Present:** ☐ Building ■ Structure ☐ Object ☐ Site ☐ District ■ Element of District ☐ Other (Isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)

P5b. Description of Photo: (view, date, accession #) Upper Otay Dam, view to north, IMG 9541

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
1902 (SDU 1902)

***P7. Owner and Address:**
Public Utilities Dept.
City of San Diego
9192 Topaz Way
San Diego, CA 92123

***P8. Recorded by:** (Name, affiliation, and address) Sarah Corder, MFA
Dudek
605 Third Street
Encinitas, CA 92024

***P9. Date Recorded:** 5/16/2018

***P10. Survey Type:** (Describe)
Pedestrian

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")
Dudek. 2020. City Of San Diego Source Water System Historic Context Statement.

***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 27 ***Resource Name or #** (Assigned by recorder) Upper Otay Reservoir Complex
***Map Name:** Jamul Mountains, USGS 7.5' Quad ***Scale:** 1:24,000 ***Date of map:** 1994

DPR 523J (Rev. 1/1995)(Word 9/2013) ***Required information**

State of California ♁ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
Primary #
HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) Upper Otay Reservoir Complex ***NRHP Status Code** 3B; 3CB, 5B

B1. Historic Name: Upper Otay Dam and Reservoir
B2. Common Name:
B3. Original Use: Municipal water source B4. Present Use: Municipal water source
***B5. Architectural Style:** Arch Dam
***B6. Construction History:** (Construction date, alterations, and date of alterations)

Upper Otay Reservoir Complex was constructed in 1902

***B7. Moved?** ■No ☐Yes ☐Unknown **Date:** **Original Location:**
***B8. Related Features:**

B9a. Architect: Elisha Spurr Babcock Jr. (engineer) b. Builder:
***B10. Significance: Theme** Early Water System Development **Area** San Diego
Period of Significance A: 1887-1916; B: 1896-1922; C: 1902
Property Type Dam **Applicable Criteria** NRHP/CRHR: A/1, B/2, C/3; City: A, B, C, D, F
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Historic Context

(See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)
***B12. References:**
(**See Continuation Sheet)**

B13. Remarks:

***B14. Evaluator:** S. Corder, MFA and N. Frank, MSHP

***Date of Evaluation:** June 30, 2020

(This space reserved for official comments.)

(Sketch Map with north arrow required.)

***P3a. Description: (continued)**

The western and eastern edges of the dam are fenced off with chain-link and topped with concertina wire (Figure 1). The overall design of the dam is an arch and covered in contemporary graffiti.

Figure 1. Upper Otay Dam view to east showing walkway fence, IMG_9387

The spillway extends form the eastern side of the dam and heads south. The spillway is approximately 20 feet wide and 190 feet long (Figure 2). The spillway curves around the eastern end of the dam, connecting the upstream and downstream without actually crossing the dam. The upstream side of the spillway extends 60 feet from the approximate end of the dam. The spillway extends 130 feet to the south, downstream of the dam. The walls of the channel are approximately 5 feet tall at their tallest point and taper to approximately 4 feet at the southern end.

Figure 2. Upper Otay Dam spillway view looking north, IMG_9545

The water underpass consists of two poured concrete enclosed passages measuring approximately 15 feet square, by a length of approximately 40 feet as it traverses (NW/SE) under Otay Lakes road, to allow water to flow into Lower Otay Reservoir (Figure 3).

Figure 3. Upper Otay Dam underpass view looking south, IMG_9346

***B10. Significance: (continued)**

While early attempts were made at developing an organized water system in San Diego during the second half of the nineteenth-century, the development of reliable water infrastructure throughout the region did not begin in earnest until the 1880s, as a result of a significant population boom. San Diego County population swelled from 8,600 residents in 1880 to over 30,000 residents by 1887. Developers and land speculators emerged throughout the region, looking to capitalize on San Diego's rapid growth. During this period over 50 private water companies formed, all with the same goal of being the first to supply the region with a reliable water supply. These companies worked to design, construct, and implement water conveyance projects as quickly as possible, with some successes and many failures (Fowler 1953; Hill 2002; Meixner 1951).

To address the ongoing water needs, the City entered into agreements with other water companies, including the Southern California Mountain Water Company (SCMWC). The SCMWC was formed by Elisha Spurr Babcock and the Spreckels brothers in 1894, when they consolidated several water companies that included the Otay Water Company and the Mount Tecarte Land and Water Company. Through the SCMWC, Babcock envisioned an ambitious system that would provide sufficient water to the City and surrounding region. The planned system would be established along the Otay-Cottonwood watershed, beginning with the construction of the Morena Dam and following downstream with the Upper and Lower Otay and Barrett. From this point, water would be piped via a network of conduits throughout the region (Crawford 2011; Fowler 1953; Hennessey 1978; LAT 1896; McGrew 1922; Ormsby 1966; San Diego History Center 2018a, 2018b; Smythe 1908; SDU 1895a).

The Upper and Lower Otay Dams were constructed primarily to provide irrigation water to nearby farms. The Upper Otay specifically served as a reservoir for storage and not as a catchment basin from streams flowing into the Upper Otay reservoir (Figure 4). There were no large streams running into or through the Upper Otay reservoir and consequently no drainage of vegetable or other matter into it. The strategic installation of the dam ensured that the water remained free of sediment from floods at all times, and flowed clearly through the main pipeline. The main pipeline terminated across the San Diego River at a location near La Jolla, where the elevation was 540 feet. (SDU 1895a, 1895b; Fowler 1953).

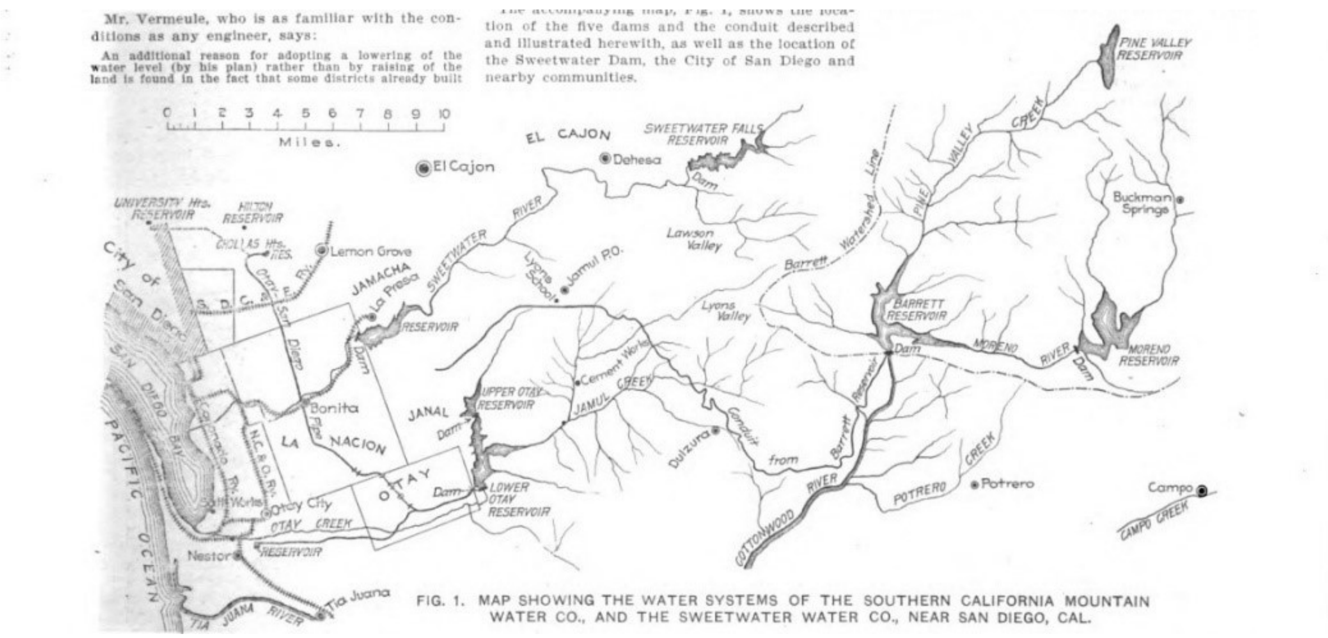


Figure 4. Map of SCMWC system, including Upper Otay (Engineering News 1904)

The reservoir formed as a result of the construction of the Upper Otay Dam and had a capacity of 650,000,000 gallons. The adjoining watershed of 8 square miles was insufficient to fill the reservoir completely. For years following the completion of the dam in 1900, the reservoir was not filled and the dam was not subject to the full water pressure it was designed to resist. The intention was to fill the reservoir from another storage basin at a higher level using a conduit. The conduit led from the Upper Otay Dam to the Lower Otay Reservoir and consisted of a pipe that was built into the dam itself through which water was drawn into the river channel near the upper end of the lower reservoir (Wegmann 1922).

Phase 1: Construction of Upper Otay Dam (1896-1901)

Work began on the Upper Otay Dam in 1896 with the construction of a masonry foundation 34 feet above bedrock. The project stopped for several years, until construction of the dam resumed in 1900 and was completed a year later at the cost of $80,000 (CSD 1943). The Upper Otay Dam was patterned after the Bear Valley Dam in the San Bernardino Mountains, and was selected by E. S. Babcock, President of the SCWC, and an instrumental figure in the development of the dam (Figure 5). The engineers in charge of constructing the dam and reservoir were C. M. Bose and H. N. Savage, who served as consulting engineer for the SCMWC beginning in 1893 (EN 1916; SDU 1900b).

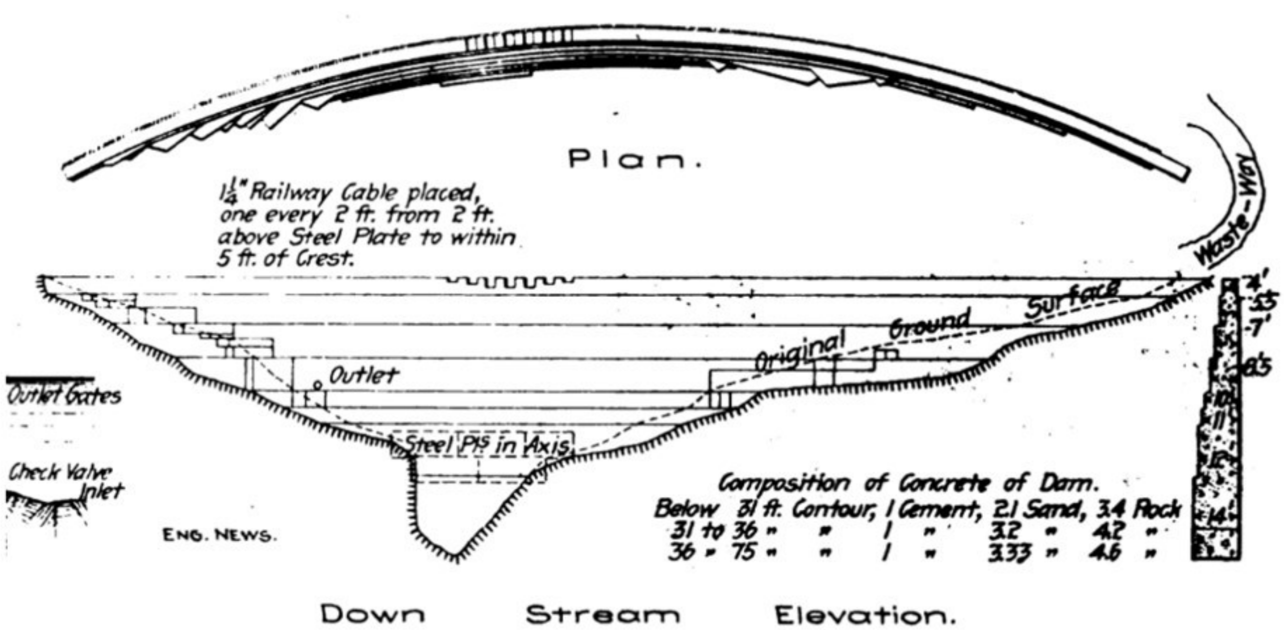
Figure 5. Portrait, Elisha Spurr Babcock (findagrave.com)

During the second round of construction on the Upper Otay Dam, the SCMWC employed a force of 55 men (Figure 6). Blasting to create the dam could be heard as far away as La Mesa and Lemon Grove (SDU 1900a). Only two months later, more than 150 men (including 40 Native Americans) were employed by the SCMWC in order to increase the pace of construction (SDU 1900b).

Figure 6. Upper Otay Dam under construction in 1900 (M.M. O'Shaughnessy photograph collection, NUI Galway Digital Collections)

The dam is a reinforced-concrete arch type constructed across a 20 foot-wide gorge on the west fork of the Otay Creek on Proctor Creek, a tributary of the Otay River. The location was chosen so that when the Lower Otay Reservoir was full, the water surface would reach the toe of the Upper Otay Dam. Edward Wegmann, who studied dams throughout the world, said of the Upper Otay Dam that "considering its height, the dam is one of the boldest structures of its kind" (Figure 7). The dam measured approximately 260 feet across the canyon, a maximum height of 84 feet above bedrock, and 4 feet thick at the top and 14 feet thick at its base. (SDU 1895b; Wegmann 1922; Fowler 1953).

CONTINUATION SHEET



CORE FIG. 10. PLAN, ELEVATION AND DETAIL OF UPPER OTAY CONCRETE DAM, WITH STEEL PLATES AND CABLES, AS INDICATED.

Figure 7. Drawing of Upper Otay Dam (Engineering News 1904)

The Upper Otay Dam owed its stability to the gentle curvature and reinforcement of its design, and steel plate and railway cable reinforcement of its upper segments. It formed a very flat, wide arch for such a thin structure, a shape that considerably reduced structural stress from water pressure throughout the design. Stepped offsets on the downstream side of the dam helped strengthen its construction. Additionally, the lowest 25 feet of the dam were too narrow to be susceptible to the kinds of structural stress that could crack concrete spanning larger widths (EN 1916; Wegmann 1922).

The Upper Otay was described upon completion as "the highest-stressed arch dam in existence" (EN 1904). The dam's plan was curved to a radius of 359 feet and its length at the crest was 350 feet. The first 34 feet of the dam was built as an ordinary masonry dam. Above the masonry level, the dam was reinforced by two parallel layers of steel plates, set upright longitudinally in the vertical access of the dam, following along with the dam's curvature. Above the steel plates set in the concrete were 1 ¼ inch railway cables which were placed vertically in the concrete, at intervals of 2 feet, reaching within 5 feet of the top crest. The steel plates were presumably set longitudinally at the axis to ensure water-tightness (Figure 8) (EN 1904, 1916).

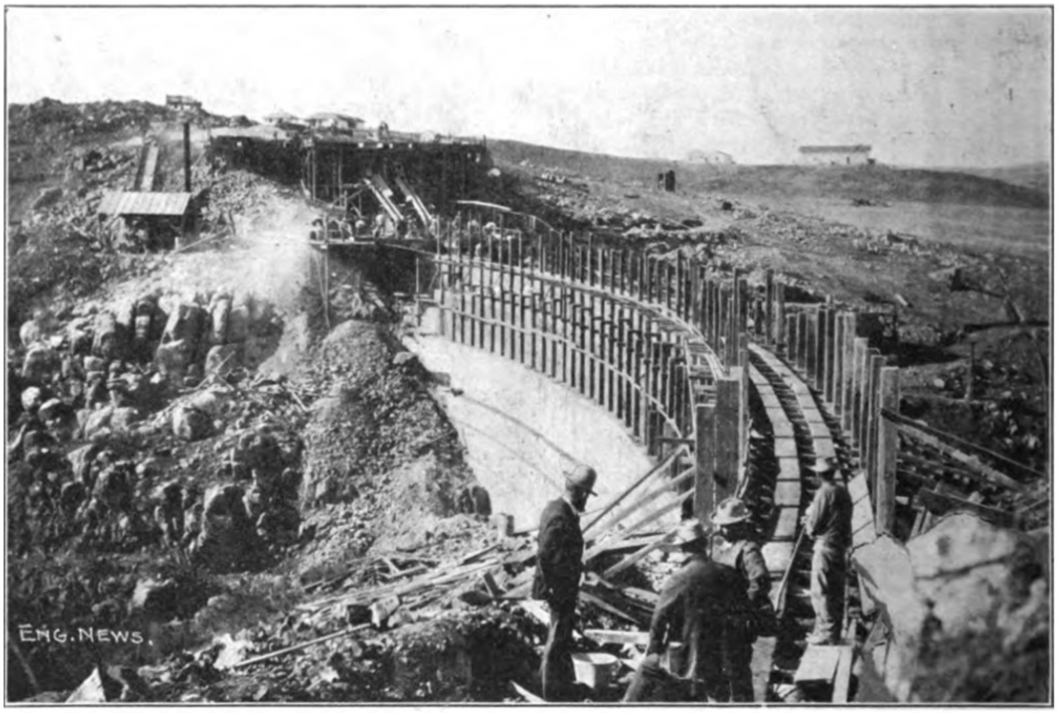


FIG. 11. VIEW OF UPPER OTAY CONCRETE DAM UNDER CONSTRUCTION.

Figure 8. Construction of Upper Otay Dam (Engineering News 1904)

The spillway consisted of a series of seven overflow notches, of varying height, at the center of the dam and a side channel (Figure 9). The crest of the spillway was 5 feet below the crest of the dam. The capacity at the spillway elevation was about 2,000 acre-feet, while the combined capacity of the dam and spillway was 3,460 acre-feet. (Wegmann 1922; Fowler 1953).

Figure 9. Completed Otay Dam with Babcock's country home indicated by red arrow (H.S. Savage Files, UC Riverside)

Phase 2: Alterations and Post-construction Development, 1905-1980s

Most of San Diego's private water companies failed to survive the drought of 1895-1904 and disappeared by 1905. Realizing the need to gain better control of its infrastructure, the City began purchasing holdings of the SDWC and the SCMWC that were within the City limits. Such holdings included reservoirs, pumping plants and machinery, pipelines, buildings, and tools. The City also began constructing its own facilities and infrastructure to meet increasing demand (Fowler 1953).

On August 13, 1906, the City reentered into a contract with the SCMWC for water supply of up to 7,776,000 gallons per day at the price of 4 cents per 1,000 gallons from the Chollas Reservoir. In 1906, Babcock and Spreckels hired famed engineer Michael Maurice O'Shaughnessy to serve as chief engineer for the SCMWC and oversee completion of the Morena Dam and Dulzura Conduit despite tensions within the company (SNAC 2015; Smythe 1908).

Tensions between Babcock and Spreckels, 1905-1906

The construction of the Upper Otay Dam and consequent creation of the Upper Otay Reservoir created tension between business partners J.D. Spreckels and E.S. Babcock Jr. Between 1905 and 1906, several lawsuits were filed on behalf of both partners. In a lawsuit filed in December 1905 against E.S. Babcock Jr. and his son, Graham E. Babcock, J.D. Spreckels & Bros. Company alleged that Babcock was indebted $2,125.37 to Spreckels for goods, wares, merchandise, and tools, as well as the use and rental of personal property leased by the plaintiff to the defendant between February 1904 and July 1904 (SDU 1905).

The construction of the Upper Otay Dam partially caused this rift. According to a 1906 hearing with J. D. Spreckels Jr., he was unhappy with the way the SCMWC was headed under Babcock's leadership:

> I told him I was dissatisfied with the way things were running, and called special attention to the building of the Upper Otay dam, telling him it was foolishness to throw away $30,000 in building that when it was a tributary to the Lower Otay. I also spoke about his inviting through the public press people to come up there and shoot ducks with him, and all done at the expense of the Southern California Mountain Water Company in the way of shells and for entertainment. (SDU 1906a)

Spreckels was told by Babcock that the water from the Upper Otay Dam could reach lands that could not be touched by the Lower Otay Dam. Spreckels did not visit the site until after the completion of the dam and told Babcock "that it was a useless expenditure" (SDU 1906a). It was noted in Babcock's obituary that:

> The Upper Otay dam was built by Babcock more especially as an improvement on the ranch property there when he developed it as a country home and hunting reserve, entertaining there many prominent men of the east(ET 1922).

This called Babcock's intentions further into question, and the led to speculation that he constructed the Upper Otay Dam for the benefit of himself rather than the City.

In his 1906 hearing, Spreckels also stated that the Upper Otay Dam "simply prevented the water going to the Lower Otay and gives a greater surface for evaporation" (SDU 1906a). The result of this lawsuit was that the two businessmen offered to buy each other out of the SCMWC and neither accepted. Mr. Spreckels was offered $700,000, while Mr. Babcock was offered $490,000 for his shares. The greater part of the $490,000 offered to buy out

Babcock was compensation for the debt owed by him to Spreckels (SDU 1906a).

Eventually, a settlement was reached later that year wherein all of E.S. Babcock Jr. and Graham E. Babcock's interests in the SCMWC would be purchased by J.D. Spreckels & Bros. Company. As a result, all litigation between the contending interests was dismissed, leaving the Spreckels brothers in full ownership and control of the company. E.S. Babcock said, "The dealing has been perfectly friendly and amicable, and the ending has been satisfactory, so far as I am concerned" (SDU 1906b). An additional part of the deal allowed for Babcock to retain exclusive rights to the hunting and fishing at the Upper Otay Reservoir. This was the last of the interests Babcock held with the Spreckels companies. Afterwards, he devoted most of his time to the development of San Diego's railway system (SDU 1906b).

Purchase by City of San Diego, 1912-1913

In August 1912, the City voted on a bond issue of $2,500,000 to purchase the Otay Lakes, as well as the Barrett intake, dam, and reservoir site; Dulzura Conduit; and Chollas Reservoir System from the SCMWC (Fowler 1953). The purchase was effective on February 1, 1913. Babcock wrote a statement that the council should be commended for having obtained such favorable terms from the SCMWC:

> By 1915 we will have at least 100,000 people. This increased population will need more water or else they will leave here and go to Los Angeles. So I think our only recourse is to buy out the system of the Southern California Mountain Water company, as it is cheap at the price offered for four million dollars… I have no interest whatever professionally in the matter, or I do not own a dollar in this system, but I know what it cost, what its influence has been on the growth of San Diego and realize that the best interests of the citizens will be served by municipal ownership(SDU 1912).

The impounding capacity of the system purchased was 29,180,000,000 gallons total. By purchasing this system, the City of San Diego assumed a servitude to supply water to the Coronado Water Company. In 1913, the sum of $705,000,000 was voted to improve the water system which would add an impounding capacity of 15,000,000 gallons and a further delivering capacity of filtered water by gravity of 7,250,000 gallons daily (Fowler 1953; FWE 1914).

In 1914, the City agreed to purchase the Morena Dam at a fixed price following a 10-year lease, solidifying its ownership of all portions of the former SCMWC. The owners of the company incurred a large profit by selling the system to the City, instead of the loss they would have incurred by selling water for the full ten-year term of the contract.

For the time being, it seemed that the City had addressed its immediate and long-term water problems. Population growth more than doubled from 17,700 in 1900 to over 39,500 in 1910, and water was relatively plentiful. However, the drought that struck San Diego in 1912 once again brought water security fears to the fore (Fowler 1953).

The Flood of 1916

The drought that started in 1912 significantly worsened by 1915. Most of the water stored in the region's dams was replenished by captured rainfall, so without rain, the reserves diminished quickly (Hill 2012). The City's solution to their drought problem was Charles Hatfield (1875–1958), a Kansas native and transplant to Southern California who was a self-proclaimed "moisture accelerator." Hatfield dedicated himself to rainmaking, inspired by the terrible years of drought near the end of the nineteenth century. His technique involved the mixing of a secret chemical compound, which he claimed attracted/extracted rain. Between 1899 and 1912, Hatfield traveled to Alaska and throughout Central California peddling his rainmaking abilities (Perry 2015; Tuthill 1954).

On January 5, 1916, a good rain was reported at Morena Reservoir, enabling 48.5 million gallons of water to be impounded (Patterson 1970). Between January 10 and 18, 1916, additional rain fell on San Diego and the surrounding area (Patterson 1970). On January 27, a third storm hit, bursting open the Lower Otay Dam and flooding the Otay Valley. Despite an overflow of three feet during the height of the flood, the Upper Otay Dam did not fail. The placement of sandbags along the crest of Upper Otay Dam was credited as one of the reasons the dam did not fail like its lower counterpart (Fowler 1953).

The storms caused the San Diego River to overrun its banks and spread across Mission Valley. Nearby infrastructure, including rail lines and bridges, was also destroyed. Local train services were halted for over a month. Highways and telegraph and telephone lines were also cut off. The only means of transportation and communication was by sea. Three days later, the Sweetwater Dam was overtopped by more than three feet and the canyon side walls began eroding away. Although the dam itself was undamaged, its abutments were breached and it was unable to retain water (Crawford 2011; Fowler 1953; McGlashan and Ebert 1918; Patterson 1970; Reynolds 2008; Tuthill 1954).

As a result of the 1916 floods, the Lower Otay Dam was a complete loss while the Upper Otay Dam required little repair. The floods left scars on the mountains and hills of San Diego County, and washed river channels down to bedrock. The hillsides were saturated with water and the soil gave way, resulting in mudslides. In addition, the pumping plants of the Coronado Water Company were destroyed, cutting off all water supplies from the Otay Valley. Nevertheless, water service was maintained through the City's pipeline under the bay with water from the system of the Cuyamaca Water Company (Fowler 1953).

The 1916 flood was a key turning point in the history of water development that inspired a critical water infrastructure boom for the City. This era of development was also motivated by the potential loss of seasonal rainfall and loss of infrastructure after a severe drought that almost ran water resources dry. The City began viewing potential rainfall losses from a financial standpoint, correlating missed opportunities for capturing rainfall with financial losses. Therefore, the City entered into a period of hyper-growth and development of existing and new water infrastructure starting in 1916. The Upper Otay Dam remained one of the earliest pieces of water infrastructure in San Diego's massive system. The only time that water is released from Upper Otay Reservoir to the Otay River downstream is when the reservoir fills up and overflows, which happened only seven times since 1917 (H & A 2018).

<u>Phase 3: Modern Changes, 1935-1980s</u>

Beginning in 1935, news reports focused less on the Upper Otay Dam and its effects on the City's water infrastructure and more on the Upper Otay Reservoir as a place for hunting and fishing. In 1943, County Fish and Game Officials in San Diego made the decision to stock the Lower Otay Reservoir with fish from the Upper Otay Reservoir. Officials stated that the fish in the Upper Otay Reservoir were starving from overcrowded conditions (SDU 1943). The reservoir use transitioned from an emergency water reserve for the Lower Otay Reservoir to a purely recreational lake in 1959, when it became a fish hatchery for imported Florida-strain largemouth bass. In May of 1959, a successful plant of 20,400 pure-strain Florida largemouth bass fry took place in the reservoir. The bass population flourished and the fish from the Upper Otay Reservoir were used to stock many other lakes in California. The reservoir was officially opened to the public for fishing in 1996, and closed to hunting at the conclusion of the 2002-2003 season (SDF 2018).

The Upper Otay Dam had its largest alteration in 1985 with the cutting of a 22-foot-deep trapezoidal slip. The slip was placed where the original seven overflow notches were at the center of the dam. There are no visual indications or historic records that any other modern changes were made to the Upper Otay Dam since its change of usage in 1959.

Engineer: Elisha Spurr Babcock Jr. (1848-1922)

Elisha Spurr Babcock Jr. was raised in Evansville, Indiana, and graduated from Evansville High School. After high school he began working for the Evansville and Terre Haute Railroad Company and quickly worked his way up to the position of general freight agent of the road by age 24. He left the railroad industry in order to help develop the Cumberland Telegraph and Telephone Company, a Bell subsidiary, which controlled a large territory from Evansville to New Orleans, while at the same time having sole ownership of the Eugene Ice Company. At this point in his life, Babcock had enough wealth to purchase five large houses and a number of agencies, in addition to being a partner in the firm of E.S. Babcock & Son. He married Isabella Graham (1850-1932), a native of Cincinnati, Ohio, and had two children, Arnold and Graham Babcock.

In 1884, Babcock retired to San Diego for his health, where he continued to advance his enterprises. In 1885, he and Hampton Story, purchased the property known as Coronado Beach, a tract of over 4,000 acres across the bay from the City of San Diego. The men organized the Coronado Beach Company, of which Babcock was president and active manager. The company soon laid out the City of Coronado, selling $2,750,000 worth of the area's property and with the profits from the land sale built the Hotel del Coronado. In 1886, Babcock created the San Diego and Coronado Ferry Company to accommodate the growing number of visitors to Coronado Island. Babcock and his three associates also built the water works for both Coronado and San Diego, the street railway lines, a railroad twenty-two miles long around San Diego Bay, an electric light plant, a shipyard, and many other enterprises (Coronado Historical Association 2020).

Bringing water to San Diego and Coronado was a high priority for Babcock, who persuaded John D. Spreckels to invest in a number of his organizations, including the SCMWC in 1895 (Smythe 1908). John D. Spreckels and A.B. Spreckels, sons of the sugar king Claus Spreckels, were also highly influential businessmen in the San Diego area. The three men became the sole owners of several enterprises developed by Babcock, and Spreckels eventually owned nearly half of Babcock's enterprises, yet he retained Babcock as his business manager (Hennessey 1978). In 1912, after completion of the Morena Dam, Babcock sold his interests to the Spreckels companies. Later, the City of San Diego took over the water system and continued its development (San Diego Union 1922).

As an engineer, the Upper Otay Dam is the only existing structure Babcock designed. Despite being patterned after the Bear Valley Dam engineered by John Eastwood, Babcock is given recognition with the dam constructed at the Upper Otay as his own creation (Jackson 1999). The rock fill Lower Otay Dam, also designed by Babcock, was destroyed in the 1916 flood. For the majority of his career Babcock functioned as an organizer or controller of corporations, which included the Cuyamaca Railway, the Los Angeles and San Diego Beach Railway (otherwise known as the La Jolla Line), the Western Salt Works, and the South San Diego Investment Company (San Diego Evening Tribune 1922b). Babcock died of a stroke in his office on October 8, 1922, at the age of 73.

Short list of Babcocks known engineering works:

- Upper Otay Dam, San Diego, 1896
- Old Lower Otay Dam, San Diego, 1894 (destroyed 1916)

NRHP and CRHR Significance Evaluation

NRHP Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.

CRHR Criterion 1: Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

The Upper Otay Reservoir Complex was constructed in 1902 during a significant period in San Diego source water development history: the Early Water System Development period (1887-1916). While still plagued with supply and quality issues, the formation of the San Diego Water Company in 1873 was a turning point for the City that set the stage for the development of reliable water sources in San Diego. Population increases also fueled the need for additional reliable water sources and by the 1880s, private water companies were forming to help meet this need. One of the great engineering achievements during the 1880s was the construction of the Sweetwater Dam by the San Diego Land and Town Company. Simultaneously, the Cuyamaca Dam was constructed on Boulder Creek in the Cuyamaca Mountains in 1887. It is this first completed major piece of water infrastructure that marks the start of the Early Water System Development period. One of the most notable companies to emerge during this time was the Southern California Mountain Water Company (SCMWC) in 1894. Through the formation of private water companies, multiple water infrastructure projects were undertaken during the late nineteenth and early twentieth century. Such projects included Morena Dam (1895), the original Lower Otay Dam (1897), Upper Otay Dam (1902), and the Dulzura Conduit (1909). Despite the early successes of some of these projects, a catastrophic flood of 1916 devastated the San Diego region and destroyed the original Lower Otay Dam. Because the flood of 1916 essentially wiped out much of the City's early water infrastructure, it serves as the end date for this period of early water development in San Diego.

The Upper Otay Dam was one of the earliest pieces of water infrastructure built by the privately owned SCMWC, starting construction in 1896. Elisha E. Babcock had an ambitious vision for a water system that would provide a sufficient water supply to the City and surrounding region. Babcock's planned system would be established along the Otay-Cottonwood watershed, beginning with the construction of the Morena Dam and following downstream with the Upper and Lower Otay and Barrett Dams. From this point, water would be piped via a network of conduits throughout the region. The Upper Otay specifically served as a reservoir for storage and not as a catchment basin from streams flowing into the Upper Otay reservoir. The strategic installation of the dam ensured that the water remained free of sediment from floods at all times, and flowed clearly through the main pipeline, which terminated across the San Diego River at a location near La Jolla.

What made constructing the Upper Otay Dam a worthy endeavor by Babcock and the SCMWC was the 650,000,000-gallon reservoir it created just north of the Lower Otay Dam and reservoir site. San Diego underwent a severe period of drought between 1895 and 1904, forcing many privatized water companies to fail. In response, the City of San Diego realized the need for control over their water infrastructure and began purchasing holdings within the SCMWC that were within the City limits. Such holdings included reservoirs, pumping plants and machinery, pipelines, buildings, and tools. In August 1912, the City voted on a bond issue of $2,500,000 to purchase the Otay Lakes, as well as the Barrett intake, dam, and reservoir site; Dulzura Conduit; and Chollas Reservoir System from the SCMWC. What was valuable for the City was addressing its immediate and long-term water problems, and reservoirs such as the Upper Otay represented an effective way to fulfill the water requirement of the growing population.

In summary, the Upper Otay Reservoir Complex is a significant water resource that serves as an important element of San Diego's source water system. It was also an intricate part of the Otay-Cottonwood watershed envisioned by Babcock and maintains this connection through surviving the flood of 1916 For the reasons discussed above, the Upper Otay Reservoir Complex appears eligible under Criterion A/1 as both a contributing element of the City of San Diego Source Water System, and as an individual property.

NRHP Criterion B: Associated with the lives of significant persons in our past.

CRHR Criterion 2: Associated with the lives of persons important in our past.

Bringing water to San Diego and Coronado was a high priority for Elisha E. Babcock, who persuaded John D. Spreckels to invest in a number of his organizations, including the SCMWC in 1895. John D. Spreckels and A.B. Spreckels, sons of the sugar king Claus Spreckels, were also highly influential businessmen in the San Diego area. The three men became the sole owners of the several enterprises developed by Babcock, and Spreckels eventually owned nearly half of Babcock's enterprises, yet he retained Babcock as his business manager.

One of the early projects taken on by the SCMWC was the construction of the Lower Otay Dam under the charge of civil engineer Walter S. Russell beginning construction in 1894. Two years later, Babcock directed the construction of the Upper Otay Dam, featuring an arch concrete design approximately 800 feet northwest of the Lower Otay reservoir. The design of the Upper Otay Dam was patterned by Babcock after the Bear Valley Dam in the San Bernardino Mountains, for its design and low cost of construction. The original Lower Otay Dam was destroyed in the flood of 1916, leaving the Upper Otay Dam as the only known dam designed by Babcock.

Construction of the Upper Otay Dam also resulted in a significant rift between Babcock and the Spreckels family. Between 1905 and 1906, several lawsuits were filed on behalf of both partners. In a lawsuit filed in December 1905 against E.S. Babcock Jr. and his son, Graham E. Babcock, J.D. Spreckels & Bros. Company alleged that Babcock was indebted $2,125.37 to Spreckels for goods, wares, merchandise, and tools. As well as the use and rental of personal property leased by the plaintiff to the defendant between February 1904 and July 1904, which was the ranch located just southwest to the Upper Otay Dam. According to a 1906 hearing with J. D. Spreckels Jr., he was unhappy with the way the SCMWC was headed under Babcock's leadership:

> I told him I was dissatisfied with the way things were running, and called special attention to the building of the Upper Otay dam, telling him it was foolishness to throw away $30,000 in building that when it was a tributary to the Lower Otay. I also spoke about his inviting through the public press people to come up there and shoot ducks with him, and all done at the expense of the Southern California Mountain Water Company in the way of shells and for entertainment (SDU 1906a).

Babcock had special interest in the construction of the dam because of the Upper Otay Reservoir that resulted. The Upper Otay Reservoir is located directly adjacent to the ranch property that acted as Babcock's country home and hunting reserve (reference figure 9). Babcock used the reservoir quite frequently as a recreational body of water, which further upset the Spreckels family. The construction of the Upper Otay Dam and Reservoir eventually resulted in a big enough rift to end Babcock's and Speckle's business relationship. Upon this split, Babcock was able to retain the rights to the hunting and fishing at the Upper Otay Reservoir. Babcock continued hunting on the ranch until his death in 1922 (SDU 1906b).

In summary, the Upper Otay Dam retains a high level of association with the locally and nationally significant figure, Elisha S. Babcock. Babcock had special interest in the construction of the Upper Otay Dam, and under his direct influence the dam was built. Despite objection from his long-time business partners, the Spreckels family, Babcock saw that the Upper Otay would be constructed and as a direct result, this was the last of the interests Babcock held with the Spreckels' companies. Babcock is additionally associated with the Upper Otay's use as a private recreational property which he used until his death in 1922. Therefore, the subject property appears eligible under NRHP/CRHR Criterion B/2.

NRHP Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

CRHR Criterion 3: Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

The dam embodies distinctive characteristics of the arch concrete dam construction type, which was used sparingly throughout California and the United States due to its complex construction techniques. The dam's period of significance is limited to the year the dam was completed, 1902.

In addition to the important associations with the development of the development of San Diego's Source Water System, the Upper Otay Dam is also important because it is an arch concrete dam. Arch dams, more specifically constant center arch dams, are particularly adapted to U-shaped canyons where the length is small in proportion to the height. This dam design relies predominantly on the abutment reaction forces for its stability. At the end of the nineteenth-century constant center arch dams became popular throughout California. Elisha S. Babcock modeled the plans for the Upper Otay Dam closely after the Bear Valley Dam built in 1884 and the Sweetwater Dam built in 1888. Arch dams are the most economical and efficient dam type when dealing with a narrow canyon, and require a minimal amount of concrete and filling material. This is due to the design that allows the curved shape to withstand forces induced by water pressure, as opposed to the dam's weight like that of the gravity dam type.

The Upper Otay Dam was constructed across a 20 foot-wide gorge, measuring approximately 260 feet across the canyon, a maximum height of 84 feet above bedrock, and 4 feet thick at the top and 14 feet thick at its base. The dam owed its stability to the gentle curvature and reinforcement of its design and steel plate and railway cable reinforcement of its upper segments. The shape formed a very flat, wide arch for such a thin structure that considerably reduced structural stress from water pressure throughout the design. Stepped offsets on the downstream side of the dam held strengthen its construction. Additionally, the lowest 25 feet of the dam were too narrow to be susceptible to the kinds of structural stress that could crack concrete spanning larger widths. Considering its height, the dam was said to be one of the boldest structures of its kind, and was called the "the highest-stressed arch dam in existence" by an article in Engineering News from 1904.

Despite the positive aspects of this dam type, a surprisingly small amount were constructed throughout California and the United States. To construct a stable constant center arch dam, a high level of skill was required to execute the design and a lot of oversight was required by an engineer. During the late-nineteenth and early-twentieth-century hydrology was a new discipline, so many of these dams were either overtopped due to floods or were subsequently altered and replaced. The Upper Otay Dam is one of the last remaining thin-arch concrete dams from the late nineteenth-century period of water infrastructure design, and has undergone a limited amount of alterations.

In summary, Upper Otay Dam is a good example of an arch concrete dam. Therefore, the Upper Otay Reservoir Complex appears eligible under NRHP/CRHR Criterion C/3 as both a contributing element of the City of San Diego Source Water System, and as an individual property.

NRHP Criterion D: Have yielded, or may be likely to yield, information important in history or prehistory.

CRHR Criterion 4: Has yielded, or may be likely to yield, information important in prehistory or history.

Archaeological survey was not conducted for this project. At this time there is no indication that the Upper Otay Reservoir Complex has the potential to yield information important to state or local history. Therefore, the property is recommended not eligible under NRHP/CRHR Criterion D/4.

City of San Diego Significance Evaluation

Criterion A: Exemplifies or reflects special elements of the City's, a community's, or a neighborhood's historical, archaeological, cultural, social, economic, political, aesthetic, engineering, landscaping, or architectural development.

The Upper Otay Reservoir Complex reflects special elements of San Diego's historical development. Construction of the complex made a significant contribution to the history of water development in the San Diego region and was a milestone in the City's quest to achieve source water independence.

The complex also reflects special elements of San Diego's engineering development. Upper Otay Dam embodies the distinctive characteristics of the thin arch or more specifically the constant center arch dam construction type. Thin-arch dams are particularly adapted to U-shaped canyons where the length is small in proportion to the height. This dam design relies predominantly on the abutment reaction forces for its stability. At the end of the nineteenth-century constant center arch dams became popular throughout California. Elisha S. Babcock modeled the plans for the Upper Otay Dam closely after the Bear Valley Dam built in 1884 and the Sweetwater Dam built in 1888. Arch dams are the most economical and efficient dam type when dealing with a narrow canyon, and require a minimal amount of concrete and filling material. This is due to the design that allows the curved shape to withstand forces induced by water pressure, as opposed to the dam's weight like that of the gravity dam type.

Despite the positive aspects of this dam type, a surprisingly small amount were constructed throughout California and the United States. To construct a stable constant center arch dam, a high level of skill was required to execute the design and a lot of oversight was required by an engineer. During the late-nineteenth and early-twentieth-centuries hydrology was a new discipline, so many of these dams were either overtopped due to floods or were subsequently altered and replaced. The Upper Otay Dam is one of the last remaining thin-arch concrete dams from the late nineteenth-century period of water infrastructure design, and is the only surviving feat of engineering remaining design by E.S. Babcock. Therefore, the subject property appears eligible under City Criterion A.

Criterion B: Is identified with persons or events significant in local, state, or national history.

Persons: As described in the NRHP/CRHR B/2 criterion discussion above, the Upper Otay Reservoir Complex is associated with persons significant in local, state, and national history for its association with Elisha S. Babcock. Additionally, construction of the Upper Otay Dam also resulted in a significant rift between Babcock and his long time business partners the Spreckels brothers. Babcock had special interest in the construction of the dam, despite J. D. Spreckels Jr's feeling that it was unnecessary to construct, because of the Upper Otay reservoir that resulted, located directly adjacent to the ranch property that acted as his country home and hunting reserve. The Upper Otay Dam is linked to Babcock through its use as a recreational water source for his ranch property and the rift it caused ending the long-time business relationship between Babcock and Spreckels. Therefore, the Upper Otay Reservoir Complex appears eligible under City Criterion B.

Events: As described in the NRHP/CRHR A/1 criterion discussion above, the Upper Otay Reservoir Complex is associated with events significant in local, state, and national history. Construction of the Morena-Barrett-Otay water project was a major undertaking in a remote part of San Diego that required significant planning and coordination, and was an important event at the time construction began. The Upper Otay Dam was part of the Otay-Cottonwood watershed, which would ultimately become the primary supplier of water to San Diego. The subject property is directly associated with important events related to water development in the San Diego region, namely with the City gaining source water independence and being a critical component to the water infrastructure that supported the City's growth and development until the end of World War II. Therefore, the Upper Otay Reservoir Complex appears eligible under City Criterion B.

Criterion C: Embodies distinctive characteristics of a style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship.

As described under NRHP/CRHR Criterion C/3 discussion above, the Upper Otay embodies distinctive characteristics of the thin-arch concrete dam construction type, which was used sparingly throughout California and the United States due to its complex construction technique. The associated auxiliary spillway is a contributing feature to the Upper Otay Dam, and the dam's period of significance is limited to the year of its completion, 1902.

Concrete thin-arched and constant center arch dams, in particular, were gaining popularity in the late nineteenth-century in the American West. Several were designed and built including the Bear Valley Dam (1884) and the Sweetwater Dam (1888) both in California. Thin-arched dams rely predominantly on the abutment reaction forces for its stability rather than thick walls of concrete or stone masonry designed to hold back water utilizing the weight of the material alone. Thin-arched dams can be divided into three types: constant radius dam, variable radius dam, and constant angle dam. The type used most often was the constant radius or center arch dam, which allowed for the construction of dams between narrow canyon openings. Upper Otay Dam is well preserved insofar as it is the only San Diego-area thin-arch dam that has not been significantly altered beyond in-kind repairs since its construction. The other thin-arch dam in the San Diego-area, the Sweetwater Dam, has been overtopped several times over its history and has undergone several large-scale alterations. Therefore, the Upper Otay Reservoir Complex appears eligible under City Criterion C.

Criterion D: Is representative of the notable work or a master builder, designer, architect, engineer, landscape architect, interior designer, artist, or craftsman.

As described under NRHP/CRHR Criteria B/2 (see full discussion above), the Upper Otay Dam represents the notable work of the locally significant person, Elisha E. Babcock. The Upper Otay Dam the only remaining known design by Babcock after the destruction of the Lower Otay Dam in 1916.

Bringing water to San Diego and Coronado was a high priority for Babcock, who persuaded John D. Spreckels to invest in a number of his organizations, including the SCMWC in 1895. One of the early projects taken on by the SCMWC was the construction of the Lower Otay Dam under the charge of civil engineer Walter S. Russell beginning construction in 1894. Two years later, Babcock directed the construction of the Upper Otay Dam, featuring a arch concrete design approximately 800 feet northwest of the Lower Otay reservoir. The design of the Upper Otay Dam was patterned by Babcock after the Bear Valley Dam in the San Bernardino Mountains for its design and low-cost of construction. The original Lower Otay Dam was destroyed in the flood of 1916, leaving the Upper Otay Dam as the only known dam designed by Babcock.

Therefore, the Upper Otay Reservoir Complex is very significant to the life of Elisha complex appears eligible under City Criterion D.

Criterion E: Is listed or has been determined eligible by the National Park Service for listing on the National Register of Historic Places or is listed or has been determined eligible by the State Historical Preservation Office for listing on the State Register of Historical Resources.

The Upper Otay Reservoir Complex is not known to be on any local, state, or national list of significant properties, nor is it known to have been determined eligible for listing on any register. Concurrence of eligibility by the State Historic Preservation Office is pending. Therefore, at this time the Upper Otay Reservoir Complex does not appear eligible under City Criterion E.

Criterion F: Is a finite group of resources related to one another in a clearly distinguishable way or is a geographically definable area or neighborhood containing improvements which have a special character, historical interest, or aesthetic value, or which represent one or more architectural periods or styles in the history and development of the City.

As described under NRHP/CRHR Criteria A/1 and C/3 (see full discussion above),the Upper Otay Reservoir Complex is significant for it role, function, and design within the larger City of San Diego Source Water System, of which it is a contributing resource to. The City of San Diego Source Water System includes ten (10) impounding reservoir complexes owned/operated by the City that function as part of the City's municipal water-supply system. These resources and their related infrastructure (e.g., dams, outlet towers, conduits, flumes, and pipelines) constitute a finite group of resources related to one another in a clear way, steeped in historical interest and representative of significant engineering achievements. Taken as a whole, these resources (including the Upper Otay Reservoir Complex) are significant for their role in the City's source water system, starting with the earliest efforts to establish privatized water in the 1880s soon followed by construction of the earliest reservoirs, Lake Cuyamaca (1887) and Sweetwater Reservoir

(1888). The period of significance ends with construction of the San Diego Aqueduct, and the importation of Colorado River Water for the first time into the San Vicente Reservoir (1947), which forever changed the composition of City's source water supply. Therefore, the Upper Otay Reservoir Complex appears eligible under City Criterion F.

Integrity Assessment

Overall, the Upper Otay Reservoir Complex retains integrity of location, materials, workmanship, and feeling. However, it does have diminished integrity of setting, design, and association, as described below:

Location: The complex retains integrity of location. Construction of the dam began in 1896 with a masonry foundation 34 feet above bedrock being finished five years later with construction resuming on that original foundation. The dam and its spillway have never been shifted or relocated since their completion in 1901. As such, the complex retains integrity of location.

Setting: The complex's setting has been diminished by subsequent developments along the western shores of the reservoir. These developments include the encroaching suburban development of the Eastlake neighborhoods in Chula Vista (1994-2005), which come up the edge of the reservoir. Upon completion in 1901, the complex displayed no residential development, and as such, there is a diminished integrity of setting.

Design: The complex has a diminished integrity of design. The original design built under the direction of E. S. Babcock was for a thin, arch dam type patterned after the Bear Valley Dam in the San Bernardino Mountains. Upon completion, the Upper Otay Dam had a series of seven overflow notches at the center of the dam. In 1985, a 22-foot-deep trapezoidal slip was cut where the original seven overflow notches were located. This was the largest alteration to the original Babcock design. This alteration does not change the majority of the dam's appearance and retains the same function for water overflow; therefore the complex retains diminished integrity in design.

Materials: The complex retains integrity of materials. No new materials have been introduced to the dam or auxiliary spillway. All minor repairs have been completed with in-kind materials. The largest alteration discussed in the design integrity section did not add any new materials to the dam, just a removal of the materials that were present. As such, the complex retains integrity of materials.

Workmanship: The complex retains integrity of workmanship. The evidence of the craftsmanship of the workers who built the dam is evident in the still-visible concrete board forms on the dam and auxiliary spillway. Additionally, the stepped nature of the concrete displays a higher level of skill that remains evident and the overall design of a thin-arch dam required a higher level of skill then most other dam designs. As such, the integrity of workmanship is retained.

Association: The complex has a diminished integrity of association. The dam was originally built between 1896 to 1901 by the SCMWC as an auxiliary storage reservoir for the Lower Otay Dam. This association with the original owners and builders was lost when the City of San Diego purchased the dam in 1912 to be part of the city's massive water infrastructure system. Therefore, the complex retains diminished integrity of association.

Feeling: Finally, the Upper Otay Dam, reservoir, associated features, and buildings retain integrity of feeling. The dam is still an imposing, massive, concrete structure. The size, scale, and design of Upper Otay Dam and Reservoir still evokes a sense of the period of intense water infrastructure growth in San Diego.

In summary, the Upper Otay Reservoir Complex, including the auxiliary spillway, retain integrity of location, materials, workmanship and a slightly diminished integrity of setting, design, and association. It does not retain enough integrity to convey significance in feeling. Therefore, the Upper Otay Reservoir Complex retains the requite integrity for listing at the national, state, and local levels.

***B12. References:**

Andrus, Patrick W. and Rebecca H. Shrimpton. 2002. "How to Apply the National Register Criteria for Evaluation." Bulletin 15. U.S. Department of the Interior, National Park Service. Accessed January 2019. https://www.nps.gov/nr/publications/bulletins/pdfs/nrb15.pdf

City of San Diego. 1943. "Summary of Cost: Existing Dams and Reservoirs in San Diego, California." Report. San Diego, California: City of San Diego. On file at the City of San Diego Public Utilities Department Archives.

Crawford, Richard. 2011. *The Way We Were in San Diego*. Charleston, South Carolina: History Press.

Evening Tribune. 1922. "Elisha Spurr Babcock, Pioneer San Diegan, Stricken in Office." Newspapers.com: *Evening Tribune* (San Diego, CA), September 9, 1922, pg. 16.

Fire and Water Engineering. 1914. "The Water System at San Diego." *Fire and Water Engineering* 56, no. 1. July 1, 1914. Accessed January 2019. pg. 195

Fowler, L. 1953. "A History of the Dams and Water Supply of Western San Diego County." Thesis; University of California. On file at the City of San Diego Water Utilities Department Archives.

Hennessey, Gregg. R. 1978. "The Politics of Water in San Diego 1895-1897." *The Journal of San Diego History*, summer 1978, 24(3). Accessed October 2018. http://www.sandiegohistory.org/journal/1978/july/water/.

Hill, Joseph. 2002. "Dry Rivers, Dammed Rivers and Floods: An Early History of the Struggle Between Droughts and Floods in San Diego" *The Journal of San Diego History*. San Diego Historical Society Quarterly. Winter, 2002. Volume 48. Accessed January 12, 2016. http://www.sandiegohistory.org/journal/2002-1/hill.htm

Historic Coronado. 2015. *Coronado's Unique History*. Coronado Historic Association and Coronado Museum. Accessed August 3, 2015. http://coronadohistory.org/historic-coronado/.

Hunsaker & Associates San Diego, Inc. 2018. "Appendix 3.1.2-1 CEQA Drainage Study: Otay Ranch Village 14 and Planning Areas 16/19, County of San Diego, California." February 5, 2018. Accessed November 5, 2018.

Jorgensen, L. 1916. "Stress in Arch Dams." *Engineering News*. V. 75, No. 10. February 10, 1916. Accessed November 5, 2018.

JRP Historical Consulting Services and California Department of Transportation. 2000. *Water Conveyance Systems in California: Historic Context Development and Evaluation*. Accessed January 12, 2016. http://www.dot.ca.gov/ser/downloads/cultural/ CanalsDitches.pdf.

Lakeside Historical Society. 2015. *The Flume.* Accessed August 4, 2015. http://www.lakesidehistory.org/Flume/flume.htm.

Los Angeles Times (LAT). 1896. "San Diego County." Newspapers.com: *Los Angeles Times* (Los Angeles, CA) Feb 15, 1896, pg. 13.

McGlashan, H.D., and F.C. Ebert. 1918. "Southern California Floods of 1916." Water Supply Paper 426. U.S. Department of the Interior. Accessed July 13, 2015. http://pubs.usgs.gov/wsp/0426/report.pdf.

McGrew, Clarence Alan. 1922. "City of San Diego and San Diego County: The Birthplace of California." Volume II. The American Historical Society, Chicago and New York. Google books. Accessed August 3, 2015.

Ormsby, Burke. 1966. The Lady Who Lives by the Sea. The Story of Hotel del Coronado. The Journal of San Diego History. San Diego Historical Society Quarterly. January 1966, Volume 12, Number 1. Accessed August 3, 2015. http://www.sandiegohistory.org/journal/66january/ladybysea.htm.

Patterson, Thomas W. 1970. "Hatfield the Rainmaker." The Journal of San Diego History. San Diego Historical Society Quarterly. Winter 1970, Volume 16, Number 4. Accessed July 27, 2015. https://www.sandiegohistory.org/journal/70winter/hatfield.htm.

Perry, Tony. 2015. He was right as rain, to a fault; with San Diego again caught in a drought, the city revisits Charles Hatfield's 1915 'rainmaker' saga. Los Angeles Times, Jun 01, 2015. B.1. ProQuest Newsstand. Accessed October 31, 2018.

Reynolds, Richard A. 2008. "Sweetwater Dam Then and Now". Accessed January 14, 2016. http://sunnycv.com/southbay/docs/doc238.pdf.

San Diego History Center. 2018a. "Biography: John D. Spreckels (1853-1926)." Accessed June 2018. http://www.sandiegohistory.org/archives/biographysubject/spreckels/.

San Diego History Center. 2018b. Photograph Collection Accessed In Person 2018.

San Diego Union (SDU). 1895a. "Upper Otay System." Genealogybank.com: *San Diego Union* (San Diego, CA), October 24, 1895, pg. 3.

San Diego Union . 1895b. "Mt. Tecarts Sites." Genealogybank.com: *San Diego Union* (San Diego, CA), June 7, 1895, pg. 7.

San Diego Union. 1900a. "Continuing Extensions: United Water Supply Company." Genealogybank.com: *San Diego Union* (San Diego, CA), September 13, 1900, pg.3.

San Diego Union. 1900b. "Work on Upper Otay." Genealogybank.com: *San Diego Union* (San Diego, CA), November 29, 1900, pg. 3.

SDU. 1902. "Construction Work on Gigantic Water System." Genealogybank.com: *San Diego*

Union (San Diego, CA), January 1, 1902. Pg. 14.

San Diego Union. 1905. "Babcocks Sued by Mountain Water Co." Genealogybank.com*: San Diego Union* (San Diego, CA), December 30, 1905, pg. 6.

San Diego Union. 1906a. "Says Mr. Babcock Made Foolish Expenditures." Genealogybank.com*: San Diego Union* (San Diego, CA), January 12, 1906, pg. 3.

San Diego Union. 1906b. "Settlement Reached in Water Company Matters." Genealogybank.com*: San Diego Union* (San Diego, CA), May 24, 1906, pg. 10.

San Diego Union. 1912. "Babcock Urges People to Buy." Genealogybank.com*: San Diego Union* (San Diego, CA), August 11, 1912, pg. 10.

San Diego Union. 1922. "Pioneer Citizen of San Diego Called by Death." Genealogybank.com: *San Diego Union* (San Diego, CA), September 9, 1922, pg. 5.

San Diego Union. 1943. "Upper Otay Fish Starved." Genealogybank.com: *San Diego Union* (San Diego, CA), September 1, 1943, pg. 19.

San Francisco Chronical. 1895. "San Diego Improvements." Newspapers.com: *San Francisco Chronical* (San Francisco, CA), October 28, 1895, pg.8.

Sholders, Mike. 2002. Water Supply Development in San Diego and a Review of Related Outstanding Projects. *The Journal of San Diego History*. San Diego Historical Society Quarterly, Winter 2002, Vol. 48, No. 1, Gregg Hennessey, Ed. Accessed January 12, 2016. http://www.sandiegohistory.org/journal/2002-1/sholders.htm.

Smythe, William Ellsworth. 1908. "History of San Diego (1542-1908)." In *An Account of the Rise and Progress of the Pioneer Settlement on the Pacific Coast of the United States,* Volume II, *The Modern City*. San Diego, California: The History Company. Accessed October 2018. https://ia902300.us.archive.org/26/items/historyofsandieg02smyt/historyofsandieg02smyt.pdf.

Social Networks and Archival Context (SNAC). 2015. "O'Shaughnessy, M.M. (Michael Maurice), 1864-1934". Biographical Notes. Accessed July 1, 2015. http://socialarchive.iath.virginia.edu/ark:/99166/w69k4n70.

"The Five Dams and Wood Stave Conduit of the Southern California Mountain Water Company."1904. *Engineering News.* V.051. April 7, 1904. Accessed October 31, 2018. https://babel.hathitrust.org/cgi/pt?id=uc1.e0000401760;view=1up;seq=403;size=175

Tuthill, Barbara. 1954. "Hatfield the Rainmaker." Western Folklore 13(2): 107-112. Berkeley, California: University of California Press. On file at the City of San Diego Public Utilities Department Archives, Box 31, folder 30.

"Upper Otay Concrete Arch Dam Stands Heavy Flood." 1916. *Engineering News*. V. 75. February 10, 1916. Accessed November 1, 2018. https://books.google.com/books?id=mONHAQAAMAAJ&pg=PA288&dq=upper+otay+dam&hl=en&sa=X&ved=0ahUKEwjMu6LGn7TeAhVLneAKHSJKDzEQ6AEIMDAB#v=onepage&q=upper%20otay%20dam&f=false.

"Upper Otay Lake." 2018. San Diego Fish. Accessed November 6, 2018. https://sdfish.com/upper- otay-lake/

Water Department Inventory. 1912. *Inventory of Southern California Mountain Water Company as Purchased By City of San Diego on August 15, 1912*. On file at the San Diego Public Utilities Department Archive.

Wegmann, Edward. 1922. *The Design and Construction of Dams, Including Masonry, Earth, Rock-fill, Timber, and Steel Structures, also the Principal Types of Movable Dams*. New York. John Wiley & Sons. Accessed November 5, 2018. https://babel.hathitrust.org/cgi/pt?id=mdp.39015021022457;view=1up;seq=4

State of California ♁ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3D; 3CD, 5D3

Other Listings
Review Code Reviewer Date

Page 1 **of** 26 ***Resource Name or #:** (Assigned by recorder) Dulzura Conduit

P1. Other Identifier:

***P2. Location:** ☐ **Not for Publication** ■ **Unrestricted**

***a. County** San Diego County **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** Barrett Lake **Date** 1996 **T** 17S; **R** 3E; ☐ **of** ☐ **of Sec** 17; San Bernardino **B.M.**

c. Address 2346-2280 Barrett Lake Rd City Jamul Zip 91935

d. UTM: (Give more than one for large and/or linear resources) Zone 11S, 530797 mE/ 3615740 mN

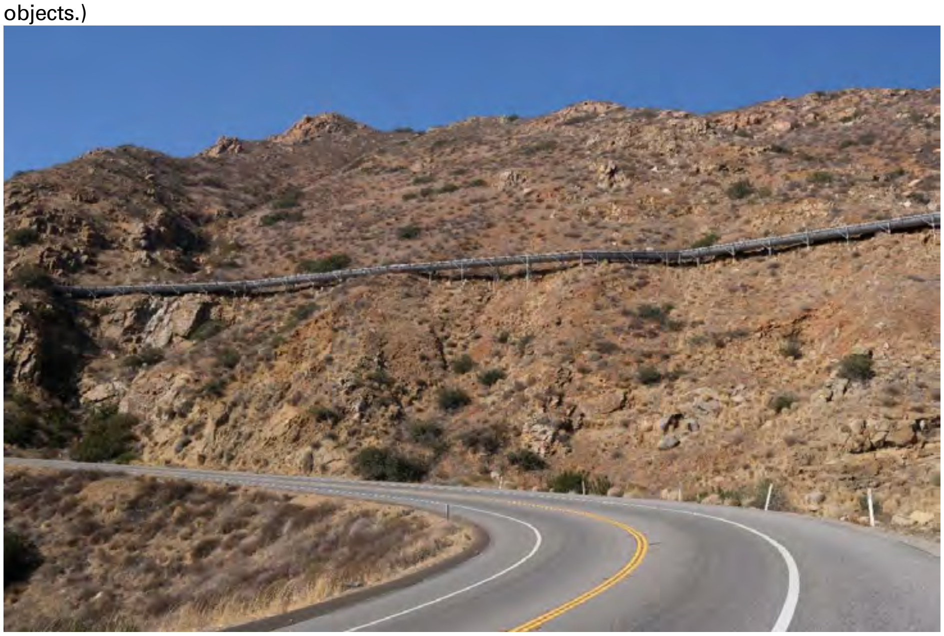
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
Lat/Long: 32°40'44.7"N 116°40'15.9"W

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
The Dulzura Conduit is located on the southern side of the Barret Lake Dam and extends approximately 13.38 miles to the southwest, where it flows down the Dulzura Creek into the Lower Otay reservoir where it is diverted for municipal use. The flume is constructed from a combination of formed concrete trenches, metal trestle supported flumes, and concrete lined tunnels. The conduit runs along the western slope of the south trending canyon below Barrett Reservoir. The flume is a combination of enclosed metal flumes measuring approximately four feet in interior diameter, and board formed poured concrete.
(See Continuation Sheet)

***P3b. Resource Attributes:** (List attributes and codes) HP11 (engineering structure), HP20 (canal/aqueduct)

***P4. Resources Present:** ☐ Building ■ Structure ☐ Object ■ Site ☐ District ■ Element of District ☐ Other (Isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)



P5b. Description of Photo: (view, date, accession #) Flume from CA HWY 94, looking north, taken 11/20/2018 (DSCF4270)

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
1909 (City of San Diego PUD)

***P7. Owner and Address:**
City of San Diego
9192 Topaz Way
San Diego, CA 92123

***P8. Recorded by:** (Name, affiliation, and address) Nicole Frank, MSHP
Dudek
605 Third Street
Encinitas, CA 92024

***P9. Date Recorded:** 11/20/2018

***P10. Survey Type:** (Describe)
Pedestrian

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") Dudek. 2020. City of San Diego Source Water System Historic Context Statement.

***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

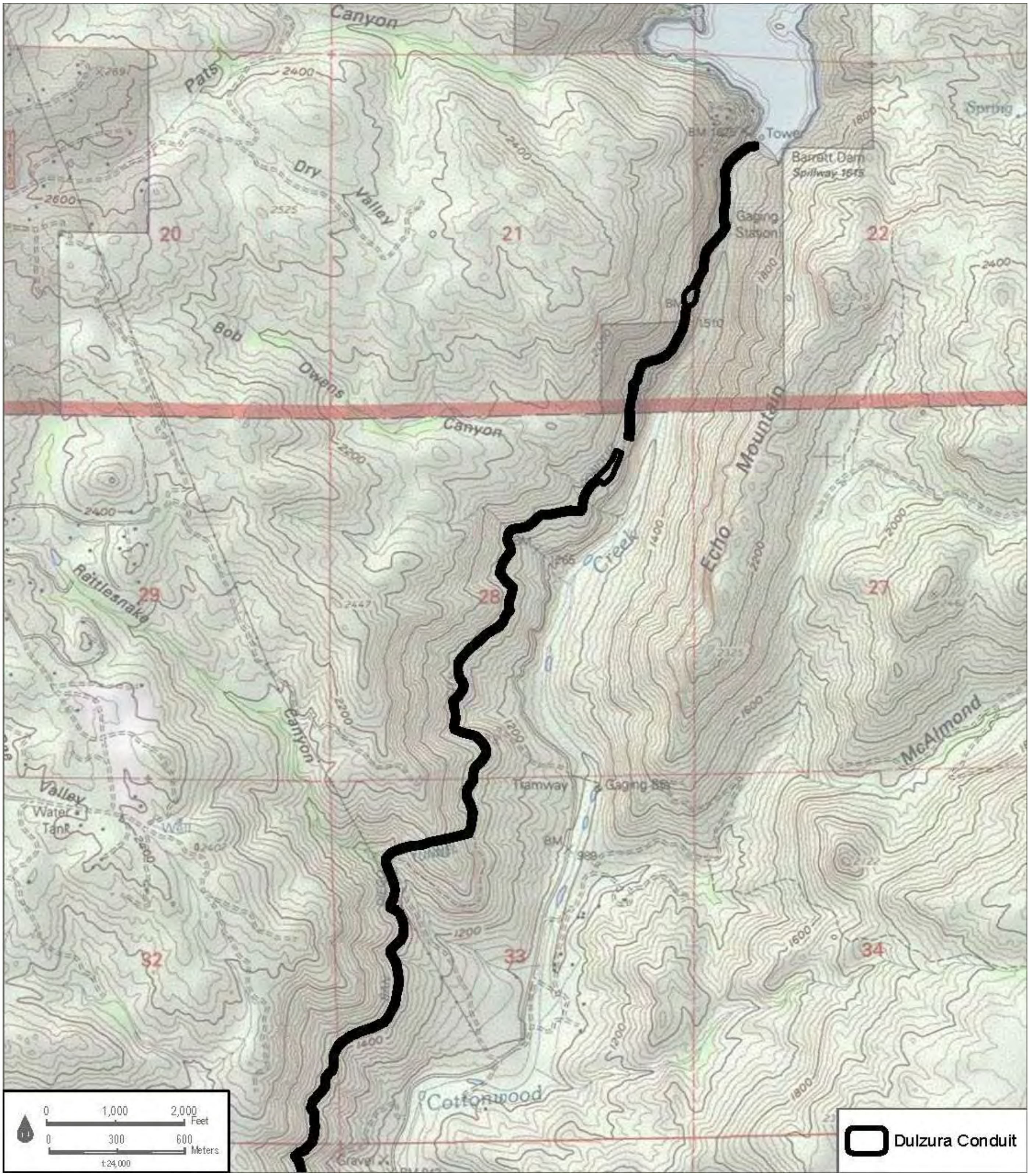
State of California ♁ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary #
HRI# _
Trinomial

Page 2 **of** 26 ***Resource Name or #** (Assigned by recorder) Dulzura Conduit

***Map Name:** Barrett Lake, USGS 7.5′ Quad ***Scale:** 1:24,000 ***Date of map:** 1996



State of California ♣ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI# _
Trinomial

Page 3 **of** 26 ***Resource Name or #** (Assigned by recorder) Dulzura Conduit
***Map Name:** Barrett Lake, USGS 7.5′ Quad ***Scale:** 1:24,000 ***Date of map:** 1996

State of California ♁ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI# _
Trinomial

Page 4 **of** 26 ***Resource Name or #** (Assigned by recorder) Dulzura Conduit

***Map Name:** Barrett Lake, USGS 7.5' Quad ***Scale:** 1:24,000 ***Date of map:** 1996

BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) Dulzura Conduit ***NRHP Status Code** 3D; 3CD, 5D3

B1. Historic Name: Dulzura Conduit

B2. Common Name:

B3. Original Use: Municipal water conduit B4. Present Use: Municipal water conduit

***B5. Architectural Style:** n/a (conduit)

***B6. Construction History:** (Construction date, alterations, and date of alterations)

Constructed in 1909 with an expansion in 1914.

***B7. Moved?** ■No ☐Yes ☐Unknown **Date:** **Original Location:**

***B8. Related Features:**

B9a. Architect: unknown b. Builder: Robert Sherer and Company and SCMWC workers

***B10. Significance: Theme** Early Water System Development **Area** San Diego

Period of Significance A: 1816-1916 **Property Type** Conduit **Applicable Criteria** NRHP/CRHR A/1 and City A, B, F

Historic Context

(See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)

***B12. References: (See Continuation Sheet)**

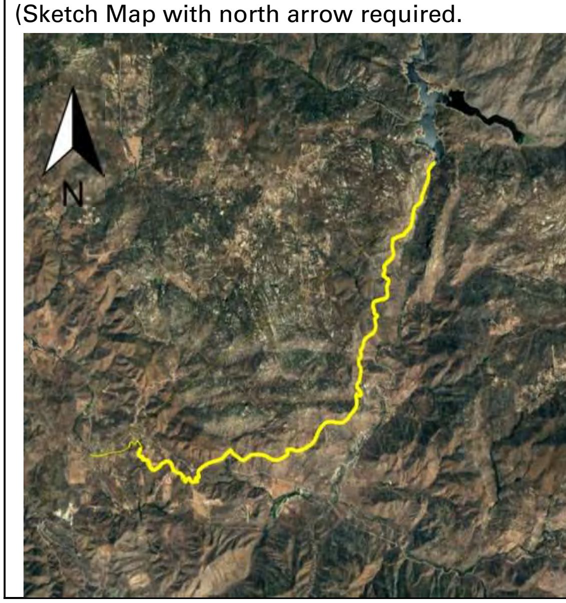
B13. Remarks:

***B14. Evaluator:** Nicole Frank, MSHP

***Date of Evaluation:** June 30, 2020

(This space reserved for official comments.)

(Sketch Map with north arrow required.



***P3a. Description: (continued)**

The average depth of the concrete trench segments is approximately four and a half feet, with a bottom width of three feet, and a top width of approximately six feet (Figure 1). The majority of the concrete trench sections are open air, though there are two types of coverings that were observed. The first type is a placed concrete slab, which appears to have concrete biscuits placed along the downslope edge, to level out the upper surface. The placed square segments of concrete measure approximately six foot square. The second type of covering are mobile segments with rebar eyelets on the surface. These are narrower strips approximately six feet long and one foot wide. Few floodgate spillways were observed. One original structure with iron components had embossing on the floodgate door, reading: CALCO/ Model No 133/California Corrugated/Culvert Company/ Los Angeles/ West Berkeley that appears to be from the 1920s.

The conduit’s path includes approximately 15 tunnels (Figure 2). These tunnels represent the original efforts of construction and do not appear to be as altered as the rest of the concourse. These passageways measure approximately six feet in height and are lined with poured-in-place concrete with a rounded roof through the rock.

Repairs, patches, and replacements of various components is evident throughout the conduit’s length (Figure 3). There do not appear to be any remaining original wooden trestle structures. Replacement of these structures with galvanized steel is seen in Figure 1. Additions to the conduit, such as the cinderblock clean out, were observed occasionally throughout the length. These modifications do not alter the path of the conduit, and ultimately illustrate the variety of updates made to keep this important piece of infrastructure in working order. During the time of survey, the segment that runs upslope from CA HWY 94 was under construction for maintenance.

Figure 1. Board formed concrete trench segment, DSC00617

Figure 2. Concrete lined tunnel entrance, DSC00679

Figure 3. Example of alteration to original line with addition of cinderblocks, DSC00713

***B10. Significance: (continued)**

Phase 1: Construction of the Dulzura Conduit, 1907-1909

The Dulzura Conduit was intended to be a major piece of water infrastructure that would connect Barret Reservoir with Dulzura Creek, preventing water runoff from flowing into the Tijuana River in Mexico. Part of a conduit was already completed on the site, consisting of a tunnel around the future Barrett Dam. Seeing an opportunity to seize a large amount of water runoff, J.D. Spreckels approached engineer Michael Maurice O'Shaughnessy to develop a proposal for the future conduit's design (Figure 4). O'Shaughnessy submitted a design on February 12, 1907 and sought to act as Consulting Engineer "to assume entire responsibility in connection with the design and completion of said works" (O'Shaughnessy 1934). Earlier in the year, O'Shaughnessy conducted an intense study to research the water conditions of San Diego and concluded that a three-year supply was recommended as reserve, which was later expanded to a timeline of seven-years after further review of the system. In May of 1907 O'Shaughnessy, Spreckels, attorney Harry L. Titus, and William Clayton, General Manager of Mr. Spreckels' interests, inspected the proposed sites of the Dulzura Conduit and Morena Dam, and subsequently made recommendations for their construction. (SDU 1916; O'Shaughnessy 1934; Fowler 1953).

Construction of the Dulzura Conduit began August 1907 by the SCMWC under the direction of O'Shaughnessy, to furnish San Diego and the surrounding area with "clear mountain water" from the Cottonwood and Pine Creeks (Figure 5). Constructing the conduit would increase the water supply of San Diego twelve-fold, with the daily capacity reaching 50,000,000 gallons and cost in excess $375,000 upon completion. The length of the conduit was approximately 13 miles in length including 10,000 feet of tunnel, two miles through solid granite; a mile and a quarter of wooden flume lines; and nine miles of open canals. The canals were lined with solid concrete, the thickness depending on the nature of the material through which the ditch passed. A majority of the conduit was lined with about four inches of concrete; where there was loose gravel or decomposed granite, six- to twelve-inch thick concrete was required; and where there was solid granite, no concrete lining was necessary (SDU 1908a).

Figure 4. M.M. O'Shaughnessy, unknown date (FoundSF.org)

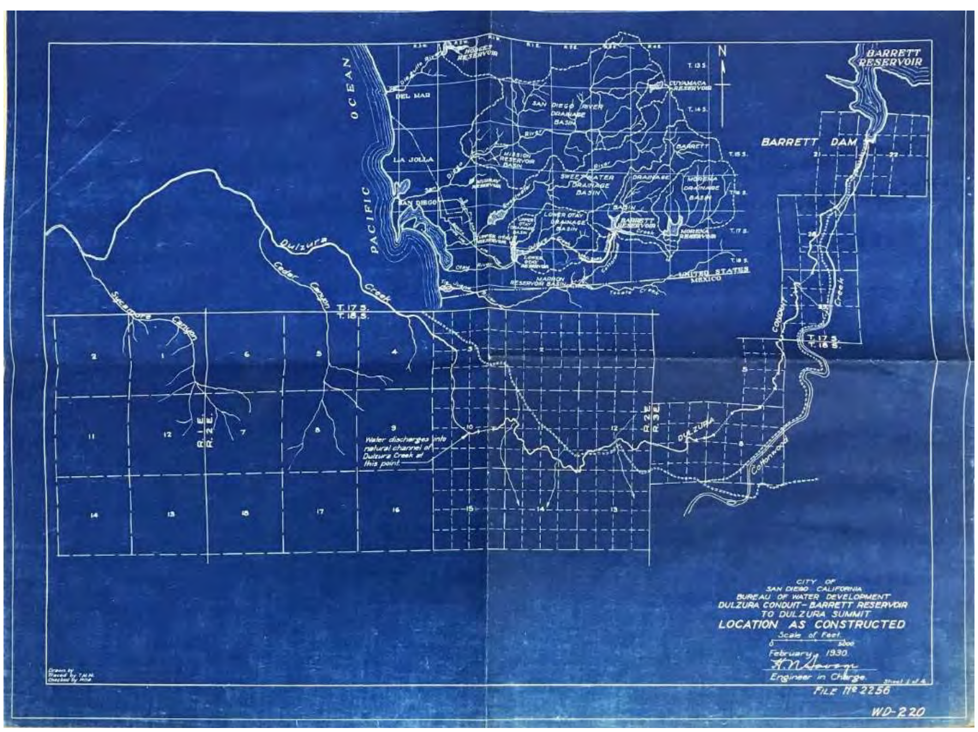


Figure 5. City of San Diego Bureau of Water Development Map of Dulzura Conduit and Barrett Reservoir, February 1930 (UC Riverside archives)

Work to construct the conduit was split between a contract with Robert Sherer and Company of Los Angeles who constructed eight miles, while the other five miles were constructed by the SCMWC's own labor. Robert Sherer and Company and SCMWC both employed about 100 men to complete their portion of the conduit excavation, while the water company would complete any cement work required. The cement used for the original 13.38 miles was noted as being "the very best possible mixture," and for this reason, no chance was to be taken with the employment of an unknown contractor for this portion of the construction (Figure 6). Throughout the job a high grade of Imperial German cement (Germania brand) was used, which cost $3.25 a barrel in San Diego but because of the distance each barrel would to travel to reach the worksite, an additional $3.75 a barrel was added to the cost. It was estimated that 5,000 barrels were required to complete the original Dulzura Conduit, making the cement costs alone $35,000 in 1907 (SDU 1908a).

Expansion joints were laid in the concrete every twelve and one-half feet, which would help to avoid cracking. About one-half mile of the conduit at different parts that "were subject to slides, [was] roofed with a concrete slab six inches thick, [and] reinforced with steel rails" (O'Shaughnessy 1934). O'Shaughnessy planned to eventually roof the entire extension of open conduit, but deemed it unnecessary and a low priority in 1912 upon the conduit's completion. Work on the Dulzura Conduit was much harder than anticipated. A large majority of the tunneling work to be completed was built through solid granite. In some locations, 40 pounds of "giant powder" was required to break the rock. On average, about 30 pounds of powder was required per foot of tunnel for the entirety of the 10,000 feet of tunnel excavation. Powder in 1907-1909 cost about 14 cents a pound, making the 10,000 foot expenditure for this material approximately $42,000 (SDU 1908a, 1912).

In order to transport materials and the blasted granite, a miniature 8-pound steel railroad was constructed with small steel cars that operated on a track 18 inches wide. The cars were loaded with material removed from the site, as well as sand and cement from various cable stations for constructing the conduit's concrete lining. Because of changes in grade from the road and the distance from the river in which the sand originated, a heavy steel cable with a pulley on top was stretched between the desired points of operation and used to transport materials. Materials would be loaded onto the pulley and pulled across the varied terrain in order to speed-up the process of construction (SDU 1908a).

O'Shaughnessy made statements in his 1934 personal papers that the project was more laborious than he anticipated, stating that "by devoting practically my exclusive time to the project in 1907 from my other interests and my family, and far beyond the conditions in the proposals I outlined to the principles for doing this work" (O'Shaughnessy 1934). He impressed through his memoirs that he sacrificed much of his personal life to accomplish the task of opening the Dulzura Conduit. O'Shaughnessy believed that the completion of an effective water system for San Diego was urgent and would act as protection for the interests and reputation of the SCMWC. Contemporary newspapers praised the engineer for his commitment to his work and the amount of experience he brought to the project (SDU 1908b; O'Shaughnessy 1934).

At its completion on January 1, 1909, the conduit had a carrying capacity of an estimated 40,000,000 gallons of water per 24 hours. The upper section above the Barrett Dam had a capacity of about 80,000,000 gallons per 24 hours. Pine Creek and Cottonwood Creek both provide water to the Conduit, with a section starting at each stream about a half-mile upstream from where they merge. The path then follows along their respective stream banks until near the point where the two streams merge, where the two conduits emptied into a single, larger conduit before shortly emptying into a flume, the largest section of flume along the entire conduit measuring six feet wide and four feet high. This flume was used to convey the water across Pine Creek and was supported by a two-truss bridge. The flume then emptied into the conduit on the southwest side of Pine Creek where it followed along the miles of tunnels, conduits, and flumes supported by bridges, passing the Barrett dam site (Figure 7). For about 10 miles, the conduit followed the path of Cottonwood Creek heading south, then turned westward, and finally passed through the divide from the Cottonwood watershed into the Otay watershed. The conduit’s endpoint was a little more than one mile southeast of the Dulzura city post office (SDU 1908b, 1909).

Figure 6. Photograph showing pouring of Dulzura Conduit concrete canals, 1907 (M.M. O’Shaughnessy Photograph Collection, NUI Galway Digital Collections)

Figure 7. Photograph showing wooden flume construction supported by bridges, near Bee Canyon, 1909 (M.M. O'Shaughnessy Photograph Collection, NUI Galway Digital Collections)

The conduit contained 18 tunnels, ranging from 48 to 1,890 feet long, totaling 9,223 feet. Seven of the tunnels, 1,807 feet total, were built by SCMWC while the other eleven are 7,418 feet long, were built by Robert Sherer and Company. The tunnels typically were built within very hard rock (granite, syenite, or porphyry), and the large cost involved for labor, explosives, and fuel put the expense at about $13 per foot of tunnel. In addition to the high construction costs for the conduit itself, it was necessary to build a wagon road nine miles long, from the Dulzura divide to the Barrett Dam site. To complete this road, $50,000 was spent to grade the alignment and then lay a granite macadam surface over it. Both the water company and the contractor had large numbers of six- to ten-horse teams constantly moving over the road hauling building materials. The water system in which the conduit played a key role made water from more than 350 square miles of mountain area available to San Diego residents. A contemporary newspaper stated "the amount of clear mountain water that is to be caught annually by the Cottonwood and Pine creeks water shed portion of the Southern California Mountain Water company's system, embracing the conduit, the Barrett and Morena dams, is something enormous" (SDU 1909, 1908a).

Phase 2: Completion of the Conduit and Dedication Ceremony, 1909

Completion of the conduit was set to be January 1, 1909, approximately two and a half years after construction began; its official completion was two days later. The event was called San Diego's Water Celebration Day, where automobiles took an expedition to the Barrett Dam site by following a line of American flags located at various turning points along the route. Letters were sent out to automobile owners from the headquarters of the Water Celebration Committee, urging that word be sent back if they were planning on attending the event and how many seats they were prepared to place at the disposal of the committee. The San Diego Merchants' Association and the Chamber of Commerce chartered "every available automobile" for the purpose of bringing citizens to the Dulzura Conduit's dedication ceremonies. Seats in the chartered cars cost $5, and the returns from that money would depend upon the expenses of the celebration. The exercises of San Diego's Water Celebration Day were to consist of addresses by then-Mayor Forward; G. Aubrey Davison, president of the Chamber of Commerce; and officers of the California Mountain Water Company. The main event of the conduit's opening ceremonies was the raising of the head gate by Mayor Forward, which would allow the water to flow into the Dulzura Conduit (LAT 1909a and 1909b; SDU 1909).

Due to heavy rains on the set date of the opening ceremonies, the date of the celebration was postponed until February 22, 1909, specifically chosen to be on George Washington's Birthday. The decision was made by the Water Celebration Committee of the Chamber of Commerce, after investigating the condition of the roads. Rains leading up to the ceremony day were "the heaviest ever experienced in that vicinity, making it almost impossible for automobiles to reach Barrett's Dam, where the celebration grounds [were] selected" (LAT 1909c). It was noted in newspapers that the program would be carried out as announced, including a meeting in the evening when speakers would dwell upon the many advantages that would accrue to San Diego as a result of the "big conduit" (LAT 1909c). Within two weeks of making the postponement announcement, it was announced that the opening ceremonies were to be postponed indefinitely. It was the opinion of the Celebration Committee of the Chamber of Commerce that it would be impossible to transport people to the scene of the proposed celebration until after the winter rains stopped. By May 1909, the proposed public demonstration of the completion of the Dulzura Conduit was abandoned. In lieu of this, Mayor Conrad and members of the Council spent the day at the conduit as guests of Manager Clayton of the Spreckels Company, owner of the water supply mechanism (LAT 1909d).

Phase 3: Purchase by the City of San Diego (1912-1915)

In August of 1912, the City of San Diego voted on a bond issue of $2,500,000 to purchase the Barrett intake, dam, and reservoir site, Dulzura Conduit, Upper and Lower Otay Lakes, and Chollas Reservoir System from the SCMWC. The impounding capacity of the system purchased was 29,180,000,000 gallons total. The purchase was effective on February 1, 1913, and by purchasing this system, the City of San Diego assumed a servitude to supply water to the Coronado Water Company. In 1913, the sum of $705,000,000 was voted to improve the water system, which would add an impounding capacity of 15,000,000 gallons. As the major portions of the company were already purchased by the City, Morena Dam was also agreed to be purchased at a fixed price following a 10-year lease. Thus, by 1914, all portions of the SCMWC were owned by the City of San Diego. For the time being, it seemed that the City had addressed its immediate and long-term water problems. Population growth more than doubled from 17,700 in 1900 to over 39,500 in 1910, and water was relatively plentiful. However, beginning in 1912, a drought struck San Diego, which continued through 1915 (Fowler 1953; SDU 1914a).

Phase 4: Alterations, Expansion, and Post-Construction Developments (1914-2018)

In January 1914, the City Water Commission, composed of Messrs. Marston, Choate, and Levi, accompanied by City Superintendent of Water Fay and City Hydraulic Engineer Whitney, took a tour of the entire San Diego water system. This survey created a mutual understanding between the commission and city officials that alterations and additions to the current system were necessary in order to avoid water famine. Several of the conclusions that resulted from the tour included the necessity to build a conduit from Houser Canyon to the Dulzura Conduit; make repairs to the Dulzura Conduit; and construction of a small pumping reservoir to catch the leakage at the Lower Otay Dam. All of the introduced improvements were voted in favor of on the previous bond issue and had funds available. After the commission walked down the canyon from Moreno Dam to the Dulzura Conduit, they realized that construction of a conduit extension was necessary to save the millions of gallons of water, or about 45 percent, that was lost through absorption into the sand of the Cottonwood Creek bed between the Morena and Barrett Dam sites. The water would soak into the swamps and sand flats resulting in great waste, causing the commission to be unanimous in the opinion that diverting the dam and conduit should be done as soon as the bond money was made available (SDU 1914a).

Work on the extension of the Dulzura conduit began in September of 1914 after being approved by voters of the city at the water bond election one year prior. The vote allocated $185,000 for the project to construct six and one-half-miles of conduit to be completed before Christmas of 1914. The conduit began at the mouth of Houser creek, which entered the Cottonwood Creek at the bottom of the Morena gorge, approximately one mile below the wall of the Morena Dam. O'Shaughnessy and other members of the water commission contemplated construction of this conduit with the original construction of the Dulzura Conduit in 1907, but it wasn't until the San Diego population began to rise rapidly in the five years after the conduit's completion that it became a necessity (SDU 1914b and SDU 1915).

Construction of the extension was split between a contractor and the water department in order to save money. The work was described as unpleasant, and the phrase "cutting the mustard" was developed to describe the cutting of the ditch where the concrete for the conduit would be poured. The "mustard" was in reference to the flour-like silt that washed down from the mountains during the centuries that the stream flowed through the gorge. The silt was cut out by mule-drawn scrapers drawn in courses, layer by layer, revealing the lead-colored "mustard." In addition to removing the silt, roads were laid out in order to perform the work and move supplies, and boulders needed to be blasted and transported over newly constructed bridges built over small canyons and hills located throughout the project site. About 50 tons of material was hauled to the site daily. A mill was also constructed on the campsite to mill timber with which the camps were built, and also cut timber for the concrete forms. Whatever materials could be used from around the site were utilized to cut down cost, including using the local sand and gravel from river deposits in the conduit's cement mixture. The project's general foreman, G.E. Gabrielson, said the hard work was "what I'm out here for, the salary is nothing to me. I like the work. It's good for them. It's been good for me. I want to get this job done in record time. I want it to be a credit to San Diego. Also I want to see this water system completed, because I worked on it under Engineer O'Shaughnessy" (SDU 1914b, 1915).

On March 31, 1915, the Dulzura Conduit extension was opened at exactly 12:40 pm by turning of the intake wheel by then-Mayor Charles E. O'Neal. A crowd of several hundred, including members of the Realty Board, their wives, members of the city government, and a large group of local ranchers, applauded the "excellent piece of engineering work." W. Irving Lewis, secretary of the water department, Superintendent Herbert R. Fay, and Hydraulic Engineer H.A Whitney who supervised the conduit's construction were also in attendance (SDU 1915).

The 1915 extension of the Dulzura Conduit was the last major addition made to that specific piece of water infrastructure. Throughout the next few decades, water from the conduit was used to fight brush fires in nearby towns and around the water system itself. The conduit also underwent several replacement efforts. In 1916, the conduit was extensively repaired by replacement of about 3,000 feet of ditch and flume. In addition, about 3,700 feet of the open ditches were covered by a concrete slab to prevent the channels from being clogged by debris sliding off the steep hillsides into the ditch (Fowler 1951).

In 1936, Hydraulic Engineer Pyle ordered bulkheads erected at various points along the Dulzura Conduit in order to stop possible drainage. This also worked to keep the wooden flumes from drying out and hold ample amounts of water to fight brush fires in the vicinity of the line. Several alterations were made to the original conduit, including the replacement of Flume 19 in 1940, which replaced the original wooden flume that was rotted with concrete pipe. Contributing to the flume's poor condition was delayed maintenance, estimated to cause the conduit to hold half its original capacity. In December 1940, a resolution was accepted for Walter H. Barber to work on Flume 19's replacement totaling $5,000. In 1948, 600 feet of the original wooden flume was burned out near Barrett Lake in a brush fire and replaced with concrete, which then resumed carrying the 20,000,000 gallons of water through the conduit (SDU 1936, 1940, 1948).

The Dulzura Conduit continued to age and the city made repairs and improvements as necessary to keep the system in operation. The original system was kept in operation into the 1980s; it wasn't until the 1990s that the City made additional large-scale alterations using helicopters to renovate the line, replacing the open sections with steel pipelines supported by concrete and steel standards, in addition to reconditioning the tunnels (Martin 2017).

Heavy rains in 2004 and 2005 followed by the 2007 Harris Wildfire caused severe damage to the Dulzura Conduit, which prevented the city from moving water from the Barrett Dam to the Upper and Lower Otay Reservoirs. Starting in 2009, a large section of the remaining open canals were outfitted with paneled concrete covers via helicopter. Reportedly, the last time the Dulzura Conduit contained water was in 2010. In the years following, large portions of the structure were replaced, including Flume 14 (old Flume 22) which was replaced in 2011 with a 54-inch diameter coated galvanized corrugated steel pipe, supported by a prefabricated steel truss bridge. None of the original wooden flumes is still extant, replaced with either concrete or metal conduit (CSDPUD 2013; Martin 2017).

Engineer: Michael Maurice O'Shaughnessy (1864-1934)

M.M. O'Shaughnessy was born in Limerick, Ireland, the son of Patrick and Margaret (O'Donnell) O'Shaughnessy. One of nine children, he was educated in the public schools in Ireland, and attended Queen's College, Cork, and then in Galway. On October 21, 1885, he graduated with a Bachelor of Engineering degree from the Royal University of Dublin. On March 8, 1885, O'Shaughnessy left for America and ten days later reached New York City. He then proceeded on to San Francisco, arriving on March 30, 1885. He began his career working as an Assistant Engineer, first for the Sierra Valley and Mohawk Railroad (1885-1886) and later for Southern Pacific Railroad (1886-1888), at various locations throughout California. In 1890, he married Mary Spottiswood in San Francisco and later they had five children together: Helen, Elizabeth, Francis, Margaret, and Mary (Boden 1934; OAC 2005).

He began private consulting as a civil engineer in August 1888 and undertook the surveying and engineering of land developments in California, laying out a number of small towns throughout the state, including Niles, Tracy, and Stanger. From 1890 to 1898, he was in general engineering practice in California, with an office in San Francisco. He served as Chief Engineer of the 1893 California Midwinter International Exposition held in Golden Gate Park. At the Exposition's close he was selected to become Chief Engineer for the Mountain Copper Company, where he built 12 miles of narrow-gauge railroad in Shasta, California, in 1895 and completed projects for several corporations, including the Spring Valley Water Company (Boden 1934; OAC 2005).

From 1899 to 1906, O'Shaughnessy was employed to design and construct four large irrigation and hydraulic projects on about 20 sugar plantations in the Hawaiian Islands, including Olokele, Koolau, Keanaiemaui, and Kohola. Shortly after the 1906 earthquake and fire in San Francisco, O'Shaughnessy returned to California. From 1907 to 1912, he served as both Chief Engineer and Consulting Engineer for John D. and Adolph Spreckels' SCMWC in San Diego, and completed the Dulzura Conduit and Morena Dam (Boden 1934; OAC 2005).

In 1912, O'Shaughnessy was appointed City Engineer of San Francisco by Mayor James Rolph and was placed in full charge of the Hetch Hetchy project, handling the financial responsibilities as well as the engineering details. He held the position of City Engineer for 20 years, until January 8, 1932, when a new City Charter was adopted that separated the ordinary work of the City Engineer from that of its public utilities, including the municipal water supply. On February 8, 1932, the newly formed Public Utilities Commission appointed O'Shaughnessy Consulting Engineer for Hetch Hetchy Water Supply, a position that he held until his death in 1934, just 16 days before the opening of the Hetch Hetchy Reservoir in Yosemite. In July 1923, the dam at Hetch Hetchy Valley was dedicated in his honor, and officially given the name O'Shaughnessy Dam. (Boden 1934; OAC 2005).

O'Shaughnessy's career as an engineer spanned 49 years, from 1885 until his death in 1934. A small sample of his work is included below (Boden 1934; OAC 2005):

- California Midwinter International Exposition Chief Engineer, San Francisco County (1890-1894)
- Olokele Aqueduct, Kauai (1902-1903)
- Koolau Aqueduct, Maui (1903-1904)

- Kohola Aqueduct, Hawaii (1905-1906).
- Dulzura Conduit, San Diego County (1907-1909)
- Morena Dam, San Diego County (1909-1912)
- Mile Rock Sewer Tunnel, San Francisco County (1914-1915)
- O'Shaughnessy Dam, Tuolumne County (1919-1923)
- Municipal Railway System, San Francisco County (1915-1927)
- Twin Peaks Tunnel, San Francisco County (1918)
- Ocean Beach Esplanade, San Francisco County (1928)

<u>NRHP and CRHR Significance Evaluation</u>

NRHP Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.

CRHR Criterion 1: Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

The Dulzura Conduit was constructed in 1909 during a significant period in San Diego source water development history: the Early Water System Development period (1887-1916). While still plagued with supply and quality issues, the formation of the San Diego Water Company in 1873 was a turning point for the City that set the stage for the development of reliable water sources in San Diego. Population increases also fueled the need for additional reliable water sources and by the 1880s, private water companies were forming to help meet this need. One of the great engineering achievements during the 1880s was the construction of the Sweetwater Dam by the San Diego Land and Town Company. Simultaneously, the Cuyamaca Dam was constructed on Boulder Creek in the Cuyamaca Mountains in 1887. It is this first completed major piece of water infrastructure that marks the start of the Early Water System Development period. One of the most notable companies to emerge during this time was the Southern California Mountain Water Company (SCMWC) in 1894. Through the formation of private water companies, multiple water infrastructure projects were undertaken during the late nineteenth and early twentieth century. Such projects included Morena Dam (1895), the original Lower Otay Dam (1897), Upper Otay Dam (1902), and the Dulzura Conduit (1909). Despite the early successes of some of these projects, a catastrophic flood of 1916 devastated the San Diego region and destroyed the original Lower Otay Dam. Because the flood of 1916 essentially wiped out much of the City's early water infrastructure, it serves as the end date for this period of early water development in San Diego.

The Dulzura Conduit, constructed between 1907 and 1909 by the SCMWC, was a major piece of water infrastructure that connected Barret Reservoir with Dulzura Creek. The procurement of water played an instrumental role in the growth and development of the City of San Diego since its founding. The original Dulzura Conduit was part of a water system designed and eventually sold to the City by the SCMWC. The association with the SCMWC is significant, as it is representative of a time in the City's history when water supply was privatized and not a public utility like it is today. Despite this significant association, many key features of the conduit, including wooden flumes and open concrete canals, have been heavily altered or replaced over time. The Dulzura Conduit's materials were replaced over time to keep the piece of water infrastructure functioning. Replacement of all wooden flumes, covering open trenches and patching original concrete were necessary in order to keep the conduit in use. Approximately 70% of the original flume materials from the period of significance have been replaced over time. Despite the conduit not retaining integrity of materials or workmanship it does retain the essential feature of its alignment.

The Dulzura Conduit is best interpreted within the context of its position in the Morena-Barrett-Otay water system, one of the earliest City-owned water infrastructure systems that supplied a burgeoning city with water during the early twentieth century. It continued to play a critical role in the City's water infrastructure until World War II, when the City finally receives water from the Colorado River. Without the purchase, development, repairs, and maintenance to this water infrastructure system over time, the City of San Diego would probably have not experienced such growth in the early twentieth-century.

In summary, the Dulzura Conduit is a significant water resource that helped expand the City of San Diego-owned water system. Despite subsequent alterations to original materials resulting in a lack of integrity, the conduit retains its original alignment, which is the most vital aspect in considering Criterion A/1. The maintenance, repair, and upgrades of the conduit are essential to maintain the original and intended use of the resource. Given the resource type, it is simply not possible to maintain the original materials and workmanship over the course of a century while simultaneously maintaining the resource's function. Due to the Dulzura Conduit's strong association with the early period of water infrastructure development in San Diego and its continuous role within this system, the Dulzura Conduit Site appears eligible under Criterion A/1 as a contributing element of the City of San Diego Source Water System. However, it is not eligible at the individual level of significance due to a lack of integrity and its dependence on other parts of the system to perform its function and convey its significance.

NRHP Criterion B: Associated with the lives of significant persons in our past.

CRHR Criterion 2: Associated with the lives of persons important in our past.

The Dulzura Conduit has connections to noted individuals, including E.S. Babcock and the Spreckels brothers, and early developers of the City of San Diego. Additionally, the subject property is not connected with any of these individuals in a way that demonstrates their contributions were demonstrably important within a local, State, or national historic context. Therefore, the subject property does not appear eligible under NRHP/CRHR Criterion B/2.

NRHP Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

CRHR Criterion 3: Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

The Dulzura Conduit does not embody the distinctive characteristics of a type, period, or method of construction. The conduit's design is simple and utilitarian and does not display high artistic values that exhibit the work of the master engineer M.M. O'Shaughnessy. Additionally, the amount of large-scale alterations done to the original design of the conduit have removed any distinguishable elements that would identify the conduit as an early-twentieth century piece of water infrastructure. The Dulzura Conduit was one of several pieces of water infrastructure designed by O'Shaughnessy while acting as Chief Engineer and Consulting Engineer for the SCMWC. Due to the amount of alterations and the lack of high engineering skill involved in its design and construction, the conduit does not represent one of the best works by the engineer.

Engineer M. M. O'Shaughnessy designed the Dulzura Conduit's wooden flumes, concrete tunnels and concrete channels in a purely utilitarian way. Upon completion, the conduit's 13.38 miles were comprised of 10,000 feet of tunnel, two miles through solid granite; a mile and a quarter of wooden flume lines; and nine miles of open canals. The wooden flumes were simple redwood box flumes with wooden trestlework bellow featuring no unique carving or visual identifiers. The concrete tunnels and channels were constructed using wooden formwork and did not feature any visual identifiers or designs. No aspect of the Dulzura Conduit's design or ornament can closely associate it as being a unique design of the master engineer M.M. O'Shaughnessy and much of the engineer's original design, materials, and workmanship is no longer evident. Wooden and concrete conduits are located throughout the United States and are not of a distinctive type or method of construction.

Additionally, subsequent alterations to the original materials further remove the conduit from its association with O'Shaughnessy. The Dulzura Conduit does not retain integrity of design. Since its construction in 1909, there have been major repairs to the structure and significant alterations that depart from the original M.M. O'Shaughnessy design. All the original redwood flumes have been replaced with either metal or concrete and a majority of the original open concrete canals has been covered with concrete panels. These two key elements made in the original conception of the property have been altered beyond recognition and can no longer be associated as a design made by O'Shaughnessy in 1909

In summary the conduit lacks integrity of design, materials, and workmanship and can no longer convey its appearance as an O'Shaughnessy design. Its intention was to be a utilitarian water delivery system. Therefore, the Dulzura Conduit appears not eligible under NRHP/CRHR C/3.

NRHP Criterion D: Have yielded, or may be likely to yield, information important in history or prehistory.

CRHR Criterion 4: Has yielded, or may be likely to yield, information important in prehistory or history.

Archaeological survey was not conducted for this project. At this time there is no indication that the Dulzura Conduit has the potential to yield information important to state or local history. Therefore, the property is recommended not eligible under NRHP/CRHR

Criterion D/4.

City of San Diego Significance Evaluation

Criterion A: Exemplifies or reflects special elements of the City's, a community's, or a neighborhood's historical, archaeological, cultural, social, economic, political, aesthetic, engineering, landscaping, or architectural development.

As described in the NRHP/CRHR Criterion A/1 discussion above the Dulzura Conduit, constructed between 1907 and 1909 by the SCMWC, was a major piece of water infrastructure that connected Barret Reservoir with Dulzura Creek. The procurement of water played an instrumental role in the growth and development of the City of San Diego since its founding. The original Dulzura Conduit was part of a water system designed and eventually sold to the City by the SCMWC. The association with the SCMWC is significant, as it is representative of a time in the City's history when water supply was privatized and not a public utility like it is today. Despite this significant association, the key features of the conduit, including wooden flumes and open concrete canals, have been heavily altered or replaced over time. The Dulzura Conduit's materials were replaced over time to keep the piece of water infrastructure functioning. Replacement of all wooden flumes, covering open trenches and patching original concrete were necessary in order to keep the conduit in use. Approximately 70% of the original flume materials from the period of significance have been replaced overtime and no longer resemble the line as it looked in 1909 upon its completion or when it was purchased by the City in 1912. Despite the conduit not retaining integrity of materials or workmanship it does retain the essential feature of its alignment.

In summary, the Dulzura Conduit is a significant water resource that helped expand the City of San Diego-owned water system. Despite subsequent alterations to original materials resulting in a lack of integrity, the conduit retains its original alignment, which is the most vital aspect in considering Criterion A. The maintenance, repair, and upgrades of the conduit are essential to maintain the original and intended use of the resource. Given the resource type, it is simply not possible to maintain the original materials and workmanship over the course of a century while simultaneously maintaining the resource's function. Due to the Dulzura Conduit's strong association with the early period of water infrastructure development in San Diego and its continuous role within this system, the Dulzura Conduit Site appears eligible under City Criterion A.

Criterion B: Is identified with persons or events significant in local, state, or national history.

Persons: The Dulzura Conduit has connections to noted individuals, including E.S. Babcock and the Spreckels brothers, and early developers of the City of San Diego. Additionally, the subject property is not connected with any of these individuals in a way that demonstrates their contributions were demonstrably important within a local, State, or national historic context.

Events: As described in the NRHP/CRHR A/1 criterion discussion above, the Dulzura Conduit is associated with events significant in local, state, and national history. Construction of the Morena-Barrett-Otay water project was a major undertaking in a remote part of San Diego that required significant planning and coordination, and was an important event at the time construction began. The Dulzura Conduit was a valuable part of the Otay-Cottonwood watershed connecting Barret Reservoir with Dulzura Creek. The subject property is directly associated with important events related to early water development in the San Diego region, namely with the City gaining source water independence and being a critical component to the water infrastructure that supported the City's growth and development until the end of World War II. Although many of the original materials and workmanship that made up its character during the period of significance have been lost, the conduit's alignment is still intact and can still convey the significant event of its planning and coordination to connect existing systems and infrastructure. Therefore, the Dulzura Conduit Site appears eligible under City Criterion B.

Criterion C: Embodies distinctive characteristics of a style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship.

As described in the NRHP/CRHR Criterion C/3 discussion above, the Dulzura Conduit does not embody distinctive characteristics of an early-twentieth century conduit. The structure's current appearance does not retain most of the physical features that constitute a wooden and concrete early twentieth-century conduit. The property retains its original basic features in the special relation of the original line's path, but a majority of its materials and details have been replaced over time. Since its construction in 1909, there have been major repairs to the structure and significant alterations. All the original redwood flumes have been replaced with either metal or concrete and a majority of the original open concrete canals has been covered with concrete panels. These two key elements made in the original conception of the property have been altered beyond recognition and can no longer be associated as a design made by O'Shaughnessy in 1909. Therefore, the Dulzura Conduit Site appears not eligible under City Criterion C.

Criterion D: Is representative of the notable work or a master builder, designer, architect, engineer, landscape architect, interior designer, artist, or craftsman.

The Dulzura Conduit's engineer, M.M. O'Shaughnessy (1864-1934) is a master engineer having served as Chief Engineer and Consulting Engineer for the Southern California Mountain Water Company (SCMWC) in San Diego from 1907 to 1912. During this time, he completed the Dulzura Conduit and the Morena Dam (1909-1912).

The conduit maintains an association with O'Shaughnessy in that it was designed and completed by him under the supervision of the SCMWC. Although, subsequent alterations to the original design as well as the lack of high skill required for the initial design of the conduit, make this association not strong enough to be a notable work. O'Shaughnessy's career as an engineer spanned 49 years, from 1885 until his death in 1934. Within this time, he designed several aqueducts including the Koolau Aqueduct, Maui (1903-1904); Olokele Aqueduct, Kauai (1902-1903);Kohola Aqueduct, Hawaii (1905-1906); and multiple dams including the Morena Dam and the O'Shaughnessy Dam. Of O'Shaughnessy's engineering accomplishments, the Dulzura Conduit does not display a high level of skill and is neither his last nor most prominent design. Further, there have been major repairs to the structure and significant alterations that depart from the original M.M. O'Shaughnessy design. All the original redwood flumes have been replaced with either metal or concrete and a majority of the original open concrete canals has been covered with concrete panels. These two key elements made in the original conception of the property have been altered beyond recognition and can no longer be associated as a design made by O'Shaughnessy in 1909. As a result, the Dulzura appears not eligible under City Criterion D.

Criterion E: Is listed or has been determined eligible by the National Park Service for listing on the National Register of Historic Places or is listed or has been determined eligible by the State Historical Preservation Office for listing on the State Register of Historical Resources.

The Dulzura Conduit Site is not known to be on any local, state, or national list of significant properties, nor is it known to have been determined eligible for listing on any register. Concurrence of eligibility by the State Historic Preservation Office is pending. Therefore, at this time the Dulzura Conduit Site appears not eligible under City Criterion E.

Criterion F: Is a finite group of resources related to one another in a clearly distinguishable way or is a geographically definable area or neighborhood containing improvements which have a special character, historical interest, or aesthetic value, or which represent one or more architectural periods or styles in the history and development of the City.

As described under NRHP/CRHR Criteria A/1 and C/3 (see full discussion above),the Dulzura Conduit is significant for it role, function, and design within the larger City of San Diego Source Water System, of which it is a contributing resource to. The City of San Diego Source Water System includes ten (10) impounding reservoir complexes owned/operated by the City that function as part of the City's municipal water-supply system. These resources and their related infrastructure (e.g., dams, outlet towers, conduits, flumes, and pipelines) constitute a finite group of resources related to one another in a clear way, steeped in historical interest and representative of significant engineering achievements. Taken as a whole, these resources (including the Dulzura Conduit) are significant for their role in the City's source water system, starting with the earliest efforts to establish privatized water in the 1880s soon followed by construction of the earliest reservoirs, Lake Cuyamaca (1887) and Sweetwater Reservoir (1888). The period of significance ends with construction of the San Diego Aqueduct, and the importation of Colorado River Water for the first time into the San Vicente Reservoir (1947), which forever changed the composition of City's source water supply. Therefore, the Dulzura Conduit appears eligible under City Criterion F.

Integrity Assessment

Overall, the Dulzura Conduit retains integrity of location and diminished integrity of setting, workmanship, and association. It does not retain enough integrity to convey significance in design, materials and feeling as described below:

Location: The Dulzura Conduit retains integrity of location. The location of the Dulzura

Conduit between the Barret Reservoir and Dulzura Creek as it was built in 1909 has been retained, acting as a valuable water delivery system between the two locations. The original 13.38 miles of flume, tunnels, and canals remain in the physical locations in which they were intended. The Dulzura Conduit's location was strategic in order to stop the flow of water from north to south, eventually ending up in the Tijuana River. The conduit has never been shifted or relocated. As such, the Dulzura Conduit Site retains its integrity of location.

Setting: The integrity of setting for the Dulzura Conduit has been diminished by subsequent development around the conduits path. Upon completion, the conduit was surrounded by open land. Over the years since its construction, the addition of Barrett Lake Road, CA-94 and multiple residences have removed it from its original physical environment of a remote site. Therefore, the Dulzura Conduit maintains a diminished amount of integrity in setting.
Design: The Dulzura Conduit does not retain integrity of design. Since its construction in 1909, there have been major repairs to the structure and significant alterations that depart from the original M.M. O'Shaughnessy design. All the original redwood flumes have been replaced with either metal or concrete and a majority of the original open concrete canals has been covered with concrete panels. These two key elements made in the original conception of the property have been altered beyond recognition and can no longer be associated as a design made by O'Shaughnessy in 1909.

Materials: Similarly, the Dulzura Conduit does not retain integrity of materials. New materials have been introduced to the site on a large-scale including modern concrete and metal. Repairs have not been done with in-kind materials, either replacing the original material entirely or being visually non-compatible. The remains of the original Dulzura Conduit's concrete have been either covered with modern reinforced concrete, or patched with modern concrete. As such, the Dulzura Conduit does not retain integrity of materials.

Workmanship: The Dulzura Conduit retains diminished integrity of workmanship. The evidence of craftsmanship of the workers who built the conduit is evident in the still-visible concrete board forms on the in-ground channels. For reasons similar to the materials aspect, this integrity has been diminished due to subsequent alterations. A majority of these open canals have been covered with modern concrete panels, eliminating the ability to view the original 1907-1909 workmanship. Additionally, the removal of the original redwood flumes has eliminated the workmanship that went into their construction. As such, the Dulzura Conduit integrity of workmanship is diminished.

Association: The Dulzura Conduit retains diminished integrity of association. It was designed and built by the SCMWC but later operated by City of San Diego employees for the purpose of supplying water to the city. The association to the City of San Diego is strong insofar that the conduit still operates as intended although it was constructed by the SCMWC and is now operated by the City. Therefore, the Dulzura Conduit Site retains diminished integrity of association.

Feeling: The Dulzura Conduit no longer retains integrity of feeling. The modern addition of roads along the conduit's path as well as the extensive alterations and replacement of design features reduce the feeling of an early-twentieth century conduit operating as an extension of the City of San Diego outside of city limits. The conduit because of subsequent alterations to design, materials, and workmanship do not convey the property's historical character. Therefore the conduit does not retain integrity of feeling.

***B12. References:**

Boden, Charles R. Dec. 1934. "Michael Maurice O'Shaughnessy Obituary." California Historical Society Quarterly. California: University of California Press. Vol. 13, No. 4 (Dec., 19, 1934), pp. 415-416. Accessed November 16, 2018. http://www.jstor.org/stable/25160549

City of San Diego. 2013. "Morena Reservoir". Public Utilities Department. Accessed October 17, 2018. http://s3.documentcloud.org/documents/1006251/morena-reservoir-7-13.pdf.

Crawford, Richard. 2011. The Way We Were in San Diego. Charleston, South Carolina: History Press.

Fowler, L. 1953. "A History of the Dams and Water Supply of Western San Diego County." Thesis. University of California. On file with the City of San Diego Water Utilities Department.

Hennessey, Gregg. R. 1978. "The Politics of Water in San Diego 1895–1897." The Journal of San Diego History, Summer 1978, 24(3). Accessed June 2018. http://www.sandiegohistory.org/journal/1978/july/water/.

Hill, Joseph. 2002. "Dry Rivers, Dammed Rivers, and Floods: An Early History of the Struggle between Droughts and Floods in San Diego" The Journal of San Diego History, Winter, 2002, 48. Accessed November 2018. https://sandiegohistory.org/journal/2002/january/hill-2/

LAT (Los Angeles Times). 1896. "San Diego County." *Los Angeles Times*. Feb 15, 1896. Page 13. Accessed on May 11, 2018 on Newspapers.com.

LAT. 1909a. "Will Dedicate Conduit." Newspapers.com: *Los Angeles Times* (Los Angeles, CA), January 19, 1909, pg. 25. Accessed on November 15, 2018 on Newspapers.com.

LAT. 1909b. "Autos for Big Celebration." Newspapers.com: *Los Angeles Times* (Los Angeles, CA), January 21, 1909, pg. 25. Accessed on November 15, 2018 on Newspapers.com.

LAT. 1909c. "Rains Cause Postponement." Newspapers.com: *Los Angeles Times* (Los Angeles, CA), February 3, 1909, pg. 28. Accessed on November 15, 2018 on Newspapers.com.

LAT. 1909d. "No Water Celebration." Newspapers.com: *Los Angeles Times* (Los Angeles, CA), February 18, 1909, pg. 25. Accessed on November 15, 2018 on Newspapers.com.

LAT. 1909e. "Celebration Abandoned." *Los Angeles Times* (Los Angeles, CA), May 27, 1909. Pg. 25. Accessed on November 15, 2018 on Newspapers.com.

Martin, John. 2017. Images of America series: The Dams of Western San Diego Country. Charleston, South Carolina: Arcadia Publishing. Accessed November 2018. https://www.google.com/books/edition/The_Dams_of_Western_San_Diego_County/f0UvDwAAQB

AJ?hl=en&gbpv=1&dq=Images+of+America+series:+The+Dams+of+Western+San+Diego+County&pg=PA128&printsec=frontcover

Meixner, G. Donald. 1951. "Historical Development of Water Utilization." Draft. On file at the San Diego Public Utilities Department Archive.

McGrew, Clarence Alan. 1922. City of San Diego and San Diego County: The Birthplace of California, Volume II. Chicago, Illinois, and New York, New York: The American Historical Society. Accessed November 2018. https://ia800200.us.archive.org/8/items/cityofsandiegosa01mcgr/cityofsandiegosa01mcgr.pdf.

Pacific Coast Architecture Database. 2015. Michael Maurice O'Shaughnessy (Civil Engineer). Accessed October 10, 2018. http://pcad.lib.washington.edu/person/1636/.

OAC (Online Archive of California). 2005. "Finding Aid to the M.M. (Michael Maurice) O'Shaughnessy papers." Biographical Information. Accessed November 16, 2018. https://oac.cdlib.org/findaid/ark:/13030/hb5d5nb6sr/entire_text/.

Ormsby, Burke. 1966. "The Lady Who Lives by the Sea. The Story of Hotel del Coronado." The Journal of San Diego History. San Diego Historical Society Quarterly. January 1966, Volume 12, Number 1. Accessed November 2018. http://www.sandiegohistory.org/journal/66january/ladybysea.htm.

O'Shaughnessy, Michael Maurice. 1934. Engineering Experience: From Honolulu to Hetch Hetchy. Personal and Family Papers, 1864-1970 of Michael Maurice O'Shaughnessy. Accessed October 11, 2018. https://digital.library.nuigalway.ie/islandora/object/nuigalway%3A22354#page/1/mode/1up

San Diego History Center. 2018a. "Biography: John D. Spreckels (1853–1926)." Accessed November 2018. http://www.sandiegohistory.org/archives/biographysubject/spreckels/.

San Diego History Center. 2018b. Photograph collection. Accessed in person Accessed June and August 2018.

SDU (San Diego Union. 1908a. "Mammoth Dulzura Conduit will be ready for Water January 1." Genealogybank.com: *San Diego Union* (San Diego, CA), June 28, 1908, pg. 9-11. Accessed November 16, 2018.

SDU. 1908b. "Water Enough for City of 40,000 Assured by Five Immense Impounding Reservoirs." Genealogybank.com: *San Diego Union* (San Diego, CA), July 2, 1908, pg. 2. Accessed November 16, 2018.

SDU. 1909. "Mammoth Conduit Assures City of Inexhaustible Water Supply." Genealogybank.com: *San Diego Union* (San Diego, CA), January 21, 1909, pg. 7. Accessed November 16, 2018.

SDU. 1912. Described San Diego's Water System: M.M. O'Shaughnessy Delivers Address to American Society of Civil Engineers." Genealogybank.com: *San Diego Union* (San Diego, CA), April 20, 1912, pg. 5. Accessed November 16, 2018.

SDU. 1914a. "Exact Status of Water Commission is Determined." Genealogybank.com: *San*

Diego Union (San Diego, CA), January 25, 1914, pg. 21. Accessed November 16, 2018.

SDU. 1914b. “Water System Improvements Being Rushed.” Genealogybank.com: *San Diego Union* (San Diego, CA), October 8, 1914, pg. 6. Accessed November 16, 2018.

SDU. 1915. “New Conduit Open as Mayor Turns Giant Wheel.” Genealogybank.com: (San Diego, CA), April 1, 1915, pg. 7. Accessed November 16, 2018.

SDU. 1916. “Engineer Alverson Favors Lower Otay Dam in Report.” Genealogybank.com: *San Diego Union* (San Diego, CA), November 16, 1916, pg. 9. Accessed November 16, 2018.

SDU. 1936. “Dulzura Conduit to be used in Battling Brush Blazes.” Genealogybank.com: *San Diego Union* (San Diego, CA), September 26, 1936, pg. 1. Accessed November 19, 2018.

SDU. 1940. “Plans Progress for new Flume.” Genealogybank.com: *San Diego Union* (San Diego, CA), October 13, 1940, pg. 21. Accessed November 19, 2018.

SDU. 1948. “Flume Replaced.” Genealogybank.com: San Diego Union (San Diego, CA), August 8, 1948, pg. 2. Accessed November 21, 2018.

Sholders, Mike. 2002. “Water Supply Development in San Diego and a Review of Related Outstanding Projects.” *The Journal of San Diego History*, Winter 2002, 48(1). Accessed November 2018. http://sandiegohistory.org/journal/2002/january/sholders/.

Smythe, William Ellsworth. 1908. “History of San Diego (1542–1908).” In *An Account of the Rise and Progress of the Pioneer Settlement on the Pacific Coast of the United States, Volume II, The Modern City.* San Diego, California: The History Company. Accessed November 2018. https://ia902300.us.archive.org/26/items/historyofsandieg02smyt/historyofsandieg02smyt.pdf

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3B; 3CB, 5B

Other Listings
Review Code Reviewer Date

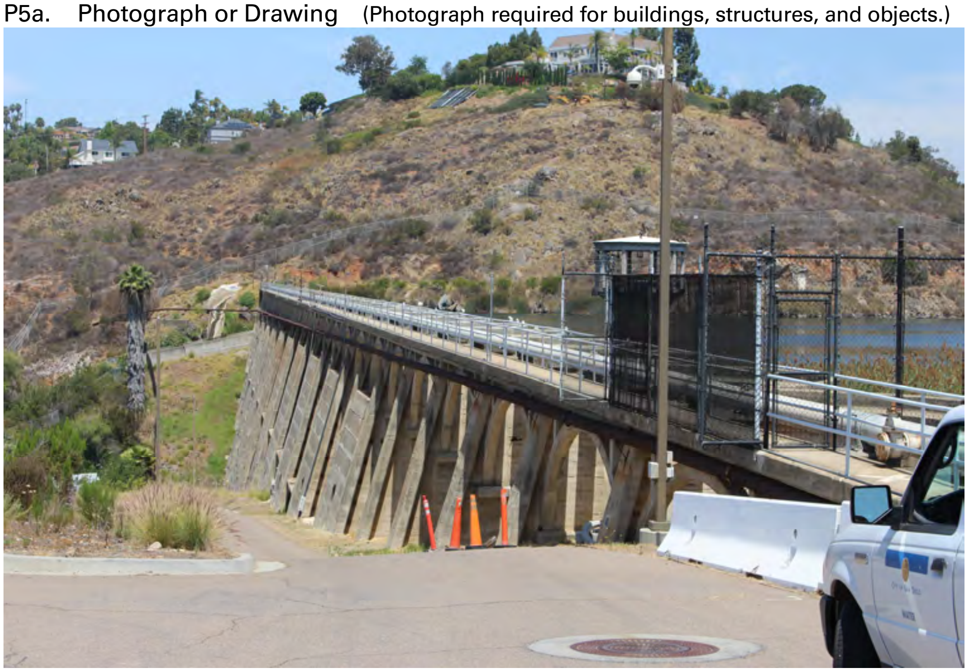
Page 1 **of** 28 ***Resource Name or #:** (Assigned by recorder) Murray Reservoir Complex
P1. Other Identifier:

***P2. Location:** ☐ **Not for Publication** ■ **Unrestricted**
***a. County** San Diego **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad** La Mesa **Date** 1994 (1998 ed.) **T** 16S; **R** 2W; ☐ **of Sec** 13; San Bernardino **B.M.**
c. Address 5540 Kiowa Drive City La Mesa Zip 91942
d. UTM: (Give more than one for large and/or linear resources) Zone 11S, 495713 mE/ 3627096 mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
Lat/Long: 32°46'54.4"N, 117°02'44.8"W

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
The Murray Reservoir Complex is located in a 250 foot wide canyon. The dam is a multiple arch, board poured concrete buttress structure (Figure 1). The crest measures approximately 890 feet long with a 4-foot wide walkway running across the crest, along the base of all the arches. **See Continuation Sheet.**

***P3b. Resource Attributes:** (List attributes and codes) HP11. Engineering structure; HP21. Dam; HP22. Reservoir
***P4. Resources Present:** ☐ Building ■ Structure ☐ Object ☐ Site ☐ District ■ Element of District ☐ Other (Isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)



P5b. Description of Photo: (view, date, accession #) Downstream side of Murray Dam, view to northwest, June 4, 2018, (IMG 0266)

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
1918 (SDU 1918b)

***P7. Owner and Address:**
Public Utilities Dept.
City of San Diego
9192 Topaz Way
San Diego, CA 92123

***P8. Recorded by:** (Name, affiliation, and address)
Nicole Frank, MSHP, Dudek
605 Third Street
Encinitas, CA 92024

***P9. Date Recorded:**
June 4, 2018

***P10. Survey Type:** (Describe)
Intensive

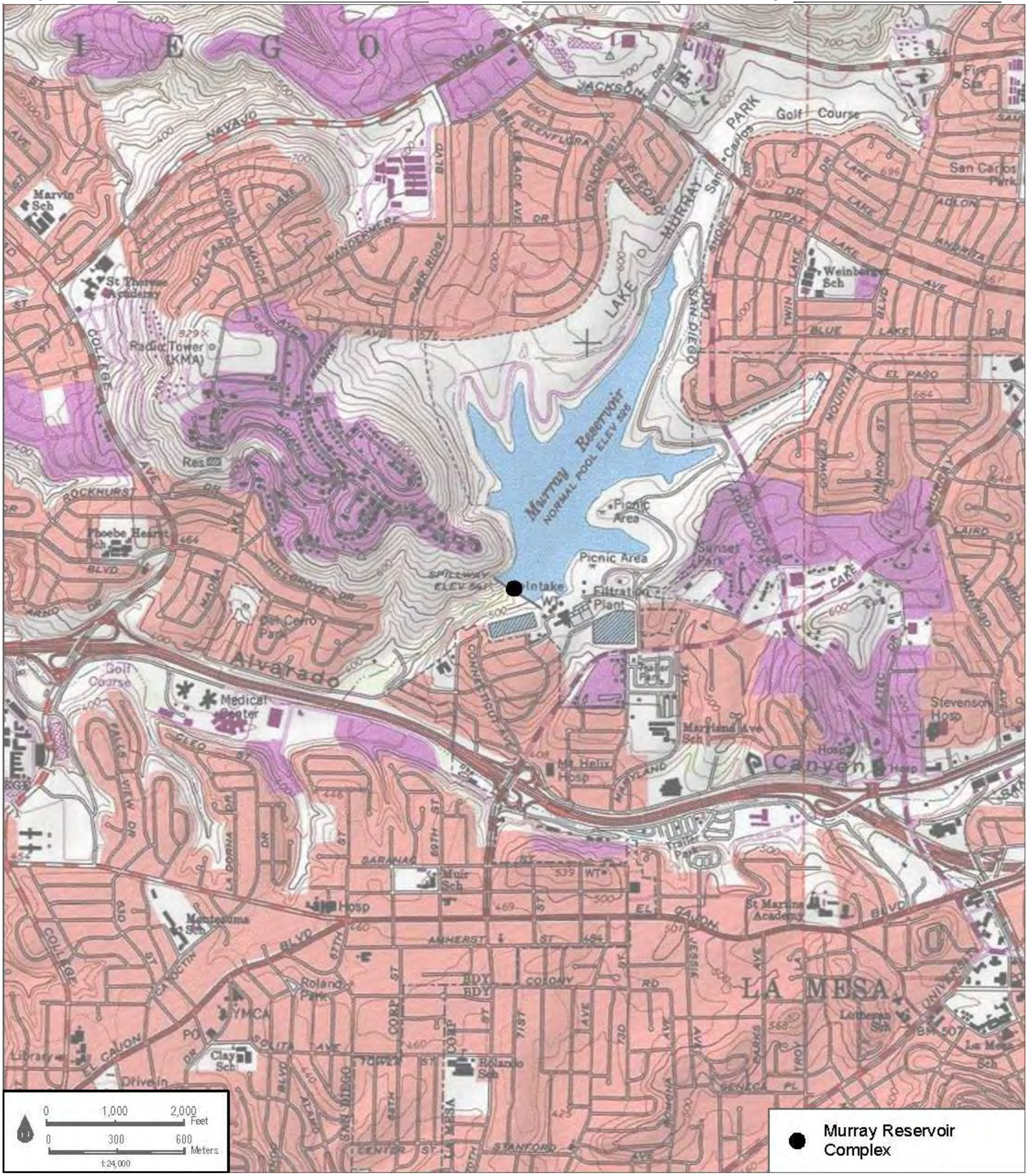
***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")
Dudek. 2020. City of San Diego Source Water System Historic Context Statement.

***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record
☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record
☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California ♁ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 28 ***Resource Name or #** (Assigned by recorder) Murray Reservoir Complex
***Map Name:** La Mesa, USGS 7.5' Quad ***Scale:** 1:24,000 ***Date of map:** 1994 (1998 ed.)



State of California ♁ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
Primary #
HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) Murray Reservoir Complex ***NRHP Status Code** 3B; 3CB, 5B

B1. Historic Name: Murray Dam and Reservoir
B2. Common Name:
B3. Original Use: Municipal water source B4. Present Use: Municipal water source
***B5. Architectural Style:** Multiple arch dam
***B6. Construction History:** (Construction date, alterations, and date of alterations)
Constructed: 1917-1918. Alterations: 1961 earthquake reinforcement

***B7. Moved?** ■No ☐Yes ☐Unknown **Date:** **Original Location:**
***B8. Related Features:**

B9a. Architect: Eastwood, Pyle (engineers) b. Builder:
***B10. Significance: Theme** Flood Recovery and Reinvestment **Area** San Diego
Period of Significance A: 1916-1928; C: 1918 **Property Type** Dam
Applicable Criteria NRHP/CRHR: A/1, C/3; City: A, B, C, D, F
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Historic Context

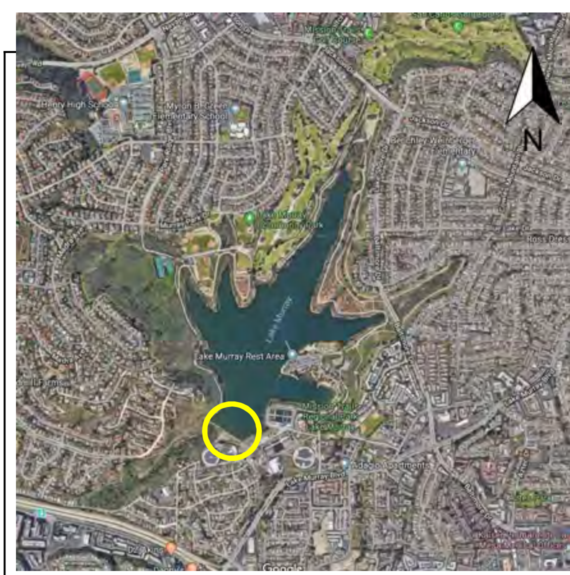
(**See Continuation Sheet)**

B11. Additional Resource Attributes: (List attributes and codes)
***B12. References: (See Continuation Sheet)**

B13. Remarks:

***B14. Evaluator:** Nicole Frank, MSHP; Sam Murray, MA
***Date of Evaluation:** June 30, 2020

(This space reserved for official comments.)



The height of the dam is at least 100 feet. The resources present consist of the dam, outlet tower, and installed stairwell down to the overflow outlet. The eastern side of the dam has a commemorative plaque for the erection of the structure in 1917 (Figure 2). This plaque reads "Murray Dam, Erected 1917 by James A. Murray, WM. G. Henshaw, Ed Fletcher." This bronze plaque is at the eastern end of the dam's concrete walkway footing.

***P3a. Description: (continued)**

Figure 1. Overview of Murray Dam from the central portion of the downstream face, view to east, JFC_0312

Figure 2. Bronze erection commemorative plaque, view to west, IMG_0276

The access walkway takes a linear path along the southern rim of the buttresses, in a southwest/northeast cant. This access walkway is made of galvanized metal with a two tiered rail at a max height of approximately 4-feet, with an integrated concrete base (Figure 3).

Figure 3. Access walkway and dam overview from the eastern end, view to northeast, IMG_0266

The outlet tower is located near the approximate middle of the dam, and approximately 50 feet away from the upstream face of the dam (Figure 4). It is an octagonal structure with a pergola top. The top of the concrete tower features a reinforced concrete operating deck that regulates the outer gates. Each gate contains a screen cover to keep fish, trash and other debris from entering into the 24-inch-diameter circular pipes. The pipes run through the walls of the tower and connect with a vertical down-pipe that discharges into the dam's spillway.

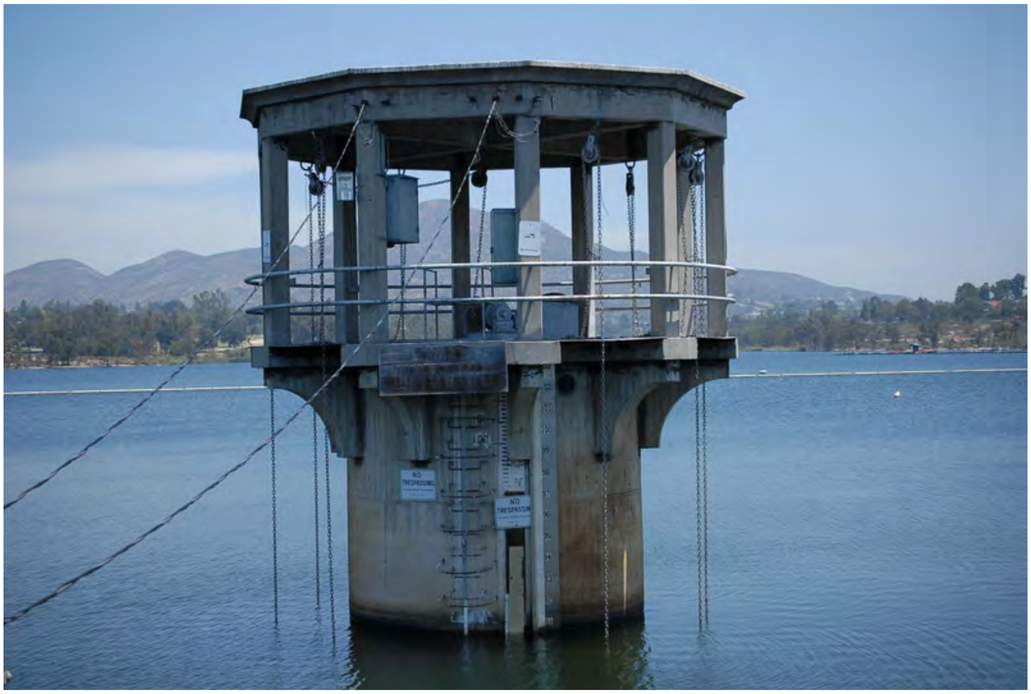


Figure 4. Outlet tower, view to north, JFC_0165

To aid in viewing the water levels, a telescope was placed on the access walkway, and aimed at the water gauge (Figure 5). The focus adjustment is located below the eyepiece and the sightline is clearly labelled on both sides. The base of the telescope reads the numbers 1 through 8, in the same way the face of a clock is divided into twelve, with 8 being aligned to the outlet tower. The telescope is attached to the rail only by a chain, and is otherwise mobile.

Figure 5. Telescope aimed at the outlet tower water gauge, view to north, IMG_0336

On the downstream side of the dam (southern face), a staircase, consisting of embedded concrete stairs trending down the slope in a curving path to the lowest release gate. This staircase is board formed poured concrete (Figure 6). There is no railing associated with this staircase, though there are also two poured concrete footings adjacent to the path and could have been previously associated. Two board poured concrete retaining walls lie maintain the slope of the stairwell.

Figure 6. Stairwell on the downstream side to the outlet at base of dam, view to southeast, JFC 0242

The western end of the dam is where completion was commemorated with stamped lettering as the top platform of a small stairwell, overlooking the spillway at the western extent of the dam (Figure 7). The letters read "FINISHED JAN: 1 1918." The spillway is an ogee overflow side channel with a shallow curved concrete lining leading south to a rectangular bottomed downstream apron (Figure 8). Along the spillway's upstream length are multiple access points.

Figure 7. Completion date stamped into spillway over look post on western end of dam, IMG 0414

Figure 8. Spillway upstream section, viewed from spillway overlook post, IMG_0428

The interior of the arched buttresses was walled off, creating a flattened downstream face, on alternating arches starting on the sixth arch from the east. The fortification of the downstream was done with segments of board formed concrete approximately 2 feet tall. Access to these enclosed buttress sections is through cast formed arched doorways with attached steel security doors. The interior walls of these sections are consistent with the exposed interior buttress arches, except for the roofing component (Figure 9). The roofing component appears to be a more recent addition with fresher plywood sheeting and metal strut work.

Figure 9. Supporting joists of plywood for the roof structure, view looking upwards, IMG 0522

***B10. Significance: (continued)**

Pre-Construction History

In 1910, Pacific Light and Power Company sold its interests on the San Luis Rey River, including Warner Ranch, Warner Dam and reservoir, and land and water rights to the Sutherland Reservoir and Carroll Reservoirs sites to William G. Henshaw. Henshaw formed the Volcan Land and Water Company in 1910 to manage the affairs of the new water system, and hired San Diego local Ed Fletcher to manage the company. Ed Fletcher and James A. Murray also headed the Cuyamaca Water Company and the Ed Fletcher Company, as well as other water and real estate ventures in the San Diego region, and the three men combined their interests. (Fowler 1953; Huber 1912; Jackson 2005; Strathman 2004).

In 1914 the Volcan Land & Water Company offered to sell all of its properties, including the rights to the San Luis Rey River, Santa Ysabel Creek, other streams, as well as Warner Dam and Reservoir, and the Sutherland, Pamo, Carroll (Hodges), Santa Maria, and Dye dam and reservoir sites to the City of San Diego for $2,500,000. The offer came just after the City’s 1913 purchase of the Southern California Mountain Water Company’s Morena-Barrett-Otay System, and Fletcher was confident he could sell the city another water system. City-contracted engineers Michael M. O'Shaughnessy and Joseph B. Lippincott surveyed and published a report in 1915 recommending that the City accept the offer, but it was ultimately declined (Fowler 1953; O'Shaughnessy and Lippincott 1915; Post and Hickok 1914; San Diego Union 1914; San Diego History Canter 2018).

After their initial failure to sell their properties to the City of San Diego, Murray and Fletcher's Cuyamaca Water Company begin planning the Murray Reservoir Complex at the Carroll site. Construction was temporarily held off after the winter storms and subsequent floods of 1916. After Lower Otay Dam was destroyed and the Sweetwater and Morena Dams were damaged however, a series of new, publicly funded and private water storage projects touched off a water infrastructure boom in the City of San Diego (Fowler 1953; Post and Hickok 1914).

Phase 1: Original Murray Dam Construction (1917-1918)

The heavy rains in 1916 produced flooding that came within a foot of overtopping and destroying the earthen La Mesa Dam, which lay at the future site of the Carroll Dam location (now the Murray Reservoir Complex). The La Mesa Dam was a 65-foot-tall hydraulic fill dam built by Julius Howell in the 1890s to store water for the Cuyamaca Water Company. In response to this near-disaster, Ed Fletcher and James A. Murray sought to increase the reservoir's storage capacity and build a new dam. Fletcher approached the engineer John S. Eastwood in early 1916 with plans to replace the La Mesa Dam using the then-controversial, but cost effective, multiple arch design. James Murray, controller of the Cuyamaca Water Company and wealthy capitalist, backed the project, and the Carroll Dam and Reservoir was eventually renamed for him. Murray believed that the construction of a larger dam would expand the company's service area and would increase income from water sales. Additionally, the current La Mesa Dam was subject to erosion in storms and after 1916 began to sag due to ground settlement; as a result, its replacement needed to happen quickly (Jackson 1995; Eastwood 1917a; Farley 2016).

By March 1917, Eastwood completed his design for a 990-foot-long, 117-foot-high dam built of poured-in-place reinforced concrete and featuring 30 arches with 30-foot spans. The top 12 feet of the concrete arches were to be 9 inches thick, making them the thinnest of any Eastwood dam except for the Los Verjels in Yuba County, California. Plans were forwarded to the State Railroad Commission of California and as soon as April 1917, they were accepted directing the Cuyamaca Water Company "to proceed with the construction of the dam as planned" (Eastwood 1917a). Approval of the plan occurred with almost no delay because of the commission's familiarity with the engineer's work. Excavation for the buttresses was already underway when the commission officially approved the design that April. During initial digging for the foundation, a problem was encountered in the upstream toe of the multiple arch dam where it cut into the downstream edge of the older earthen dam. The problem was solved by building timbered trenches to protect the foundation excavations of the new dam, preventing the surrounding sand from filling in the new foundations as they were dug (Jackson 1995; Eastwood 1917a; Farley 2016).

Construction of the Murray Dam took place under the field supervision of Frederic Faude, assistant manager of the Cuyamaca Water Company, and it was built by the Sharp and Fellows Contracting Company. The specific dam design type was known as the Eastwood Multiple-Arched type named for the engineer who developed it, John S. Eastwood. This dam type used arches for the water face deck while the buttresses were used to support the rear, which was designed especially to meet the conditions of the site's contoured elevation of 200 feet. During construction, Eastwood offered to take personal responsibility in overseeing the project, but Fletcher and Murray preferred to keep him in the role of supervisory engineer with general authority overseeing the work. The foundation preparation was complete by August, and concrete to construct the dam was poured soon thereafter (Jackson 1995; Eastwood 1917a; Farley 2016).

A siphon spillway of over 1,000 feet per second capacity was built on the north end with the dams' outlet gates located as near the present creek channel as possible, between buttresses 8 and 9 on the dam itself. The spillway was built with 5 barrel shaped arches each 3 feet by 4 feet in size, arranged in a semi-circle with the crest placed at the same level as the top of the dam. The purpose of the siphon spillway was to regulate the reservoir's water level during floods. Wood forms were used to shape the somewhat unusual concrete shapes, with steel reinforcement bars placed throughout the structure. All concrete was to be of the best quality possible, machine mixed, and then smoothed out once the wooden forms were removed (Figure 10). The buttresses had the same loading at the edge where they met the arches and less as the base was approached due to the tapering thickness from 1 feet at the top and 4.09 feet at the bottom. Most aspects of the dam were built as designed; such as the arch barrels slopping 45 ° at the top 12 feet of the dam. The tops of the arches were capped with a heavily reinforced coping, three feet thick, on the front edge of which was a wave parapet of coping one foot high (Jackson 1995; Eastwood 1917a; Farley 2016; Fowler 1953; Eastwood 1917b).

Figure 10. Photograph of Murray Dam under construction, 1917 (Ed Fletcher Papers, University of California, San Diego)

Upon completion in January 1918, the Murray Dam cost $121,788 to construct and exhibited several changes from its original design. The largest change was the reduction from 30 to 27 arches, although they still spanned 30 feet between the centers of each of the buttresses. Also, the thickness of the arch walls were constructed at 1 feet at the top instead of the original 9 inches, giving a direct loading of 325 pounds per a square inch with the water at the top 200 foot elevation. Additionally upon completion, the dam measured 107 feet high and 864 feet long as opposed to the 117 feet height and 990-foot length originally proposed (Figure 11). The original La Mesa Dam could be seen in the new reservoir when water was low (Fowler 1953; Eastwood 1917b). Because of the new dam, Murray

Reservoir's capacity increased six fold. Within a year after Eastwood submitted the final design, the dam was operational. Fletcher often placed his own name on his engineering accomplishments; however, out of good faith, he named the new dam "Murray Dam" after his business partner. Although this was not well received by Murray, claiming naming a structure after oneself was bad luck, and he looked to change the name, that change never actually occurred (Fowler 1953; Farley 2016).

San Diego Historical Society

Figure 11. Photograph of completed Murray Dam with the spillway at the bottom left, 1919 (Lee Passmore, San Diego Historical Society Archives)

Phase 2: Post-Construction Development (1919-1970)

While the complex was under construction, Murray and Fletcher were seeking out investors to purchase the expanded system. The two sets of investors that were specifically targeted for its purchase were the City of San Diego or the newly formed La Mesa, Lemon Grove, and Spring Valley Irrigation District that serviced rural San Diego County. Fletcher felt that the Cuyamaca system was worth up to $1.5 million. If they sold the company at this price, each owner would be repaid their cash contributions, interest, and profit according to their stock percentages. In 1917, the City of San Diego was asked to buy the Cuyamaca system and requested the Railroad Commission to set a fair price. The price was set at $746,000, although the deal did not go through. Unexpectedly, in 1921, Murray passed away, leaving his holdings vulnerable to a long legal battle between his widow Mary Murray and Ed Fletcher. While still in contention, Fletcher and Charles E. Stern, a Los Angeles banker, tried to sell the system to the City of San Diego in 1922 for $1,000,000 (Farley 2006; Fowler 1956).

After the second unsuccessful sale to the City of San Diego, Fletcher and Stern focused on selling the system to the La Mesa, Lemon Grove, and Spring Valley Irrigation District. The irrigation district was an easier path for the shareholders to receive payment quickly.

A sales price of $1.1 million was negotiated for a portion of the system, although not before Stern had to pay $145,000 to the Murray Estate to maintain control of the Cuyamaca Water Company. The portion of the system was sold to the La Mesa, Lemon Grove, and Spring Valley Irrigation District in 1924. On January 4, 1926, the sale went through and only two years later the remaining portions of the system were sold to the City of San Diego for $400,000, including the Cuyamaca Reservoir and Upper El Capitan Dam to La Mesa (Farley 2016; Fowler 1953).

In 1933, an agreement was signed that San Diego would acquire the right to most of Lake Murray's 5,000 acre-feet capacity, although the La Mesa, Lemon Grove, and Spring Valley Irrigation District still owned the facility. The City exchanged this storage capacity for 10,000 acre-feet of storage capacity in the El Capitan Reservoir, with additional temporary storage during the summer months. Along with this exchange, the District gave the City title to several parcels of land that it owned in the bed of the San Diego River. San Diego Hydraulic Engineer Fred Pyle in 1935 recommended spending $1,060,000 for improving the City's water system, including a pipeline 2.5 miles long from the Murray Reservoir to the City's El Capitan pipeline, and the construction of a new water tower. It was not until 1943, after repairs were made to the dam's outlet, that funds were allotted for the construction of the outlet tower and pipeline Pyle recommended. The city council awarded Trepte Construction Co. a $27,709 contract to construct a concrete outlet tower and 400 feet of 48-inch pipe directly adjacent to the center of the dam (Figure 12). In order to conduct this work the lake needed to be emptied completely. Once construction was complete, water was transferred from the El Capitan Reservoir through the city's El Capitan pipeline and through the La Mesa Irrigation District's conduit in the spring of 1944 to refill Murray Lake (Fowler 1953; SDU 1943, 1944).

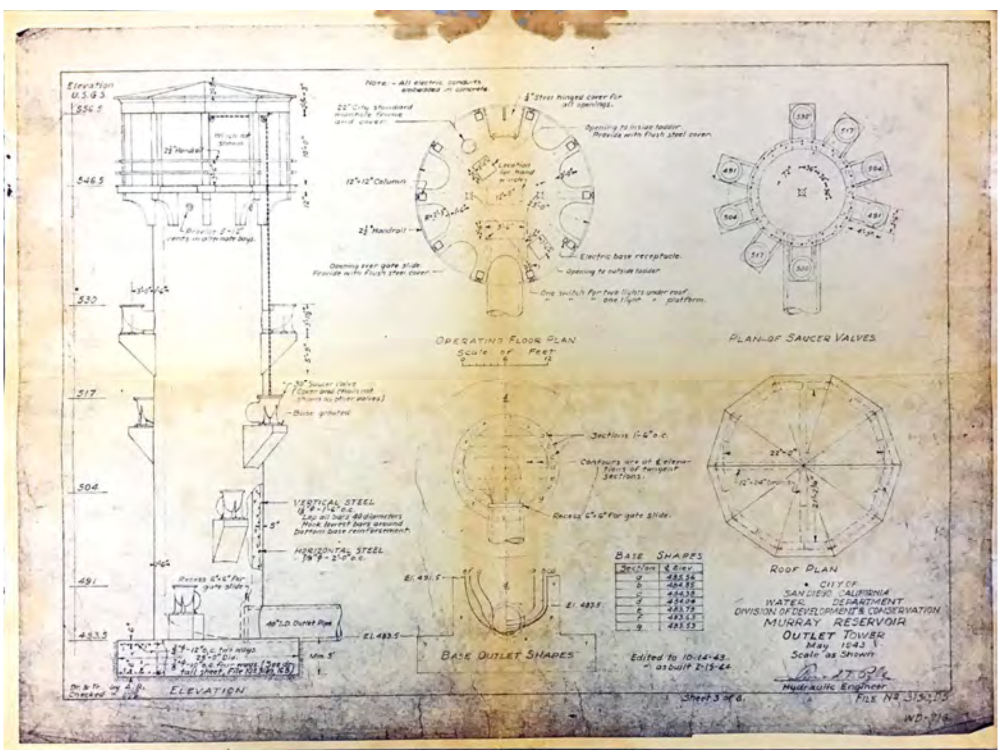


Figure 12. Blueprint of Murray Dam Reservoir outlet tower, 1943 (City of San Diego Public Utilities Department Archives)

In January of 1951, the City of San Diego opened the Alvarado Filtration Plant, costing $4 million, directly east of the Murray Dam and Reservoir (Figure 13). The Alvarado Plant was to replace the University Heights Filtration Plant, which was demolished in 1952 (SDU 1950). The plant would receive gravity-flow water through underground pipes from the San Vicente and El Capitan Reservoirs. Ten years later in 1961, the City of San Diego began negotiations with the Helix Irrigation District to purchase the Lake Murray Dam and Reservoir and the portion of the land on which the City's Alvarado Filtration Plant occupied (SDU 1961a). The La Mesa, Lemon Grove, and Spring Valley Irrigation District was renamed for brevity, and the Helix District after the Helix Mountain in 1956 (SDU 1960). The Helix District agreed to deed the property to the City of San Diego and put up $300,000 to pay for reinforcement of the dam to meet state earthquake stability requirements (SDU 1961b). The District was to pay the $300,000 in installments over 10 years with interest. In return, the City would allow the Helix Irrigation District to store Colorado River water in the City's El Capitan Reservoir as part of the District's 10,000-acre-feet of storage capacity in El Capitan.

From 1961 on, the City of San Diego has maintained ownership of the Murray Reservoir Complex (SDU 1961b). In the late 1960s, the Murray Dam underwent a $513,063 reinforcement project by RIHA Construction Co. to strengthen the dam and meet modern earthquake requirements. This project was conducted under recommendation of then City Manager Walter Hahn, who checked all the City dams for potential hazards (SDU 1968). This represented the last major change made to the site both ownership wise and structurally.

Engineer: John Samuel Eastwood (1857-1924)

John Samuel Eastwood was born in rural Minnesota to Dutch immigrants, near Minneapolis in in 1857. Eastwood "Americanized" his Dutch surname name from Oosterhout in 1878 in anticipation of entering the commercial and professional world. He graduated from University of Minnesota with a B.S. in Engineering in 1879 and emigrated west in 1880 to work on the Northern Pacific Railroad. In 1883, Eastwood moved on from railroad work to the San Joaquin Valley in central California, where he began working on water infrastructure. In 1885, after the incorporation of Fresno as a city, Eastwood was appointed City Engineer. After just one year in this position, Eastwood left, preferring to work for local private logging and hydroelectric engineering projects in the Fresno region of the Sierra Nevada Mountains (Jackson 1979, 1999, 2005, 2009; Whitney 1969).

From 1895 to 1896, he worked as chief engineer for the Fresno-based San Joaquin Electric Company (SJEC) and developed their hydroelectric power system. The system, which relied on the natural flow of the San Joaquin River, eventually failed in the drought conditions of the late 1890s. The failure of design served an important lesson for Eastwood, as he realized the importance of long-term water storage and provided for this in his future California water infrastructure projects (Jackson 1999, 2005; Whitney 1969).

Eastwood designed his first multiple arch dam for Henry Huntington's Pacific Light & Power Corporation, at what was then known as the Big Creek system. Eastwood's innovative dam design promised a strong, but not a material-intensive structure that could be cheaply constructed. In 1906, Eastwood first developed multiple arch designs for Big Creek that required significantly less concrete to build than conventional concrete gravity dams, therefore saving clients' money. The dam never came to fruition due to the Financial Panic of 1907, however, in 1908 Eastwood was hired by the Hume-Bennet Logging Company and used his design for the Hume Lake Dam, completed in 1909 (Jackson 1999, 2005; Whitney 1969).

After the initial success of Hume Lake Dam, Eastwood continued to use and promote his economical and strong multiple arch dam design. In 1910, Eastwood moved on again, this time to design another multiple arch dam and serve as chief engineer for the Big Bear Dam in the San Bernardino Mountains. In 1911, he moved to Oakland to work with the Great Western Power Company (GWPC) in northern California. GWPC planned a large storage dam at Big Meadows as part of the Feather River hydroelectric power system. Here, Eastwood came into conflict with another engineer, John R. Freeman, who promoted a concrete gravity dam design. Though Eastwood's design was initially selected, and construction of a multiple arch dam began at the Big Meadows site, changes in GWPC leadership and the influence of Freeman ultimately led the GWPC to abandon construction of Eastwood's dam in 1913. Surprisingly, the reasons for abandoning the project were not due to any failure of design or miscalculation by Eastwood, but rather with the "psychological disquiet" such a design would inspire in the general public. After the Big Meadows Dam, Eastwood found himself professionally ostracized by the international engineering community. Rather than abandoning the multiple arch design, Eastwood doubled down on his promotion of inexpensive and structurally sound designs (Jackson 1999, 2005, 2009; Whitney 1969).

For a few years, Eastwood was commissioned for small dam projects at Los Verjels Dam and Kennedy Dam before being sought for the Mountain Dell Dam near Salt Lake City, Utah. Shortly afterward, Eastwood was sought by San Diego developer Colonel Ed Fletcher to bring his economical designs to San Diego County. Eastwood designed four dams for Fletcher from 1917 to 1918: Lake Hodges, San Dieguito, Murray, and Eagle's Nest Dams. Though he did not build any other dams in San Diego County after this, Eastwood maintained a warm relationship with Fletcher and it eventually led to a connection to the City of Phoenix, who engaged him to design Cave Creek Dam in the early 1920s (Jackson 1979, 1999, 2005; Whitney 1969).

While working with Fletcher in 1924 on new dam designs, Eastwood spent time at Fletcher's ranch along the King's River. There, he suffered a heart attack while swimming and passed away. The ranch is now covered by the Pine Flat Reservoir, which was dammed in 1954 by a concrete gravity dam (Jackson 1999).

Eastwood's career as an engineer extended 44 years, from 1883 until his death in 1924. A small sample of his work is included below (Jackson 1979, 1999, 2005, 2009; Whitney 1969):

- Hume Lake Dam, Fresno County, California (1908)
- Big Bear Lake Dam, San Bernardino County, California (1912)
- Los Verjels Dam, Yuba County, California (1914)
- Kennedy Dam, Amador County, California (1914)
- Mountain Dell Dam, Salt Lake County, Utah (1916-1925)
- Murray Dam Complex, San Diego County, California (1917)
- Lake Hodges Dam Complex, San Diego County, California (1919)
- Fish Creek Dam, Carey, Idaho (1919)
- San Dieguito Dam, San Diego County, California (1919)
- Cave Creek Dam, Maricopa County, Arizona (1923)
- Anyox Hydroelectric Dam, British Columbia, Canada (1924)

Engineer: Fred Dale Pyle (1882-1950)

Fred Dale Pyle (Oct 8, 1882-July 21. 1950) was born in Perry Township, Pennsylvania. He graduated in 1903 from Utah Agricultural College with a B.S. degree in Civil Engineering. Upon graduating, he took on various jobs, including at Utah Agricultural College conducting crop irrigation experiments, then as a surveyor for the Bureau of Reclamation (then called U.S. Reclamation Service) where he surveyed Bear Lake and Utah Lake. During the latter half of 1904, he conducted groundwater surveys for the U.S Geographic Survey at Utah Lake and Jordan Valleys. In 1905, he briefly worked for fellow classmate W.W. McLaughlin's engineering practice in Utah. Immediately following that, from 1905-1912, he took on several different roles while working on the U.S. Reclamation Service's North Platte Irrigation Project in Nebraska, where he worked in various roles such as Junior Engineer, Instrumentman, and Superintendent of Operation and Maintenance, before finishing his tenure there as the "Irrigation Manager in charge of all operations and maintenance work". From 1913 to 1920, Pyle continued to work on various U.S Reclamation Service irrigation projects including the Belle Fourche Project, Grand Valley Project, and Uncompahgre Project in Colorado and South Dakota (Merrill et al. 1918, Pyle 1949, San Diego Union 1950, WRCA 1999).

Pyle arrived in California in 1922, where he initially took the position of Business Manager at Imperial Irrigation District in Calexico, California. While in that position, he organized the take over and operation, as well as the Rules and Regulations of 14 Mutual Water Companies, which until November 1st, 1922 handled all water deliveries in Imperial County. After the dissolution of these water companies, he became the Irrigation Engineer at a different Imperial Irrigation District office in Imperial, California. There, Pyle was in charge of operations, collection, and maintenance of "1720 miles of canals, laterals, and waste ditches which delivered water to 3200 water users" (Pyle 1949). He remained in that position until April 1925. From 1925 until his hire by the City of San Diego in 1928, he inspected several water supply projects in San Diego and Yakima, Washington. From 1926 until October 1928, he was employed by Vista Irrigation District in Vista California, as the Engineer-Manager (Dowd 1956, Pyle 1949).

In October 1928, Pyle was hired by the City of San Diego as Assistant Hydraulic Engineer, working on the Otay Pipeline Plans, under City Hydraulic Engineer Hiram Savage. After the Savages' death in 1934, City Manager Fred Lockwood appointed Pyle as Chief Hydraulic Engineer for the City of San Diego. Pyle saw the completion El Capitan Dam and was instrumental in the development and building of San Vicente Dam (1941) and the San Diego Aqueduct. He was also responsible for the strengthening of Hodges Dam, the Morena Dam enlargement, San Dieguito Dam strengthening, and conduit work (Pyle 1949; San Diego Union 1928a, 1928b 1932, 1938, 1939a, 1939b, 1940a, 1940b, 1950).

Pyle's career as an engineer extended 45 years, from 1905 until his death in 1950. His work history includes:

- Instrumentman with Reclamation Service (July 1903-February 1904)
- Experiment Station at Logan, Utah (April-September 1904)
- U.S. Geographic Survey (October-December 1904)
- W.W. McLaughlin (January-April 1905)
- North Platte Project Junior Engineer (May 1905-March 1910)
- North Platte Project Irrigation Manager (March 1910-August 1912)
- Belle Fourche, North Platte, Grand Valley and Uncompahgre projects Operation and Maintenance Inspector (August 1912-March 1913)
- Uncompahgre Valley Project Irrigation Manager (March 1913-October 1913)
- Uncompahgre Project Project Manager (October 1913-June 1920)
- Colombia Irrigation District Secretary and Manager (August 1920-March 1922)
- Imperial Irrigation District Business Manager (March 1922-Novmeber 1922)
- Imperial Irrigation District Irrigation Engineer (November 1922-April 1925)
- Vista Irrigation District Engineer-Manager (February 1925-October 1928)
- City of San Diego Assistant Hydraulic Engineer (October1928-June 1932)
- City of San Diego Chief Hydraulic Engineer (June 1934-July 1950)

NRHP and CRHR Significance Evaluation

NRHP Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.

CRHR Criterion 1: Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

The Murray Reservoir Complex was constructed in 1918 during a significant period in San Diego source water development history: Flood Recovery and Reinvestment (1916-1928). This significant period of water infrastructure development in San Diego is clearly defined by two catastrophic events in Southern California that had far-reaching effects, the flood of 1916 and the St. Francis Dam Disaster in 1928. Despite the City' efforts, the flood of 1916 led to the collapse of the original Lower Otay Dam and destruction of many elements of the early water system in San Diego. Following this disaster, the City took extensive measures to ensure that these types of disasters were somewhat preventable in the future, by building their own dams versus purchasing dams designed by private water companies.

One of the most notable changes made following the flood of 1916 was the hiring of the City's first Hydraulic Engineer in 1917. In the previous period of development, it was the common occurrence for the private water companies to hire engineers like Michael O'Shaughnessy who were not employed by the City. However, the hiring of Hiram Savage in 1917 forever changed the way the City handled their water system development by having an engineer in house that oversaw the construction of water infrastructure projects. In response to the 1916 flood, Savage was responsible for implementing numerous safety measures to help prevent infrastructure failures in the future and was in charge of the rebuilding and repairing of damaged water infrastructure throughout the City. Despite the fact that Savage was replaced as the City's Hydraulic Engineer during this period of development, it is clear that his role was pivotal for the City's infrastructure development, as further evidenced by his eventual rehiring in 1928.

Murray Dam is one of several dams that developed after the flood of 1916. In the wake of the 1916 floods, the City recognized the high potential of capturing flood waters and the missed opportunity to store and sell its own water. Murray Dam was designed by John S. Eastwood and built by the Cuyamaca Water Company, which was co-owned by Ed Fletcher and James A. Murray. The dam was completed only two years after the flood of 1916 nearly overtopped the earthen La Mesa Dam. Other dams built in this period were Lower Otay Dam (City of San Diego), Barrett Dam (City of San Diego), Lake Hodges Dam (San Dieguito Mutual Water Company), and San Dieguito Dam (San Dieguito Mutual Water Company), as well as major repair projects for the Sweetwater Dam (San Diego Land and Town Company) and Morena Dam (City of San Diego).

Murray Dam continued the pattern of privately-owned water infrastructure intended for eventual purchase by either another private water company or the City of San Diego. Murray Dam was designed by John S. Eastwood and built in 1918 by the Cuyamaca Water Company, which was co-owned by Ed Fletcher and James A. Murray. In 1926, a portion of the Cuyamaca Water Company system was sold to the newly formed La Mesa, Lemon Grove, and Spring Valley Irrigation District that serviced rural San Diego County. In 1933, an agreement was signed that the City of San Diego would acquire the water rights to most of Lake Murray's capacity, 5,000 acre-feet, although the La Mesa, Lemon Grove, and Spring Valley Irrigation District still owned the facility. In 1935, City of San Diego hydraulic engineer Fred Pyle recommended spending $1,060,000 for improving the City's water system, including a pipeline 2.5 miles long from the Murray Reservoir to the City's El Capitan pipeline, and the construction of a new water tower at the Murray Reservoir Complex. These recommended improvements were completed by 1943.

It was not until 1961 that the City of San Diego began negotiations with the Helix Irrigation District (formerly La Mesa, Lemon Grove, and Spring Valley Irrigation District) to purchase the Murray Reservoir Complex. The Helix Irrigation District agreed to sell the property to the City of San Diego and offered $300,000 to pay for reinforcement of the dam to meet state earthquake stability requirements (SDU 1961b) and paid in installments over ten years with interest, which ended in 1971.

In summary, the Murray Reservoir Complex is directly associated with important events related to the period of flood recovery and reinvestment seen in San Diego from 1916-1928 and stands today as a critical component of the San Diego Source Water System that supported the City's growth and development. Therefore, Murray Reservoir Complex appears eligible under NRHP/CRHR Criterion A/1 as both a contributing element of the City of San Diego Source Water System, and as an individual property.

NRHP Criterion B: Associated with the lives of significant persons in our past.

CRHR Criterion 2: Associated with the lives of persons important in our past.

The Murray Reservoir Complex had connections to noted individuals, including Colonel Ed Fletcher and James A. Murray who were early developers and notable capitalists in the City of San Diego. However, the Murray Reservoir Complex is not exemplary of either person's productive life, as both Murray and Fletcher's influence and achievements extended far beyond their land acquisition venture companies and the construction of the Murray Dam in 1918. Other properties, such as Murray's home or office, where Murray actually resided or operated the company may be a better candidate for significance under Criterion B/2. For Fletcher, who went on to serve San Diego in the California State Senate, other properties may also better exemplify significance for association with Fletcher. Archival research did not indicate that the Murray Reservoir Complex was connected with any other demonstrably important historical figures. Therefore, the Murray Reservoir Complex does not appear eligible under NRHP/CRHR Criterion B/2.

NRHP Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

CRHR Criterion 3: Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

The Murray Dam embodies distinctive characteristics of the multiple arch dam construction type, invented and promoted by engineer John S. Eastwood. The complex's period of significance under Criterion C/3 is limited to its year of completion in 1918. In addition to its important associations with the development of San Diego's Source Water System, the Murray Reservoir Complex is also important because of its embodiment of a multiple arch dam design. Multiple arch dams (also called Buttress dams) are made of concrete or masonry and feature buttresses that are built perpendicular to the wall of the dam, which is usually thin. These types of dams require much less material than gravity dams, and they do not require narrow canyons with rock faces like arch dams. The structural integrity of the arch holds back the water of the reservoir by distributing the weight of the water along each arch. This dam type was invented by Eastwood in 1909 and promoted ever since. The Murray Reservoir Complex embodies the distinctive characteristics of the multiple arch concrete dam construction type, designed and promoted by master engineer John Samuel Eastwood, who invented the innovative dam design. Murray Dam retains its 1918 character defining features: a slim profile, delicate buttresses, and repeating arches. These features have been retained despite a 1968 alteration that added concrete stabilization walls to ten of the open archways. While these alterations are not necessarily complementary, the original design and materials are still present and clearly discernable.

Master engineer John S. Eastwood invented and promoted the multiple arch dam, in response to the desire to create a low-cost, low-material alternative to massive embankment dams and concrete gravity dams, which were typical of dam construction types in the early twentieth century. Other Eastwood-designed multiple arch dams are extant at Hume Lake Dam (1908), Big Bear Lake Dam (1912), Mountain Dell Dam (1914), Lake Hodges Dam (1919), San Dieguito Dam (1919), and Cave Creek Dam (1923). San Diego County is home to three of these dams, of which Murray Dam was the first.

In summary, Murray Reservoir Complex has an excellent example of a multiple arch dam; represents a notable engineering achievement for the City of San Diego; and is a notable work of master engineer John S. Eastwood. Therefore, the Murray Reservoir Complex appears eligible under NRHP/CRHR Criterion C/3 as both a contributing element of the City of San Diego Source Water System, and as an individual property.

NRHP Criterion D: Have yielded, or may be likely to yield, information important in history or prehistory.

CRHR Criterion 4: Has yielded, or may be likely to yield, information important in prehistory or history.

Archaeological survey was not conducted for this project. At this time there is no indication that the Murray Reservoir Complex has the potential to yield information important to state or local history. Therefore, the property is recommended not eligible under NRHP/CRHR Criterion D/4.

City of San Diego Significance Evaluation

Criterion A: Exemplifies or reflects special elements of the City's, a community's, or a neighborhood's historical, archaeological, cultural, social, economic, political, aesthetic, engineering, landscaping, or architectural development.

The Murray Reservoir Complex reflects special elements of San Diego's historical development. Construction of the complex made a significant contribution to the history of water development in the San Diego region and was a milestone in the City's quest to achieve source water independence. The complex also reflects special elements of San Diego's engineering development. Murray Dam embodies the distinctive characteristics of the multiple arch dam construction type, used and promoted by engineer John S. Eastwood. Multiple arch dams are made of concrete or masonry and feature buttresses that are built perpendicular to the wall of the dam, which is usually thin. These types of dams require much less material than gravity dams, and they do not require narrow canyons with rock faces like arch dams. The attractive qualities of cost and material-savings, attracted private water company Cuyamaca Water Company to employ Eastwood to design the Murray Reservoir Complex, San Diego County's first multiple arch dam, at a time when gravity and arch dams were the preferred design. Multiple arch dams were an important innovation in dam engineering and critical to the water supply needs of the City of San

Diego. Therefore, the subject property appears eligible under City Criterion A.

Criterion B: Is identified with persons or events significant in local, state, or national history.

Persons: Although the Murray Reservoir Complex has connections to noted individuals, including Colonel Ed Fletcher and James A. Murray who hold importance within the history of development in San Diego, the subject property is not connected with any of these individuals in a way that directly represents their contributions within the local historic context.

Events As described in the NRHP/CRHR A/1 criterion discussion above, the Murray Reservoir Complex is associated with events significant in local and state history. The Murray Reservoir Complex is associated with the post-1916 floodwater infrastructure boom that led to the design and construction of several major privately and City-owned dam projects. The complex is associated with the expansion of the City of San Diego Source Water System. As a local resource, the Murray Reservoir Complex remained critical to the survival the La Mesa, Lemon Grove, and Spring Valley Irrigation District that serviced rural San Diego County, as well as the City of San Diego, until 1947 when the City and County began to receive imported water from the Colorado River. The subject property is directly associated with important events related to water development in the San Diego region, namely with the City gaining source water independence and being a critical component to the water infrastructure that supported the City’s growth and development. Therefore, the Murray Reservoir Complex appears eligible under City Criterion B.

Criterion C: Embodies distinctive characteristics of a style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship

As described under NRHP/CRHR Criterion C/3 (see full discussion above), the Murray Reservoir Complex embodies distinctive characteristics of the multiple arch dam, used and promoted by hydraulic engineer John S. Eastwood. Additionally, the Site also contains an excellent example of an outlet tower designed by City of San Diego Chief Hydraulic Engineer Fred Pyle.

Multiple arch dams (also called Buttress dams) are made of concrete or masonry and feature buttresses that are built perpendicular to the wall of the dam, which is usually thin. These types of dams require much less material than gravity dams, and they do not require narrow canyons with rock faces like arch dams. The structural integrity of the arch holds back the water of the reservoir by distributing the weight of the water along each arch. This dam type was invented by Eastwood in 1909, and promoted ever since. San Diego County is home to three of these dams, Murray Dam (1918), Lake Hodges Dam (1919), and San Dieguito Dam (1919). After the St. Francis Dam disaster in 1928, all of the multiple arch dams in San Diego County were “strengthened” with braces set between the arches, however, despite this alteration, Murray Dam still retains the character defining features of the multiple arch type: a slim profile, delicate buttresses, and repeating arches. Therefore, the Murray Reservoir Complex appears eligible under City Criterion C.

Criterion D: Is representative of the notable work or a master builder, designer, architect, engineer, landscape architect, interior designer, artist, or craftsman.

As described under NRHP/CRHR Criteria C/3 (see full discussion above), the Murray Reservoir Complex represents a notable work of master engineer John Samuel Eastwood. Eastwood was hired by the Ed Fletcher in 1917 to work on dams in the greater San Diego region including

Murray Dam, Lake Hodges Dam, and San Dieguito Dam. Eastwood's designs were particularly attractive because of their low cost and requirement of fewer building materials. Despite earthquake stabilization alterations, and the introduction of a new outlet tower in 1943, the Murray Reservoir Complex remains an excellent example of and Eastwood-designed multiple arch dam.
Therefore, the Murray Reservoir Complex appears eligible under City Criterion D.

Criterion E: Is listed or has been determined eligible by the National Park Service for listing on the National Register of Historic Places or is listed or has been determined eligible by the State Historical Preservation Office for listing on the State Register of Historical Resources.

The Murray Reservoir Complex is not known to be on any local, state, or national list of significant properties, nor is it known to have been determined eligible for listing on any register. Therefore, the Murray Reservoir Complex is not currently eligible under City Criterion E.

Criterion F: Is a finite group of resources related to one another in a clearly distinguishable way or is a geographically definable area or neighborhood containing improvements which have a special character, historical interest, or aesthetic value, or which represent one or more architectural periods or styles in the history and development of the City.

As described under NRHP/CRHR Criteria A/1 and C/3 (see full discussion above), the Murray Reservoir Complex is significant for its role, function, and design within the larger City of San Diego Source Water System, of which it is a contributing resource to. The City of San Diego Source Water System includes ten (10) impounding reservoir complexes owned/operated by the City that function as part of the City's municipal water-supply system. These resources and their related infrastructure (e.g., dams, outlet towers, conduits, flumes, and pipelines) constitute a finite group of resources related to one another in a clear way, steeped in historical interest and representative of significant engineering achievements. Taken as a whole, these resources (including the Murray Reservoir Complex) are significant for their role in the City's source water system, starting with the earliest efforts to establish privatized water in the 1880s soon followed by construction of the earliest reservoirs, Lake Cuyamaca (1887) and Sweetwater Reservoir (1888). The period of significance ends with construction of the San Diego Aqueduct, and the importation of Colorado River Water for the first time into the San Vicente Reservoir (1947), which forever changed the composition of City's source water supply. Therefore, the Murray Reservoir Complex appears eligible under City Criterion F.

Integrity Assessment

Overall, the Murray Reservoir Complex retains integrity of location, design, materials, workmanship, and feeling. While some secondary elements of the complex suffer from a lack of integrity, the complex as a whole retains requisite integrity, as described below:

Location: The complex retains integrity of location. The location of the Murray Reservoir Complex off Kumeyaay Highway in San Diego has been retained. The site's location is important given the role of the location next to the Alvarado Filtration Plant, which moved water through underground pipes from the San Vicente and El Capitan Reservoirs. The contributing features to the site have never been shifted or relocated. As such, the Murray Reservoir Complex retains its integrity of location.

Setting: The integrity of setting for the complex has been compromised since its construction in 1918 by subsequent developments along the shores of the reservoir. These developments including construction of the Alvarado Filtration Plant (1951), the developments of a San Diego County parks site near the dam structure (1964), the residential neighborhoods of Del Centro to the west, San Carlos to the north and Lake Murray to the east, and College East to the south (1960s-1990s). These neighborhoods have filled in the original open land surrounding the Murray Dam, Lake, and outlet tower resulting in a lack of integrity of setting.

Design: The complex retains integrity of design. Although there have been minor repairs to all structures, there are no significant alterations or incompatible departures from John S. Eastwood's design. The most visible alteration to the dam's design occurred in the late 1960s with the pouring of concrete between ten of the dam's arches to meet modern earthquake requirements of the State. This alteration was necessary in order to keep the piece of water infrastructure safe and functioning properly. The contributing 1943 outlet tower and pipeline remain as originally designed and built. While other sections of the larger complex have a diminished integrity of design, the complex as a whole retains the requisite integrity of design.

Materials: The Murray Reservoir Complex's dam and associated engineering structures retain integrity of materials. The new additions that were made in 1968 were made with in-kind materials and do not significantly change or alter existing materials. The ten earthquake stabilization walls added to the dam are constructed of reinforced concrete as is the original structure, and no subsequent alteration resulted in a large-scale removal of original materials. Therefore, the Murray Reservoir Complex retains integrity of materials.

Workmanship: The Murray Dam and associated engineering structures retain integrity of workmanship. The original workmanship, including visible board forms, delicate buttresses, and thin arches, are still visible and operate as intended. The alterations to the dam's design do not obscure or alter original workmanship. The associated structure, the outlet tower has not undergone any major alterations as evident in comparing the original blueprint to the current structure. As a result, the Murray Reservoir Complex retains integrity of workmanship.

Association: The complex retains diminished integrity of association. It was built by the Cuyamaca Water Company for the sale to either a private water company or the City of San Diego specifically to be used in its large water infrastructure system. The dam was originally owned by La Mesa, Lemon Grove, and Spring Valley Irrigation District, and eventually purchased by the City of San Diego, as intended. Although the dam was not built by the City there has been a continuous connection since 1918. Therefore, the Murray Reservoir Complex retains diminished integrity of association.

Feeling:
The Murray Reservoir Complex retains integrity of feeling. While modern development on the shore of the reservoir and within sight of the dam and outlet tower structures distracts from the feeling of a remote, rural reservoir complex, the Murray Reservoir Complex still appears and operates as a delicate concrete multiple arch dam, and evokes a sense of the period of intense water infrastructure growth in San Diego in the late 1910s and 1920s in response to the 1916 flood, a booming population, and a lack of water infrastructure to support the City. Therefore, the Murray Reservoir Complex retains integrity of feeling.

***B12. References:**

Andrus, Patrick W. and Rebecca H. Shrimpton. 2002. "How to Apply the National Register Criteria for Evaluation." Bulletin 15. U.S. Department of the Interior, National Park Service. Accessed March 1, 2019. https://www.nps.gov/nr/publications/bulletins/pdfs/nrb15.pdf

Crawford, Richard. 2011. *The Way We Were in San Diego*. Charleston, South Carolina: History Press.

Eastwood, J.S. 1917a. "Descriptive and Detail Specification of the Murray Dam at Old La Mesa Dam Cuyamaca Water Company describing the Eastwood Multiple-Arched Dam." Water Resources Center Archives, University of California, Berkeley.

Eastwood, J.S. 1917b. "Recent Multiple-Arched Dams." Water Resources Center Archives, University of California, Berkeley.

Farley, Bill. Spring 2016. "The Cuyamaca Water Company Partnership: New Scenes from San Diego's Water History." *The Journal of San Diego History*. Vol 62, No. 2. pg. 181-202.

Fowler, L. 1953. "A History of the Dams and Water Supply of Western San Diego County." Thesis; University of California. On file at the City of San Diego Water Utilities Department Archives.

Hennessey, Gregg. R. 1978. "The Politics of Water in San Diego 1895–1897." *The Journal of San Diego History,* Summer 1978, 24(3). Accessed January 2019. http://www.sandiegohistory.org/journal/1978/july/water/.Hill, Joseph. 2002. "Dry Rivers, Dammed Rivers and Floods: An Early History of the Struggle between Droughts and Floods in San Diego" *The Journal of San Diego History,* Winter, 2002, 48. Accessed June 2018. https://sandiegohistory.org/journal/2002/january/hill-2/

"History of San Diego Water Supply." Water Supply History and Development: San Diego City and County. On file at the City of San Diego Water Utilities Department Archives.

Huber, Walter L. 1912. "District Engineer's Report on Application of the Volcan Land & Water Company for Rights of Way for Reservoirs and Conduits in the Cleveland National Forest." Walter L. Huber Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Jackson, Donald C. 1979. "John S. Eastwood and the Mountain Dell Dam." *IA. The Journal of the Society for Industrial Archeology*. Vol. 5, No. 1 (1979), pp. 33-48. Accessed July 25, 2018. https://www.jstor.org/stable/40967975

Jackson, Donald C. 1995. *Building the Ultimate Dam: John S. Eastwood and Control of Water in the West*. Lawrence, Kansas: University Press of Kansas.

Jackson. 1999. "Biographical Information." John S. Eastwood Papers. Water Resources Collections and Archives. Special Collections & University Archives, University of California, Riverside. Accessed January 2019. http://pdf.oac.cdlib.org/pdf/ucr/wrca/eastwood.pdf

Jackson. 2005. *Building the Ultimate Dam: John S. Eastwood and the Control of Water in the West.* Norman, OK: University of Oklahoma Press.

Jackson. 2009. "Structural Art: John S. Eastwood and the Multiple Arch Dam." *Engineering History and Heritage*. 162. Issue EH3. August 2009. Pgs. 136-147. Accessed January 2019. https://dspace.lafayette.edu/bitstream/handle/10385/880/jackson-proceedingsoftheice-vol162-no3-2009.pdf?sequence=1

Los Angeles Times (LAT). 1896. "San Diego County." Newspapers.com: *The Los Angeles Times* (Los Angeles, Ca), Feb 15, 1896, pg 13.

McClelland, Linda F. 1997. How to Complete the National Register Registration Form. National Register Bulletin 16a. Accessed January 24, 2019. https://www.nps.gov/nr/publications/bulletins/pdfs/nrb16a.pdf

McGrew, Clarence Alan. 1922. "City of San Diego and San Diego County: The Birthplace of California," Volume II. Chicago, Illinois, and New York, New York: The American Historical Society. Accessed January 2019. https://ia800200.us.archive.org/8/items/cityofsandiegosa01mcgr/cityofsandiegosa01mcgr.pdf.

Meixner, G. Donald. 1951. "Historical Development of Water Utilization." Draft. On file at the San Diego Public Utilities Department Archive.

Ormsby, Burke. 1966. "The Lady Who Lives by the Sea." *The Journal of San Diego History* 12(1). Accessed January 2019. http://sandiegohistory.org/journal/1966/january/ladybysea/.

O'Shaughnessy, M.M. and J.B. Lippincott. 1915. "Report on the Volcan Land and Water Company to the City of San Diego, CA." Report. Ed Fletcher papers. MSS 81. Special Collections & Archives, University of California San Diego. https://library.ucsd.edu/dc/object/bb52917110/_1.pdf

Post, William S. and C. E. Hickok. 1914. "Report of the Cost of Construction of Warner-Carroll-University Supply to the City of San Diego As Outlined in Offer of the Volcan Land & Water Company to the City of San Diego." Report No. 23. October 10, 1914. John S. Eastwood Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

San Diego Evening Tribune (SDET). "San Diego Materials and Labor Employed in Great Enterprise." Genealogybank.com: *The Evening Tribune* (San Diego, CA), August 2, 1919 p. 5.

San Diego History Center. 2018a. "Biography: John D. Spreckels (1853–1926)." Accessed January 2019. http://www.sandiegohistory.org/archives/biographysubject/spreckels/.

San Diego History Center. 2018b. Photograph Collection Accessed In Person 2018.

San Diego Union (SDU). 1914. "Volcan Water Company Offer to be Held Open Four Months." Genealogybank.com: *San Diego Union* (San Diego, CA), May 29, 1914, pg. 11.

San Diego Union.1917. "Dieguito Water Company Heads Inspect Property." Genealogybank.com: *San Diego Union* (San Diego, CA), May 15, 1917, pg 5.

SDU. 1918a. "Many Thousands of Acres to Be Made Productive." Genealogybank.com: *San Diego Union* (San Diego, CA), January 1, 1918, pg. 4.

SDU. 1918b. "Council Visits Dam." Genealogybank.com: *San Diego Union* (San Diego, CA), March 7, 1918. Pg. 3.

SDU. 1950. "Aerial View Shows Alvarado Filtration Plant." *San Diego Union*. December 3, 1950, pg. 12. On file at the City of San Diego Public Utilities Department Archives.

SDU. 1960. "Combination for Name." Genealogy.com: *San Diego Union* (San Diego, CA), July 26, 1960, pg. 79.

SDU. 1961a. 'City Backs Deal for Murray Dam." Genealogy.com: *San Diego Union* (San Diego, CA), October 18, 1961, pg. 22.

SDU. 1961b. "Helix Approves Lake Murray Deal with S.D." Genealogy.com: *San Diego Union* (San Diego, CA), October 25, 1961, pg. 20.

SDU. 1932. "City Hall Notes" San Diego Union. June 9, 1932. Accessed July 23, 2018 from SDU. 1938. "Pyle Named Emissary in Flood Control Parleys" San Diego Union. August 3, 1038. Accessed July 23, 2018 from Genealogybank.com.

SDU 1939a. "Dam Foundation Test To Continue 2 Weeks" San Diego Union. September 30, 1938. Accessed July 23, 2018 from Genealogybank.com.

SDU. 1939b. "San Diego River Flood Control Plan Approved" San Diego Union. Dec 20, 1939. Accessed July 23, 2018 from Genealogybank.com.

SDU. 1940a. "Vicente Project Request Proposed." San Diego Union. March 10, 1940. Accessed July 23, 2018 from Genealogybank.com.

SDU. 1940b. "Pasqual Survey Asked for City Water Projects" San Diego Union. February 4, 1940. Accessed July 23, 2018 from Genealogybank.com

SDU. 1950a. "Aerial View Shows Alvarado Filtration Plant." *San Diego Union*. December 3, 1950, pg. 12. On file at the City of San Diego Public Utilities Department Archives.

SDU. 1950b. "Fred D. Pyle Mourned." San Diego Union. July 22, 1950. Accessed July 19, 2018 from Genealogybank.com.

SDU. 1960. "Combination for Name." Genealogy.com: *San Diego Union* (San Diego, CA), July 26, 1960, pg. 79.

SDU. 1961a. 'City Backs Deal for Murray Dam." Genealogy.com: *San Diego Union* (San Diego, CA), October 18, 1961, pg. 22.

SDU. 1961b. "Helix Approves Lake Murray Deal with S.D." Genealogy.com: *San Diego Union* (San Diego, CA), October 25, 1961, pg. 20.

SDU. 1968. "Murray Dam Project Set." Genealogy.com: *San Diego Union* (San Diego, CA), December 27, 1968, pg. 12.

San Diego Weekly Union. 1917. "Great Water Project for County Given Out; Santa Fe to Back It." *The San Diego Weekly Union*, March 29, 1917, pg. 8. On file at the City of San Diego Public Utilities Department Archives.

Sholders, Mike. 2002. "Water Supply Development in San Diego and a Review of Related Outstanding Projects." The Journal of San Diego History, Winter 2002, 48(1). Accessed January 2019. http://sandiegohistory.org/journal/2002/january/sholders/

Smythe, William Ellsworth. 1908. "History of San Diego (1542-1908)." In An Account of the Rise and Progress of the Pioneer Settlement on the Pacific Coast of the United States, Volume II, The Modern City. San Diego, California: The History Company. Accessed January 2019. https://ia902300.us.archive.org/26/items/historyofsandieg02smyt/historyofsandieg02smyt.pdf

Strathman, Theodore. 2004. "Land, Water, and Real Estate: Ed Fletcher and the Cuyamaca Water Company 1910-1926." Journal of San Diego History 50(3). Accessed January 2019. http://www.sandiegohistory.org/journal/v50-3/cuyamaca.pdf

Whitney, Charles Allen. 1969. "John Eastwood: Unsung Genius of the Drawing Board." *Montana: The Magazine of Western History*. Vol. 19, No. 3 (Summer 1969), pp. 38-49 Accessed January 2019. https://www.jstor.org/stable/4517382

State of California ♣ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3B; 3CB, 5B

Other Listings
Review Code Reviewer Date

 ***Resource Name or #:** (Assigned by recorder) Lake Hodges Reservoir Complex

P1. Other Identifier:

***P2. Location:** ☐ **Not for Publication** ■ **Unrestricted**

***a. County** San Diego **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** Rancho Santa Fe **Date** 2018 **T** 13S; **R** 02W; SW ¼ **of** NE ¼ **of Sec** 18; S.B. **B.M.**

c. Address City Escondido Zip 92029

d. UTM: (Give more than one for large and/or linear resources) Zone 11S , 487995 mE/ 3656303 mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate) Lake Hodges Reservoir Complex is located along the San Dieguito River, in Del Dios Valley, outside the community of Rancho Santa Fe, southeast of the town of Escondido. The complex is accessed via Lake Road, near the 9300 block of Del Dios Road (County Highway S6). Lat/Long: 33.045406, -117.128845.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

The Lake Hodges Reservoir Complex is located near the upper reaches of the San Dieguito River (also called Santa Ysabel Creek). The Lake Hodges drainage basin is estimated to be 303 square miles, and total reservoir capacity is 33,600 acre-feet. The complex consists of a dam and integrated spillway, flume remnants, a utility shed, Quonset hut, shed, keeper's house, public outreach display, and culvert with associated foundation. **(See Continuation Sheet)**

P3b. Resource Attributes: (List attributes and codes) HP21. Dam; HP 22. Reservoir; HP11. Engineering structure; HP2. Single family property; HP4. Shed, outbuilding

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)

***P4. Resources Present:** ■ Building ■ Structure ☐ Object ☐ Site ☐ District ■ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #) Dam overview, June 11, 2018; View to northeast (IMG 2710)

***P6. Date Constructed/Age and Source:** ☒ Historic ☐ Prehistoric ☐ Both
1919 (Fletcher 1919)

***P7. Owner and Address:**
Public Utilities Dept.
City of San Diego
9192 Topaz Way
San Diego, CA 92123

***P8. Recorded by:** (Name, affiliation, and address) Kate Kaiser, MSHP
Dudek
605 Third Street
Encinitas, CA 92024

***P9. Date Recorded:** June 2018

***P10. Survey Type:** (Describe)
Pedestrian

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") Dudek. 2020. City of San Diego Source Water System Historic Context Statement.

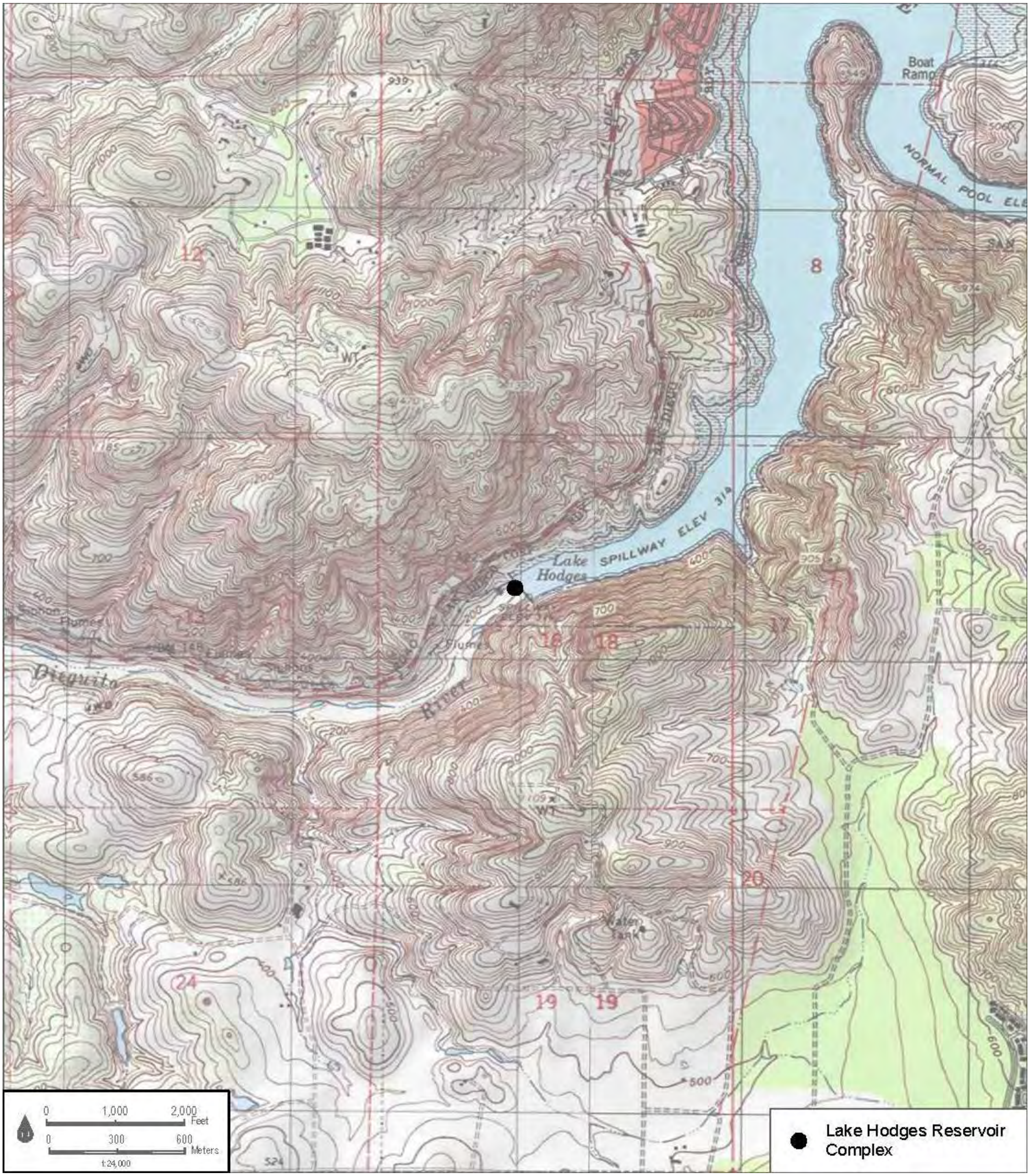
*** Attachments:** ☐NONE ■ Location Map ■ Continuation Sheet ■Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California ♁ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 42 ***Resource Name or #** (Assigned by recorder) Lake Hodges Reservoir Complex

***Map Name:** Rancho Santa Fe, 7.5' USGS Quadrangle ***Scale:** 1:24,000 ***Date of map:** 2019



BUILDING, STRUCTURE, AND OBJECT RECORD

B1. Historic Name: Lake Hodges Dam and Reservoir; Carroll Dam
B2. Common Name:
B3. Original Use: Municipal water source B4. Present Use: Municipal water source, recreation
***B5. Architectural Style:** Multiple arch dam
***B6. Construction History:** (Construction date, alterations, and date of alterations)
Lake Hodges Dam, spillway, and associated structures and buildings were built between 1917 and 1919 and altered in 1927, 1932, and 1936. The original Keeper's House, designed in the Craftsman style, were built some time before 1936 and demolished between 1947 and 1953. The existing Keeper's House, Quonset Hut, and shed were built or placed at the complex between 1958 and 1963 (Cartwright Aerial Surveys 1963; Fairchild Aerial Survey 1939, 1958; JAPE 1947; NETR 2018; Park Aerial Survey 1953; Public Utility Department 1936).

***B7. Moved?** ☒**No** ☐**Yes** ☐**Unknown** **Date:** **Original Location:**
***B8. Related Features:** Lake Hodges Flume (HAER CA-307)

B9a. Architect: John S. Eastwood (engineer) b. Builder: San Dieguito Mutual Water Company
***B10. Significance: Theme** Flood Recovery and Reinvestment **Area** San Diego
Period of Significance A: 1916-1928; C: 1919 **Property Type** Dam
Applicable Criteria NRHP/CRHR: A/1, C/3; City: A, B, C, D, F

Historic Context

(See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)

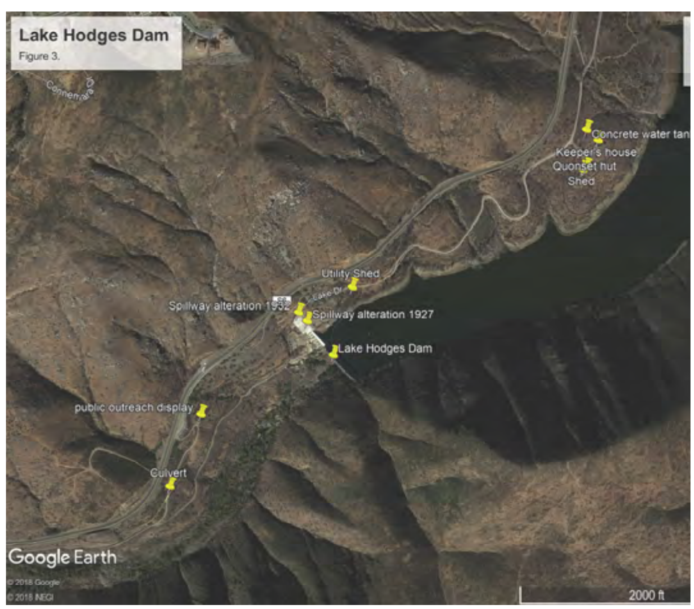
***B12. References: (See Continuation Sheet)**

B13. Remarks:

***B14. Evaluator:** Kate Kaiser, MSHP
***Date of Evaluation:** June 30, 2020

(This space reserved for official comments.)

(Sketch Map with north arrow required.)



P3a. Description (continued):

Lake Hodges Dam and spillway (1919; altered 1927, 1932, 1936)

Lake Hodges dam is a concrete multiple arch dam with an integrated spillway. The entire structure consists of 24 thin, board-formed concrete barrel arches, coated in gunite on the upstream side, reinforced with steel, and oriented skyward, so the rounded, convex side faces upstream (Figure 1) and the concave, hollow side faces downstream (Figure 2). The arches are supported by buttresses, placed between the arches spaced 24 feet center to center. Arches vary between 1 and 2 feet-8 inches thick. Buttresses varying in thickness between 18 inches and 4 feet-2inches at the base of the deepest section. Hodges Dam measures 137 feet in height above the streambed and 550 feet long along the dam crest, maintaining a mean elevation of 330 feet above mean sea level (amsl). The dam is 160 feet thick at the base and 17 feet thick at the crest. Along the crest of the dam is a walkway that spans over the curved arches. The concrete walkway has a metal railing on both sides and extends from the spillway to the south abutment.

Figure 1. Lake Hodges Dam, upstream side, looking south. June 11, 2018. (IMG 2327)

Figure 2. Lake Hodges Dam, downstream side, looking northeast. June 11, 2018. (IMG JFC0237)

The spillway is built into the dam along its northern section and is 160 feet thick at the base and approximately 30 feet thick at the spillway crest (Figure 3). The spillway crest along the northern portion is 122 feet above the streambed, maintaining a mean elevation of 315 amsl. The spillway inlet, on the upstream side, is 50 feet wide and 170 feet long. The original spillway consists of a rounded board-formed concrete crest that lets out onto a series of 12 stepped concrete platforms, separated by piers. This section is approximately 170 feet long and 50 feet wide from the upstream side of the crest top the downstream edge of the spillway apron. The spillway was altered in 1927 and again in 1936 to accommodate an additional discharge apron section that is 55 feet wide and 190 feet long, creating a total spillway apron lengths of 360 feet to the north abutment (Figure 4).

Figure 3. Spillway, upstream side, looking north. June 11, 2018. (IMG 2347)

Figure 4. Spillway, detailing apron, looking east. June 11, 2018. (IMG JFC0240)

Built into the north abutment, on the crest of the dam, is a concrete structure and concrete staircase with metal railing extending from a path that follows the hill contour until it meets with Lake Drive, which leads to the Keeper's House and other buildings. The concrete structure is formed of board formed concrete, and finished in a gunite slurry. The north elevation is built into the bedrock. The west and south elevations have no fenestration. The south elevation, facing towards the spillway has metal ladder rungs along the east side of the south elevation, allowing auxiliary access to the top of the structure. The east elevation is partially built into the bedrock and accommodates a doorway that is accessed from the top of the platform structure stairwell. The dam's internal concourse entrance is through this stairwell. The platform measures approximately 12-feet tall, 20-feet wide, with a minimum depth to the rock face of 4-feet. It appears that there is an access tunnel that extends further into the rock face and under the spillway portion of the dam. Near the start of the path to staircase and the access tunnel there is a partially dressed boulder with concrete pedestal which looks to have previously held a commemorative plaque (Figure 5).

Figure 5. South and east elevations of platform, showing stair entrance to tunnel, looking northwest. June 11, 2018. (IMG JFC0941)

Utility Shed (No date)

There is a cinderblock utility shed located on the upstream side of the dam, along the western slope (Figure 6). The structure is on a concrete slab foundation and with a rectangular plan, and concrete shed roof with a ventilation pipe. The shed is simple in construction, with concrete masonry units laid in stretcher bonds on all four sides, and a metal door on the south elevation. There is a single concrete step leading to the entrance. This structure is located along the dirt access road leading to the upstream apron of the spillway from Lake Drive, in a small grove of eucalyptus trees downslope of Lake Drive and upslope of the spillway access road.

Figure 6. South and east elevations of utility shed, with spillway access road at left, looking west. June 11, 2018. (IMG 2360)

Lake Hodges Flume (1919)

Downstream of the Lake Hodges Reservoir Complex is an elevated flume structure, in some disrepair, that consists of a short, 40-50 foot long segment (Figure 7). The structure segment consists of a riveted steel half cylinder flume, lined with concrete or gunite, supported by a wood trestle on concrete pier foundations. This flume has been determined to be part of the Lake Hodges Flume and connected Lake Hodges to San Dieguito reservoir when it was constructed. The entire flume is approximately 4.5 miles in length and consists of either a trestle-elevated pipeline, a concrete open-air conduit, or a below-ground structure.

Further downstream, the flume appears as a board-formed concrete, V-shaped, open-air conduit that is visible from a concrete culvert structure near the dam overlook parking area along Del Dios Road (Figure 8). The concrete flume segment picks up just northeast of the culvert, and extends approximately 500 feet, following the contour of the hillside before disappearing underground. There are more flume remnants west of these this, but they were not recorded for this project, as they extend 4.5 miles into the town of Rancho Santa Fe to connect to the San Dieguito Reservoir.

Figure 7. Segment of flume and trestle, looking northwest. June 11, 2018. (IMG 115707)

Figure 8. Concrete flume segment, looking east. June 11, 2018. (IMG 120804)

Keeper’s House (circa 1958-1963)

The keeper’s house is located in a complex of four buildings along the western side of the lake. It is an L-shaped plan, cross-gabled, one story house with an attached garage. The foundation was not visible. The roof is low-pitched, with wide, overhanging, open eaves and clad in asphalt shingles. The building is clad in stucco, obscuring the framing or other construction technique. Fenestration consists of several variably-sized, vinyl, sliding windows, fiberboard doors, and a sliding glass door that leads out to a concrete patio.

The main elevation faces northwest, towards Lake Drive and Del Dios Road (Figure 9). From left to right there is are two sliding vinyl windows, a fiberboard door, small vinyl fixed window, and a roll-up garage door. At the left end of the northwest elevation there is a metal vent in the gable above the two sliding windows. The southwest elevation is the gable end of the garage and has no fenestration. There is a gas meter attached to the wall at the west corner. The southeast elevation faces towards Lake Hodges. From left to right there is a fiberboard door, a sliding vinyl window, a sliding glass door, and another sliding vinyl window (Figure 10). There is a vent in the gable near the right side of the southeast elevation. Finally, the northeast elevation contains only a single, small, sliding vinyl window.

Around the Keeper’s House there is a series of recreation structures and ornamental tree plantings. There is a small yard, bound by chain link fence off of the northeast elevation. Southwest of the house is a hand-built BBQ oven and chimney (Figure 11). The structure is composed of cement mortared red, hollow concrete block and is in disrepair. Between Lake Road and the main elevation of the house, there is a board-formed concrete, rectangular water tank, measuring approximately 6 feet long by 8 feet wide and banked into the hillside. The tank has buried pipes leading back towards the Keeper’s House.

Figure 9. Northwest (main) and southwest elevations of the Keeper's House, looking east. June 11, 2018. (IMG 2864)

Figure 10. Southeast and northeast elevations of the Keeper's House, looking west. June 11, 2018. (IMG 2889)

Figure 11. Concrete and brick barbeque, looking southwest. June 11, 2018. (IMG 2882)

Quonset Hut (circa 1958-1963)

Southwest of the Keeper's House is a Stran-Steel Quonset Hut building (Figure 12). The Quonset Hut footprint has a footprint of approximately 25 feet by 16 feet and faces northwest towards Lake Drive and Del Dios Road. The Quonset Hut building is composed of steel framing with corrugated galvanized steel cladding on all sides. The building is set onto a poured concrete foundation which also serves as the floor. The main (northwest) elevation contains two large metal doors that provide a door opening wide and tall enough to accommodate a vehicle. To the left of the door is near a utility pole which has the electrical fuse box attached to it. The southwest elevation features two, 3-lite, wood sash, hopper windows in wood frames, with small, corrugated metal shades over the top of the window. In the curve of the cylindrical roof, there is a small lip vent, just a few inches in height, which extends the length of the elevation. The southeast elevation faces towards Lake Hodges, and also features two 3-lite, wood sash, hopper windows in wood frames, that have been nailed shut and rendered inoperable. The northeast elevation faces towards the Keeper's House and features two, 3-lite, wood sash, hopper windows in wood frames, with small, corrugated metal shades over the top of the window. There is a metal cylindrical vent emerging from the wall near the right-most corner. In the curve of the cylindrical roof, there is a small lip vent, just a few inches in height, which extends the length of the elevation.

Figure 12. Quonset Hut main and northeast elevations, looking west. June 11, 2018. (IMG 2734)

Shed (circa 1958-1963)

Approximately 15 feet southwest of the Quonset Hut building is a small wooden shed (Figure 13). The shed features a gabled roof, clad with rolled asphalt, and is a lightly framed, square-plan building clad with vertical wood board. There main elevation faces northwest and features a wood door under the numbers "3704", and the remaining elevations feature interior-swinging, wood framed, single-lite awning windows that afford views of Lake Hodges, the various access roads, and the surrounding area.

Figure 13. Shed, looking south. June 11, 2018. (IMG 2808)

B10. Significance (Continued):

Pre-Construction History

In 1910, Pacific Light and Power Company sold its interests on the San Luis Rey River, including Warner Ranch, Warner Dam and reservoir, and land and water rights to the Sutherland Reservoir and Carroll Reservoirs sites to William G. Henshaw. Henshaw formed the Volcan Land and Water Company in 1910 to manage the affairs of the new water system, and hired San Diego local Ed Fletcher to manage the company. Ed Fletcher and James A. Murray also headed the Cuyamaca Water Company and the Ed Fletcher Company, as well as other water and real estate ventures in the San Diego region, and the three men combined their interests (Fowler 1953; Huber 1912; Jackson 2005; Strathman 2004).

In 1914 the Volcan Land & Water Company offered to sell all of its properties, including the rights to the San Luis Rey River, Santa Ysabel Creek, other streams, as well as Warner Dam and Reservoir, and the Sutherland, Pamo, Carroll (Hodges), Santa Maria, and Dye dam and reservoir sites to the City of San Diego for $2,500,000. The offer came just after the City’s 1913 purchase of the Southern California Mountain Water Company’s Morena-Barrett-Otay System, and Fletcher was confident he could sell the city another water system. City-contracted engineers Michael M. O’Shaughnessy and Joseph B. Lippincott surveyed and published a report in 1915 recommending that the City accept the offer, but it was ultimately declined (Fowler 1953; O’Shaughnessy and Lippincott 1915; Post and Hickok 1914; San Diego Union 1914; San Diego History Canter 2018).

After their initial failure to sell their properties to the City of San Diego, Henshaw and Fletcher begin negotiations with the Santa Fe Land Improvement Company, a subsidiary of the Santa Fe Railroad company, to furnish funds for Carroll Reservoir (Figure 14), downstream of Warner Dam reservoir and the Pamo Dam and reservoir site. Construction was temporarily held off after the winter storms and subsequent floods of 1916. After Lower Otay Dam was overtopped and destroyed, and the Sweetwater and Morena dams were damaged however, a series of new publicly funded and private water storage projects touched off a building boom in San Diego (Fowler 1953; Post and Hickok 1914).

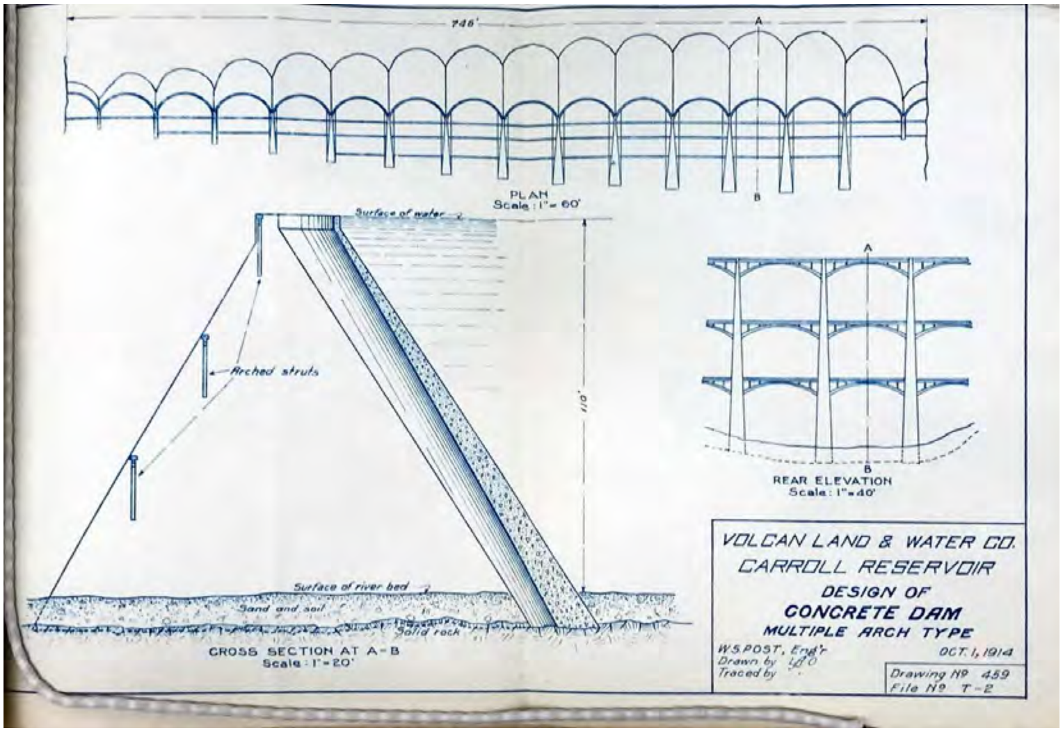


Figure 14. W.S. Post Drawing based on proposed Eastwood design, 1914 (John S. Eastwood Papers Collection, Water Resources Collections and Archives, University of California, Riverside)

Phase I: Development and Construction (1917-1919)

Volcan Land & Water Company and the Santa Fe Land Improvement Company formed a new company to control the Carroll Reservoir development, incorporated as the San Dieguito Mutual Water Company in 1917. Henshaw retained a 33% controlling interest in the San Dieguito Mutual Water Company and Santa Fe Land Improvement Company retained the remaining 67% interest. After incorporation, Ed Fletcher, president of the San Dieguito Mutual Water Company, announced that the company would build two concrete dams, the Carroll Dam and the San Dieguito Dam, and the Lake Hodges Flume (in 1914, called the Carroll-University Heights Conduit Canal) to serve irrigation purposes and Fletcher's real estate ventures (ASM Affiliates 2002; Evening Tribune 1917; Fowler 1953; Post and Hickok 1914; San Diego Union 1917a, 1917b).

At the recommendation of Volcan Land & Water Company engineer W.S. Post, Ed Fletcher selected John Samuel Eastwood, a civil engineer and inventor/proponent of the multiple arch dam design, as the lead engineer for the Carroll and San Dieguito Dam projects. Fletcher had previously worked with Eastwood in 1916, when Eastwood designed the Murray Dam to replace the La Mesa Dam for Fletcher's other water venture, the Cuyamaca Water Company. Eastwood's multiple arch dam design was impressively economical compared to the cost of gravity dams favored by engineers Hiram Savage and Lars Jorgensen, or rock fill embankment dams favored by M.M. O'Shaughnessy. Eastwood would design and manage the Murray Dam, San Dieguito Dam, and Carroll Dam construction projects simultaneously from 1917 to 1919 (Eastwood 1916; Fletcher, Murray, and Henshaw 1917; Jackson 2005; Post and Hickok 1914).

In February 1917, Eastwood surveyed the potential dam sites with San Dieguito Mutual Water Company engineer W.S. Post, and foundation preparation began in June 1917. Bent Brothers Construction Company of Los Angeles, whom had worked with Eastwood for other multiple arch dam projects in Southern California, was selected as the contractor. During construction, the complex continued to be referred to interchangeably as the Carroll Reservoir and Lake Hodges, after Santa Fe Railroad Company vice president Walter E. Hodges, but by January 1918, it was almost exclusively referred to as Lake Hodges Dam. In comparison to other public utility projects, construction of the Lake Hodges Reservoir Complex was relatively quick. The actual pouring and placing of concrete took only twelve months, from November 1917 to November 1918. In March 1918, as the dam neared the 60% completion mark, a severe flood overtopped the dam (Figure 15). The dam was undamaged by the overtopping, a credit to Eastwood's design. Lake Hodges Dam consisted of 23 hollow 24-foot wide, 24-inch thick reinforced concrete arches, supported with buttresses of mass concrete. It was 550 feet long and 137 feet high (Eastwood 1916; Evening Tribune 1918; Jackson 2005; San Diego Union 1917c, 1918a, 1918b; Tilley 1918).

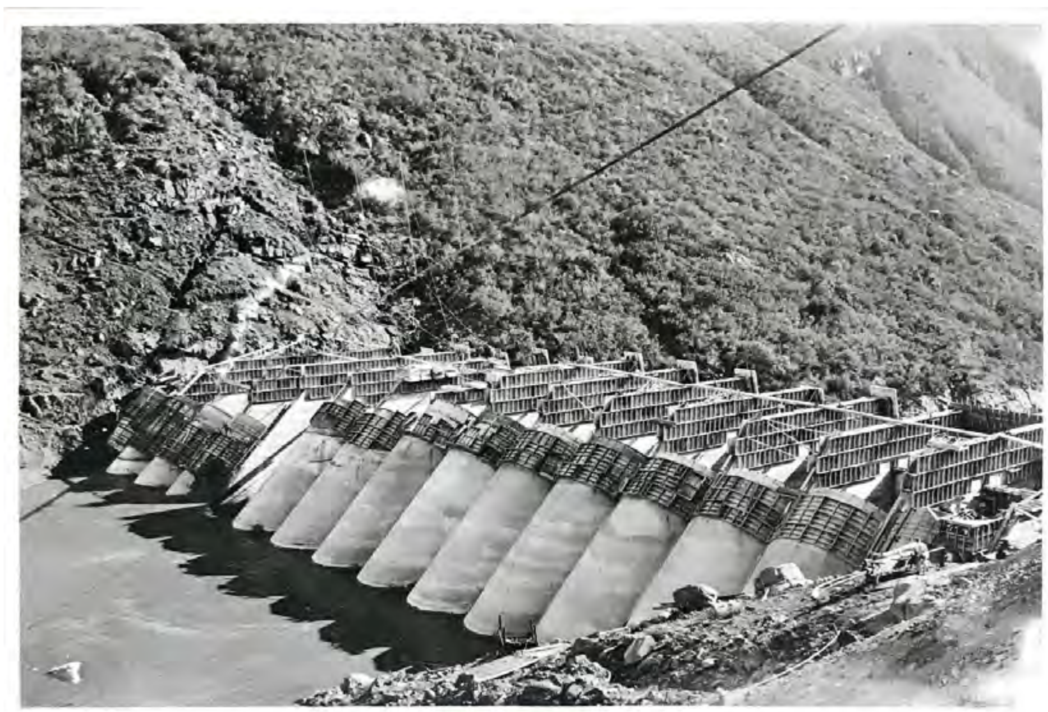


Figure 15. Lake Hodges Dam during construction, March 14, 1918 (Walter L. Huber Papers Collection, Water Resources Collections and Archives, University of California, Riverside)

The quick pace of concrete pouring and lack of reinforcement in the buttresses caused shrinkage and small cracks in the buttresses, which were noted, but not addressed during the construction process. Because the project was managed by a private company, the state engineer required a redesigned, larger spillway. Even with the extra work, the dam was completed shortly after by February 1919. San Dieguito Dam was also completed in January 1919. The Lake Hodges Flume, which delivered water to the lower dams and to the proposed irrigated area between Del Mar and Encinitas, was also completed in early 1919 (Figure 16) (ASM Affiliates 2002; Evening Tribune 1919a, 1919b; Fletcher 1919; Jackson 2005; Tilley 1918).

Figure 16. Lake Hodges Reservoir Complex after completion 1919, flume trestle in foreground (Walter L. Huber Papers Collection, Water Resources Collections and Archives, University of California, Riverside)

<u>Phase 2: Post-Construction Development (1920-present)</u>

City of San Diego Water Leases (1920-1939)

After completion of the Lake Hodges Reservoir Complex construction, the San Dieguito Mutual Water Company and Ed Fletcher continued to promote Lake Hodges and the San Dieguito Dam and reservoir as water sources for irrigation, however, as early as December 1919, not a full year after construction was complete, the City of San Diego began to pursue a resolution to purchase water from the San Dieguito Mutual system to supplement city sources. In spring 1920, the City entered into a contract with Fletcher to build a pipeline from the San Dieguito Mutual system to the city and purchase the system's water for a ten-year period, and began to investigate the costs of buying the San Dieguito Mutual system outright (Evening Tribune 1919d, 1919e, 1920a, 1920b; Fowler 1953; San Diego History Canter 2018; San Diego Union 1920a, 1920b).

In 1922, the Santa Fe Railroad subsidiary Santa Fe Land Improvement Company bought William G. Henshaw's 33% interest in the San Dieguito Mutual Water Company, effectively becoming sole owner. Henshaw used the proceeds to consolidate Volcan Land & Water Company into the San Diego County Water Company, which would go on to secure non-local water sources for the City of San Diego (Fowler 1953).

By 1925, the City of San Diego entered into another lease with the San Dieguito Mutual Water Company for the entire San Dieguito Mutual system.

> The City of San Diego acquired the San Dieguito water system including the Hodges Reservoir dam from the San Dieguito Water Company under the terms of the lease option to purchase agreement dated October 1925, which was confirmed by an 11 to 1

> vote at an election on October 5, 1925 when a bond issue for $500,000 to provide for part payment was approved by the electors. The purchase price for the entire system is $3,750,000 of which Hodges reservoir dam represents only about one-seventh (Pyle 1934: 1).

This agreement also included water from the Pamo and Sutherland drainage basins. This move came while the City was struggling to secure water rights to the San Diego River, ensuring enough water for its growing population (Lippincott 1925; Pyle 1934; San Diego Union 1925).

In 1927, the winter rainy season caused flooding, and Lake Hodges dam began spilling over on February 15, 1927. Initially, no problem was perceived, since Lake Hodges Dam had admirably remained undamaged after floods in 1918 and 1922, however in May 1927 it was reported that the flood water pouring over the Lake Hodges spillway had damaged the solid rock ledge near the outlet siphon. The spillway was redesigned and the approach channel deepened as a result. This redesign led to an official investigation of the dam in 1928 (Dewell 1929; Evening Tribune 1927a, 1927b, 1928; Fowler 1953).

The investigation rediscovered the cracks in the buttresses at Lake Hodges Dam and was reported to the California State Engineer, Edward Hyatt. The cracks were cause for alarm once the newspaper published the dam’s condition, however, the state’s investigation found that the cracks were “almost entirely due to shrinkage of the concrete and to temperature changes. Except for weakening the effectiveness of the lateral bracing, these cracks are not found to be dangerous” (Dewell 1929: 4). It recommended that the buttresses would be able to carry the water loads of a full reservoir, provided that the structure was not subject to a destructive earthquake or vibration resulting from overtopping. Lateral bracing of the buttresses, which had not been reinforced in the original Eastwood design, was also recommended to protect the buttresses from shifting further. Ultimately, the only pressing issue at the Lake Hodges Reservoir Complex was the need for an adequate spillway (Dewell 1929; Evening Tribune 1928; Fowler 1953; San Diego Union 1928).

From 1930 to 1932, a new spillway for Hodges, required by state engineer Hyatt, was excavated and rebuilt. Bond measures to fund the project were repeatedly defeated, however, eventually the state engineer threatened litigation in order to force the City to pay for repairs out of existing bonds. The City in turn sued for the San Dieguito Mutual Water Company to bear the cost of the repairs, and won (Evening Tribune 1930, 1931a, 1931b, 1931c, 1932; Fowler 1953; Hart 1931).

At the same time, the state engineer also ordered an investigation of all multiple arch dams in California, investigating how the structures had aged, and addressing safety complaints similar to the crack issue at Lake Hodges Dam. The report covered 19 dams including Lake Hodges, Murray, and San Dieguito, in addition to other J.S. Eastwood dams. The report measured the progress of the buttress cracks and determined that they were increasing. Even more alarming, the report discovered that nearly all dams included in the project scope were leaking either at cracks or joints in the structures. Horizontal cracks were discovered between successive pours or lifts, and diagonal cracks were discovered to have grown from continuous cracks that began in the structure’s buttress (Figure 17a, 17b). In short, the report shook the confidence of the dam owners and general public living below or relying upon the various dams (Huber, Dennis, and Elliot 1932).


Figure 17a. Buttress 10, March 31, 1919 (left);
Figure 17b. Buttress 10 with dam cracks June 3, 1931 (right) (Walter L. Huber Papers Collection, Water Resources Collections and Archives, University of California, Riverside)

On March 10, 1933, a 6.4 magnitude earthquake struck in Long Beach. The earthquake caused significant damage in southern Los Angeles, but also served as a motivating factor for the City of San Diego to continue with the Hodges Dam Strengthening Project required by the state engineer. Repair plans had stalled continuously over the past three years, but four days after the earthquake, repair of Lake Hodges Dam as an emergency work project was approved by city and county officials. The city applied for state emergency relief administration funds and federal work relief funds, which were eventually rewarded, but continued to struggle to fund the dam repairs though voter-funded bonds. Repeatedly, the state engineer, water commission, and hydraulic engineers pleaded that the repairs be funded to avoid the state condemning the dam and lowering the water level, as this would cut-off an important source of water for the City of San Diego and open the city to lawsuits from irrigation districts leasing the water. Eventually, enough funds were collected between state emergency funds, Public Works Administration (PWA) funds, and voter-funded bonds for the $180,000 project. Hiram Savage, the city hydraulic engineer, drew up specifications and plans for the strengthening project shortly before being forced from his position as hydraulic engineer. Fred D. Pyle replaced Savage and in 1935, Pyle circulated a call for proposals. The project was also supported by Ed Fletcher, who had been elected State Senator, and continuously boosted San Diego and San Diego County projects to the state (Evening Tribune 1933, 1934; Pyle 1934, 1935, 1936; San Diego Union 1933, 1934; Savage 1934a, 1934b; SDHS 2018).

Work began on Lake Hodges Dam in spring 1936, after the bid by Morley Golden was approved by the City. The dam strengthening included building a spillway apron; installing concrete reinforced bracing and steel ties between the buttresses; and adding concrete protected steel rods along to each buttress near the arch spring line (Figure 18). The first concrete was poured in June 1936, and work progressed rapidly until December 1936. Hodges Lake Dam was finally declared safe by the state engineer, and approved as a unit in the City of San Diego's water supply system in March 1937 (Fowler 1953; Pyle 1936; San Diego Union 1936a, 1936b, 1936c, 1936d, 1937b; Savage 1934).

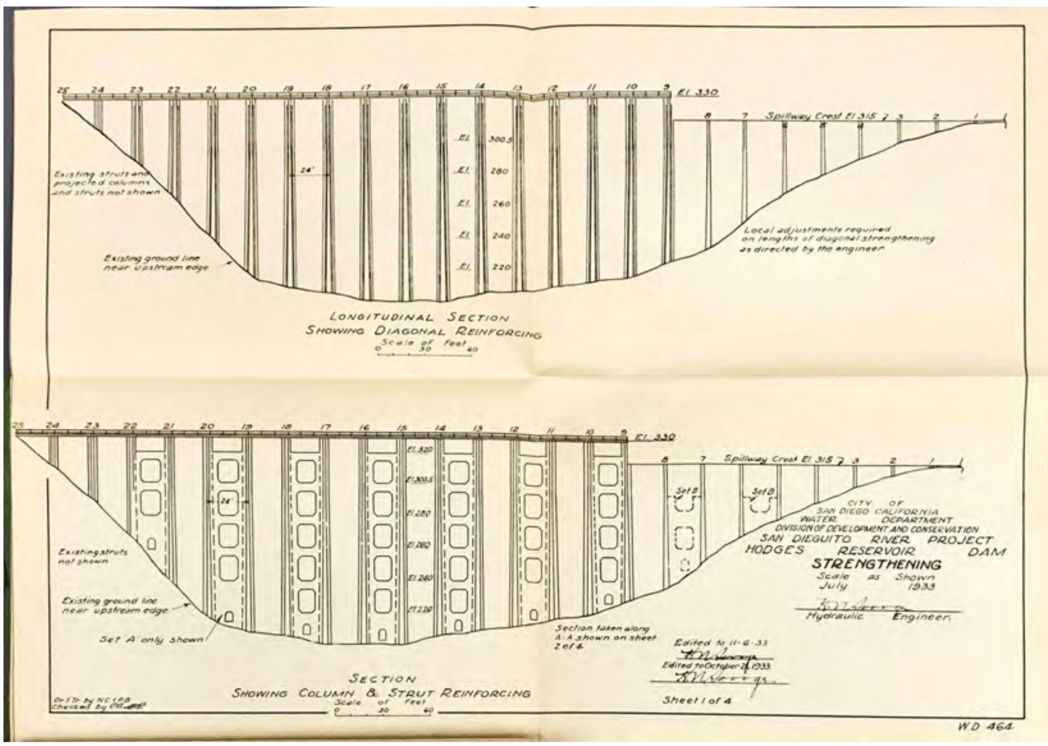


Figure 18. Hodges Dam Strengthening plans, Hiram Savage, 1934 (City of San Diego Public Utilities Department Archives)

After reinforcing Lake Hodges Dam, the City also began to entertain the idea of building a newer, taller dam, a "Super Hodges" immediately downstream of the existing Lake Hodges Reservoir Complex. Runoff statistics at Lake Hodges showed that even in dry years, water still overflowed from Lake Hodges Reservoir Complex. In 1937, the city began to promote Super Hodges as a viable, local water source. The plan met resistance initially due to the early estimated $7,000,000 cost, but also because it would flood several of the developed residential neighborhoods and towns that had sprung up around the reservoir, require a realignment of State Highway 395, and negate bridge projects already funded by the state (Fowler 1953; San Diego Union 1937a, 1937c).

City of San Diego Water Ownership (1939-present)

In 1939, the City of San Diego gave notice of its intention to buy the San Dieguito water system from the San Diego Water Supply Company (the company that succeeded San Dieguito Mutual Water Company). The City had been paying San Diego Water Supply Company as part of a 30-year lease with an option to purchase the San Dieguito system since 1925. After

$2,600,000 in bonds were approved in spring 1939, the city purchased the Lake Hodges Reservoir Complex, San Dieguito Dam, and the Sutherland Dam's proposed location in October 1939 (San Diego Union 1939a, 1939b, 1940).

In the greater context of a growing population and dire need for water in San Diego, the City was forced to supplement its local water supply sources with Colorado River water. The City had long been expecting this, originally applying to the Secretary of the Interior for a Colorado River water contract as early as 1933. The City of San Diego added El Capitan dam and reservoir (1935) and San Vicente dam and reservoir (1943) to its water supply system, but the supply continued to lag behind its booming population. The Colorado River water contract would provide 250,000 acre-feet of water storage in Boulder Reservoir and 112,000 acre-feet of water delivered annually once Boulder Dam was complete. (Fowler 1953).

Water fears were exacerbated by the San Diego area population increase due to the ongoing World War. The population ballooned from 225,000 in 1941 to 325,000 in 1943. Per Fred D. Pyle, the City's Hydraulic Engineer:

> With this increase in population, which so greatly exceeds normal growth, there is grave danger of a water shortage in the event of a drought such as occurred from 1896 to 1904. The excess in population is coming to San Diego because of the National Defense activities and so rapidly that it will be impossible to construct reservoirs and impound water in time to be of use should such a drought occur (Pyle 1943: 3).

The severe strain on local water supplies prompted the San Diego County Water Authority to organize in June 1944 and the water authority became a member agency of the Metropolitan Water District. This resulted in the construction of the San Jacinto Tunnel by the U.S. Navy, which diverted water from the Metropolitan Water District (Los Angeles's Colorado River source) which was placed into service in 1947. The same year, water from the Boulder Dam contract was finally delivered to the City, as the All-American Canal was completed and the first Colorado River water was delivered to San Vicente Dam. With Colorado River water being supplied to the City, reliance on local water storage was diminished (City of San Diego 1943; Fowler 1953; Pyle 1943, 1946, 1947).

In tandem, the City began to more seriously consider plans to raise Lake Hodges Dam by building a new "Super Hodges" dam. In 1946, just before the first Colorado River water reached the City, the City applied for a permit to divert 230,000 acre-feet of water to Hodges reservoir, and purchased land necessary to raise Hodges for Super Hodges Project. After the construction of the San Diego Aqueduct and San Jacinto Tunnel, however, the need for Super Hodges lessened. Sometime in this period, likely around the time the City began to plan in earnest for Super Hodges, the original Craftsman-style Keeper's House on the reservoir's western shoreline was demolished (Figure 19) (Fairchild Aerial Survey 1939; JAPE 1947; NETR 2018; Park Aerial Survey 1953; Public Utility Department 1936, 1972).

The Super Hodges project reemerged in 1949, after the State Water Resource Board published Bulletin No. 55, the "San Dieguito and San Diego Rivers Investigation" report. This report recommended that the City of San Diego again look to the conservation and development of local water resources. This included the completion of Sutherland Dam and the construction of an enlarged Hodges Dam, citing the large losses of water due to runoff. The project was again met with resistance due to its estimated $14,000,000 price tag (DWR 1949; Public Utilities Department 1972; Pyle and Beerman 1949; San Diego Union 1949a, 1949b).

Figure 19. Original Keeper's House, 1936 (City of San Diego Public Utilities Department Archives)

Instead of making progress on the Super Hodges plan, the City instead chose to build the Sutherland Dam. Sutherland Dam construction began in 1927 but was halted for a variety of reasons relating to its proposed location and foundation. The City of San Diego began work on Sutherland Dam again in 1952, when funds were approved by a bond measure. While Sutherland was being constructed, the City of San Diego quietly purchased privately held agricultural lands near Lake Hodges, in anticipation of the area's eventual flooding due to a larger reservoir. The Sutherland Dam was completed in 1954 to fanfare, and in response to the new local water source, there was pushback against City Council's decisions to fund the Super Hodges project (Public Utilities Department 1972; San Diego Union 1952, 1953a, 1953b).

In May 1956, land owners in San Pasqual Valley brought suit against the City of San Diego in connection with the Sutherland Reservoir infringing on their riparian rights. Both the suit and appeal were in favor of the land owners and the City's use of waters in Sutherland Reservoir became extremely restricted. The City began to aggressively purchase the remaining private lands in San Pasqual Valley in response to the suit, and combined it with purchases already made for the Super Hodges project. As a result, with the exception of the San Pasqual Academy, the City became the sole land owner in San Pasqual Valley (Public Utilities Department 1972).

Support for Super Hodges project waned as the City sought federal funds to aid the ever increasing cost of the project. Originally scoped at $7 million, the proposed project ballooned to over $20 million from private land purchases, relocating state and federal highways, and increasing costs for the US-395 Highway Bridge. In 1959, The California Department of Water Resources released the results of their San Dieguito River Investigation, which demonstrated that the increase in water storage at the potential Super Hodges Reservoir would not necessarily be more efficient that the extant Lake Hodges Reservoir Complex due to evaporation and increasing costs. The city hydraulic engineer, Paul Beerman, eventually publicly concurred with the report's finding and declared that the project was too costly. The City resisted the findings for another couple of years, but in 1961, they finally abandoned the Super Hodges Project for good (DWR 1959; Public

Utilities Department 1972; San Diego Union 1958, 1960, 1961).

Fortunately, the City was well positioned to recuperate their losses on the Super Hodges Project. Private lands originally purchased for the eventual flooding by Super Hodges had increased several times in value, and the Water Department sold the lands at a profit. The lands around Lake Hodges had also been annexed to the City of San Diego in 1962. In 1964, the City developed the San Pasqual Valley Plan, a comprehensive plan for agricultural, recreational, and urban development in San Pasqual Valley around Lake Hodges (Public Utilities Department 1972; San Diego Union 1962).

There have been few alterations to the dam and reservoir features of the Lake Hodges Reservoir Complex since the Super Hodges project was abandoned. Between 1958 and 1963 a new Keeper’s House, Quonset Hut, and shed were established northeast of the original Keeper’s House location. Then in 1969, the current Lake Hodges Bridge over Interstate 15 was completed. After this, the Lake Hodges Reservoir Complex was left alone until 2012, except as a recreational location for fishing and hunting (Cartwright Aerial Surveys 1963; Fairchild Aerial Survey 1958; NETR 2018; Public Utility Department 1936, 1972).

The most recent project at Lake Hodges was in 2012, when the San Diego County Water Authority built a pump station, 1.25 mile pipeline to Olivenhain Reservoir, and an inlet-outlet structure within Hodges Reservoir on the west banks of Lake Hodges. The project connected Olivenhain Reservoir, completed in 2003, to Lake Hodges reservoir and generated hydroelectric power (NETR 2018; San Diego County Water Authority 2018).

Engineer: John Samuel Eastwood (1857-1924)

John Samuel Eastwood was born in rural Minnesota to Dutch immigrants, near Minneapolis in in 1857. Eastwood "Americanized" his Dutch surname name from Oosterhout in 1878 in anticipation of entering the commercial and professional world. He graduated from University of Minnesota with a B.S. in Engineering in 1879 and emigrated west in 1880 to work on the Northern Pacific Railroad. In 1883, Eastwood moved on from railroad work to the San Joaquin Valley in central California, where he began working on water infrastructure. In 1885, after the incorporation of Fresno as a city, Eastwood was appointed City Engineer. After just one year in this position, Eastwood left, preferring to work for local private logging and hydroelectric engineering projects in the Fresno region of the Sierra Nevada Mountains (Jackson 1979, 1999, 2005, 2009; Whitney 1969).

From 1895 to 1896, he worked as chief engineer for the Fresno-based San Joaquin Electric Company (SJEC) and developed their hydroelectric power system. The system, which relied on the natural flow of the San Joaquin River, eventually failed in the drought conditions of the late 1890s. The failure of design served an important lesson for Eastwood, as he realized the importance of long-term water storage and provided for this in his future California water infrastructure projects (Jackson 1999, 2005; Whitney 1969).

Eastwood designed his first multiple arch dam for Henry Huntington's Pacific Light & Power Corporation, at what was then known as the Big Creek system. Eastwood’s innovative dam design promised a strong, but not a material-intensive structure that could be cheaply constructed. In 1906, Eastwood first developed multiple arch designs for Big Creek that required significantly less concrete to build than conventional concrete gravity dams, therefore saving clients’ money. The dam never came to fruition due to the Financial Panic of 1907, however, in 1908 Eastwood was hired by the Hume-Bennet Logging Company and used his design for the Hume Lake Dam, completed in 1909 (Jackson 1999, 2005; Whitney 1969).

After the initial success of Hume Lake Dam, Eastwood continued to use and promote his economical and strong multiple arch dam design. In 1910, Eastwood moved on again, this time to design another multiple arch dam and serve as chief engineer for the Big Bear Dam in the San Bernardino Mountains. In 1911, he moved to Oakland to work with the Great Western Power Company (GWPC) in northern California. GWPC planned a large storage dam at Big Meadows as part of the Feather River hydroelectric power system. Here, Eastwood came into conflict with another engineer, John R. Freeman, who promoted a concrete gravity dam design. Though Eastwood's design was initially selected, and construction of a multiple arch dam began at the Big Meadows site, changes in GWPC leadership and the influence of Freeman ultimately led the GWPC to abandon construction of Eastwood's dam in 1913. Surprisingly, the reasons for abandoning the project were not due to any failure of design or miscalculation by Eastwood, but rather with the "psychological disquiet" such a design would inspire in the general public. After the Big Meadows Dam, Eastwood found himself professionally ostracized by the international engineering community. Rather than abandoning the multiple arch design, Eastwood doubled down on his promotion of inexpensive and structurally sound designs (Jackson 1999, 2005, 2009; Whitney 1969).

For a few years, Eastwood was commissioned for small dam projects at Los Verjels Dam and Kennedy Dam before being sought for the Mountain Dell Dam near Salt Lake City, Utah. Shortly afterward, Eastwood was sought by San Diego developer Colonel Ed Fletcher to bring his economical designs to San Diego County. Eastwood designed four dams for Fletcher from 1917 to 1918: Lake Hodges, San Dieguito, Murray, and Eagle's Nest Dams. Though he did not build any other dams in San Diego County after this, Eastwood maintained a warm relationship with Fletcher and it eventually led to a connection to the City of Phoenix, who engaged him to design Cave Creek Dam in the early 1920s (Jackson 1979, 1999, 2005; Whitney 1969).

While working with Fletcher in 1924 on new dam designs, Eastwood spent time at Fletcher's ranch along the Kings River. There, he suffered a heart attack while swimming and passed away. The ranch is now covered by the Pine Flat Reservoir, which was dammed in 1954 by a concrete gravity dam (Jackson 1999).

Eastwood's career as an engineer extended 44 years, from 1883 until his death in 1924. A small sample of his work is included below (Jackson 1979, 1999, 2005, 2009; Whitney 1969):

- Hume Lake Dam, Fresno County, California (1908)
- Big Bear Lake Dam, San Bernardino County, California (1912)
- Los Verjels Dam, Yuba County, California (1914)
- Kennedy Dam, Amador County, California (1914)
- Mountain Dell Dam, Salt Lake County, Utah (1916-1925)
- Murray Reservoir Complex, San Diego County, California (1917)
- Lake Hodges Reservoir Complex, San Diego County, California (1919)
- Fish Creek Dam, Carey, Idaho (1919)
- San Dieguito Dam, San Diego County, California (1919)
- Cave Creek Dam, Maricopa County, Arizona (1923)
- Anyox Hydroelectric Dam, British Columbia, Canada (1924)

NRHP/CRHR Significance Evaluation

NRHP Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.

CRHR Criterion 1: Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

The Lake Hodges Reservoir Complex was constructed in 1919 during a significant period in San Diego source water development history: Flood Recovery and Reinvestment (1916-1928). This significant period of water infrastructure development in San Diego and is clearly defined by two catastrophic events in Southern California that had far-reaching effects, the flood of 1916 and the St. Francis Dam Disaster in 1928. Despite the City' efforts, the flood of 1916 led to the collapse of the original Lower Otay Dam and destruction of many elements of the early water system in San Diego. Following this disaster, the City took extensive measures to ensure that these types of disasters were somewhat preventable in the future, by building their own dams versus purchasing dams designed by private water companies.

One of the most notable changes made following the flood of 1916 was the hiring of the City's first Hydraulic Engineer in 1917. In the previous period of development, it was the common occurrence for the private water companies to hire engineers like Michael O'Shaughnessy who were not employed by the City. However, the hiring of Hiram Savage in 1917 forever changed the way the City handled their water system development by having an engineer in house that oversaw the construction of water infrastructure projects. In response to the 1916 flood, Savage was responsible for implementing numerous safety measures to help prevent infrastructure failures in the future and was in charge of the rebuilding and repairing of damaged water infrastructure throughout the City. Despite the fact that Savage was replaced as the City's Hydraulic Engineer during this period of development, it is clear that his role was pivotal for the City's infrastructure development, as further evidenced by his eventual rehiring in 1928.

The Lake Hodges Reservoir Complex is one of several dams that developed after the flood of 1916. In the wake of the 1916 floods, the City recognized the high potential of capturing flood waters and the missed opportunity to store and sell its own water. Lake Hodges Dam was designed by John S. Eastwood and built by the San Dieguito Mutual Water Company, and co-owned and operated by Ed Fletcher, capitalist William G. Henshaw, and the Santa Fe Railroad Company. The dam was completed in a remarkably short period of time and opened in 1919. Other dams built in this period were Lower Otay Dam (City of San Diego) Barrett Dam (City of San Diego) Murray Dam (Cuyamaca Water Company), and San Dieguito Dam (San Dieguito Mutual Water Company), as well as major repair projects for the Sweetwater Dam (San Diego Land and Town Company) and Morena Dam (City of San Diego).

The pattern of attracting the City's interest and capital with an already-built water storage and conveyance system, entering into a lease with the City, and the City's eventual purchase of the water system is well illustrated by the Lake Hodges Reservoir Complex. After years of failing to sell the system to the City of San Diego, in 1919, Lake Hodges Dam and the San Dieguito water system finally drew the attention of the City as another potential major water source. The City debated funding a lease for five years before agreeing to a 30-year lease with an option to buy in 1925. The City of San Diego was also responsible for repairs and strengthening projects ordered by the state engineer as part of the lease terms. After years of investment in the Lake Hodges Reservoir Complex, the City decided to purchase the entire San Dieguito system in 1939, eleven years before their 30-year lease was finished. The purchase came at a critical period, just before World War

II caused the military base population in San Diego to grow by hundreds of thousands. The influx of the military population during World War II eventually necessitated supplementing local water resources with Colorado River water.

In summary, the Lake Hodges Reservoir Complex is directly associated with important events related to the period of flood recovery and reinvestment seen in San Diego from 1916-1928 and stands today as a critical component of the San Diego Source Water System that supported the City's growth and development. Therefore, Lake Hodges Reservoir Complex appears eligible under NRHP/CRHR Criterion A/1 as both a contributing element of the City of San Diego Source Water System, and as an individual property.

NRHP Criterion B: Associated with the lives of significant persons in our past.

CRHR Criterion 2: Associated with the lives of persons important in our past.

The Lake Hodges Reservoir Complex has connections to noted individuals, including Colonel Ed Fletcher, W.G. Henshaw, and Walter E. Hodges, who were early developers and notable capitalists of the City of San Diego. Although though these individuals facilitated the sale of the San Dieguito system to the City of San Diego, the Lake Hodges Reservoir Complex does not illustrate the productive periods of their respective lives. Other properties where these individual lived or directly worked, may be a better candidate for significance under Criterion B. Archival research did not indicate that the Lake Hodges Reservoir Complex was connected with any other demonstrably important historical figures. Therefore, the Lake Hodges Reservoir Complex does not appear eligible under NRHP/CRHR Criteria B/2.

NRHP Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

CRHR Criterion 3: Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

The Lake Hodges Reservoir Complex appears eligible under NRHP/CRHR Criterion C/3. The dam embodies distinctive characteristics of the multiple arch dam construction type, invented and promoted by engineer John S. Eastwood. The complex's period of significance is limited to its year of completion in 1919.

In addition to its important associations with the development of San Diego's Source Water System, the Lake Hodges Reservoir Complex is also important because of its embodiment of a multiple arch dam design. Multiple arch dams (also called Buttress dams) are made of concrete or masonry and feature buttresses that are built perpendicular to the wall of the dam, which is usually thin. These types of dams require much less material than gravity dams, and they do not require narrow canyons with rock faces like arch dams. The structural integrity of the arch holds back the water of the reservoir by distributing the weight of the water along each arch. This dam type was invented by Eastwood in 1909 and promoted ever since. The Lake Hodges Reservoir Complex embodies the distinctive characteristics of the multiple arch concrete dam construction and retains its 1919 character defining features: a slim profile, delicate buttresses, and repeating arches that span the San Dieguito River drainage. These features have been retained despite alterations in 1936 that added a spillway apron; installed concrete reinforced bracing and steel ties between the buttresses; and added concrete protected steel rods to each buttress near the arch spring line. While these alterations are not necessarily complementary, the original design and materials are still present.

Master engineer John S. Eastwood invented and promoted the multiple arch dam, in response to the desire to create a low-cost, low-material alternative to massive embankment dams and concrete gravity dams, which were typical of dam construction types in the early twentieth century. Other Eastwood-designed multiple arch dams are extant at Hume Lake Dam (1908), Big Bear Lake Dam (1912), Mountain Dell Dam (1914), Murray Dam (1918), San Dieguito Dam (1919), and Cave Creek Dam (1923). San Diego County is home to three of these dams including the Lake Hodges Reservoir Complex.

Alterations to the dam are a significant part of the Lake Hodges Reservoir Complex engineering story, and serve to illustrate how the introduction of a new design failed to inspire confidence in the communities they served. The discovery of minor cracks in the dam, combined with the thinness of the arch design, led to widespread mistrust and vilification of the multiple arch design. The dam's obvious visual and structural alterations were meant to abate the "psychological disquiet," initially coined by John R. Freeman in 1913, of living beneath such a "thin" and low-cost structure. This effect is illustrated especially well by Lake Hodges Dam. From Hiram Savage to the state engineer to the general public below the dam, cracks in Lake Hodges Dam were enough to induce panic and call for the dam to be removed or replaced by a concrete gravity dam called "Super-Hodges." Instead, dam improvements to Lake Hodges Dam are typical of the treatment of multiple arch dams and popular opinion of their designs. After an earthquake in 1933, the City of San Diego's Hydraulic Engineer Hiram N. Savage designed the reinforced concrete buttresses that supported the arches, and these alterations were implemented by another City Hydraulic Engineer, Fred D. Pyle in 1936.

In summary, the Lake Hodges Reservoir Complex is an excellent example of a multiple arch dam; represents a notable engineering achievement for the City of San Diego; and is a notable work of master engineer John S. Eastwood. Therefore, the subject property appears eligible under NRHP/CRHR Criterion C/3 as both a contributing element of the City of San Diego Source Water System, and as an individual property.

NRHP Criterion D: Have yielded, or may be likely to yield, information important in history or prehistory.

CRHR Criterion 4: Has yielded, or may be likely to yield, information important in prehistory or history.

Archaeological survey was not conducted for this project. At this time there is no indication that the Lake Hodges Reservoir Complex has the potential to yield information important to state or local history. Therefore, the property is recommended not eligible under NRHP/CRHR Criterion D/4.

City of San Diego Significance Evaluation

Criterion A: Exemplifies or reflects special elements of the City's, a community's, or a neighborhood's historical, archaeological, cultural, social, economic, political, aesthetic, engineering, landscaping, or architectural development.

The Lake Hodges Reservoir Complex exemplifies special elements of San Diego's historical development. Construction of the dam made a significant contribution to the history of water development in the San Diego region and illustrates how the City of San Diego typically absorbed privately owned, local water sources into the City-owned water infrastructure through a multi-year lease process. The complex also reflects special elements of San Diego’s engineering development. The Lake Hodges dam embodies the distinctive characteristics of the multiple arch dam construction type, used and promoted by engineer John S. Eastwood. Multiple arch dams are made of concrete or masonry and feature buttresses that are built perpendicular to the wall of the dam, which is usually thin. These types of dams require much less material than gravity dams, and they do not require narrow canyons with rock faces like arch dams. The attractive qualities of cost and material-saving, attracted private water company San Dieguito Mutual Water Company to employ Eastwood to design the Lake Hodges Reservoir Complex at a time when gravity and arch dams were the preferred design. Multiple arch dams were an important innovation in dam engineering and critical to the water supply needs of the City of San Diego. Therefore, the subject property appears eligible under City Criterion A.

Criterion B: Is identified with persons or events significant in local, state, or national history.

Persons: Although the Lake Hodges Reservoir Complex has connections to noted individuals, including Ed Fletcher, W.G. Henshaw, and Walter E. Hodges who hold importance within the history of development in San Diego, the subject property is not connected with any of these individuals in a way that directly represents their contributions within the local historic context.

Events: As described in the NRHP/CRHR A/1 criterion discussion above, the Lake Hodges Reservoir Complex is associated with events significant in local and state history. Lake Hodges Reservoir Complex is associated with the post-1916 flood water infrastructure boom that led to the design and construction of several major privately and City-owned dam projects. These projects sustained the growth of early twentieth century San Diego until 1947, when the City began to receive imported water from the Colorado River. The subject property is directly associated with important events related to water development in the San Diego region, namely with the City gaining source water independence and being a critical component to the water infrastructure that supported the City’s growth and development until the end of World War II. Therefore, the subject property appears eligible under City Criterion B.

Criterion C: Embodies distinctive characteristics of a style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship.

As described in the NRHP/CRHR Criterion C/3 discussion above, the Lake Hodges dam is an excellent example of a multiple arch dam, and its alterations are a typical and illustrative example of a strengthening treatment applied to Eastwood’s multiple arch dam designs. Multiple arch dams (also called Buttress dams) are made of concrete or masonry and feature buttresses that are built perpendicular to the wall of the dam, which is usually thin. These types of dams require much less material than gravity dams, and they do not require narrow canyons with rock faces like arch dams. The structural integrity of the arch holds back the water of the reservoir by distributing the weight of the water along each arch. This dam type was invented by Eastwood in 1909 and promoted by him ever since. The Lake Hodges Reservoir Complex embodies the distinctive characteristics of the multiple arch concrete dam construction and retains its 1919 character defining features: a slim profile, delicate buttresses, and repeating arches that span the San Dieguito River drainage. These features have been retained despite alterations in 1936 that added a spillway apron; installed concrete reinforced bracing and steel ties between the buttresses; and added concrete protected steel rods to each buttress near the arch spring line. Therefore, the subject property appears eligible under City Criterion C.

Criterion D: Is representative of the notable work or a master builder, designer, architect, engineer, landscape architect, interior designer, artist, or craftsman.

As described under NRHP/CRHR Criteria C/3 (see full discussion above), the Lake Hodges Reservoir Complex represents a notable work of master engineer John Samuel Eastwood. Eastwood was hired by the Ed Fletcher in 1917 to work on dams in the greater San Diego region: Lake Hodges Dam, San Dieguito Dam, and Murray Dam. Eastwood's designs were particularly attractive because of their low cost and requirement of fewer building materials. Alterations to the original Eastwood design are indicative of how Eastwood's designs were rejected and vilified by the professional engineering community and the general public and convey an important part of the master architect's career. Therefore, the subject property appears eligible under City Criterion D.

Criterion E: Is listed or has been determined eligible by the National Park Service for listing on the National Register of Historic Places or is listed or has been determined eligible by the State Historical Preservation Office for listing on the State Register of Historical Resources.

The Lake Hodges Reservoir Complex is not known to be on any local, state, or national list of significant properties, nor is it known to have been determined eligible for listing on any register. Therefore, at this time, Lake Hodges Reservoir Complex does not appear eligible under City Criterion E.

Criterion F: Is a finite group of resources related to one another in a clearly distinguishable way or is a geographically definable area or neighborhood containing improvements which have a special character, historical interest, or aesthetic value, or which represent one or more architectural periods or styles in the history and development of the City.

As described under NRHP/CRHR Criteria A/1 and C/3 (see full discussion above), the Lake Hodges Reservoir Complex is significant for it role, function, and design within the larger City of San Diego Source Water System, of which it is a contributing resource to. The City of San Diego Source Water System includes ten (10) impounding reservoir complexes owned/operated by the City that function as part of the City's municipal water-supply system. These resources and their related infrastructure (e.g., dams, outlet towers, conduits, flumes, and pipelines) constitute a finite group of resources related to one another in a clear way, steeped in historical interest and representative of significant engineering achievements. Taken as a whole, these resources (including the Lake Hodges Reservoir Complex) are significant for their role in the City's source water system, starting with the earliest efforts to establish privatized water in the 1880s soon followed by construction of the earliest reservoirs, Lake Cuyamaca (1887) and Sweetwater Reservoir (1888). The period of significance ends with construction of the San Diego Aqueduct, and the importation of Colorado River Water for the first time into the San Vicente Reservoir (1947), which forever changed the composition of City's source water supply. Therefore, the Lake Hodges Reservoir Complex appears eligible under City Criterion F.

Integrity

Overall, the Lake Hodges Reservoir Complex retains high integrity of location, setting, design, materials, workmanship, association, and feeling. While some secondary elements of the complex (e.g., Keeper's house, Quonset Hut) suffer from a lack of integrity, the complex as a whole retains requisite integrity, as described below:

Location: The Lake Hodges Reservoir Complex retain integrity of location. The location of the Lake Hodges Reservoir Complex, along the San Dieguito River in Carroll Canyon has been retained. Though there were plans to move the dam downstream, Lake Hodges Reservoir Complex was ultimately not relocated to the "Super-Hodges" site and the complex retains its location relative to other reservoirs in the San Dieguito system.

Setting: The complex's setting remains unaltered from its opening in 1919. The acquiring of private property surrounding the dam in anticipation of the "Super-Hodges" project led to City of San-Diego control over development in the area of the dam and reservoir. As a result, there is relatively little development on the reservoir shores, including at the town of Del Dios, which was spared from flooding when the reservoir was originally filled. The remote setting, free from residential or commercial development, has been retained at the site of the dam and associated buildings.

Design: Lake Hodges Reservoir Complex structures and associated buildings retain integrity of design. It retains the concrete construction, slim profile, and repeating arches spanning the drainage that are typical of the multiple arch design. Alterations to this dam are also significant to integrity of design. The dam design was altered in 1936 by the interventions of Hiram Savage, which added structural steel and reinforced supports between the dam arches. These alterations are illustrative of the overall treatment and public opinion of John Eastwood's multiple arch design. While other sections of the larger Lake Hodges Reservoir Complex have some diminished integrity of design, the complex as a whole retains the requisite integrity of design.

Materials: The Lake Hodges Dam and associated engineering structures maintain integrity of materials. New additions are made with in-kind materials and do not significantly change or alter existing materials. The associate buildings, including the Keeper's House and Quonset Hut , have had some diminished integrity due to subsequent incompatible window and door replacements throughout.

Workmanship: The Lake Hodges Dam and associated engineering structures maintain integrity of workmanship. The original workmanship, including visible board forms, delicate buttresses, and thin arches, are still visible and operate as intended. The alterations to the dam design do not obscure or alter original workmanship. The Keeper's House, Quonset Hut, and associated structures have had some diminished integrity due to subsequent alterations.

Association: The Lake Hodges Dam, its alterations, and associated engineering structures, and all associated buildings retain integrity of association with John S. Eastwood and with the City of San Diego source water system. It was designed by Eastwood for San Dieguito Mutual Water Company, for the eventual sale to the City of San Diego. Although the dam was not built by City engineers, the reservoir complex was supplying water to the City of San Diego by lease from its opening until the City purchased it in 1939. Today it still furnishes water for the City of San Diego, as well as providing recreation to San Diego County residents and businesses. Therefore, the Lake Hodges Reservoir Complex retains integrity of association.

Feeling: The Lake Hodges Reservoir Complex retains integrity of feeling. The dam retains its original 1919 scale, relationship to its surroundings, and the 1936 alterations have not changed the downstream appearance of the dam enough to distract from the delicate appearance of the multiple arch design. The Lake Hodges Reservoir Complex still evokes a sense of the period of intense water infrastructure growth in San Diego in the late 1910s and 1920s in response to the 1916 flood, a booming population, and a lack of water infrastructure to support the City.

B12. References:

Andrus, Patrick, and Rebecca Shrimpton. 2002. How to Apply the National Register Criteria for Evaluation. National Register Bulletin 15. Accessed August 3, 2018. https://www.nps.gov/nr/publications/bulletins/pdfs/nrb15.pdf

ASM Affiliates. 2002. "Lake Hodges Flume, Along San Dieguito River between Lake Hodges & San Dieguito Reservoir, Rancho Santa Fe, San Diego County, CA." HAER (Historic American Engineering Survey) Cover Sheet. Washington D.C.: National Park Service, U.S. Department of the Interior. From Prints and Photographs Division, Library of Congress (HAER CA-307). Retrieved from the Library of Congress. http://www.loc.gov/item/ca3122

Caltrans (California Department of Transportation) and JRP Historical Consulting Services. 2000. *Water Conveyance Systems in California: Historic Context Development and Evaluation Procedures*. Sacramento, California: California Department of Transportation. Accessed June 2018. http://www.dot.ca.gov/ser/downloads/cultural/CanalsDitches.pdf

Cartwright Aerial Surveys. 1963. Aerial photograph. Flight Number CAS-SD, frame 1-107. 1:20,000 scale. September 8, 1963. Aerial Photograph Collection, Map and Imagery Laboratory, University of California Santa Barbara. Accessed August 2, 2018. http://mil.library.ucsb.edu/apcatalog/report/report.php?filed_by=CAS-SD

City of Escondido. 2018. "History of Water Supply Development." City of Escondido website. Accessed August 1, 2018. https://www.escondido.org/history-of-water-supply-development.aspx

City of San Diego. 1943. "Planning San Diego: a Program for the Development of a Post War Plan for San Diego, California." San Diego, CA: City of San Diego. Fred D. Pyle Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Dewell, Henry D. 1929. "Report to the State Engineer of California, on Recommended Bracing of Dam: Lake Hodges Dam, San Diego County, California." Report. September 19, 1929. Fred D. Pyle Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

DWR (Division of Water Resources). 1949. "San Dieguito and San Diego Rivers Investigation." Bulletin No. 55. Sacramento, California State of California, Department of Public Works, Division of Water Resources. http://wdl.water.ca.gov/waterdatalibrary/docs/historic/Bulletins/Bulletin_55/Bulletin_55__1949.pdf

DWR. 1959. "San Dieguito River Investigation." Bulletin No. 72. Sacramento, California State of California, Department of Public Works, Department of Water Resources. http://wdl.water.ca.gov/waterdatalibrary/docs/historic/Bulletins/Bulletin_72/Bulletin_72-Vol1__1959.pdf

Eastwood, John S. 1916. Letter to William G. Henshaw. June 2, 1916. John S. Eastwood Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Engineering and Contracting. 1915. "Water Supply for San Diego, Cal.: Proposed Purchase of System of Volcan land & Water Company." *Engineering and Contracting*, Volume 44. August 25, 1915. p 21. https://books.google.com/books?id=TZdMAAAAYAAJ&pg=RA1-PA21&lpg=RA1-PA21&dq=volcan+land+and+water+company&source=bl&ots=e5CyCpCIbL&sig=8XAajb0lM9sy5bhn2W43rVO7nE4&hl=en&sa=X&ved=2ahUKEwjM6sn6p7vcAhXByoMKHZXrAtYQ6AEwAnoECAMQAQ#v=onepage&q=volcan%20land%20and%20water%20company&f=false

Evening Tribune. 1917. "Cuyamaca Co. To Build Large Dam." Genealogybank.com: *The Evening Tribune* (San Diego, CA), March 24, 1917, pg. 9.

Evening Tribune. 1918. "Heavy Rains to be Followed By Frost." Genealogybank.com: *The Evening Tribune* (San Diego, CA), March 13, pg. 11.

Evening Tribune. 1919a. "Pour Last Concrete at Lake Hodges Dam." Genealogybank.com: *The Evening Tribune* (San Diego, CA), January 25, 1919, pg. 12.

Evening Tribune. 1919b. "Lake Hodges Dam Completed; Has Immense Storage Capacity." Genealogybank.com: *The Evening Tribune* (San Diego, CA), February 5, 1919, pg. 4.

Evening Tribune. 1919c. "U.S. Railroad Board Boosts San Diego As Sportsmen's Paradise." Genealogybank.com: *The Evening Tribune* (San Diego, CA), October 18, 1919, pg. 16.

Evening Tribune. 1919d. "Ask Council Make Contract for Water." Genealogybank.com: *The Evening Tribune* (San Diego, CA), December 13, 1919, pg. 21.

Evening Tribune. 1919e. "Plans for Auxiliary Water Supply Being Prepared for City." Genealogybank.com: *The Evening Tribune* (San Diego, CA), December 31, 1919, pg. 1.

Evening Tribune. 1920a. "Contract For Buying Of Lake Hodges Water Is Completed By City." Genealogybank.com: *The Evening Tribune* (San Diego, CA), March 16, 1920, pg. 9.

Evening Tribune. 1920b. "Councilmen Decide on Negotiations For Buying Water System." Genealogybank.com: *The Evening Tribune* (San Diego, CA), April 6, 1920, pg. 13.

Evening Tribune. 1927a. "Reservoirs Fill From 24 Hour Runoff." Genealogybank.com: *The Evening Tribune* (San Diego, CA), February 15, 1927, pgs. 1, 6.

Evening Tribune. 1927b. "Probe Damage Caused By Storms." Genealogybank.com: *The Evening Tribune* (San Diego, CA), May 16, 1927, pg. 3.

Evening Tribune. 1929. "To View Dams of City for Safety." Genealogybank.com: *The Evening Tribune* (San Diego, CA), May 17, 1928, pg. 20.

Evening Tribune. 1930. "Discuss question of Hodges Dam Funds at City Conference." Genealogybank.com: *The Evening Tribune* (San Diego, CA), March 6, 1930, pg. 1.

Evening Tribune. 1931a. "Fletcher Favors Fund Transfer to Strengthen Hodges Dam." Genealogybank.com: *The Evening Tribune* (San Diego, CA), August 3, 1931, pg. 8.

Evening Tribune. 1931b. "Clear Up River Rights, Reach District Accord, Fletcher Water Plea." Genealogybank.com: *The Evening Tribune* (San Diego, CA), August 22, 1931, pg. 1.

Evening Tribune. 1931c. "City Is Informed Repairs Must Be Made At Lake Hodges Dam." Genealogybank.com: *The Evening Tribune* (San Diego, CA), December 7, 1931, pg. 20.

Evening Tribune. 1932. "City Winner In Fight Over Dam Repair." Genealogybank.com: *The Evening Tribune* (San Diego, CA), March 26, 1932, pg. 15.

Evening Tribune. 1933. "Hodges Repair Approved By S.D. Officials." Genealogybank.com: *The Evening Tribune* (San Diego, CA), March 14, 1933, pg. 1.

Evening Tribune. 1934. "Fund for Hodges Dam Favored by PWA, Is Indication." Genealogybank.com: *The Evening Tribune* (San Diego, CA), January 25, 1934, pg. 1.

Evening Tribune. 1936. "Notice to Contractors." Genealogybank.com: *The Evening Tribune* (San Diego, CA), February 22, 1936, pg. 21.

Fairchild Aerial Survey. 1939. Aerial photograph. Flight Number C-5750, frame 205-6. 1:20,000 scale. April 16, 1939. Aerial Photograph Collection, Map and Imagery Laboratory, University of California Santa Barbara. Accessed August 2, 2018. http://mil.library.ucsb.edu/apcatalog/report/report.php?filed_by=C-5750

Fairchild Aerial Survey. 1958. Aerial photograph. Flight Number C23023, frame 12-109. 1:36,000 scale. March 4, 1958. Aerial Photograph Collection, Map and Imagery Laboratory, University of California Santa Barbara. Accessed August 2, 2018. http://mil.library.ucsb.edu/apcatalog/report/report.php?filed_by=C-23023

Fletcher, Ed, James A. Murray, and William G. Henshaw. 1917. "Contract Between Ed Fletcher, James A. Murray, and William G. Henshaw and John S. Eastwood for the Engineering and Supervision of the Construction of the Murray Dam at the La Mesa Heights Reservoir." March 28, 1917. John S. Eastwood Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Fletcher, Ed. 1919. "Notice of Completion and Acceptance of Work." February 1919. On file at the City of San Diego Public Utilities Department Archives.

Fowler, L. 1953. "A History of the Dams and Water Supply of Western San Diego County." Thesis; University of California. On file at the City of San Diego Water Utilities Department Archives.

Hart, S.A. 1931. "Estimate for Spillway requirements for Hodges Dam 8-3." Report to the California State Engineer. April 20, 1931. Walter L. Huber Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Hill, Joseph. 2002. "Dry Rivers, Dammed Rivers and Floods: An Early History of the Struggle Between Droughts and Floods in San Diego" *The Journal of San Diego History,* Winter, 2002, 48. Accessed June 2018. https://sandiegohistory.org/journal/2002/january/hill-2/

Huber, Walter L. 1912. "District Engineer's Report on Application of the Volcan Land & Water Company for Rights of Way for Reservoirs and Conduits in the Cleveland National Forest." Walter L. Huber Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Huber, Walter L. H.W. Dennis, G.A. Elliott. 1932. "Multiple Arch Dams in California." Report to California State Engineer. Walter L. Huber Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

JAPE (Jack Ammann Photogrammetric Engineers). 1947. Aerial photograph. Flight Number GS-CP, frame 11-142. 1:23,600 scale. January 16, 1947. Aerial Photograph Collection, Map and Imagery Laboratory, University of California Santa Barbara. Accessed August 2, 2018. http://mil.library.ucsb.edu/apcatalog/report/report.php?filed_by=GS-CP

Jackson, Donald C. 1979. "John S. Eastwood and the Mountain Dell Dam." *IA. The Journal of the Society for Industrial Archeology*. Vol. 5, No. 1 (1979), pp. 33-48. Accessed July 25, 2018. https://www.jstor.org/stable/40967975

Jackson. 1999. "Biographical Information." John S. Eastwood Papers. Water Resources Collections and Archives. Special Collections & University Archives, University of California, Riverside. Accessed August 6, 2018. http://pdf.oac.cdlib.org/pdf/ucr/wrca/eastwood.pdf

Jackson. 2005. *Building the Ultimate Dam: John S. Eastwood and the Control of Water in the West.* Norman, OK: University of Oklahoma Press.

Jackson. 2009. "Structural Art: John S. Eastwood and the Multiple Arch Dam." *Engineering History and Heritage*. 162. Issue EH3. August 2009. Pgs. 136-147. Accessed August 6, 2018. https://dspace.lafayette.edu/bitstream/handle/10385/880/jackson-proceedingsoftheice-vol162-no3-2009.pdf?sequence=1

Lippincott, Joseph B. 1925. "San Dieguito Water Company report of the Present Lake Hodges System and the Upper Lake Hodges report for the Delivery of Water to the University heights Reservoir." May 1925. On file at the San Diego Public Utilities Department Archive.

McClelland, Linda F. 1997. *How to Complete the National Register Registration Form*. National Register Bulletin 16a. Accessed January 24, 2019. https://www.nps.gov/nr/publications/bulletins/pdfs/nrb16a.pdf

Meixner, G. Donald. 1951. "Historical Development of Water Utilization." Draft. On file at the San Diego Public Utilities Department Archive.

NETR (National Environmental Title Research, LLC). 2018. Historic Aerial Photographs of Hodges Dam, dating from 1947, 1953, 1964, 1967, 1980, 1989, 1995, 1996, 2002, 2003, 2005, 2009, 2010, 2012, and 2014. August 2, 2018. https://www.historicaerials.com/viewer

O'Shaughnessy, M.M. and J.B. Lippincott. 1915. "Report on the Volcan Land and Water Company to the City of San Diego, CA." Report. Ed Fletcher papers. MSS 81.

Special Collections & Archives, University of California San Diego. https://library.ucsd.edu/dc/object/bb52917110/_1.pdf

Park Aerial Survey. 1953. Aerial photograph. Flight Number AXN-1953, frame 3M-117. 1:20,000 scale. March 31, 1953. Aerial Photograph Collection, Map and Imagery Laboratory, University of California Santa Barbara. Accessed August 2, 2018. http://mil.library.ucsb.edu/apcatalog/report/report.php?filed_by=AXN-1953

Post, William S. and C. E. Hickok. 1914. "Report of the Cost of Construction of Warner-Carroll-University Supply to the City of San Diego As Outlined in Offer of the Volcan Land & Water Company to the City of San Diego." Report No. 23. October 10, 1914. John S. Eastwood Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Public Utility Department. 1936. "Various Keeper's Houses from survey 1936." Photographs. On file at the City of San Diego Public Utility Department.

Public Utility Department. 1972. "Acquisition and Development of the San Pasqual-Lake Hodges Area." Draft. May 25, 1972. On file at the City of San Diego Public Utility Department.

Pyle, Fred D. 1934. "San Dieguito River Project: Hodges Dam Strengthening." Draft report. Fred D. Pyle Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Pyle. 1935. Letter to City Manager, RE: "Municipal Water Supply, Funds Available, Work To Be Completed." Fred D. Pyle Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Pyle. 1936. "Hodges Reservoir Dam Strengthening: Notice to Contractors, Instructions to Bidders, Proposal, Drawings and Specifications." San Diego, CA: City of San Diego Water Department, Division of Development and Conservation. Fred D. Pyle Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Pyle. 1943. "Plans for Meeting the Demands of the San Diego Municipal Water Supply." Report. February 1, 1941. Fred D. Pyle Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Pyle. 1946. "Water Supply of San Diego, California." Report. February 23, 1946. Fred D. Pyle Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Pyle. 1947. "The Influence of War on Design of Water Facilities for San Diego, California." Draft. Fred D. Pyle Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Pyle, Fred D. and Paul Beerman. 1949. "Memorandum: San Dieguito System, Additional Development." Draft. Fred D. Pyle Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

San Diego County Water Authority. 2018. "Lake Hodges Projects." Accessed August 6, 2018. https://www.sdcwa.org/lake-hodges-projects

San Diego History Center. 2018. "Colonel Ed Fletcher (1872-1955)." Website. Accessed August 3, 2018. http://www.sandiegohistory.org/archives/biographysubject/edfletcher/

San Diego Union. 1887. "The San Luis Rey Flume." Genealogybank.com: *San Diego Union* (San Diego, CA), August 11, 1887, pg. 1.

San Diego Union. 1889. "Cheap Water: San Luis Rey Flume Company Meets the Committee." Genealogybank.com: *San Diego Union* (San Diego, CA), August 29, 1889, pg. 7.

San Diego Union. 1892. "Water Supply First: Recommendations of the Citizen's Water Committee." Genealogybank.com: *San Diego Union* (San Diego, CA), November 17, 1892, pg. 8.

San Diego Union. 1914. "Volcan Water Company Offer to be Held Open Four Months." Genealogybank.com: *San Diego Union* (San Diego, CA), May 29, 1914, pg. 11.

San Diego Union. 1917a. "Great Water Project For County Given Out; Santa Fe to Back It." Genealogybank.com: *San Diego Union* (San Diego, CA), March 24, 1917, pg. 1.

San Diego Union. 1917b. "Real Estate Transfers." Genealogybank.com: *San Diego Union* (San Diego, CA), May 3, 1917, pg. 13.

San Diego Union. 1917c. "Escondido Plans Dam Celebration." Genealogybank.com: *San Diego Union* (San Diego, CA), June 11, 1917, pg. 11.

San Diego Union. 1918a. "River Rising; Rain to Continue." Genealogybank.com: *San Diego Union* (San Diego, CA), March 12, 1918, pg. 3.

San Diego Union. 1918b. "City Hall Notes." Genealogybank.com: *San Diego Union* (San Diego, CA), November 9, 1918, pg. 8.

San Diego Union. 1920a. "Thousand Acres of land in County Await Irrigation." Genealogybank.com: *San Diego Union* (San Diego, CA), January 1, 1920, pg. 4.

San Diego Union. 1920b. "City Officials Favor Plan to Buy Lake Hodges System." Genealogybank.com: *San Diego Union* (San Diego, CA), April 8, 1920, pg. 6.

San Diego Union. 1925. "City Plans Early Vote on Dieguito." Genealogybank.com: *San Diego Union* (San Diego, CA), August 11, 1925, pg. 1, 10.

San Diego Union. 1928. "Savage to Assume Job as water Development Head at Once, Decision." Genealogybank.com: *San Diego Union* (San Diego, CA), June 28, 1928, pgs. 1, 2.

San Diego Union. 1933. "City Gets Government Check for Dam Bonds." Genealogybank.com: *San Diego Union* (San Diego, CA), May 14, 1933, pg. 1.

San Diego Union. 1934. "Vote Bonds For Hodges or Lose Dam, Pyle Warns." Genealogybank.com: *San Diego Union* (San Diego, CA), July 13, 1934, pg. 14.

San Diego Union. 1936a. "$130,612 Low Bid For Hodges Dam Repair Project." Genealogybank.com: *San Diego Union* (San Diego, CA), March 11, 1936, pg. 1.

San Diego Union. 1936b. "Hodges Digging Begins for Dam Strengthening." Genealogybank.com: *San Diego Union* (San Diego, CA), April 4, 1936, pg. 11.

San Diego Union. 1936c. "Hodges Dam Reinforcement 85 Percent Complete; Construction Plan Explained." Genealogybank.com: *San Diego Union* (San Diego, CA), November 7, 1936, pg. 4.

San Diego Union. 1936d. "Hodges Dam Task Completed; Plan San Dieguito Job." *San Diego Union* (San Diego, CA), December 20, 1936. On file at the City of San Diego Public Utility Department.

San Diego Union. 1937a. "Board Recommends $15,500,000 Water Development Plan." Genealogybank.com: *San Diego Union* (San Diego, CA), March 2, 1937, pg 11.

San Diego Union. 1937b. "Hodges Gets O.K. After 7 Years." Genealogybank.com: *San Diego Union* (San Diego, CA), March 24, 1937, pg. 4.

San Diego Union. 1937c. "Facts About San Diego's Water Situation – Present Facilities, Future Needs." Genealogybank.com: *San Diego Union* (San Diego, CA), May 28, 1937, pg. 32.

San Diego Union. 1939a. "City Gives Notice Of Intent to Buy Water System." Genealogybank.com: *San Diego Union* (San Diego, CA), January 1, 1939, pg. 44.

San Diego Union. 1939b. "City To Pay Bill, Save $980,000." Genealogybank.com: *San Diego Union* (San Diego, CA), October 20, 1939, pg. 1.

San Diego Union. 1940. "Decision Possible Soon On Water From Colorado Or Local Sources." Genealogybank.com: *San Diego Union* (San Diego, CA), May 21, 1940, pg. 22.

San Diego Union. 1949a. "Super-Hodges Dam Studied in Second Barrel Project." Genealogybank.com: *San Diego Union* (San Diego, CA), April 14, 1949, pg. 8.

San Diego Union. 1949b. "Cramer to Drop Hodges Dam Bill." Genealogybank.com: *San Diego Union* (San Diego, CA), April 17, 1949, pg. 14.

San Diego Union. 1952. "Election Only Answer to Water Shortage." Genealogybank.com: *San Diego Union* (San Diego, CA), February 24, 1952, pg. 6.

San Diego Union. 1953a. "Sutherland Dam Arches Skyward." Genealogybank.com: *San Diego Union* (San Diego, CA), August 9, 1953, pg. 21.

San Diego Union. 1953b. "City Council Ratifies Purchase of Land." Genealogybank.com: *San Diego Union* (San Diego, CA), December 24, 1953, pg. 15.

San Diego Union. 1958. "Harbors Bill Is Signed By President." Genealogybank.com: *San Diego Union* (San Diego, CA), July 4, 1958, pg. 14.

San Diego Union. 1959. "Super Hodges Dam Declared Too Costly." Genealogybank.com: *San Diego Union* (San Diego, CA), April 3, 1959, pg. 18.

San Diego Union. 1960. "City Council Backs Big Hodges Dam." Genealogybank.com: *San Diego Union* (San Diego, CA), July 1, 1960, pg. 17.

San Diego Union. 1961. "'Super' Hodges Dam Abandoned." Genealogybank.com: *San Diego Union* (San Diego, CA), February 22, 1961, pg. 23.

San Diego Union. 1962. "Annexation of 11 Square Miles Slated." Genealogybank.com: *San Diego Union* (San Diego, CA), February 19, 1962, pg. 17.

San Diego Union. 1969. "Rains Revive Lake Hodges, Memory of Fishing, Boating." Genealogybank.com: *San Diego Union* (San Diego, CA), March 23, 1969, pg. 21.

Savage, Hiram Newton. 1934a. "Hodges Reservoir Dam Strengthening: Drawings and Specifications." San Diego, CA: City of San Diego Water Department, Division of Development and Conservation. On file at the City of San Diego Public Utility Department.

Savage. 1934b. Letter to the Mayor and City Council, RE: "San Dieguito River Project, Hodges Reservoir Dam Strengthening, Resolutions No. 61702, 61739, 61740." Hiram N. Savage Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Sholders, Mike. 2002. "Water Supply Development in San Diego and a Review of Related Outstanding Projects." The Journal of San Diego History, Winter 2002, 48(1). Accessed June 2018. http://sandiegohistory.org/journal/2002/january/sholders/

Smythe, William Ellsworth. 1908. "History of San Diego (1542-1908)." In An Account of the Rise and Progress of the Pioneer Settlement on the Pacific Coast of the United States, Volume II, The Modern City. San Diego, California: The History Company. Accessed June 2018. https://ia902300.us.archive.org/26/items/historyofsandieg02smyt/historyofsandieg02smyt.pdf

Strathman, Theodore. 2004. "Land, Water, and Real Estate: Ed Fletcher and the Cuyamaca Water Company 1910-1926." Journal of San Diego History 50(3). Accessed June 25, 2018. http://www.sandiegohistory.org/journal/v50-3/cuyamaca.pdf

SWRB (State Water Resources Board). 1951. "Water Resources of California." Bulletin No 1. Accessed June 2018. https://ia800608.us.archive.org/31/items/waterresourcesof01cali/waterresourcesof01cali.pdf

Tilley, H.L. 1918. "Multiple-Arch Dam Withstands Overtopping During Construction." *Western Engineering*. Volume 9. May 1918, pgs. 177-178. https://books.google.com/books?id=mPc9AQAAMAAJ&lpg=PA178&ots=yBBFdcxmVI&dq=san%20dieguito%20mutual%20water%20company%20volcan%20fletcher&pg=PA178#v=onepage&q=san%20dieguito%20mutual%20water%20company%20volcan%20fletcher&f=false

Whitney, Charles Allen. 1969. "John Eastwood: Unsung Genius of the Drawing Board." *Montana: The Magazine of Western History*. Vol. 19, No. 3 (Summer, 1969), pp. 38-49 Accessed August 6, 2018. https://www.jstor.org/stable/4517382

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3B, 3CB, 5B

Other Listings
Review Code Reviewer Date

 ***Resource Name or #:** (Assigned by recorder) Barrett Reservoir Complex
P1. Other Identifier:

***P2. Location:** ☐ **Not for Publication** ■ **Unrestricted**
***a. County** San Diego County **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad** Barrett Lake **Date** 1997 **T** 17S; **R** 03E; **Sec** 3,9,10,16,15,22; San Bernardino **B.M.**
c. Address 19886 Japatul Lyons Valley Road City Jamul Zip 91935
d. UTM: (Give more than one for large and/or linear resources) Zone 11S, 0530883 mE/ 3615767 mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
The Barrett Reservoir Complex is sited in the southwestern portion of Cleveland National Forest, east-southeast of San Diego, and may be accessed via Barrett Lake Road, off Japatul Lyons Valley Road. Lat/Long: 32.679178, -116.670677.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
The Barrett Reservoir Complex is part of the City of San Diego's Source Water System and is located east-southeast of the City in a canyon approximately 475 feet wide. The Barrett Reservoir Complex comprises the Barret Dam, outlet tower, spillway, two Dam Keeper's houses, two pump houses, remnants of a flume, a powder magazine, and the ruins of a demolished building consisting of foundations and random rubble masonry now used as a reservoir picnic area. The curved gravity type dam is constructed of poured-in-place concrete with a board-formed finish. **(See Continuation Sheet)**

***P3b. Resource Attributes:** (List attributes and codes) HP21-dam; HP22-reservoir; HP11-engineering structure; HP2-single family property; HP9-public utility building

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)

***P4. Resources Present:** ■ Building ■ Structure ☐ Object ☐ Site ☐ District ■ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #) Barrett Dam and outlet tower, view to the southeast. May 18, 2018 (JFC 0828)

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
1922 (San Diego Evening Tribune)

***P7. Owner and Address:**
Public Utilities Dept.
City of San Diego
9192 Topaz Way
San Diego, CA 92123

***P8. Recorded by:** (Name, affiliation, and address)
Kate Kaiser, MSHP, Dudek
605 Third Street
Encinitas, CA 92024

***P9. Date Recorded:** July 2018

***P10. Survey Type:** (Describe) Pedestrian

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") Dudek 2020. City of San Diego Source Water System Historic Context Statement.

***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California ♁ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI#
Trinomial

 ***Resource Name or #** (Assigned by recorder) Barrett Reservoir Complex

***Map Name:** Barrett Lake, 7.5' USGS Quadrangle ***Scale:** 1:24,000 ***Date of map:** 1996

State of California ♁ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

Primary #
HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) Barrett Reservoir Complex ***NRHP Status Code** 3B, 3CB, 5B

Page 3 **of** 36

B1. Historic Name: Barrett Dam and Reservoir

B2. Common Name:

B3. Original Use: Municipal water source B4. Present Use: Municipal water source, recreation

***B5. Architectural Style:** Curved Gravity Dam

***B6. Construction History:** (Construction date, alterations, and date of alterations)

The Barrett Reservoir Complex was completed in 1922 and Barrett Reservoir (Barrett Lake) was first filled in 1923. There are no known or observed alterations.

***B7. Moved?** ☒**No** ☐**Yes** ☐**Unknown** **Date:** **Original Location:**

***B8. Related Features:**

B9a. Architect: Hiram Newton Savage (engineer) b. Builder:

***B10. Significance: Theme** Flood Recovery and Reinvestment **Area** San Diego

Period of Significance A/1: 1916-1928; C/3: 1922 **Property Type** Dam **Applicable Criteria** NRHP/CRHR A/1 and C/3; City A, B, C, D, F (Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Historic Context

(See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)

***B12. References: (See Continuation Sheet)**

B13. Remarks:

***B14. Evaluator:** Kate Kaiser, MSHP

***Date of Evaluation:** June 30, 2020

(This space reserved for official comments.)

(Sketch Map with north arrow required.)

P3a Site Description (continued):

The upstream side of the dam rises 160 feet above the floor of the canyon (Figure 1). At its longest point the dam is 730 feet long, and at the crest of the dam, 17 feet wide. The downstream side of the dam is stepped, designed to lessen the impact of water flowing over the spillway gates towards the dam foundation. Each step has a 20-foot rise and 15-foot run. At its base, the dam width was planned as 165 feet wide. At the crest of the dam there is a pedestrian walkway with a metal railing, wide enough for a single vehicle to pass. The existing metal railing is approximately 4 feet high (above the crest) (Savage 1919b, 1919c, 1919d, 1920a, 1920b, 1920c, 1920d, 1920e, 1921a, 1921b, 1921c, 1921d).

The spillway is integrated into the design of the dam, and contains 26 radial gates that can be reeled up with a rolling crank cart which is original to the construction and still extant. The spillway gates are accessed from the crest walkway through slots protected by hinged iron flaps. These flaps measure approximately 9-inches by 30-inches.

The dam's internal concourse is accessed through a door on the western and eastern ends of the dam's downstream side. Access is gained from an external enclosed ladder approximately 40 feet in length.

The octagonal outlet tower measures approximately 30 feet in external diameter (Figure 2). The top of the concrete tower features a reinforced concrete operating deck that regulates the outer gates. Each gate contains a screen cover to keep fish, trash and other debris from entering into the 24-inch-diameter circular pipes. The pipes run through the walls of the tower and connect with a vertical down-pipe that discharges into the dam's spillway. Eight drains run down the outlet tower and are controlled by a hoist on the outlet tower deck. The hoist is made by Silent Hoist and Crane Co. A stairway and rail set-up was recently added to access the roof of the outlet tower. Imprinted into the concrete, on the crest walkway adjacent to the outlet tower stairs, is a footprint measuring approximately 10 1/8-inches. According to the original plans, the outlet tower stood 130 feet and 9 inches above the foundation.

A terraced recreation and picnic area is located upslope from the current marina, and is accessed on the south side of Barrett Lake Road, and overlooks the reservoir. This park includes a semi-coursed local river rock and assorted cobble masonry retaining walls, cut stone and cement stairs, and large boulder and cut stone railings (Figure 3). Embedded in the retaining wall by the stairwell is an integrated, masonry stove/barbeque with a short chimney. This picnic area also has a large buried ceramic pipe that was used as a fire pit, as well as three tables and shade structures.

Moving further upslope from the dam, a large cinderblock and steel mesh building is located just south of a scar marking the former rock blasting area and appears to be a more recent addition. However, continuing south from that structure is the powder magazine, or dynamite containment structure, built just south of the rock blasting area and facing the dam (Figure 4). The little building is built from poured-in-place concrete, approximately 3-inches thick, with a concrete slab roof. The interior is lined with plywood, and the single door is an industrial steel door with two enclosed lock hasps.

Two associated pump houses are located along the roads leading further upslope towards two keeper's houses. The first pump house is labelled with the numerals "23," and contains Bowser pump machinery and gauges (Figure 5). It has hopper windows on each elevation and corrugated metal siding. In front of this building is a concrete valve structure. A second pump house building mirrors the first one and is located on the upslope side of the road; no interior access was available.

Several board-formed concrete footings are located on the western slopes on the south side of the dam, near the "23" pump house. The footings appear to have been supports for the concrete sluice that was used during construction of the dam (Figure 6).

The Keeper's House and Assistant Keeper's House are located on the upper slopes west of the dam (Figure 7). Both houses are rectangular in plan and are side-gabled, single-family residences with attached garages, reflecting a utilitarian adaptation of the Minimal Traditional style. The roofs have low pitches and wide, overhanging eaves with covered rafters, and concrete foundations. The houses are both clad in asbestos-cement shingles, and roofed with asphalt shingle. The houses feature several different window types, including the original metal casement windows, replacement metal sliding windows, and replacement vinyl sliding windows. Additionally, it appears that the entry doors and one of the garage doors are later replacements. The gardens are also heavily landscaped. These buildings have paved driveways, picket fence-enclosed front and rear gardens, and attached garages.

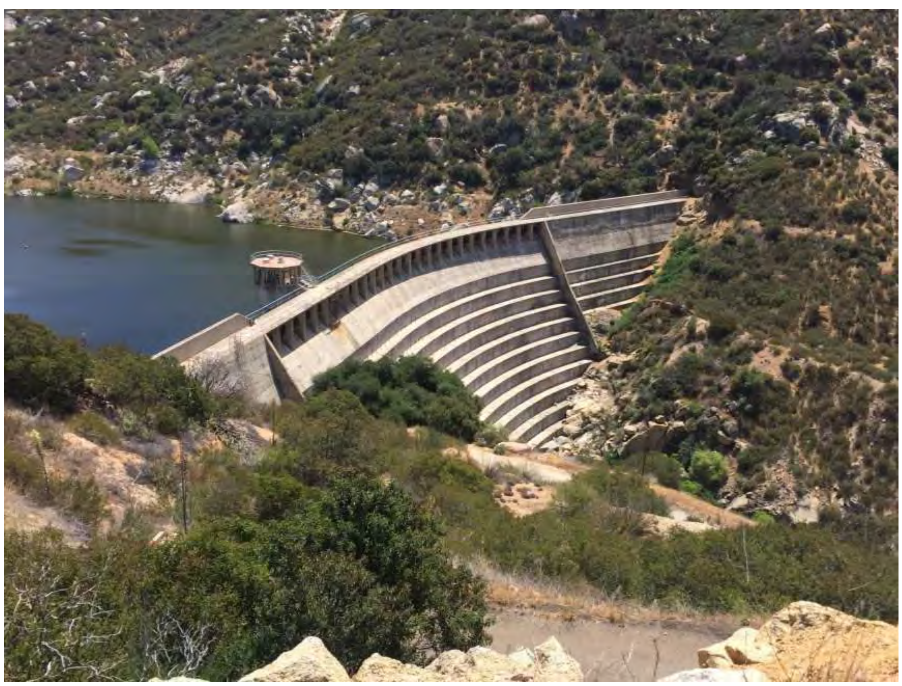


Figure 1. Overview of Barret Dam from western slope face, view looking northeast (IMG_5947)

Figure 2. Outlet tower, view looking north (JFC_0828)

Figure 3. Rubble masonry hardscaping and BBQ in center of picnic area, with the Barrett Reservoir in the background (IMG_6022)

Figure 4. Powder magazine, view looking south (IMG JFC_0698)

Figure 5. One of the pump houses, view looking south (IMG_5935)

Figure 6. Two pairs of concrete support walls for the concrete sluice, view looking south (IMG_5936)

Figure 7. The Keeper's house, view looking north (IMG_0043)

B10. Significance (Continued):

Phase I: The Southern California Mountain Water Company and the First Barrett Dam, 1886-1916

To address the ongoing water needs, the City entered into agreements with private water companies, including the Southern California Mountain Water Company (SCMWC). The SCMWC was led by Elisha Spurr Babcock Jr. (1848–1922), a native of Indiana, who earned his fortune in the railroad industry. Babcock purchased property on Coronado Beach, establishing the Coronado Beach Company, which incorporated the Otay Water Company in 1886. John Diedrich Spreckels (1853–1926) of San Francisco earned his fortune in the shipping business and Hawaiian sugar industry. During an 1887 visit to the City, Spreckels was impressed by the real estate boom at the time, which led him to invest in construction of a wharf and coal bunkers at Broadway (at the time known as D Street). The boom ended quickly, but Spreckels continued his interest in the area. He acquired controlling interest of Babcock's Coronado Beach Company, then the *San Diego Union* in 1890, the *San Diego Tribune* in 1891, and the City's street railway system in 1892. Babcock persuaded Spreckels to invest in a number of his other organizations, including Otay Water Company and the Mount Tecarte Land and Water Company. The SCMWC was born from a consolidation of water companies that included the Otay Water Company and the Mount Tecarte Land and Water Company in 1894. Because of these transactions, Spreckels owned controlling interest in nearly half of Babcock's enterprises (Crawford 2011; Fowler 1953; Hennessey 1978; LAT 1896; McGrew 1922; Ormsby 1966; San Diego History Center 2018; Smythe 1908).

Though Babcock's Otay Water Company and Mount Tecarte Land and Water Company held land interests in Otay Canyon, it was not until the two companies incorporated as SCMWC in 1894 and the City engaged the company with a water supply contract that tangible plans for the Otay Dam, Morena Dam, Barrett Dam, and Dulzura Conduit emerged (Figure 8). The planned system would be established along the Otay-Cottonwood watershed, beginning with construction of the Morena Dam and following downstream with the Upper and Lower Otay Dams and Barrett Dam. From Lower Otay Dam, water was to be piped through the Dulzura Conduit and then distributed throughout the region. Babcock ordered the construction of the Lower Otay Dam, a decision that would lead to future problems for the company.

Figure 8. Bear Cañon Reservoir and Dam, December 1895 (Hiram N. Savage Papers Collection, Water Resources Collections and Archives, University of California, Riverside).

Lower Otay Dam, a rock-filled embankment dam with a riveted steel plate and concrete core, was started in 1894 and completed in 1897. Drought during the construction years hid flaws in the design, and the normal runoff was insufficient to fill the reservoir. Despite issues, the Upper Otay Dam on the western branch of Otay Creek at Proctor Valley was started in 1896, a then-novel, curved gravity dam design intended to reach the lake edge of Lower Otay Reservoir were it ever full. Construction stopped on Upper Otay, but resumed in 1900 when the dam was finally completed. The SCMWC made plans for another masonry dam on the Cottonwood Creek watershed, which would discharge through a new conduit to the Otay watershed. These planned structures were the Morena Dam and the Dulzura Conduit. Construction of the rock-filled embankment dam, Morena Dam, began in 1896; however, construction halted in 1898 due to serious construction concerns (Crawford 2011; Fowler 1953; Meixner 1951).

The SCMWC completed the Lower Otay Dam, and while working on the first Morena Dam, they also started construction of the Bear Cañon Dam, later renamed Barrett Dam in 1897 (Figure 9). The SCMWC Dam was to be on Cottonwood Creek, downstream of Morena Dam. The construction was supposed to be for a 72-foot tall dam, of masonry construction with a granite bedrock foundation. There were minor concerns about the left abutment of the dam not being suitable for a tall dam, so after the dam reached 50 feet above the streambed, construction was halted in 1898. Construction resumed intermittently, but the Barrett Dam design turned out to be flawed. The initial intent of the original Barrett Dam had been to feed water from the dam to Lower Otay Reservoir via a conduit. Due to the height of the dam, and the limitations on the reservoir’s capacity, the reservoir simply never held enough water in storage to efficiently carry out this task. When the SCMWC system was eventually purchased, the City inherited a dam that did not operate. They did, however, gain the rights to the Barrett Reservoir, which would figure later into the construction of the second Barrett Dam (Fowler 1953; Martin 2017; San Diego Union 1895, 1899, 1903).

Figure 9. “Barrett’s” Dam, mid-construction at 35 feet high, Slocum Photography. July 1, 1898 (City of San Diego Public Utilities Department Archives)

Severe drought from 1895 to 1904 initially hid structural issues at all of these dams which caused them to leak. By 1905, most of San Diego's water companies had disappeared, having failed to survive the drought of 1895-1904. Realizing the need to gain better control of its infrastructure, the City began purchasing the holdings of the San Diego Water Company and the SCMWC that were within the City limits. Such holdings included reservoirs, pumping plants and machinery, pipelines, buildings, and tools. The city also began constructing its own facilities and infrastructure to keep up with increasing demand. To ensure a continuous supply of water, the City entered into a contract with the SCMWC in the summer of 1906, replacing the San Diego Flume Company as chief water supplier. Michael Maurice O'Shaughnessy, who would later gain fame as the designer of the Hetch Hetchy Dam, became the SCMWC's chief consulting engineer in 1907 and worked on the Dulzura conduit, effectively connecting the Barrett, Morena, and Lower Otay sources to the City of San Diego's water system. From 1908 to 1912, O'Shaughnessy worked to complete the Morena Dam, which let out into Cottonwood Creek to the pick-up weirs at Barrett Dam, completing the system (Fowler 1953; Smythe 1908).

In 1913, the City purchased the Barrett-Dulzura-Otay portion of the SCMWC. In 1914, the City purchased the pipeline that connected Otay Valley with the Otay Reservoir from the Coronado Water Company. Morena Dam was also agreed to be purchased from SCMWC at a fixed price following a 10-year lease. Thus, by 1914, all holdings and structures of the SCMWC were owned by the City of San Diego (Fowler 1953).

Phase 2: City of San Diego's Second Barrett Dam, 1916-1923

By the 1910s, it seemed that the City had addressed many of its immediate and long-term water problems. Population growth had more than doubled from 17,700 in 1900 to over 39,500 in 1910, and as a result of acquiring SCMWC's reservoirs, dams, and the Dulzura Conduit, water was relatively plentiful. However, beginning in 1912, a drought struck the City which continued through 1915. Since most of the water stored in the region's dams was replenished by captured rainfall, the reserves diminished quickly. The City's solution to their drought problem was Charles Mallory Hatfield (1875–1958). Hatfield was a native of Kansas, a former sewing machine salesman, and a self-proclaimed "moisture accelerator." Hatfield's "moisture accelerator" technique operated similar to cloud-seeding, and involved mixing of liquid chemicals and then dispersing them into the sky, which Hatfield claimed attracted the rain. In December 1915, the City's Common Council received letters from Hatfield who offered to produce at least 40 inches of rain in the vicinity of the Morena Reservoir. Following receipt of his letter, the City hired Hatfield to address the severe drought and fill the Morena Dam. On January 5, 1916, a good rain was reported at Morena Reservoir, with 48.5 million gallons being impounded since December 27. The rain fell again beginning on January 10, 1916, and continued until January 18 in the City and the surrounding area (Crawford 2011; Department of Commerce 1930; Hill 2002; Patterson 1970; Tuthill 1954).

On January 27, 1916, a second storm struck. The second storm caused Lower Otay Dam to burst and flood the Tijuana River Valley, severely damaged the Dulzura Conduit and Morena Dam, and overtopped Sweetwater Dam. The storm caused the San Diego River to go over its banks and spread across Mission Valley. Twenty-two people were killed by the flooding. Nearby infrastructure, including rail lines and bridges, was destroyed and local trains were stopped for more than a month. Highways, electricity, and telegraph/telephone lines were also cut off, and the only means of transportation was through the sea. Three days later, the Sweetwater Dam was overtopped by more than 3 feet, and the canyon side walls began eroding away (Figure 10). Although the dam itself was undamaged, its abutments had been breached, and it was unable to retain water. The waters behind Morena Dam rose within 18 inches of the top of the parapet wall, or 18 inches above the crest of the dam. Debris that had been washed into the reservoir accumulated on the trash racks in front of the spillway and choked the flow of water. SCMWC's 1894 Lower Otay Dam was a complete loss. The floods left scars on the mountains and hills of the County, and washed out river channels to bedrock. The hillsides were saturated with mud, and the soil gave way, resulting in mudslides. In addition, the pumping plants of the Coronado Water Company were destroyed, cutting off supplies from the Otay Valley. Nevertheless, water service was maintained through the City's pipeline under the bay with water from the Cuyamaca Water Company (formerly the San Diego Flume Company) system. In short, the damage to multiple water systems was debilitating and widespread in San Diego County. Nevertheless, water service was maintained through the City's pipeline under the bay with water from the system of the Cuyamaca Water Company (Crawford 2011; Fowler 1953; McGlashan and Ebert 1918; Patterson 1970; Tuthill 1954).

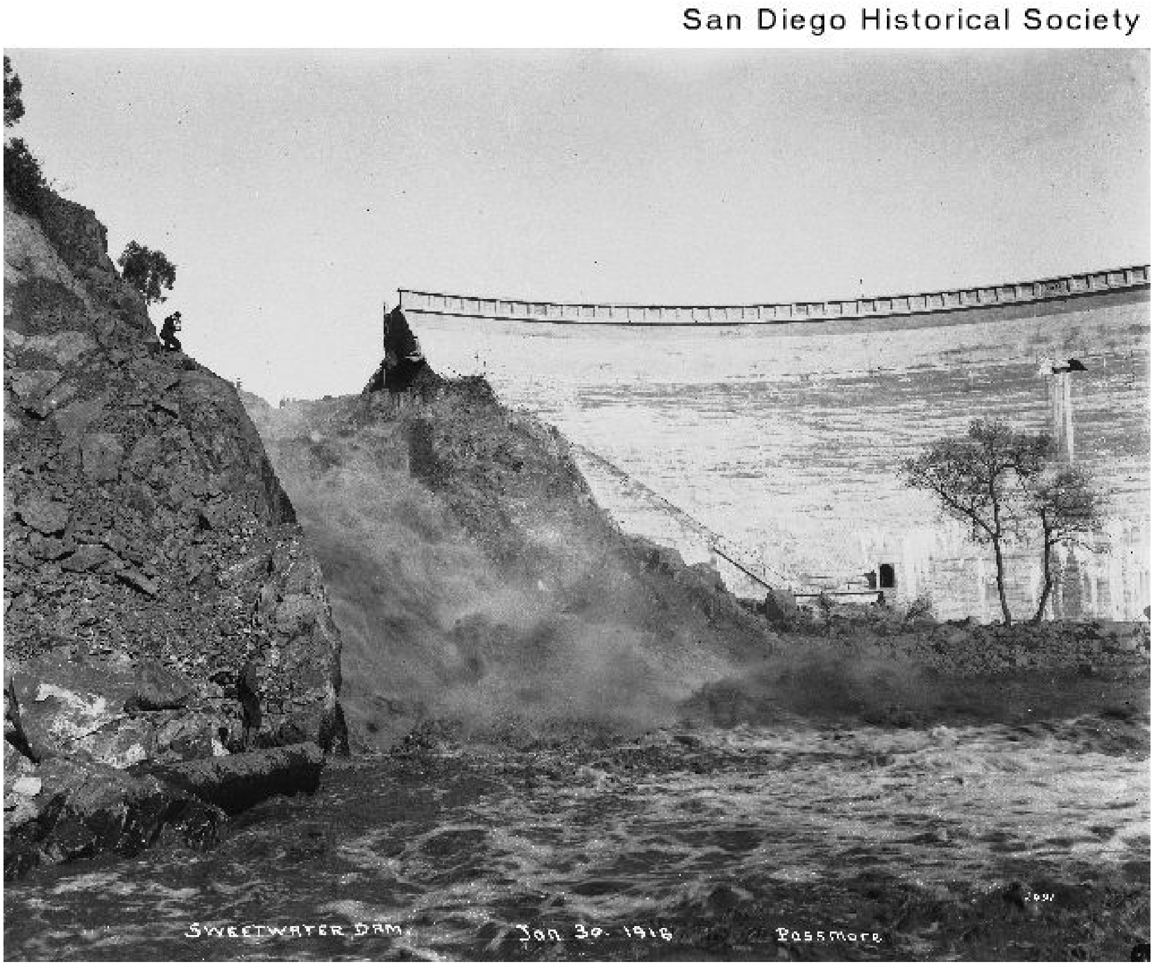


Figure 10. Water rushing through a break at Sweetwater Dam, Photographer Lee Passmore, 1916, (California Border Region Digitization Project: 1870-1939, San Diego History Center)

In the years immediately following the 1916 floods, a number of new water infrastructure projects were completed throughout the City to replace what was destroyed and to accommodate the constantly increasing needs. These dams were built by the City and by private companies hoping to be bought by the City or to get a City water contract. As a result, the Cuyamaca Water Company built the Murray Dam (1916-1918), the San Dieguito Water Company built the Hodges and San Dieguito Dams, and the City of San Diego repaired the spillway at Morena Dam (1916-1917) and replaced Lower Otay Dam (1917-1919) At the urging of M.M. O'Shaughnessy, now a consulting engineer for the City of San Diego, the City also decided to develop the Barrett Reservoir Complex after Lower Otay Reservoir Complex was complete. For these projects, the City hired engineer Hiram Newton Savage (1861-1934), who had been supervisory engineer for several high profile United States Reclamation Service dam and irrigation projects, as well as the consulting engineer for the repairs to the Sweetwater Dam (BOR 2018; Fowler 1953; O'Shaughnessy 1916; WRCA 2005).

August 21, 1918 the City of San Diego held a public meeting with city organizations, the press and citizens to pass a resolution in favor of constructing Barrett Dam. Resolution 24216 and general consensus of the City Council was that after the 1916 floods, as devastating as they were, the City realized the importance of having numerous water storage reservoirs, as they made it possible to take advantage of flood runoff. The resolutions authorized the City's Hydraulic Engineer, recently-hired Hiram Newton Savage, to survey the Barrett Reservoir and make a report to the Common Council. In February 1919, Savage reported that he had gathered enough data about the Barrett Drainage basin, local rainfall, and the dam construction site to recommend coring to determine the quality of the bedrock. By summer 1919, the coring had been completed and Savage recommended his curved gravity dam design for Barrett Dam. By September, the City of San Diego passed a resolution to build Savage's recommended dam and Savage released specifications for the Barrett Dam, Spillway, and Outlet Tower (San Diego Union 1918b; Savage 1919a, 1919b; Savage 1921d).

After authorizing the initial funding, the City began construction on the new Barrett Dam in 1919, just upstream of the SCMWC Barrett Reservoir Complex and downstream of Morena Dam. The City transferred laborers, tools, and leftover materials from the newly completed Lower Otay Dam to the Barrett Reservoir. The remainder of the year was spent in preparation; Savage and his engineering team had workers construct the camp, concrete plants, and haul road, as well as stage and store the equipment and building materials. The camp contained five laborers' dormitories, 25 married employee cottages, a recreation building, a wash house, a toilet and bath house, vehicle garages, Savage's engineering office, a mess house including meat house and cold storage, several offices, a water supply and reservoir, and sewer system. The plant contained two cement stock houses, a blacksmith and machine shop, the quarry, concrete spouting towers, a rock crushing plant, aggregate bins, and a sand stockpile. Materials would be transported to the site via a San Diego and Arizona railroad spur, then hauled up the 14-mile road to Barrett Dam. The San Diego Consolidated Gas & Electric Company also worked to connect the Barrett Reservoir Complex to the electrical grid via transmission line, which was also completed in anticipation of the dam construction. Construction costs were estimated at $881,270. Initially the Mayor of San Diego, Louis J. Wilde, sought to pay for the dam out of existing water funds. However, in November 1919, voters authorized Resolution 70, which released $1 million, the approximate cost of Lower Otay Dam, in water bonds to be used for the construction of Barrett Dam (City of San Diego 1919; Fowler 1953; San Diego Union 1919a, 1919b, 1920; Savage 1919c, 1919d).

After the $1 million was released, Savage began his design work in earnest. Like the Lower Otay Dam, Savage also designed Barrett Dam as a curved gravity dam, constructed entirely of concrete (Figure 11). Savage hired 225 men to work in two shifts on the various excavation, concrete production, hauling work, and masonry work at the dam site. In January 1920, workers began to excavate the Barrett Dam foundation, driving down to bedrock and strengthening wherever needed. By the following July, the first masonry was placed for the Barrett Dam curtain wall. The dam concrete was placed in board forms and left to set, and each laborer shift could set nearly one hundred cubic feet of concrete each day (Concrete 1922; San Diego Union 1920b; Savage 1920a, 1920b).

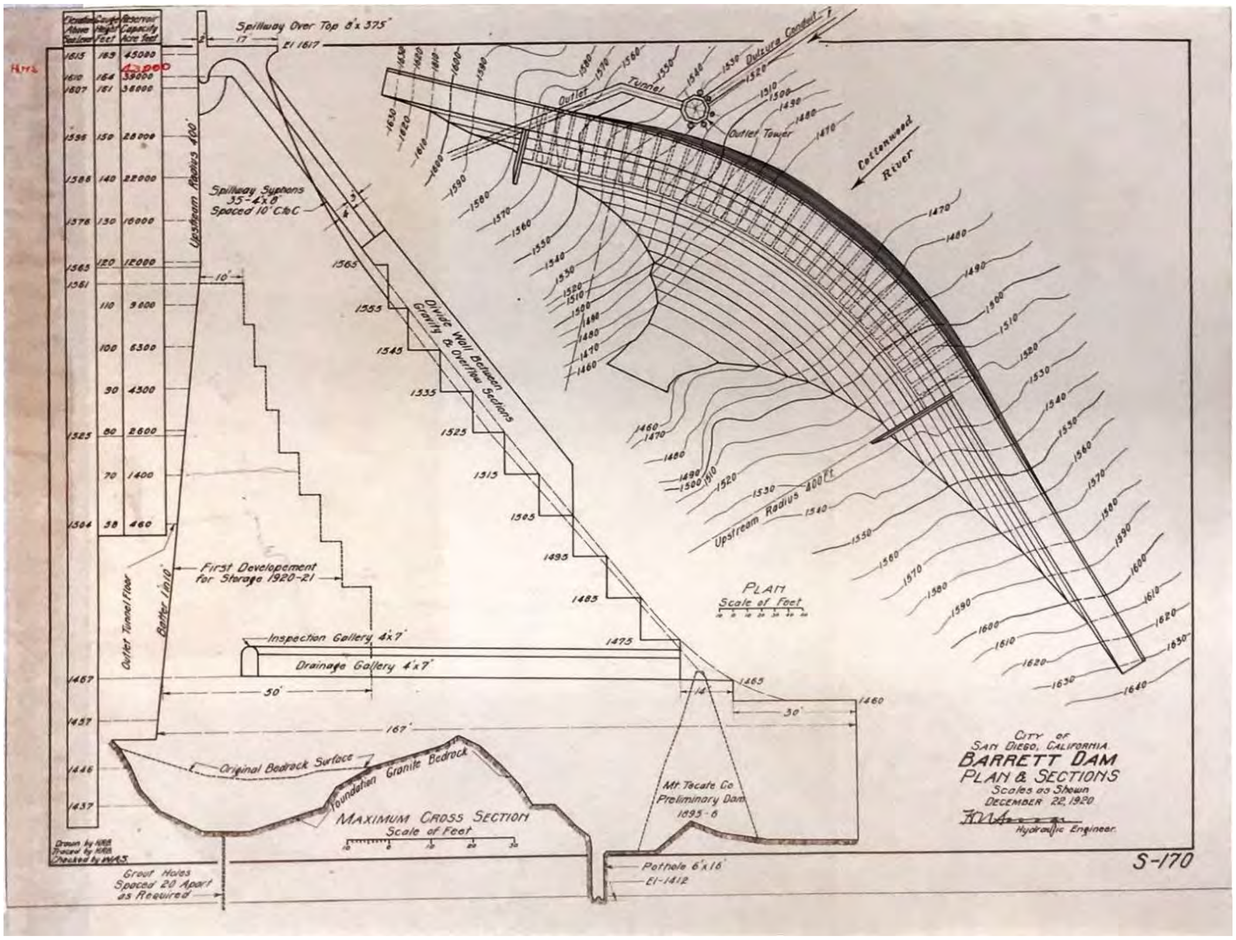


Figure 11. Barrett Dam plan and section, drawn by H.N. Savage, 1920 (Barrett and Morena Dam Collection, Water Resources Collections and Archives, University of California, Riverside)

In October, foundation work commenced on the outlet tower and tunnel. Even though Savage's ten-day reports to the San Diego City Council stated that work had progressed to being 33% compete by October, the initial $1 million had simply not gone as far as it had for Lower Otay Dam; Savage again requested an increase of funding, through another water bond measure. Savage and others defended the increase by citing the Armistice and the return of veterans expecting work and decent pay, as well as increased material costs in the post-World War I years. After new funds were secured, work continued as usual at Barrett Reservoir Complex. With the foundation complete at the outlet tower, the laborers began placing masonry at the tower in December 1920 (Concrete 1922; San Diego Union 1920b; Savage 1920a, 1920b, 1920c, 1920d; WRCA 1921).

In January 1921, Savage reported that "the entire first portion of the dam [was] now constructed to elevation 1518, reservoir gauge 72, except at the left abutment… and two sections, five feet wide, near the center of the dam, which are being kept five feet lower than the adjacent masonry for use as emergency flood spillways" (Savage 1921a). Savage used this "success" to poll the board of water commissioners again for a funding increase, demonstrating how much water the reservoir could hold at this low height and how much potential water capacity the dam would have if completed to its contemplated height. By the end of March, Savage reported that the dam was 50% complete (Figure 12).

Perhaps in response to the regularly perceived progress at the dam, the idea of forfeiting the dam's progress and taking a monetary loss, and the upcoming summer drought season, voters approved another $500,000 bond issue in April 1921 (Adsil 1921; City of San Diego 1923; San Diego Evening Tribune 1921; San Diego Union 1921; Savage 1921a, 1921b).

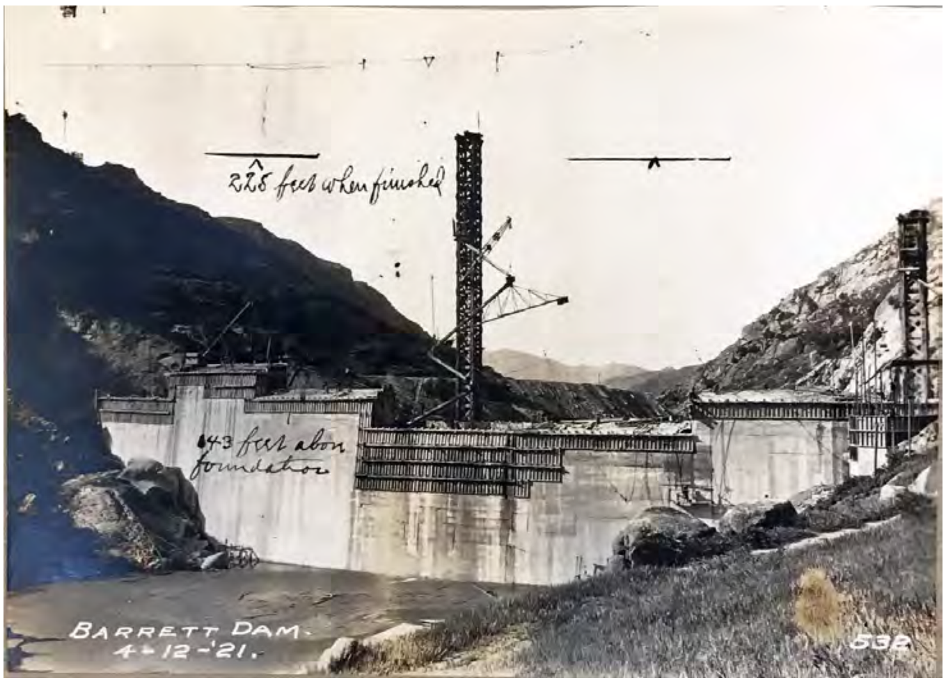


Figure 12. Barrett Dam, 143 feet above foundation, April 1921 (Barrett and Morena Dam Collection, Water Resources Collections and Archives, University of California, Riverside)

By fall 1921, the work at the dam was 75% complete. The outlet tunnel was completely lined, and the outlet tower completed to elevation 1548 feet amsl, reservoir gauge 102, 44 feet above the floor for the outlet tunnel. Construction progressed at the dam at a regular rate until December 18, when a heavy rainfall began. The dam site saw just over 4 inches of rainfall over three days, and the reservoir filled to the 55.22 feet gauge mark, filling the reservoir to nearly half its capacity. Over the remainder of December 1921, another 9.5 inches of rain fell, with the Barrett Reservoir capturing over 2 million gallons from December 21 to December 31. Water came within several feet of overtopping the lowest constructed height of the dam at that time, which was at elevation 1543 feet amsl, or gauge 99 (Figure 13). Temporary sandbags had to be placed in the lower masonry sections of the dam and outlet tower, until the height could be raised. Rain continued into January, adding another 3.75 inches and raising the water level in the reservoir another 4 feet. Savage utilized the Dulzura Conduit to discharge excess water from the unfinished Barrett Reservoir into Lower Otay Reservoir, but the water level still came within a few feet of overtopping the partially-built dam. Work crews at Barrett Reservoir Complex spent the beginning of January placing emergency sandbags, salvaging flooded equipment, and reclaiming quarry spoils to return to work. (City of San Diego 1923; Savage 1921c).

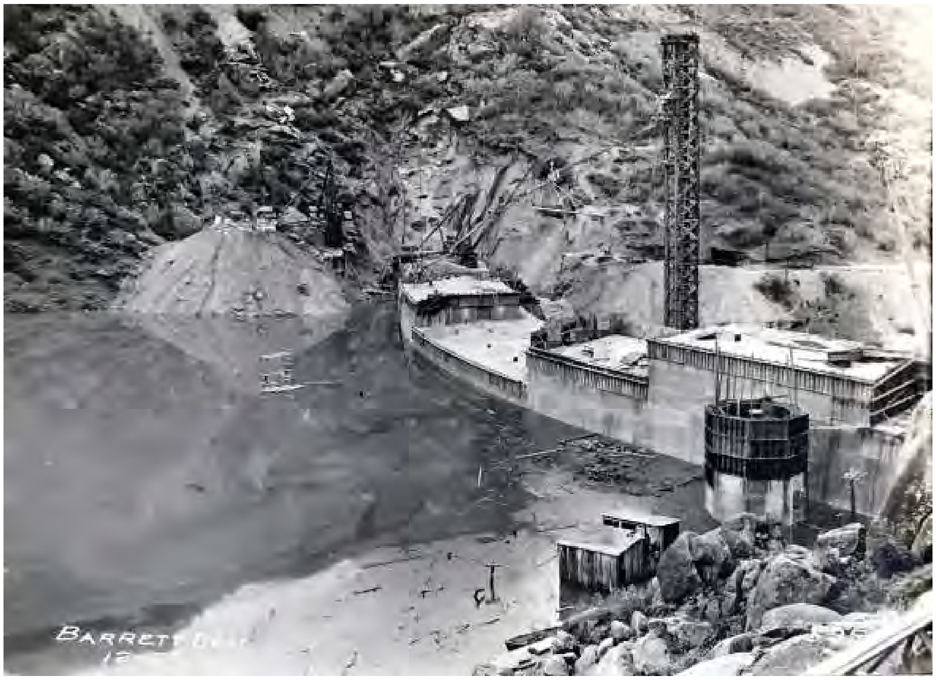


Figure 13. Barrett Dam looking downstream across reservoir after heavy rainstorms December 27, 1921 (City of San Diego Public Utilities Department Archives)

Once the emergency abated and the seasonal rains subsided somewhat, work continued at the dam. Savage redoubled efforts, reassigning a night crew to work on the dam in addition to the day shift. In thirty days he raised the lowest section height by 40 feet according to his ten day reports (City of San Diego 1923).

In February 1922, Savage again requested a funding increase of at least $133,000, and potentially more if the City wished to install radial gates at the spillway and add 2 billion more gallons to the potential water capacity of Barrett Dam, then projected at 12 billion gallons when full. In addition to the matter of increasing funding, Savage also highlighted that the original non-transferable permit at Barrett had expired, and that the City would have to work with the Cleveland National Forest to secure another permit (San Diego Sun 1922a; San Diego Union 1922a).

Continued spring rains in 1922 kept the water level at Barrett Reservoir high as construction drew towards its completion. By April, over 800 million gallons of water had been discharged from the reservoir via the Dulzura Conduit, but crews still had to work two shifts to prevent the dam from overtopping. Nearly all aspects of the dam were 95% compete or higher by April, and crews also began intermittently dismantling the workers' camp, salvaging lumber and metal for the City of San Diego's next dam project. In May 1922, the dam was completed to its top height and workers began placing structural steel for the roadway floor (Figure 14). The outlet tower walls had been completed and the tower was being reinforced internally (City of San Diego 1923).

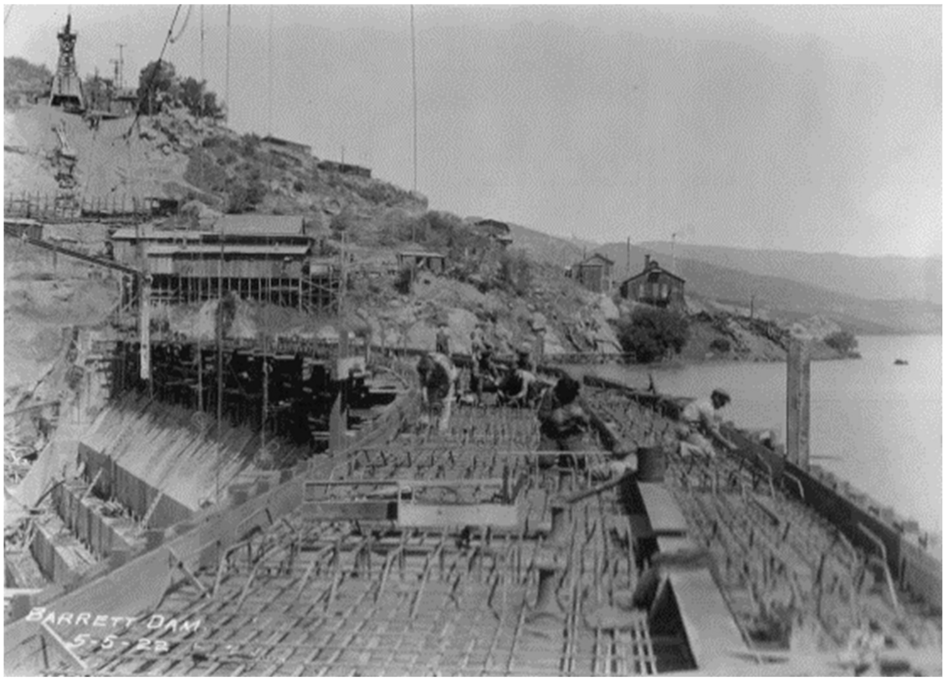


Figure 14. Barrett Dam nearing completion, with working laying reinforcing steel for roadway, May 5, 1922 (City of San Diego Public Utilities Department Archives)

The last section of concrete for the dam itself was set on May 22, 1922. The outlet tower and spillway work was completed June 10, 1922. Barrett Dam was officially dedicated on July 25, 1922, and turned over from the Common Council to the Board of Water Commissioners for operation and maintenance (Figure 15). More than 400 locals and City of San Diego citizens attended the dedication. While Barrett was dedicated, City officials announced that the next City project would be to enlarge the spillway at the Morena Reservoir Complex. The final height of Barrett Dam was 215 feet, resulting in an 862 acre reservoir fed by a 130 square mile drainage area (City of San Diego 1923; San Diego Evening Tribune 1922; San Diego Union 1922b).

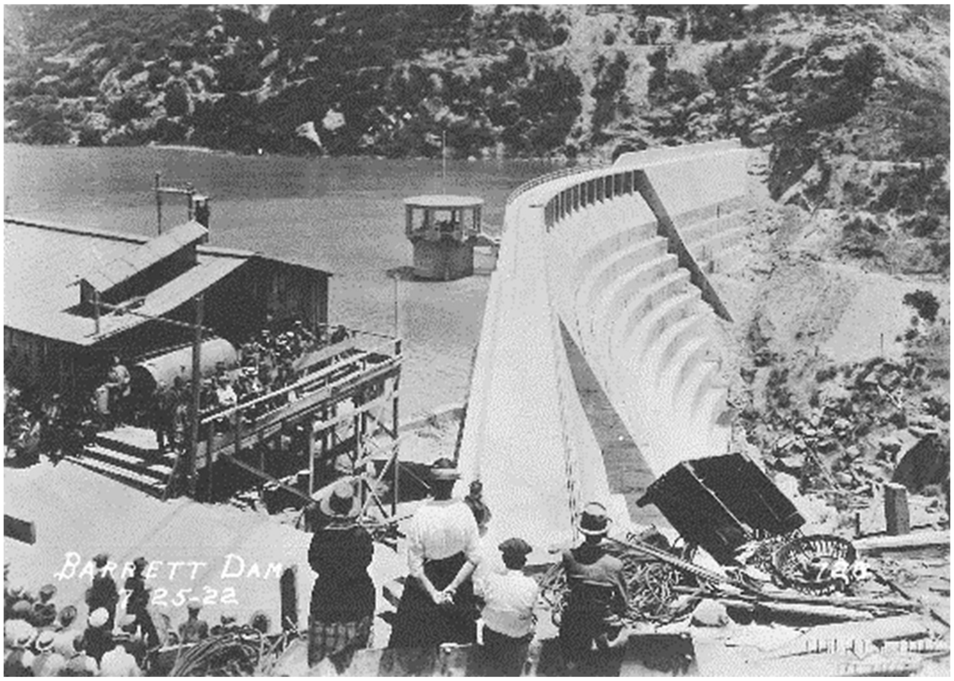


Figure 15. Barrett Dam dedication July 25, 1922 (City of San Diego Public Utilities Department Archives)

In the final months of the Barrett Dam construction, Savage ran afoul of poor public opinion and ongoing issues with the San Diego City Council. Savage had several issues with public opinion and with the city council due to the high cost and overruns of his projects, which funded by voters through bond measures. This issue was not helped by his stoic, impersonal demeanor which was often poorly characterized in newspapers and by political opponents. After the completion of the Barrett Reservoir Complex, Savage was fired from his position as City Engineer. The Common Council of San Diego unanimously voted to repeal the ordinance that employed Savage and denied an appeal to retain Savage as City Engineer. At the urging of council member Heilbron, Freeman was retained in Savage’s place (San Diego Evening Tribune 1923a, 1923b; San Diego Sun 1922b, 1922c, 1923).

Post-construction Developments (1922-present)

Just five years after Barrett Dam was dedicated it was overtopped in the floods of February 1927, the worst the region had seen since 1916 (Figure 16). Dam Keeper E.J. Walker and his assistants witnessed debris piling up at the spillway gates and allegedly risked their lives to remove and destroy the debris piling up at the spillway gates. If the spillway had jammed, the dam would overtop and potentially fail as the foundation below would have been damaged by water. After the storm, the City of San Diego ordered investigations into structural integrity at Barrett, Lower Otay, Morena, and Hodges Dams. (Crawford 2011; San Diego Evening Tribune 1927).

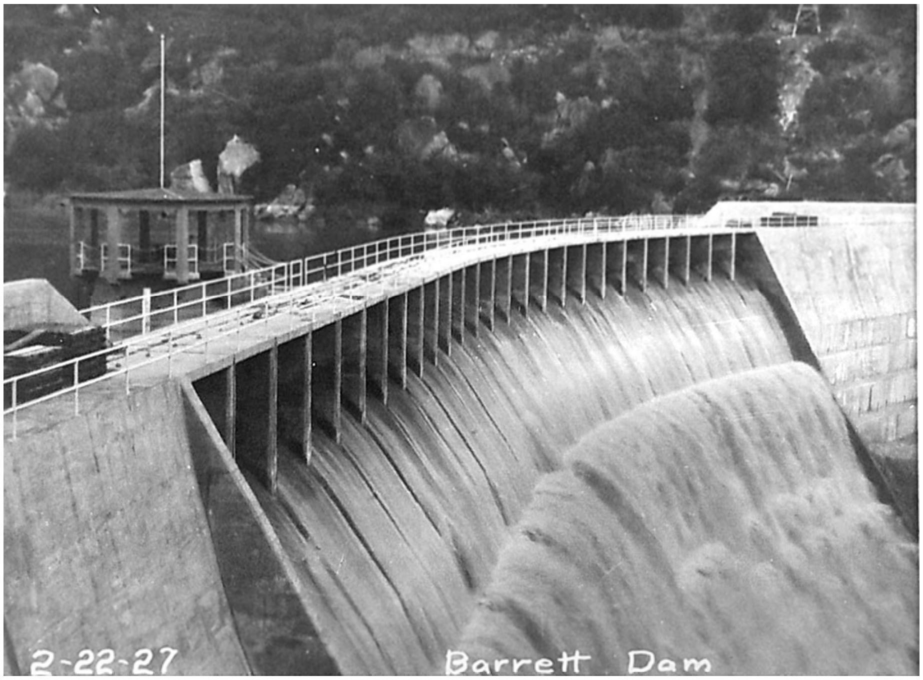


Figure 16. Barrett Dam with storm water pouring over spillway, February 1927 (City of San Diego Public Utilities Department Archives)

In response to this, the City of San Diego proposed increasing the height of Barrett Dam in 1929, but could not pass funding for the project. Talks continued through 1931, but the funding and project never materialized. Savage, rehired by the City of San Diego in 1928 as hydraulic engineer, continued to push that by increasing the height of Barrett Dam, the city could utilize its existing water rights while waiting for legal matters with Colorado River water to reach some end. After Savage's death in 1934, citizens of San Diego were favorable to the idea of renaming Barrett Dam as Savage Dam, but that also never materialized. Instead minor repairs took place. In 1935, the Barrett outlet gates had to be repaired after a large piece of flood debris prevented them from completely closing. The dam temporarily closed for a wildfire in 1948 (San Diego Union 1929a, 1929b, 1931a, 1931b; 1934a, 1934b, 1935, 1948; Savage 1929).

Heightening the dam remained on the City's docket of bond measures for nearly twenty years. In 1930, the City of San Diego, had finally succeeded in obtaining the right of way on lands in Barrett Basin. However, in 1952, an international water treaty between the United States and Mexico again complicated those water rights and put to rest the City's plans for raising the height of Barrett Dam. No other alterations to the dam were recorded (San Diego Union 1930, 1952).

Within the greater context San Diego's local water storage, Barrett Dam, and the Morena-Barrett-Otay system, remained a major source of water for the City of San Diego until 1947, when San Diego began in earnest to supplement its water storage with non-local sources. In 1925 the City added Hodges Dam in the San Dieguito System to the City-owned water storage system. In 1935 El Capitan was completed, followed by San Vicente in 1943. Despite these additions to the city's overall storage, population outpaced available water, and the City of San Diego turned to outside sources. The City of San Diego had submitted an application in 1926 to the California Division of Water Rights to divert

Colorado River water. As a result, the City entered into a contract with the Secretary of the Interior in 1933, which would provide 250,000 acre-feet of water storage in Boulder Reservoir and 112,000 acre-feet of water delivered annually once Boulder Dam was complete. Though the agreements were in place, the city still did not have the water they needed (Fowler 1953).

Water fears were exacerbated by the San Diego area population increase due to the ongoing World War. The population ballooned from 225,000 in 1941 to 325,000 in 1943. Per Fred D. Pyle, the City's Hydraulic Engineer:

> With this increase in population, which so greatly exceeds normal growth, there is grave danger of a water shortage in the event of a drought such as occurred from 1896 to 1904. The excess in population is coming to San Diego because of the National Defense activities and so rapidly that it will be impossible to construct reservoirs and impound water in time to be of use should such a drought occur (Pyle 1943: 3).

The severe strain on local water supplies prompted the San Diego County Water Authority to organize in June 1944, and the water authority became a member agency of the Metropolitan Water District. This resulted in the construction of the San Jacinto Tunnel by the U.S. Navy, which diverted water from the Metropolitan Water District (Los Angeles's Colorado River source) which was placed into service in 1947. That same year, water from the Boulder Dam contract was finally delivered to the City. The All- American Canal was completed in 1947 and the first Colorado River water was delivered to San Vicente Dam. With Colorado River water now in the City, reliance on local water storage was diminished (City of San Diego 1943; Fowler 1953; Pyle 1943, 1946, 1947).

Engineer: Hiram Newton Savage (1861-1934)

Hiram Newton Savage (Oct 6, 1861-June 24, 1934) was born in Lancaster, New Hampshire, to farmer Hazen Nelson Savage and Laura Ann Savage (née Newton). In 1887, he graduated with a Bachelor's in Science (B.S.) from New Hampshire College of Agriculture and Mechanical Arts, following that degree in 1891 with a Civil Engineering degree from Thayer School of Engineering at Dartmouth College. After graduating, Savage immediately began seeking engineering work (WRCA 2005).

While completing his degree at Dartmouth, Savage began his engineering career in Tennessee, where he was hired as assistant engineer by the East Tennessee and Georgia Railway, the Nashville and Tellico Railway, and the Athens (Tennessee) Improvement Company in 1888. In 1889 he was an Assistant Engineer for the Hydraulic Mining and Irrigation Company in the San Pedro Mining District of New Mexico, and later that same year he served as Chief Engineer at the Rio Grande Water Company in New Mexico. In 1891, Savage relocated to Southern California, where the San Diego Land and Town Company in National City, California, hired him as chief engineer; he worked there until 1903. His biggest achievement at San Diego Land and Town Company was the enlargement of the Sweetwater Dam, raising the dam to 110 feet tall and resulting in a total storage capacity greater than 26,000 acre-feet. Completed in 1911, the work entailed addition of a 20-foot-tall parapet along the top of the dam; addition of concrete to the downstream side of the dam to compensate for the extra pressure from the increased water storage; inserting a two-chute overflow weir on left side of the dam; and raising the height of the outlet tower (Reynolds 2008, WRCA 2005).

While with the San Diego Land and Town Company, Savage also took outside consultant work. He took consulting jobs with several San Diego-area railroads: the San Diego and Cuyamaca Railway, the San Diego and La Jolla Railway Company, and the Cuyamaca Beach Railway Company. He also consulted for water-related engineering projects with the Cuyamaca Water

Company, including the Zuninga Shoals Jetty Project for the City of San Diego. In 1895, the SCMWC hired Savage as a Consulting Engineer in connection with the Morena, Upper Otay, and Lower Otay Dams, and the water-conveyance system to the City (WRCA 2005).
In 1903, Savage was appointed Consulting Engineer for the United States Reclamation Service (a predecessor to the Bureau of Reclamation). In 1905, Savage was promoted to the Supervising Engineer of the Northern Division of the Reclamation Service in Montana, North Dakota, and Wyoming, where he oversaw several Reclamation Service dam projects, such as: the Milk River Project and Sun River Dam Project in Montana, the Williston Dam project in North Dakota, and the Shoshone Dam Project in Wyoming, which was at the time of its construction the highest dam in the world. Savage also consulted on other Reclamation Service projects for other regional divisions, including the Southern Division's Salt River Valley and Roosevelt Dam projects in Arizona. During his time with the Reclamation Service, New Hampshire State College awarded Savage with an honorary Doctor of Science in Engineering degree in 1913. His engagement at the federal level lasted from 1905 until 1915, before he resigned and returned to Southern California. In 1916, the Sweetwater Water Company of California hired Savage as a Consulting Engineer and later as a Supervising Engineer for the enlargement of the Sweetwater Dam, which had been damaged in the 1916 floods (Bureau of Reclamation 2018; WRCA 2005).

Savage was officially hired by the City of San Diego as the city's Hydraulic Engineer on June 4, 1917. The position had not previously existed for the city, and came with the authority to direct the water department, design infrastructure, and make recommendations There he continued the water infrastructure recovery from the 1916 floods. The flood of 1916 had destroyed Lower Otay dam, a structural failure that flooded Otay Valley and caused 22 drowning deaths. Savage's role in the reconstruction of Lower Otay Dam, the construction of Barrett Dam, and the repairs to Sweetwater Dam and Morena Dam, solidified the important role that he played in San Diego's water system. The acquisition of Savage was seen as an immeasurable triumph, the results of which would put the City of San Diego ahead both technologically and financially (McGlashan and Ebert 1918; San Diego Evening Tribune 1917; San Diego Union 1918c; Scientific American 1923; WRCA 2005).

In addition to Savage's successful dam projects, he also submitted several reports on the City's future needs for new water resources and infrastructure development. Savage also brokered several deals to secure water rights for the City in several cases. These reports and legal issues contributed to the deterioration of Savage's relationship and rapport with the City Council. Savage's employment as City Hydraulic Engineer for the City of San Diego lasted until 1923, when he was summarily dismissed after multiple disputes with the City Council and consulting hydraulic engineers J. B Lippincott and John R. Freeman (LAT 1922; San Diego Evening Tribune 1923b; San Diego Sun 1923; WRCA 2005).

After his dismissal from the City's employment, Savage embarked on two world tours from 1923 to 1925, studying foreign engineering projects at the Aswan Dam in Egypt, water supply projects in England, and irrigation projects in Brazil, before returning to the United States and offering hydraulic engineering consulting services. Savage's work during this period is unknown (WRCA 2005).

Meanwhile, by 1928, the City of San Diego's water infrastructure development suffered without Savage's leadership, culminating in the ultimate failure and abandonment of the Sutherland Dam project. The City invited Savage to return as Hydraulic Engineer, heading the Municipal Bureau of Water Development, Operations, and Maintenance. Savage returned to San Diego in 1928, with the condition that he be allowed to work independently of political interference. This was not to be. The City Council resumed their antagonistic relationship with Savage almost immediately, undercutting his authority by hiring consulting engineers who publicly dissented with Savage's ideas and publicly criticizing Savage's reports. Savage, for his part, resumed securing water rights for the City and began the El Capitan Dam project in 1928. His re-employment with the city of San Diego lasted until 1933 when Savage resigned, but he remained a consultant until the dam was completed. Shortly after Savage's resignation, he succumbed to a longstanding sickness and died in 1934 from heart failure (Savage 1932; San Diego Evening Tribune 1934; San Diego Sun 1932, 1933; San Diego Union 1932a, 1934a; WRCA 2005).

Savage's career as an engineer extended 46 years, from 1888 to his death in 1934. A sample of his known work includes:

- Sweetwater Dam and Distribution System, San Diego, California, 1891
- Sweetwater Park and Race Track, National City, California 1891
- Zuniga Jetty, San Diego, 1904
- Lower Yellowstone Project, Montana 1904
- Huntley Project, Montana, 1907
- Williston Project, North Dakota, 1907
- Buford-Trenton Project, North Dakota, 1907
- Sun River Project, Montana, 1908
- Flathead Irrigation Project, Montana, 1908
- Shoshone Project, Wyoming, 1908-1910
- Milk River Project, Montana, 1910
- St. Mary Diversion Dam, Montana, 1915
- Sweetwater Dam Enlargement Project, San Diego County, California, 1917
- Lower Otay Dam (Savage Dam), San Diego County, California, 1919
- Morena Dam Enlargement Project, San Diego County, California, 1923
- Barrett Dam, San Diego County, California, 1922
- El Capitan Dam, San Diego County, California, 1932-1934

<u>NRHP/CRHR Statement of Significance</u>

NRHP Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.

CRHR Criterion 1: Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

The Barrett Reservoir Complex has a period of significance from 1916 to 1928 for its important associations with the Flood Recovery and Reinvestment Period of San Diego's source water history. This is a significant period of water infrastructure development in San Diego and is clearly defined by two catastrophic events in Southern California that had far-reaching effects, the flood in 1916 and the St. Francis Dam Disaster in 1928. Despite the City' efforts, the flood of 1916 led to the collapse of the original Lower Otay Dam and destruction of many elements of the early water system in San Diego. Following this disaster, the City took extensive measures to ensure that these types of disasters were somewhat preventable in the future, by building their own dams versus purchasing dams designed by private water companies.

One of the most notable changes made following the flood of 1916 was the hiring of the City's first Hydraulic Engineer in 1917. In the previous period of development, it was the common occurrence for the private water companies to hire engineers like Michael O'Shaughnessy who were not employed by the City. However, the hiring of Hiram Savage in 1917 forever changed the way the City handled their water system development by having an engineer in house that oversaw the construction of water infrastructure projects. In response to the 1916 flood, Savage was responsible for implementing numerous safety measures to help prevent infrastructure failures in the future and was in charge of the rebuilding and repairing of damaged water infrastructure throughout the City. Despite the fact that Savage was replaced as the City's Hydraulic Engineer during this period of development, it is clear that his role was pivotal for the City's infrastructure development, as further evidenced by his eventual rehiring in 1928.

Barrett Dam was one of the first three city-owned and city-constructed dams developed after the 1916 floods. In the wake of the 1916 floods, the City recognized the high potential of capturing flood waters and the missed opportunity to store and sell its own water. The City purchased the Morena-Barrett-Otay system from SCMWC in 1913, anticipating the need for water independence from private companies and ongoing litigation for seeking new resources. The purchased holdings included the Barrett Dam Site and original Barrett Dam. In the wake of the 1916 flood, the city voters authorized water bonds funding for three major water infrastructure projects: raising the Morena Dam (1917), rebuilding the Lower Otay Dam which had been destroyed by the 1916 flood (1917-1919), and building an improved Barrett Dam (1919-1923).

While the work on the other two dams were essentially repairs or replacements on an existing system, aimed at protecting and recapturing lost water storage, the intent of the new Barrett Dam was to expand the City's water storage by a significant margin. Rather than repairing or replacing the existing Barrett Dam with a similarly-scaled small embankment dam, then-city hydraulic engineer Savage envisioned a concrete curved gravity dam over 150 feet in height, that could create a reservoir with a 14 billion gallon capacity. Barrett Dam stood to increase the water storage capacity of the City by a third, adding the 43,000 acre-feet at Barrett reservoir to 50,000 acre-feet of water at Lower Otay, 3,000 acre-feet at Upper Otay, and 40,000 acre-feet at Morena. The improvements to the Morena-Barrett-Otay system supported and enabled the city's growth and development and freed the City from the grip of private water company ownership for at least the next 20 years. However, the influx of the military population in San Diego during World War II necessitated supplementing local water sources with Colorado River water.

In summary, the subject property is directly associated with important events related to the period of flood recovery and reinvestment seen in San Diego from 1916-1928 and stands today as a critical component of the San Diego Source Water System that supported the City's growth and development. Therefore, Barrett Reservoir Complex appears eligible under NRHP/CRHR Criterion A/1 as both a contributing element of the City of San Diego Source Water System, and as an individual property.

NRHP Criterion B: Associated with the lives of significant persons in our past.

CRHR Criterion 2: Associated with the lives of persons important in our past.

The original Barrett Dam had connections to noted individuals, including E.S. Babcock and the Spreckels brothers, early developers of the City of San Diego. Despite these associations, the original dam designed by Babcock's SCMWC was subsumed in the construction of the current Barrett Reservoir Complex, leaving no tangible connection between the current complex and these historical figures. The current complex is not connected with any of these individuals in a way that demonstrates their contributions were important within a local, State, or national historic context. Therefore, the Barrett Reservoir Complex does not appear eligible under NRHP/CRHR Criterion B/2.

NRHP Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

CRHR Criterion 3: Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

The Barrett Dam embodies distinctive characteristics of the curved gravity dam construction type, used and promoted by hydraulic engineer Hiram N. Savage. The complex's period of significance is limited to its year of completion in 1922.

In addition to its important associations with the development of San Diego's Source Water System, the Barrett Dam is also important because of its embodiment of a curved gravity design. Concrete gravity dams and curved gravity dams, in particular, were popular in the American West from the early twentieth century. Several grand-scale curved gravity dams in the United States include the O'Shaughnessy Dam (1919-1923), Hoover Dam (1931-1936), Shasta Dam (1937-1945), and Glen Canyon Dam (1956-1966). Gravity dams are constructed of concrete or stone masonry and designed to hold back water by the weight of the dam material alone. Gravity dams can have either a straight or curved axis, and the Barrett Dam design has a curved axis. Barrett Dam is well preserved insofar that it is one of the five San Diego-area gravity dams, and the only one which has not been altered since its construction. Other gravity dams, such as Lower Otay (1917-1919), San Vicente (1943), and Olivenhain (2003) were subsequently raised, or had major structural repairs after flooding episodes. Concrete gravity dams were especially promoted by Savage because they were considered more expensive but required less land area and labor to complete than embankment dams.

Savage's career began with the Bureau of Reclamation and ended in San Diego. In San Diego, Savage worked on Sweetwater Dam (repair), Morena Dam (height increase, spillway repair), Lower Otay (design/rebuild), Barrett Dam (design/build), and El Capitan Dam (design/build). Barrett Dam is also tied to Savage's career because it was the last dam Savage designed and completed before the City of San Diego fired him for the first time in 1923. Despite Savage's success with the Barret Dam project, internal city politics led to the mayor dismissing the entire board of water commissioners in 1923. The board was replaced with enough commissioners to capitulate to poor public image and look for ways to fire Savage. Therefore, Barrett Dam was an important milestone and important to shaping the overall career of Savage.

In summary, Barrett Dam is an excellent example of a curved concrete gravity dam; represents a notable engineering achievement for the City of San Diego; and is a notable work of master engineer Hiram N. Savage. Therefore, the Barrett Reservoir appears eligible under NRHP/CRHR Criterion C/3 as both a contributing element of the City of San Diego Source Water System, and as an individual property.

NRHP Criterion D: Have yielded, or may be likely to yield, information important in history or prehistory.

CRHR Criterion 4: Has yielded, or may be likely to yield, information important in prehistory or history.

Archaeological survey was not conducted for this project. At this time there is no indication that the Barrett Reservoir Complex has the potential to yield information important to state or local history. Therefore, the property is recommended not eligible under NRHP/CRHR Criterion D/4.

City of San Diego Significance Evaluation

Criterion A: Exemplifies or reflects special elements of the City's, a community's, or a neighborhood's historical, archaeological, cultural, social, economic, political, aesthetic, engineering, landscaping, or architectural development.

The Barrett Reservoir Complex reflects special elements of San Diego's historical development. Construction of the complex made a significant contribution to the history of water development in the San Diego region and was a milestone in the City's quest to achieve source water independence.

The complex also reflects special elements of San Diego's engineering development. Barrett Dam embodies the distinctive characteristics of the curved gravity dam construction type, used and promoted by hydraulic engineer Hiram N. Savage. Gravity dams can have either a straight or a curved axis, and at the Barrett Dam, Hiram N. Savage implemented the curved axis design, resulting in a curved gravity dam. Barrett Dam is well preserved insofar as it is one of the five San Diego-area gravity dams, and has not been significantly altered beyond in-kind repairs since its construction. Other gravity dams, such as San Vicente Dam (1943), and Olivenhain Dam (2003), were subsequently altered. The concrete gravity dam design was promoted by hydraulic engineer Hiram N. Savage because, although more expensive, it required less land area and labor to complete than embankment dams. Additionally, the design allowed dams to be taller than embankment dams (e.g., Morena Dam) and therefore increased water storage capacity of the reservoir, an important innovation in dam engineering and critical to the water supply needs of the City of San Diego. Therefore, the subject property appears eligible under City Criterion A.

Criterion B: Is identified with persons or events significant in local, state, or national history.

Persons: Although the subject property does have connections to noted individuals, including E.S. Babcock, the Spreckels brothers, and Charles Hatfield who hold importance within the history of San Diego, the subject property is not connected with any of these individuals in a way that directly represents their contributions within the local historic context.

Events: As described in the NRHP/CRHR A/1 criterion discussion above, (the Barrett Reservoir Complex is associated with events significant in local, state, and national history. Construction of the Morena-Barrett-Otay water project was a major undertaking in a remote part of San Diego that required significant planning and coordination, and was an important event at the time construction began. The complex is associated with the expansion of the City of San Diego Source Water System. As a local resource, Barrett Dam and the Morena-Barrett-Otay storage system remained critical to the survival of the City of San Diego until 1947, when the City began to receive imported water from the Colorado River. The subject property is directly associated with important events related to water development in the San Diego region, namely with the City gaining source water independence and being a critical component to the water infrastructure that supported the City's growth and development until the end of World War II. Therefore, the subject property appears eligible under City Criterion B.

Criterion C: Embodies distinctive characteristics of a style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship.

As described under NRHP/CRHR Criterion C/3 (see full discussion above), Barrett Dam embodies distinctive characteristics of the curved gravity dam construction type, used and promoted by hydraulic engineer Hiram N. Savage. The associated outlet tower is a contributing feature to Barrett Dam, and the dam's period of significance spans its construction period 1919-1923.

Concrete gravity dams and curved gravity dams, in particular, were popular in the American West from the early twentieth century. Several grand-scale curved gravity dams exist in the United States, including the O'Shaughnessy Dam (1919-1923), Hoover Dam (1931-1936), Shasta Dam (1937-1945), and Glen Canyon Dam (1956-1966). Gravity dams are constructed of concrete or stone masonry and designed to hold back water by the weight of the dam material alone. Gravity dams can have either a straight or a curved axis, and at Barrett Dam Hiram N. Savage implemented the curved axis design, resulting in a curved gravity dam. Barrett Dam is well preserved insofar as it is one of the five San Diego-area gravity dams, and has not been significantly altered beyond in-kind repairs since its construction. Other gravity dams, such as San Vicente Dam (1943), and Olivenhain Dam (2003), were altered since their original construction. Therefore, the Barrett Reservoir Complex appears eligible under City Criterion C.

Criterion D: Is representative of the notable work or a master builder, designer, architect, engineer, landscape architect, interior designer, artist, or craftsman.

As described under NRHP/CRHR Criterion C/3 (see full discussion above), Barrett Dam represent a notable work of master engineer Hiram Newton Savage. Savage was hired by the City of San Diego in 1917 to work on designing and managing the rebuilding the Lower Otay Dam. After Lower Otay Dam was completed in 1919, Savage designed and managed construction of Barrett Dam. Barrett Dam and Lower Otay Dam are both concrete curved gravity dams, dam designs heavily promoted by Savage as safer, more cost-effective, and capable of greater storage capacity when compared to embankment dams such as earthen dams or rock-fill dams. Barrett Dam is an excellent and unaltered example of master engineer Savage's concrete curved gravity dam design. Therefore, the subject property appears eligible under City Criterion D.

Criterion E: Is listed or has been determined eligible by the National Park Service for listing on the National Register of Historic Places or is listed or has been determined eligible by the State Historical Preservation Office for listing on the State Register of Historical Resources.

The Barrett Reservoir Complex is not known to be on any local, state, or national list of significant properties, nor is it known to have been determined eligible for listing on any register. Therefore, at this time, the Barrett Reservoir Complex does not appear eligible under City Criterion E.

Criterion F: Is a finite group of resources related to one another in a clearly distinguishable way or is a geographically definable area or neighborhood containing improvements which have a special character, historical interest, or aesthetic value, or which represent one or more architectural periods or styles in the history and development of the City.

As described under NRHP/CRHR Criteria A/1 and C/3 (see full discussion above),the Barrett Reservoir Complex is significant for it role, function, and design within the larger City of San Diego Source Water System, of which it is a contributing resource to. The City of San Diego Source Water System includes ten (10) impounding reservoir complexes owned/operated by the City that function as part of the City's municipal water-supply system. These resources and their related infrastructure (e.g., dams, outlet towers, conduits, flumes, and pipelines) constitute a finite group of resources related to one another in a clear way, steeped in historical interest and representative of significant engineering achievements. Taken as a whole, these resources (including the Barrett reservoir Complex) are significant for their role in the City's source water system, starting with the earliest efforts to establish privatized water in the 1880s soon followed by construction of the earliest reservoirs, Lake Cuyamaca (1887) and Sweetwater Reservoir (1888). The period of significance ends with construction of the San Diego Aqueduct, and the importation of Colorado River Water for the first time into the San Vicente Reservoir (1947), which forever changed the composition of City's source water supply. Therefore, the Barrett Reservoir Complex is appears eligible under City Criterion F.

Integrity Assessment

Overall, the Barrett Reservoir Complex retains high integrity of location, setting, design, materials, workmanship, association, and feeling. While some secondary elements of the complex (e.g., Keeper's houses) suffer from a lack of integrity, the complex as a whole retains requisite integrity, as described below:

Location: The complex retains integrity of location. The location of the complex, at the site of the original, much smaller SCMWC dam and at the middle reservoir location on the Morena-Barrett-Lower Otay system has been retained. The complex's location is highly important given the role of the location as the middle reservoir of three in the Morena-Barrett-Lower Otay System, and therefore the feeder reservoir to Dulzura Conduit and Lower Otay Dam. The dam has never been shifted, or relocated, and the complex retains its location relative to other reservoirs in the system.

Setting: The complex's setting remains unaltered from its dedication in 1922. The complex retains its undeveloped setting within the boundaries of the Cleveland National Forest. The area northeast of Barrett Reservoir has been designated as legal wilderness, preventing any future development in that section of the National Forest.

Design: Barrett Dam, reservoir, and outlet tower retain integrity of design. There have been no major or minor alterations to these structures for their lifespan, and plans to alter the Barrett Dam by raising its height were abandoned in 1958. The dam continues to operate as designed and calculated by H.N. Savage in 1919, as well as operate as intended in the greater Morena-Barrett-Lower Otay water storage and conveyance system to the City of San Diego. While other sections of the larger Reservoir Complex have a diminished integrity of design, the complex as a whole retains the requisite integrity of design.

Materials: Similarly, the dam and associated engineering structures retain integrity of materials. No new materials have been introduced to the dam or outlet tower. The dam's associated buildings, especially Keepers' houses, as with integrity of design, do not retain integrity of materials. Both houses have been resided with vinyl, introduced garage additions, had multiple incompatible window replacements, and door replacements.

Workmanship: The Barrett Dam and its associated engineering structures retain integrity of workmanship. The evidence of the craftsmanship of the workers who built the dam is evident in the still-visible concrete board forms on the dam and outlet tower. The recreation and picnic area also retains integrity of workmanship, with semi-coursed masonry retaining walls, stairs, and railings, and barbeque that evoke the artistic elements and craftsmanship of rustic design, which was popular in public parks in the 1920s. The Keepers' houses do not retain integrity of workmanship. The architectural style of the houses was likely Craftsman Style, but with the loss of original plan, scale, and materials, the evident workmanship of the building has been removed or covered over.

Association: The dam, reservoir, outlet tower and associated features and buildings retain integrity of association. They were designed, built, and operated by City employees for the purpose of supplying water to the City of San Diego and providing recreation to San Diego residents and businesses. The association to the City of San Diego is especially strong insofar that the dam still operates as it did the day it was dedicated in 1923.

Feeling: Finally, the Barrett Dam, reservoir, associated features, and buildings retain integrity of feeling. The dam is still an imposing, massive, concrete structure. The size, scale, and design of Barrett Dam and Reservoir still evokes a sense of the period of intense water infrastructure growth in San Diego in the late 1910s and 1920s in response to the 1916 flood, a booming population, and a lack of water infrastructure to support the City.

B12. References (Continued):

Adsil, Henry B. 1921. Letter to O.W. Cottonwood, San Diego California Club. March 28, 1921. Barrett and Morena Dam Collection, Water Resources Collections and Archives, University of California, Riverside.

Andrus, Patrick W., and Rebecca H. Shrimpton. 2002. "How to Apply the National Register Criteria for Evaluation." Bulletin 15. U.S. Department of the Interior, National Park Service. Accessed June 2018. https://www.nps.gov/nr/publications/bulletins/pdfs/nrb15.pdf.

BOR (Bureau of Reclamation). 2018. "Projects and Facilities." *Reclamation: Managing Water in the West*. Accessed July 12, 2018. https://www.usbr.gov/projects/facilities.php?type=Project

Caltrans (California Department of Transportation) and JRP Historical Consulting Services. 2000. *Water Conveyance Systems in California: Historic Context Development and Evaluation Procedures*. Sacramento, California: California Department of Transportation. Accessed June 2018. http://www.dot.ca.gov/ser/downloads/cultural/CanalsDitches.pdf.

City of San Diego. 1919. *Feature History Lower Otay Dam*, Volumes 1–4. Report. San Diego, California: City of San Diego. On file at the City of San Diego Public Utilities Department Archives, Book Box 3.

City of San Diego. 1923. *Feature History Barrett Dam*, Volume 3. Report. San Diego, California: City of San Diego. On file at the City of San Diego Public Utilities Department Archives, Gray Box 3.

Concrete. 1922. "Build Dam Against Rising Water." *Concrete*. October 1922. On file at the City of San Diego Public Utilities Department Archives.

Crawford, Richard. 2011. *The Way We Were in San Diego*. Charleston, South Carolina: History Press.

Department of Commerce (Department of Commerce, Bureau of the Census). 1930. *California: Number and Distribution of Inhabitants.* Population Bulletin First Series: 15th Census of the United States 1930. On file at the City of San Diego Public Utilities Department Archives, Box 20, folder 6.

Fowler, L. 1953. "A History of the Dams and Water Supply of Western San Diego County." Thesis; University of California. On file at the City of San Diego Water Utilities Department Archives.

Hennessey, Gregg. R. 1978. "The Politics of Water in San Diego 1895–1897." *The Journal of San Diego History,* Summer 1978, 24(3). Accessed June 2018. http://www.sandiegohistory.org/journal/1978/july/water/.

Hill, Joseph. 2002. "Dry Rivers, Dammed Rivers and Floods: An Early History of the Struggle Between Droughts and Floods in San Diego" *The Journal of San Diego History,* Winter, 2002, 48. Accessed June 2018. https://sandiegohistory.org/journal/2002/january/hill-2/.

LAT. 1922. "City to Employ Special Engineer." *Los Angeles Times*. May 30, 1922. On file at the San Diego Public Utilities Department Archive.

Leech, Ellen. Ed. 1922. "Water: San Diego's Compelling Romance." Manuscript. *California Southland Magazine*. Pasadena, CA. Hiram N. Savage Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

McGlashan, H.D., and F.C. Ebert. 1918. "Southern California Floods of 1916." *Water Supply Paper* 426. U.S. Department of the Interior. Accessed June 2018. http://pubs.usgs.gov/wsp/0426/report.pdf.

McGrew, Clarence Alan. 1922. "City of San Diego and San Diego County: The Birthplace of California," Volume II. Chicago, Illinois, and New York, New York: The American Historical Society. Accessed June 2018. https://ia800200.us.archive.org/8/items/cityofsandiegosa01mcgr/cityofsandiegosa01mcgr.pdf.

Meixner, G. Donald. 1951. "Historical Development of Water Utilization." Draft. On file at the San Diego Public Utilities Department Archive.

O'Shaughnessy, M.M. 1916. "Report to the City of San Diego, California on the Proposed Barrett and Lower Otay Dams." Ed Fletcher Papers. MSS81. Special Collections & Archives, University of California San Diego. Accessed July 13, 2018. https://library.ucsd.edu/dc/object/bb4028903p

Ormsby, Burke. 1966. "The Lady Who Lives by the Sea." *The Journal of San Diego History* 12(1). Accessed June 2018. http://sandiegohistory.org/journal/1966/january/ladybysea/.

Patterson, Thomas W. 1970. "Hatfield the Rainmaker." *Journal of San Diego History,* Winter 1970, 16(4). Accessed June 2018. http://www.sandiegohistory.org/journal/1970/january/hatfield/.

Pourade, Richard F. 1977. *The History of San Diego,* Volumes 1–7. San Diego History Center. Accessed June 2018. http://www.sandiegohistory.org/archives/books/risingtide/ch3/

Pyle, Fred D. 1935. "City of San Diego Municipal Water Supply, Reservoir Dams." Draft. September 3, 1935. On file at the City of San Diego Public Utilities Department Archives, Box 38, folder 87.

Pyle. 1943. "Plans for Meeting the Demands of trhe San Diego Municipal Water Supply." Report. February 1, 1941. Fred D. Pyle Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Pyle. 1946. "Water Supply of San Diego, California." Report. February 23, 1946. Fred D. Pyle Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Pyle. 1947. "The Influence of War on Design of Water Facilities for San Diego, California." Draft. Fred D. Pyle Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Reynolds, Richard A. 2008. *Sweetwater Dam: Then and Now*. Accessed August 24, 2018. http://history.sandiego.edu/gen/local/docs/doc238.pdf

San Diego Evening Tribune. 1920. "Barrett Dam Concrete Masonry Construction Is Under Full Headway." *Evening News* August 14, 1920. On file at the City of San Diego Water Utilities Department Archives.

San Diego Evening Tribune.1921. "Visit to Barrett Dam Emphasizes Necessity for Voting Bond Issue." Genealogybank.com: *The Evening Tribune* (San Diego, CA). March 16, 1921, pg. 5.

San Diego Evening Tribune. 1922. "Hundreds Attend Dedication of Barrett Dam; Big Program." *Evening News* July 25, 1922. On file at the City of San Diego Water Utilities Department Archives.

San Diego Evening Tribune. 1923a. "Water Board is Removed Today By Mayor." *The Evening Tribune*. January 3, 1923. On file at the San Diego Public Utilities Department Archives.

San Diego Evening Tribune. 1923b. "Discharge of Savage by City Manager Has Approval of Council." *San Diego Evening Tribune*. June 18, 1923. On file at the San Diego Public Utilities Department Archives.

San Diego Evening Tribune.1927. "Seven Risk Lives in Saving S.D. Dam." Genealogybank.com: *The Evening Tribune* (San Diego, CA). February 24, 927, pg. 5.

San Diego Evening Tribune. 1934. "Savage Still at Work in Interest of City When Heart Ends Task" *The Evening Tribune*. June 25, 1934. Accessed July 11, 2018 from geneologybank.com.

San Diego History Center. 2018. "Biography: John D. Spreckels (1853–1926)." Accessed June 2018. http://www.sandiegohistory.org/archives/biographysubject/spreckels/.

San Diego Sun. 1922a. "Barrett Dam Funds Needed." *The San Diego Sun*. February 1, 1922. On file at the San Diego Public Utilities Department Archives.

San Diego Sun. 1922b. "Fire Savage, is Stewart's Council Plan." *The San Diego Sun*. May 29, 1922. On file at the San Diego Public Utilities Department Archives.

San Diego Sun. 1922c. "Oppose City Engineer on Water Plans." *The San Diego Sun*. November 29, 1922. On file at the San Diego Public Utilities Department Archives.

San Diego Sun. 1923. "Leaks Found in Lower Otay Dam; City Water Engineer Savage Fired." *The San Diego Sun*. November 29, 1922. On file at the San Diego Public Utilities Department Archives.

San Diego Sun. 1932. "Council Backs H.N. Savage; Unanimous Move Made to Twart Goeddel's Program." *The San Diego Sun*. August 15, 1932. On file at the San Diego Public Utilities Department Archives.

San Diego Sun. 1933. "Savage to Quit Engineer's Posit in Row over Capitan." *The San Diego Sun*. May 15, 1933. On file at the San Diego Public Utilities Department Archives.

San Diego Union. 1895. "Barrett Reservoir." *San Diego Union*. July 4, 1895. On file at the San Diego Public Utilities Department Archives.

San Diego Union. 1899. "Barrett Dam." *San Diego Union*. January 5, 1899. On file at the San Diego Public Utilities Department Archives.

San Diego Union. 1903. "Will Resume Work on Great Water System." *San Diego Union*. January 1, 1903. On file at the San Diego Public Utilities Department Archives.

San Diego Union. 1918a. "H.N. Savage Holds Brilliant Record for Past Work." *San Diego Union.* January 1, 1918. On file at the San Diego Public Utilities Department Archive.

San Diego Union. 1918b. "Necessity for Building Barrett Dam is Shown." *San Diego Union.* September 1, 1918. On file at the San Diego Public Utilities Department Archives.

San Diego Union. 1919a. "City Will Build Dam At Barrett." *San Diego Union.* June 17, 1919. On file at the San Diego Public Utilities Department Archive.

San Diego Union. 1919b. "Plans for Construction of Barrett Before Council; Cost Estimated at $881,270." *San Diego Union.* July 10, 1919. On file at the San Diego Public Utilities Department Archive.

San Diego Union. 1920a. "Barrett Dam Preliminaries Making Progress, Report." Genealogy Bank.com: *San Diego Union* (San Diego, CA). October 16, 1920, page 5.

San Diego Union. 1920b. "Need $400,000 More to Finish Barrett Dam." *San Diego Union.* October 16, 1920. On file at the San Diego Public Utilities Department Archive

San Diego Union. 1921. "Wadham 95 Behind At End; Barrett Dam Bonds Carry; Paving Propositions Lost." Genealogybank.com: *San Diego Union* (San Diego, CA). April 6, 1921, pg. 1

San Diego Union. 1922a. "Council to Hold Conference With Hydraulic Engineer." Genealogybank.com: *San Diego Union* (San Diego, CA) March 30, 1922, pg. 8.

San Diego Union. 1922b. "Hundreds Attend Formal Exercises at Barrett Dam." *San Diego Union*. July 26, 1922. On file at the San Diego Public Utilities Department Archive.

San Diego Union. 1927. "Mayor, Council to Hold Savage-Session Today." *San Diego Union.* June 14, 1927. On file at the San Diego Public Utilities Department Archive.

San Diego Union. 1929a. "Savage Urges $2,750,000 Bond Issue For Water Project." *San Diego Union.* January 11, 1929. On file at the San Diego Public Utilities Department Archive.

San Diego Union. 1929b. "Next Step in San Diego's Water Supply." Genealogybank.com: *San Diego Union* (San Diego, CA) November 3, 1929, pg. 1

San Diego Union. 1930. "City Gets Right of Way on Lands For Flooding in Barrett Raising." Genealogybank.com: *San Diego Union* (San Diego, CA) January 12, 1930, pgs. 1, 3.

San Diego Union. 1931a. "All Water Items Lose in Light Vote." Genealogybank.com: *San Diego Union* (San Diego, CA) August 12, 1931 pg. 1

San Diego Union. 1931b. "Special Division in City Legal Department May Be Established In Move To Develop More Water." Genealogybank.com: *San Diego Union* (San Diego, CA) August 12, 1931 pg. 1

San Diego Union. 1932. "Easing Him Out." *San Diego Union*. August 10, 1932. On file at the San Diego Public Utilities Department Archives.

San Diego Union. 1934a. "H.N. Savage, City Dam Builder, Dies on Duty In San Diego Service" Genealogybank.com: *San Diego Union* (San Diego, CA). June 25, 1934.

San Diego Union 1934b. "Seal of Merit." Genealogybank.com: *San Diego Union* (San Diego, CA). July 4, 1934, pg. 4.

San Diego Union. 1935. "Repairs Planned on Gate of Dam." Genealogybank.com: *San Diego Union* (San Diego, CA). September 26, 1935, pg. 11.

San Diego Union. 1948 "Barrett Dam Area To Be Reopened By City Wednesday." Genealogybank.com: *San Diego Union* (San Diego, CA). July 18, 1948, pg. 20.

San Diego Union. 1952. "Water Pact Restrains City in Heightening of Barrett." Genealogybank.com: *San Diego Union* (San Diego, CA). November 30, pg. 33.

Savage, Hiram N. 1919a. Letter to Common Council, City of San Diego. Regarding "Water Supply" Barrett and Morena Dams Collection, Water Resources Collections and Archives, University of California, Riverside.

Savage. 1919b. "Drawings and specifications: Barrett Dam, Spillway, and Outlet Tower." Specifications S-100. Box 1, folder 21. Barrett and Morena Dams Collection, Water Resources Collections and Archives, University of California, Riverside.

Savage. 1919c. "Barrett Dam – October, First Ten Day Report." October 10, 1919. Box 5, Folder 33:1; Hiram N. Savage Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Savage. 1919d. "Barrett Dam – October, Third Ten Day Report." October 31, 1919. Box 5, Folder 33:1; Hiram N. Savage Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Savage. 1920a. "Barrett Dam – January, Second Ten Day Report." January 20, 1920. Box 5, Folder 33:1; Hiram N. Savage Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Savage. 1920b. "Barrett Dam. July, Second Ten Day Period Report." July 20, 1920. Box 5, Folder 33:2; Hiram N. Savage Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Savage. 1920c. "Barrett Dam. October, First Ten Day Period Report." October 10, 1920. Box 5, Folder 33:2; Hiram N. Savage Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Savage. 1920d. "Barrett Dam. December, Second Ten Day Period Report." December 21, 1920. Box 5, Folder 33:2; Hiram N. Savage Papers Collection, Water Resources Collections and Archives, University of California, Riverside

Savage. 1920e. "Barrett Dam Plan and Sections." Drawing S-170 December 22, 1920. Box 1 Folder 5. Barret and Morena Dams Collection, Water Resources Collections and Archives, University of California, Riverside.

Savage. 1921a. "Barrett Dam. January, Third Ten Day Period Report." January 31, 1921. Box 5, Folder 33:2; Hiram N. Savage Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Savage. 1921b. "Barrett Dam. March, Second Ten Day Period Report." March 20, 1921. Box 5, Folder 33:2; Hiram N. Savage Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Savage. 1921c. "Barrett Dam. September, Third Ten Day Period Report." September 30, 1921. Box 5, Folder 33:3; Hiram N. Savage Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

Savage. 1921d. "Drawings and specifications: Barrett Dam, Spillway, and Outlet Tower." Report. Box 1, folder 21. Barret and Morena Dams Collection, Water Resources Collections and Archives, University of California, Riverside.

Savage. 1929. "Barret Dam Projected Heightening, Material for Construction, Sand Investigation." Letter to J.Y. Jewett. On file at the San Diego Public Utilities Department Archives, Box 13, Folder 26.

Savage. 1932. "Drawings, El Capitan Reservoir Dam, Spillway, and Outlet Works." City of San Diego, California: Bureau of Water Development. On file at the San Diego Public Utilities Department Archive.

Scientific American. 1923. "A Rush Job In Dam Construction." *Scientific American.* April 1923. On file at the San Diego Public Utilities Department Archive.

Sholders, Mike. 2002. "Water Supply Development in San Diego and a Review of Related Outstanding Projects." *The Journal of San Diego History*, Winter 2002, 48(1). Accessed June 2018. http://sandiegohistory.org/journal/2002/january/sholders/.

Smythe, William Ellsworth. 1908. "History of San Diego (1542-1908)." In *An Account of the Rise and Progress of the Pioneer Settlement on the Pacific Coast of the United States,* Volume II, *The Modern City*. San Diego, California: The History Company. Accessed June 2018. https://ia902300.us.archive.org/26/items/historyofsandieg02smyt/historyofsandieg02smyt.pdf.

SWRB (State Water Resources Board). 1951. "Water Resources of California." Bulletin No 1. Accessed June 2018. https://ia800608.us.archive.org/31/items/waterresourcesof01cali/waterresourcesof01cali.pdf.

Tuthill, Barbara. 1954. "Hatfield the Rainmaker." *Western Folklore* 13(2): 107-112. Berkeley, California: University of California Press. On file at the City of San Diego Public Utilities Department Archives, Box 31, folder 30.

White, Almira Larkin. *Genealogy of the Descendants of John White of Wenham and Lancaster, Massachusetts*. Vol. 3, Chase Brothers, Printers, 1900. Accessed July 16, 2018. https://books.google.com/books?id=gKZbAAAAMAAJ&pg=PA72&dq=Hiram+Newton+Savage&hl=en&sa=X&ved=0ahUKEwjm0fHrm5jcAhWr54MKHdeRCekQ6AEIMTAC#v=onepage&q=Hiram%20Newton%20Savage&f=false

WRCA (Water Resources Collections and Archives). 1921. "Chronological history Construction of Barrett Dam." Barrett and Morena Dams Collection, Water Resources Collections and Archives, University of California, Riverside.

WRCA. 2005. "Biographical Summary: Hiram Newton Savage, M. Am. Soc. C. E." Hiram N. Savage papers collection, Water Resources Collections and Archives, University of California, Riverside. Accessed July 12, 2018. http://pdf.oac.cdlib.org/pdf/ucr/wrca/savagehn.pdf

WRCA. No Date. Map of the San Diego Water Systems and Drainage Systems. Hiram N. Savage Papers Collection, Water Resources Collections and Archives, University of California, Riverside.

State of California ♦ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3B; 3CB, 5B

Other Listings
Review Code Reviewer Date

 ***Resource Name or #:** (Assigned by recorder) El Capitan Reservoir Complex
P1. Other Identifier:

***P2. Location:** ☐ **Not for Publication** ■ **Unrestricted**
***a. County** San Diego County **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad** El Cajon Mountain **Date** 1997 **T** 15S; **R** 02E; NE ¼ of **Sec** 7; San Bernardino **B.M.**
c. Address City Lakeside Zip 92040
d. UTM: (Give more than one for large and/or linear resources) Zone 11S , 517819 mE/ 3638403 mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
El Capitan Reservoir Complex is sited in the Cleveland National Forest, immediately east of the Capitan Grande Indian Reservation border. The dam is east of the town of Lakeside, northeast of San Diego, and may be accessed via El Monte Road. Lat/Long: 32.884075, -116.809169

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
The El Capitan Reservoir Complex presently consists of the El Capitan dam, spillway, flume remnants, storage structure, keeper's house foundations, and the outlet tower. The El Capitan Dam is a hydraulic rock-filled embankment dam, with an impervious clay puddle core. **(See Continuation Sheet)**

***P3b. Resource Attributes:** (List attributes and codes) HP21. Dam; HP22. Reservoir; HP11. Engineering structure; HP02. Single family property; HP04. Ancillary building
***P4.Resources Present:** ■ Building ■ Structure ☐ Object ☐ Site ☐ District ■ Element of District ☐ Other (Isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)

P5b. Description of Photo: (view, date, accession #) El Capitan Dam, looking upstream view to the southeast. June 8, 2018 (IMG 1919)

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
1935(SDU 1935e)

***P7. Owner and Address:**
Public Utilities Dept.
City of San Diego
9192 Topaz Way
San Diego, CA 92123

***P8. Recorded by:** (Name, affiliation, and address) Dudek
Kate Kaiser, MSHP
605 Third Street
Encinitas, CA 92024

***P9. Date Recorded:** June 8-11, 2018

***P10. Survey Type:** (Describe) Pedestrian

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") Dudek. 2020. City Of San Diego Source Water System Historic Context Statement.

***Attachments:** ☐NONE ■ Location Map ■ Continuation Sheet ■Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

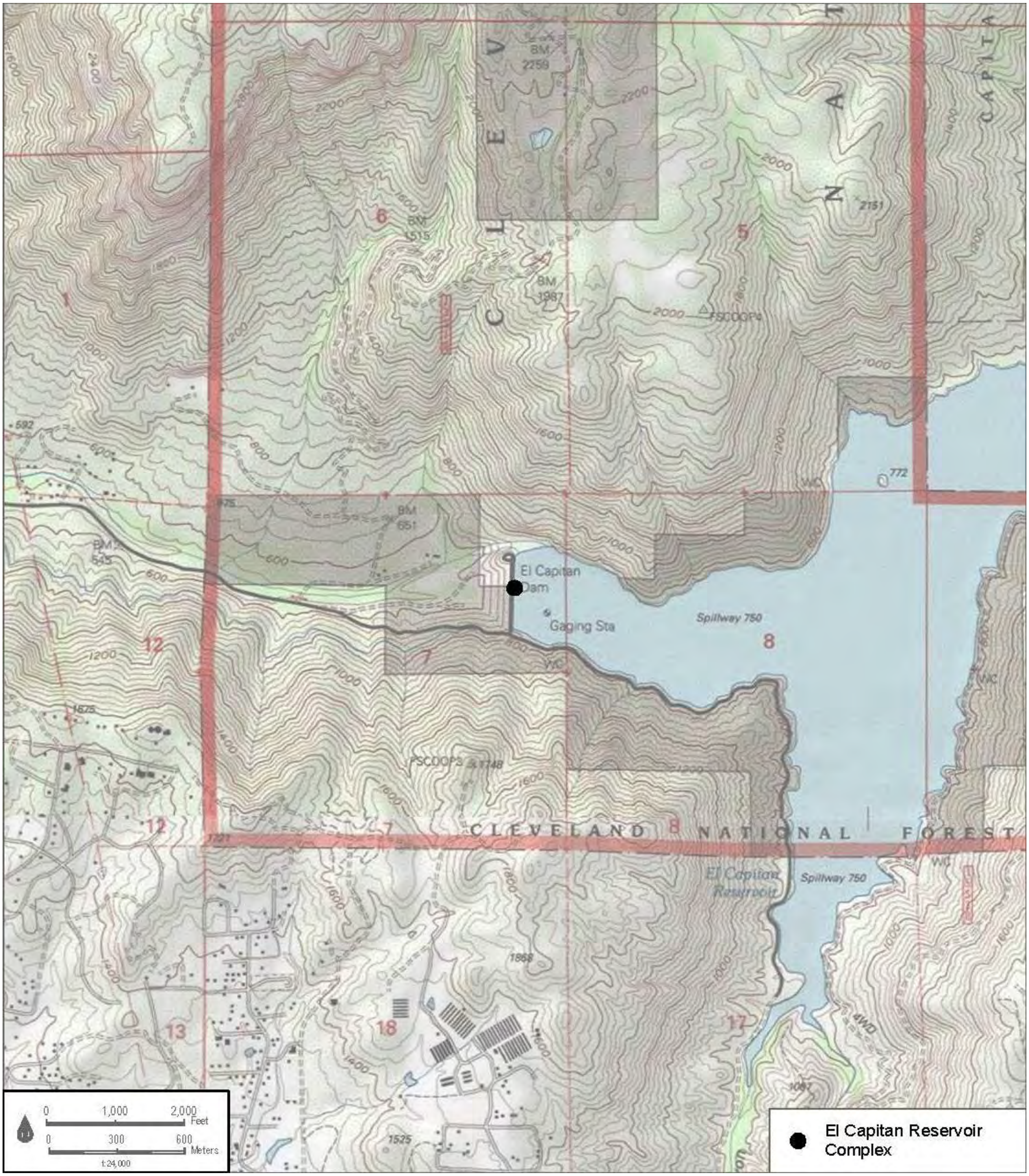
State of California – Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 38 ***Resource Name or #** (Assigned by recorder) El Capitan Reservoir Complex

***Map Name:** El Cajon Mountain, 7.5' USGS Quadrangle ***Scale:** 1:24,000 ***Date of map:** 1996



State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
Primary #
HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) El Capitan Reservoir Complex ***NRHP Status Code** 3B; 3CB, 5B

B1. Historic Name: El Capitan Dam and Reservoir
B2. Common Name:
B3. Original Use: Municipal water source B4. Present Use: Municipal water source, recreation
***B5. Architectural Style:** Hydraulic rock-filled embankment dam
***B6. Construction History:** (Construction date, alterations, and date of alterations)

El Capitan Reservoir Complex was built between 1932 and 1935. El Capitan Reservoir was first filled in 1935. There are no known or observed alterations.

***B7. Moved?** ■No ☐Yes ☐Unknown **Date:** **Original Location:**
***B8. Related Features:**

B9a. Architect: Hiram Newton Savage (engineer) b. Builder: H.W. Rohl and T.E. Connolly
***B10. Significance: Theme** Post St. Francis Dam Disaster Development **Area** San Diego
Period of Significance A: 1928-1947; C: 1935 **Property Type** Dam
Applicable Criteria NRHP/CRHR: A/1, C/3; City: A, B, C, D, F
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Historic Context

(See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)

***B12. References: (See Continuation Sheet)**

B13. Remarks:

***B14. Evaluator:** Kate Kaiser, MSHP
***Date of Evaluation:** June 30, 2020

(This space reserved for official comments.)

(Sketch Map with north arrow required.)

P3a Site Description (continued):
The dam is oriented north to south, with the southern side meeting up with El Monte Road and the northern side terminating perpendicularly with the spillway (Figures 1 and 2). The dam is 217 feet tall, with the crest measuring 1,170 feet long and 26 feet wide at the crest walkway. The dam base thickness is 1150 feet wide (Pyle 1935c). The walkway is paved and has water table testing wells spaced through the crest as well as through large hemi-circular access ports at the toe of the dam. On the northern end of the dam is a turnaround area adjacent to the spillway with a commemorative plaque (Figure 3).

Figure 1. Overview of upstream side of El Capitan Dam from El Monte Road with spillway on right, view to west (IMG_1807)

Figure 2. Overview of upstream side of El Capitan Dam from El Monte Road with spillway on right, view to west (IMG_1807)

Figure 3. Plaque on crest of dam (IMG_1941)

On the downstream face of the dam are three well access ports near the tow of the dam (Figure 4). The well itself is constructed of board-form concrete, reinforced with rebar. It is capped with a board form concrete, semi-circular collar, and a hinged metal lid. Access to the well is provided by metal rebar rungs.

Figure 4. Well access port on downstream access road for dam, looking northeast (IMG 2062)

The spillway is located on the northern end of the dam (Figure 5).It is a concrete, uncontrolled ogee side channel spillway, with a crest height of 197 feet, and a vertical upstream face that measures 1,100-feet long and 220 feet wide at the low end of the spillway crest and 150 feet wide at the at the entrance to the spillway. The spillway crest measures approximately 560-feet. The spillway can be accessed from both the northern and southern sides. Recent grading (less than five years) was evident on the northern side. This was likely in response to maintenance needs created by falling rocks cluttering the spillway basin.

Figure 5. Spillway looking north from the crest (IMG_1853)

The outlet works consists of an outlet tower and outlet tunnel. The outlet tower is a free-standing, wet tower with six 30-inch saucer valves for selective level draft control (Figure 6). The tower is constructed of rebar reinforced, board form concrete and extend 200 feet above the reservoir basin floor and its base has a diameter of 16 feet. The top of the concrete tower features a reinforced concrete operating deck with controls that regulate the outlet gates. Metal rebar rungs provide exterior access. Water is taken into the tower through the six saucer valves located at various levels, and one 30 by 30-inch slide gate and may be drawn out through the bottom of the tower through two 36-inch and two 42-inch pipes, all of which discharge to the El Capitan Pipeline. Each saucer valve contains a screen cover to keep fish, trash and other debris from entering into the 24-inch-diameter circular pipes. The corrugated metal pipe leads up to the operating deck and was used for water depth testing, but is currently in disrepair.

Figure 6. Overview of Outlet Tower looking northwest (IMG_20180608_093140)

The horseshoe-shaped diversion tunnel is located on the southern end of the dam, on the downstream/western face and has an approximate interior diameter of 25-feet (Figure 7). This tunnel contains the El Capitan Pipeline, a 48-inch concrete pipe, with metal concourse above it. The pipeline is supported in the approximate center of the tunnel by metal and concrete supports. Full access to the tunnel was prohibited without appropriate safety training and equipment for confined spaces. The face of the tunnel entrance is composed of board-form concrete with rebar reinforcement (Figure 8). In front of the tunnel is a water quality testing well-house. It is a small (approximately 6-feet square, and 10-feet tall) structure poised atop concrete access vents.

Figure 7. Diversion tunnel with El Capitan Pipeline below concourse, metal and concrete supports visible below (IMG_2009)

Figure 8. El Capitan pipeline tunnel, looking east (IMG 1952)

Associated with the reservoir complex on the eastern slopes is a small, indeterminate, concrete structure foundation adjacent to a dirt road (Figure 9). This foundation stands approximately 4-feet above the surface of the surrounding soil, however it appears to descend at least 2 –feet below the rest of the soil. It appears to possibly be a vent clean-out or water table well. It is approximately 130-feet from the flume remnants that lead east along the canyon.

Figure 9. Indeterminate structure on eastern shore near flume remnants, looking east (IMG_1717)

The two keeper's house foundations were still present. Both structures appear to have had the same basic floorplan, with alterations occurring after initial construction and mirrored layout. This floorplan includes a rectangular house wall foundation, slab garage and three-step stairs. These two structures appeared to have pier and beam foundations. The wall foundation was poured concrete with concrete piers aligned in a grid pattern approximately 24-inches from one another, within the house's rectangular footprint. The foundation measured approximately 25-feet long by 20-feet wide (Figure 10). This does not include the garage, which had its own poured concrete slab foundation. The southern of the two houses had the majority of its cement block chimney still in-tact. The northern has no chimney but an outdoor patio and brick BBQ. Pavers along the northern side of the foundation also outline a walkway from the northern yard to the western back yard, where a clothes line pole is still extant. The BBQ is composed of cinderblock, red brick, and concrete (Figure 11).

Figure 10. Northern keeper's house foundation, looking north (IMG_2209)

Figure 11. Southern keeper's house foundation and chimney, looking north (IMG_2185)

Downstream from the reservoir complex, at the end of the road to the keeper's houses at the toe of the dam is a building termed the "storage structure." The building has no particular architectural style and seems to just be a utilitarian building with a rectangular plan (Figure 12). The building is side gabled, steel I-beam framed building clad with corrugated metal on each elevation and the roof. There are sliding metal doors on a track in the gable ends, as well as a metal vent in the gable. Standard two panel wood doors are set into the metal sliding doors. Neither gable end appears to be the main elevation. From the exterior, all of the windows appear boarded over, but on the interior, they are 12-lite, metal framed, wire glass windows, with the middle four lites operating as an awning window. Several metal containers, a flammable materials shed, spare lumber, portable restrooms, and other equipment are stored against the south elevation wall, obscuring it completely.

Figure 12. Overview of storage structure (IMG_2300)

The last feature is a dry-laid, stacked rock wall that has three distinct segments. It follows along the eastern side of El Cajon Mountain Truck Trail from its intersection with El Monte Road and El Cajon Truck Trail going north and curves eastward to follow the curve of an unnamed spillway access road towards the dam spillway. This portion is approximately 1500 feet in length and is broken into two segments by an 80 foot long break around vegetation. This rock wall also has a segment along the south side of El Monte Road and El Cajon Truck Trail leading from the same intersection eastward towards the storage building for approximately 900 feet along an unnamed, dirt road leading to the toe of the dam's downstream side. The wall varies in height and thickness, averaging 2-feet in height and 16-inches in thickness. The rocks appeared to be locally-sourced decomposing granite cobbles. No mortar was noted. All segments of the wall are overgrown with various vegetation, grasses, trees, and are tumbled down to one or two courses in some places (Figure 13).

Figure 13. Rock wall along the dam toe access road, view to the east (IMG_2235)

B10. Significance (Continued):

Phase 1: Planning and Funding (1914-1931)

Development of the El Capitan dam began in the early 1910s with Colonel Ed Fletcher's Cuyamaca Water Company's initial land acquisitions. After the City of San Diego refused to purchase the system in 1913, the Cuyamaca Water Company was offered to the La Mesa, Lemon Grove, and Spring Valley Irrigation District after the district's formation in fall 1913. Since the district's supply was supposed to come from the San Diego River, Cuyamaca Water Company began to acquire private tracts along in the San Diego River watershed, near the El Capitan dam site (Figure 14). However, the Cuyamaca Water Company land acquisitions were met with opposition from the City. Some of the City planners felt that the City should be taking on the responsibility for land acquisitions along the San Diego River instead of allowing a private water company to establish precedent. In 1914, City Attorney T.B. Cosgrove issued a legal opinion stating the City's prior and paramount right to the San Diego River Waters (City of San Diego 1935; Fowler 1953).

Figure 14. 1917 survey of San Diego River Project (Hiram N. Savage Photograph Collection, 1905-1933, Water Resources Collections and Archives, University of California, Riverside).

The City took its first step towards land acquisitions on June 9, 1915 with the W.B. Hamilton water filings. In 1912 Hamilton filed for an easement to flood U.S. Forest Service lands. This was approved in 1915, and the same year the City of San Diego applied to the Department of the Interior for an easement to flood the Capitan Grande Mission Indian Reservation lands, located near their proposed reservoir on the San Diego River. The City's application was immediately protested by all groups, but the application was approved by the Secretary of the Interior in 1917. During the hearings on the matter, the City of San Diego introduced a bill in Congress to grant the city water rights in order to build the dam. In February 1919, a special bill was passed condemning the City's desired portion of Capitan Grande Mission Indian Reservation lands for reservoir purposes, with an amendment compelling the city to protect the riparian rights of the landowners downstream from the proposed reservoir complex (DOI 1931; Fowler 1953; Savage 1923).

Despite the amendment, the City filed suit against the Cuyamaca Water Company with the intention to establish paramount water rights to the San Diego River, based on their role as successor to the original Spanish pueblo water rights (*City of San Diego v. Cuyamaca Water Company*). Fowler clearly defines the issue of the City's paramount right to water in the following excerpt:

> The City of San Diego had for some time claimed a paramount right to all water of the San Diego River by virtue of the fact that the city was successor to the original Spanish pueblo. The pueblo was entitled under the old Spanish laws to all waters of the river, and when California became part of the United States, the established rights were to be recognized by the new rulers (Fowler 1953).

The issue of the City's water rights continued for the next decade with several lawsuits ending in a U.S. Supreme Court case. A subsequent lawsuit in 1926 acknowledged the City's paramount right to water but did not give them full rights to the water. The 1926 decision was appealed to the State Supreme Court, who decided in 1929 that the City's right to the San Diego River water was paramount based on the treaty of Guadalupe-Hidalgo. Furthermore, the court went on to say that once the Pueblo of San Diego was acquired by the U.S., the City had exclusive rights to the San Diego River. The court case progressed to the U.S. Supreme Court in 1930, where they concurred that City of San Diego indeed had prior and paramount water rights to the San Diego River (Figure 15) (City of San Diego 1935; Fowler 1953).

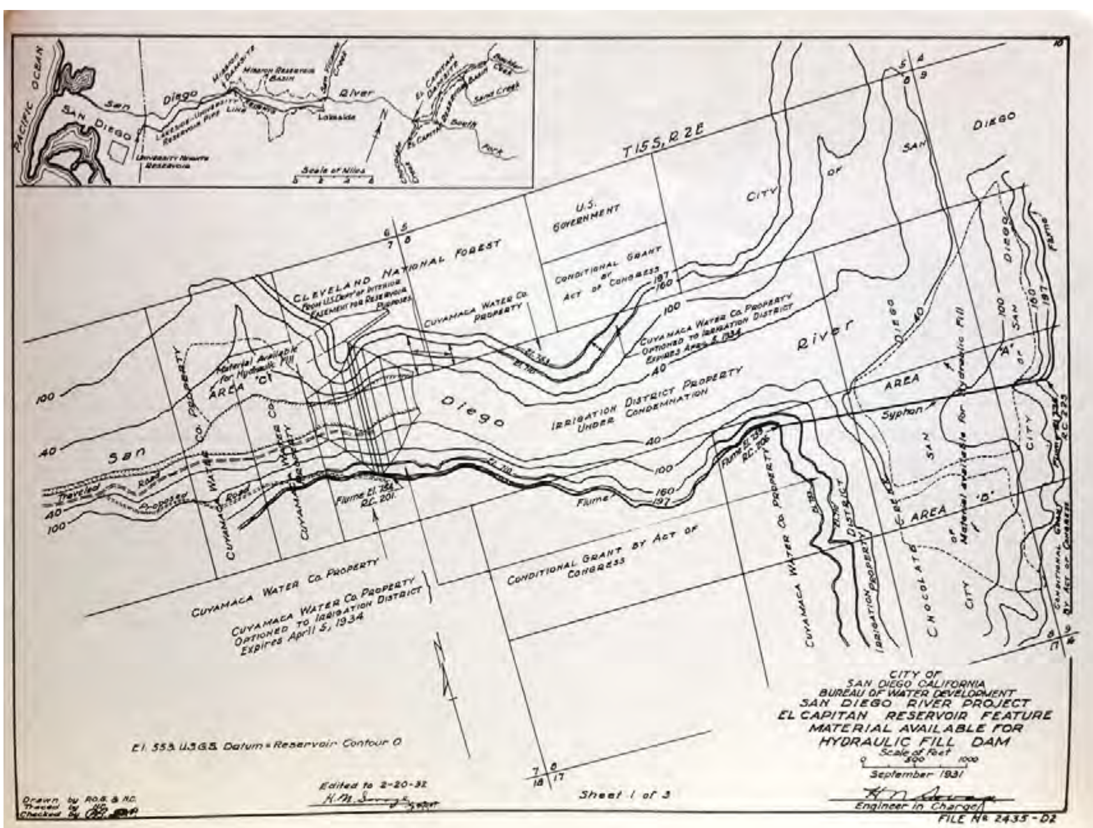


Figure 15. Private and Public plots around El Capitan Reservoir Complex ca. 1932. (Hiram N. Savage Papers Collection, 1905-1933, Water Resources Collections and Archives, University of California, Riverside).

In addition to the legal battles over paramount water rights, the development of the El Capitan Reservoir Complex also encountered delays as a result of a portion of the land being Federal land and the site of the Capitan Grande Reservation. The Reservation was approximately 17,000 acres with two bands of Native Americans residing on the property. In order to develop the El Capitan Reservoir Complex, the City had to get consent from multiple federal parties including the Department of the Interior and the Bureau of Indian Affairs as the land containing the Reservation was federal trust land. The purchase of the federal land was an uphill battle and was met with opposition from the start of the process in 1916. However, progress was made in 1919 when Congress passed the El Capitan Act. The passage of the El Capitan Act officially transferred the water rights and land to the City. In exchange, the City would bear the cost of removal and relocation of the Capitan Grande Indians. In February of 1919, the City of San Diego paid $361,428 into the United States Treasury for the water and reservoir rights associated with the Capitan Grande Reservation. However, the Native Americans refused to give up the land until the Department of the Interior agreed to purchase the nearby Baron Long Ranch, so that it could be established as a home for the Native Americans residing on the Capitan Grande Reservation. The battle with the Native Americans and the Department of the Interior continued through the Summer of 1934 and delayed some of the construction and development activities at the Reservoir Complex (DOI 1931; Evening Tribune 1926; Thorne 2010).

Land acquisition from riparian owners for the El Capitan Reservoir Complex was met with opposition as shown in an article in the *San Diego Sun* in 1919. Colonel Ed Fletcher of the Cuyamaca Water Company was an opponent of the acquisition of the Reservoir Complex property stating that "the state has already proven that there is no water there, at least not sufficient to warrant a dam, there would be endless litigation with both the Cuyamaca Water Co. and the riparian owners (SDS 1919a)." Fletcher believed this was an impractical use of the City's money and should not be moved forward. In 1919, Fletcher appealed the land acquisition to Mayor Wilde and later appeared in a meeting with the City Council. Fletcher was supported in his opposition to the acquisition of the reservoir complex site by ranchers, including those from El Cajon, Lemon Grove, Spring Valley and La Mesa. One of the ranchers' primary concerns was losing their riparian rights to the existing water supply if the development of the El Capitan Reservoir Complex moved forward (SDS 1919a, 1919b; SDU 1926).

While the legal battles continued, funding efforts for El Capitan were also underway. In 1924 $4,500,000 in bonds for El Capitan Reservoir Complex were approved by voters, which led to the construction of the Riverview pumping plant and the Lakeside-University pipeline. Fowler went on to define the project as follows:

> The project consisted of the construction of a semi-hydraulic fill rock embankment dam and an 8-mile pipeline from El Capitan to Lakeside. Foundation exploration had shown that it would be uneconomic to build a concrete dam as originally intended. Construction began in 1932, and the project was completed in 1935. The dam is 2.7 feet high above the streambed, 1,170 feet long on the crest, and has an ungated side channel spillway 510 feet long with a capacity of 70,000 cubic feet per second. The reservoir has a capacity of 116,500 acre-feet. Of this capacity 10,000 acre-feet had been granted to the La Mesa, Lemon Grove, and Spring Valley Irrigation District at the time of the sale of the dam site to the city, and the city in turn received 5,000 acre-feet of storage capacity in Murray Reservoir (Fowler 1953).

With land acquisition being precariously decided by the courts, the road to construction of the El Capitan dam was one that was fraught with struggles. While the bonds for the

El Capitan Reservoir Complex were passed by a majority in the municipal election held on November 18, 1924, the election also served as the endpoint of an ongoing controversy over the location of the reservoir complex site. Two schools of thought were involved in the fight for the reservoir complex site, one school believed that that Mission Gorge site was the better site and the other school of thought, led by consulting engineer M.M. O'Shaughnessy, believed that the El Capitan Reservoir Complex site would provide the greatest amount of water especially when the connection to the proposed San Vicente Dam was considered in the equation (ENR 1924).

Like many other dams serving San Diego County, the design of El Capitan Dam was contested between consulting engineers M.M. O'Shaughnessy and John R. Freeman, State Engineer Ed Hyatt, and City hydraulic engineers Hiram N. Savage and Fred D. Pyle. Original designs for the site were for a concrete gravity dam, but the foundation tests proved that the decomposing granite geology of the dam location would make the cost of such a design unfeasible. Savage, Freeman, and O'Shaughnessy bickered openly about the various design flaws of other dam types before eventually settling on a combination type of dam: hydraulic fill with rockfill embankments up- and downstream. Savage eventually prepared the design of El Capitan Dam, closely following plans originally made by John R. Freeman in 1923 (Fowler 1953; Freeman 1924; WCN 1932).

In 1931, the balance needed for construction was approved by voter bond. Fowler captured the details of the funding as follows:

> The electorate of the city on December 15, 1931, approved the transfer of $2,693,000 of bonds previously voted in 1924 for the construction of a concrete gravity dam at the El Capitan site and $926,000 of other unused water supply bond funds also previously voted. A new bond issue of $184,000 was also voted, bringing the total funds to $3,803,000 to which was added a loan of $2,000,000 from the Reconstruction Finance Corporation (Fowler 1953).

Following many years of court battles, debates, land acquisitions, design reviews, and other hurdles the El Capitan authorized a significant bond measure in December of 1931. Voters approved the transfer of $2,693,000 of bonds previously voted on in 1924 for the construction of a concrete gravity dam at the El Capitan site, and $926,000 of other unused water supply bond funds also previously voted on. A new bond issue of $184,000 was also voted on, bringing the total funds to $3,803,000 funded through bonds as well as an additional loan of $2,000,000 from the Reconstruction Finance Corporation. A total of $5,803,000 was set aside for the construction and development of the El Capitan Reservoir Complex. Site work was scheduled to begin immediately and would take approximately two and a half years to complete, according to City engineer Fred Pyle (Bryan 1933; Fowler 1953; SDS 1931).

Phase 2: Construction of the Dam (1931 – 1935)

Originally, the El Capitan dam was planned as a concrete gravity dam, like other Savage designed dams in the City. However, foundation testing and exploration found that it would take excessive excavation to reach sound rock levels. Given the need for excessive excavation and the availability of fill material already in the reservoir, the idea for a concrete gravity dam was replaced by a hydraulic rock-filled embankment dam. Given the dam failures seen in the past, additional safety measures were taken during construction to minimize the risk of dam failure at El Capitan. Such steps included the construction of toewalls upstream and downstream, as well as, horseshoe shaped tunnels to provide proper drainage. (Fowler 1953).

In early December 1931, the State Engineer approved the preliminary plans for the El Capitan dam and by December 15, 1931 the electors officially authorized the construction of the dam (Figure 16). Details of the plans for the El Capitan dam were captured in an article from the WCN in 1932 and were as follows:

> El Capitan reservoir dam is to be a hydraulic fill-rock embankment structure. It will be 1160 ft. long on top and 1240 ft. thick at the base and will provide storage to elev. 750 ft. The foundation will be about 25 ft. below streambed and the spillway crest 197 ft. above streambed, the parapet crest rising 20 ft. above the spillway lip, or to elev. 770 ft. Clear width on the crest will be 20 ft. A vertical reinforced-concrete flexible core-wall 18 in. thick at the bottom and 16 in. at the top will extend from the base of the cutoff trench to elev. 770 ft. Enclosing the concrete wall will be a puddle core of fine, impervious material 30 ft. thick at the top and 125 ft. at the base. Against the puddled core will be a hydraulic fill, faced in turn with loose rock (dumped) and hand-placed surface rock. Side slopes of the dam will range from 1:2 to 1:3 on both up and downstream slopes and will be broken by berms…A 25-ft. diam. horseshoe-shaped tunnel about 1150 ft. long , on a grade of 0.0167 per ft. and lined with reinforced concrete (6-in. minimum thickness), will carry the river through the south abutment during construction. This tunnel will later be plugged with concrete and a grouted rock fill, and used as part of the outlet works. Four 40-in. cast-iron drainpipes will be laid through the plug. A large drain will be constructed along the downstream toe of the dam. There will be a concrete-lined spillway in a large cut around the north end of the dam, maximum width of spillway 200 ft., length of crest 510 ft. (WCN 1932).

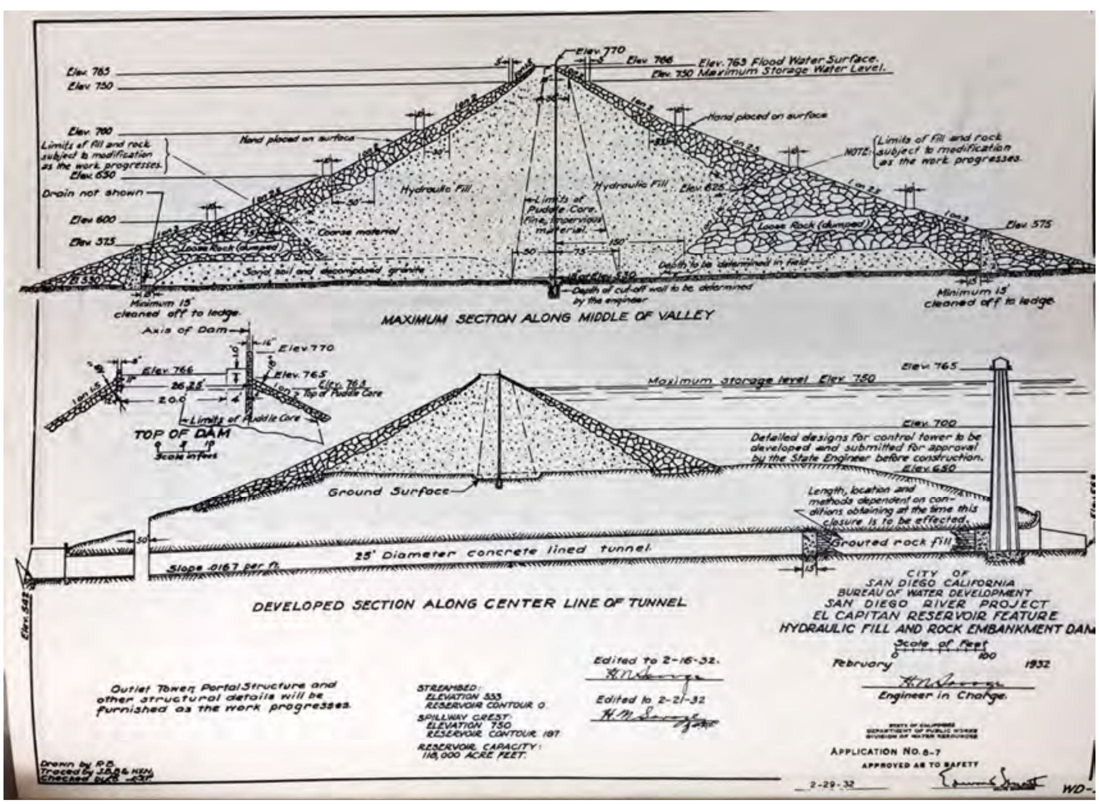


Figure 16. Combination Dam Design by H.N. Savage, approved 1932. (Hiram N. Savage Papers Collection, 1905-1933, Water Resources Collections and Archives, University of California, Riverside).

Construction and development of the El Capitan Reservoir Complex officially started on December 23, 1931 with a groundbreaking ceremony. Mayor Walter W. Austin was in attendance and tasked with turning over the first earth at the site. Shortly after the ceremony, a crew of 25 workmen began the preliminary work for the dam site. At the time of the groundbreaking, Savage was noted as having a plan to increase the workmen to a crew of 85 by the end of the month and focus on brush clearing, constructing of the housing camp and mess, as well as, sinking a foundation test pit (HN 1932; SDS 1931b).

Following the approval of general construction drawings by the State Engineer in February of 1932, proposals for the construction of the El Capitan Dam, Spillway and Outlet Works were submitted by contractors. By April of 1932, preliminary site work was well underway and Phase 2 of the project was put into full swing with the signing of a construction contract, the movement of machinery to the site, and the required road work for the increased traffic to the reservoir complex site. At the time of the contract signing by the City Council it was noted that the next step in construction would involve the establishment of the construction camp and the review of applicants for the 500 positions available for the construction of El Capitan. Preliminary estimates in April 1932 were as follows: "Work orders on the project call for a full crew of 500 men to be on the job before the end of May. The contract time for the work is two and a half years and the contract cost is $2,332,806" (SDS 1932a)." On April 23, 1932 the contract was awarded to H.W. Rohl and T.E. Connolly from Los Angeles (Bryan 1933; City of San Diego 1935; SDS 1932a).

Legal issues continued to plague the construction process. The bulk of these originated from suits and claims filed by the reservoir complex construction contractors, Rohl-Connolly. One of the early legal issues brought up by the contractors challenged the inclusion of the spillway channel extension west of Station 7+40 in the existing contract that they were working under. The case was heard before the Superior Court and Judge Clarence Harden decreed that the spillway channel extension in question was not part of the original contract. Following this decision, proposals were received by the City for the El Capitan Spillway Extension and on April 23, 1934 the contract was awarded to Bodenhamer Construction Company from Oakland in the amount of $197,700 (City of San Diego 1935; LAT 1933).

Construction activities continued on the reservoir complex site and tragedy struck on June 24, 1934 when Savage passed away. Savage was quickly replaced on the project and as the City Hydraulic Engineer by Fred D. Pyle on July 1, 1934. Under Pyle's direction the construction continued and in October of 1934 bids were again requested for additional work on the dam for the Tunnel Inner Lining. After receipt of proposals the contract for the Tunnel Inner Lining was awarded to M.H. Golden of San Diego on November 20, 1934 in the amount of $53,177.75 (City of San Diego 1935; SDU 1934a).

After the award of the Tunnel Inner Lining Contract, other work on the dam was completed by Rohl-Connolly on November 27, 1934. Bodenhamer wrapped up their work shortly thereafter on December 1, 1934. By December 4, 1934 the contractors' work was accepted by the council (Figure 17). Work for the Tunnel Inner Lining Contract continued until February of 1935 and was also accepted by the council. (City of San Diego 1935).

Figure 17. December 1934 progress photo for the El Capitan Reservoir Complex (City of San Diego 1935)

Despite the completion of work and acceptance by the council, there were claims of payment hold backs between the City and Rohl and Connolly, as well as Bodenhamer, which continued into January of 1935 (City of San Diego 1935). A final agreement and release was settled between the parties on January 12, 1935, which resulted in the dropping of the contractors' suits against the city for approximately $300,000. The following details of the agreement between the City and Connolly were included in the *San Diego Union* on January 13, 1935:

> In regard to El Capitan he [Pyle] wrote: "The contractors completed the contract work on El Capitan Nov. 27, 1934, and the work was officially accepted Dec. 4, 1934. After the spillway excavation was completed, a review of the classification was made for the final estimate with the city's consultants, and it was decided that in addition to the solid rock excavated from the spillway and placed in the rock embankment of the dam, there was an additional amount of class 1 material, equal to 11 percent of the total spillway excavation which when loosened by blasting broke down in such a way that it could not be separated from class 2 material and was accordingly placed in the spoil banks. The final estimated as prepared and checked by the hydraulic engineer has been accepted by H.W. Rohl and T.E. Connolly and a release of all claims against the city of San Diego under and by virtue of the contract has been executed by the contractors and delivered to the city (SDU 1935a)."

The final amounts paid to the contractors were settled in April 1935. According to City Hydraulic Engineer Pyle, "the El Capitan dam, a hydraulic fill-rock embankment type of dam 217 feet high was completed in 1935 at a cost of about $3,000,000. Six miles of 48-inch and two miles of 36-inch steel pipe are required before the water can be brought to San Diego (Pyle 1936)."

Phase 3: Completion of the El Capitan Reservoir Complex and Dedication Ceremony (1935-1936)

On November 6, 1934, San Diego residents voted to defeat a bond proposal to fund the 8-mile pipeline that would join the nearly completed El Capitan Reservoir Complex to the municipal water system, granting the City access to the water supply therein. At this point, construction of the dam was quickly drawing to a close, leaving City officials rushing to develop an alternative plan for the delivery of impounded water to San Diego Residents. Despite this delay in the use of the reservoir, the City Council made plans for a large dedication ceremony for the dam in February 1935. The timing of the ceremony was planned around the last stages of work on the interior functions of the dam, which involved the plugging and relining of the of the outlet tunnel by contractor M. H. Golden (SDU 1934b, 1934c, 1935c).

Apart from the work on the outlet tunnel, efforts on the dam were officially complete on November 27, 1934 and the work was subsequently accepted on December 4, 1934 by City officials. By mid-January 1935, T.E. Connolly, of the contracting firm Rohl and Connolly, the engineers responsible for the construction of the dam, claimed that the firm was not paid in full for their work and filed claims of declaratory relief against the City. When the engineers agreed to drop their suit and any future claims, they were paid in full the balance they were owed on January 14, 1935. Additionally, the Bodenhammer Construction Company, responsible for the construction of the spillway extension, received the remaining balance they were owed at this time also (Pyle 1935c; SDS 1935a, 1935b, 1935c; SDU 1934d).

Following settlement of the cost for the construction of the dam, plans were made for a dedication ceremony on February 22, 1935, set for the Friday immediately following the completion of the outlet tunnel work. The completion of the outlet tunnel on February 20, 1935 meant that the there was a higher probability of impounding winter rains. The San Diego Union reported that the reservoir was expected to have a lake "60 feet deep and more than a mile long, containing about a billion gallons of water" (SDU 1935c) by the time of the dedication ceremony. Additionally, roads leading to the dam and parking areas with a cumulative capacity of 1,500 automobiles were cleared and graded by the city for the upcoming dedication (Pyle 1935a; SDU 1935b, 1935c; 1935d).

Approximately 1,500 onlookers gathered at the dam site on February 22 to watch the ceremonies, their enjoyment of the festivities aided by the installation of loud speakers (Figure 18). Prepared speeches were delivered by Albert V. Mayrhofer, the Chairman of the Water Commission, Terrance B. Cosgrove, the legal advisor to the City, W. H. Holmes, deputy state Engineer, Albert E Bennett, acting Mayor, and Hydraulic Engineer Fred Pyle, among others. The ceremonies highlighted the role that hydraulic engineer and builder Hiram Newton Savage played in the project prior to his death, and the dedicatory plaque unveiled by Cosgrove bore Savage's name prominently among the many other names who made the completion of the dam possible. Music was provided by the SERA band under the direction of J. B. Larkin (Evening Tribune 1935). An additional 1,000 people paid to tour the dam in the afternoon following the dedication (Evening Tribune 1935; Pyle 1935b, 1935c).

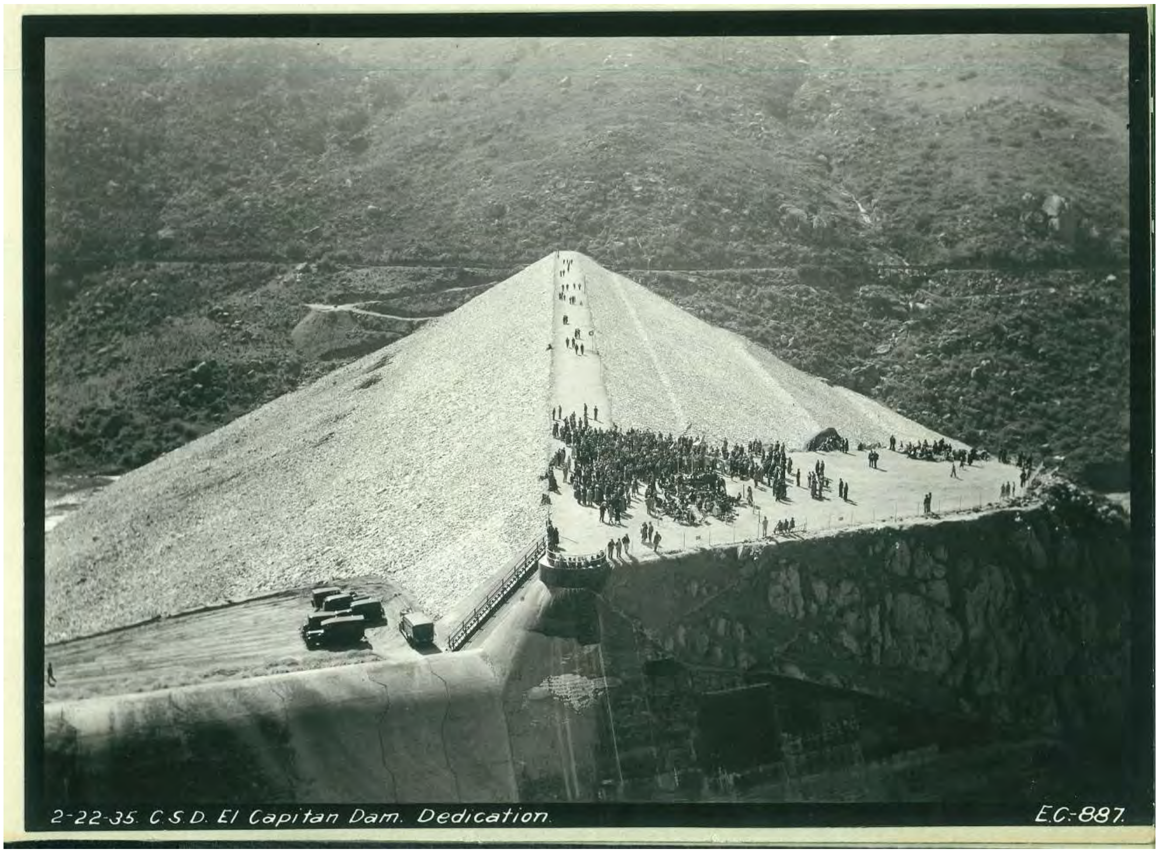


Figure 18. El Capitan Reservoir Complex Dedication ceremony, February 22, 1935 (City of San Diego 1935)

Nevertheless, following the ceremony, the prospect of San Diego residents receiving the impounded water from the newly completed and dedicated reservoir complex was still far off. The first recipients of water pumped from the El Capitan Reservoir Complex were not residents of San Diego proper, but rather residents of the La Mesa Irrigation District, who received water by way of a pump near the reservoir complex outlet which lifted 18,000.000 gallons of water into the district's flume starting on July 11, 1935. A pipe to Lakeside from the reservoir complex was still in the planning stages (SDU 1935f).

When the bonds to fund the pipeline were defeated in November 1934, the City Attorney, Clinton Byers, attempted loan negotiations with the Reconstruction Finance Corporation (RFC) to secure a loan for the cost of the El Capitan pipeline. These efforts ultimately failed, and it was not until August 1935 that the City revised its agreement with the La Mesa, Lemon Grove and Spring Valley Irrigation District so that it would be responsible for funding a 10,400-foot portion of the proposed pipeline leading from the reservoir complex to the district pumping station located at El Monte. La Mesa was entitled to approximately half of the water impounded by the reservoir, and the funding of this section represented their respective share of the pipeline cost. In order to fund the remainder of the pipeline, the City district obtained aid from the Public Works Administration and a 30 percent grant from the federal government (SDS 1935d; SDU 1934a, 1935e, 1935f, 1935g).

The pipeline project was awarded to the Consolidated Steel Corp. Ltd. in February of 1936. The project would entail laying two miles of 36-inch coated steel pipe and another four miles of 48-inch coated steel pipe between Lakeside and the junction with the two miles of 48-inch coated steel pipe to be funded by the La Mesa Irrigation District. Work on the pipeline began in May 1936 with eight miles of trench excavation, and ended six months later in November, following the installation of appurtenances and final inspections. The completion of the El Capitan Pipeline meant that San Diego residents were finally granted access to the impounded water from El Captain Reservoir. The twenty-one-year project planning period, including land purchase, numerous legal battles, design, and construction of the reservoir complex, was now officially complete (SDU 1936a; 1936b, 1936c).

Alterations and Post-Construction Developments (1935-1939)

No evidence of alterations or updates to the El Capitan Reservoir Complex were encountered during the course of archival research. However, historical sources did indicate that the property below the reservoir complex was used as a Prison Rehabilitation Camp between December 1934 and 1939, and the inmates made changes to the site surrounding the reservoir complex during this period.

Following the completion of the El Capitan Reservoir Complex in 1935, the City of San Diego Prison purchased the permanent buildings and equipment from contractors Rohl and Connolly located at the base of the of the reservoir complex for $1,500 and established the El Capitan Rehabilitation Camp on the land . The camp housed an average of 100 incarcerated men who labored daily on the property, clearing rocks to build roads, developing attractive landscaping in the recreation areas around the reservoir complex, establishing a kitchen garden, and clearing an area for a farm to raise pigs. The smaller rocks cleared from the property were relocated to the El Capitan camp grounds and stacked to form a substantial decorative wall, while the larger stones were set aside and proposed to create a protective barrier around the spillway channel. Although the Rehabilitation Camp was considered a worthwhile venture during its initial years, the camp was abandoned in 1939 citing a less than desirable return for the cost of the project (City of San Diego 1935; Pyle 1935c; SDU 1938; SDU 1939).

Engineer: Hiram Newton Savage (1861-1934)

Hiram Newton Savage (Oct 6, 1861-June 24, 1934) was born in Lancaster, New Hampshire, to farmer Hazen Nelson Savage and Laura Ann Savage (née Newton). In 1887, he graduated with a Bachelor’s in Science (B.S.) from New Hampshire College of Agriculture and Mechanical Arts, following that degree in 1891 with a Civil Engineering degree from Thayer School of Engineering at Dartmouth College. After graduating, Savage immediately began seeking engineering work (WRCA 2005).

While completing his degree at Dartmouth, Savage began his engineering career in Tennessee, where he was hired as assistant engineer by the East Tennessee and Georgia Railway, the Nashville and Tellico Railway, and the Athens (Tennessee) Improvement Company in 1888. In 1889 he was an Assistant Engineer for the Hydraulic Mining and Irrigation Company in the San Pedro Mining District of New Mexico, and later that same year he served as Chief Engineer at the Rio Grande Water Company in New Mexico. In 1891, Savage relocated to Southern California, where the San Diego Land and Town Company in National City, California, hired him as chief engineer; he worked there until 1903. His biggest achievement at San Diego Land and Town Company was the enlargement of the Sweetwater Dam, raising the dam to 110 feet tall and resulting in a total storage capacity greater than 26,000 acre-feet. Completed in 1911, the work entailed addition of a 20-

foot-tall parapet along the top of the dam; addition of concrete to the downstream side of the dam to compensate for the extra pressure from the increased water storage; inserting a two-chute overflow weir on left side of the dam; and raising the height of the outlet tower (Reynolds 2008, WRCA 2005).

While with the San Diego Land and Town Company, Savage also took outside consultant work. He took consulting jobs with several San Diego-area railroads: the San Diego and Cuyamaca Railway, the San Diego and La Jolla Railway Company, and the Cuyamaca Beach Railway Company. He also consulted for water-related engineering projects with the Cuyamaca Water Company, including the Zuninga Shoals Jetty Project for the City of San Diego. In 1895, the SCMWC hired Savage as a Consulting Engineer in connection with the Morena, Upper Otay, and Lower Otay Dams, and the water-conveyance system to the City (WRCA 2005).
In 1903, Savage was appointed Consulting Engineer for the United States Reclamation Service (a predecessor to the Bureau of Reclamation). In 1905, Savage was promoted to the Supervising Engineer of the Northern Division of the Reclamation Service in Montana, North Dakota, and Wyoming, where he oversaw several Reclamation Service dam projects, such as: the Milk River Project and Sun River Dam Project in Montana, the Williston Dam project in North Dakota, and the Shoshone Dam Project in Wyoming, which was at the time of its construction the highest dam in the world. Savage also consulted on other Reclamation Service projects for other regional divisions, including the Southern Division’s Salt River Valley and Roosevelt Dam projects in Arizona. During his time with the Reclamation Service, New Hampshire State College awarded Savage with an honorary Doctor of Science in Engineering degree in 1913. His engagement at the federal level lasted from 1905 until 1915, before he resigned and returned to Southern California. In 1916, the Sweetwater Water Company of California hired Savage as a Consulting Engineer and later as a Supervising Engineer for the enlargement of the Sweetwater Dam, which had been damaged in the 1916 floods (Bureau of Reclamation 2018; WRCA 2005).

Savage was officially hired by the City of San Diego as the city’s Hydraulic Engineer on June 4, 1917. The position had not previously existed for the city, and came with the authority to direct the water department, design infrastructure, and make recommendations There he continued the water infrastructure recovery from the 1916 floods. The flood of 1916 had destroyed Lower Otay dam, a structural failure that flooded Otay Valley and caused 22 drowning deaths. Savage’s role in the reconstruction of Lower Otay Dam, the construction of Barrett Dam, and the repairs to Sweetwater Dam and Morena Dam, solidified the important role that he played in San Diego’s water system. The acquisition of Savage was seen as an immeasurable triumph, the results of which would put the City of San Diego ahead both technologically and financially (McGlashan and Ebert 1918; San Diego Evening Tribune 1917; San Diego Union 1918c; Scientific American 1923; WRCA 2005).

In addition to Savage’s successful dam projects, he also submitted several reports on the City’s future needs for new water resources and infrastructure development. Savage also brokered several deals to secure water rights for the City in several cases. These reports and legal issues contributed to the deterioration of Savage’s relationship and rapport with the City Council. Savage’s employment as City Hydraulic Engineer for the City of San Diego lasted until 1923, when he was summarily dismissed after multiple disputes with the City Council and consulting hydraulic engineers J. B Lippincott and John R. Freeman (LAT 1922; San Diego Evening Tribune 1923b; San Diego Sun 1923; WRCA 2005).

After his dismissal from the City’s employment, Savage embarked on two world tours from 1923 to 1925, studying foreign engineering projects at the Aswan Dam in Egypt, water supply projects in England, and irrigation projects in Brazil, before returning to the United States and offering hydraulic engineering consulting services. Savage’s work during this period is unknown (WRCA 2005).

Meanwhile, by 1928, the City of San Diego's water infrastructure development suffered without Savage's leadership, culminating in the ultimate failure and abandonment of the Sutherland Dam project. The City invited Savage to return as Hydraulic Engineer, heading the Municipal Bureau of Water Development, Operations, and Maintenance. Savage returned to San Diego in 1928, with the condition that he be allowed to work independently of political interference. This was not to be. The City Council resumed their antagonistic relationship with Savage almost immediately, undercutting his authority by hiring consulting engineers who publicly dissented with Savage's ideas and publicly criticizing Savage's reports. Savage, for his part, resumed securing water rights for the City and began the El Capitan Dam project in 1928. His re-employment with the city of San Diego lasted until 1933 when Savage resigned, but he remained a consultant until the dam was completed. Shortly after Savage's resignation, he succumbed to a longstanding sickness and died in 1934 from heart failure (Savage 1932; San Diego Evening Tribune 1934; San Diego Sun 1932, 1933; San Diego Union 1932a, 1934a; WRCA 2005).

Savage's career as an engineer extended 46 years, from 1888 to his death in 1934. A sample of his known work includes:

- Sweetwater Dam and Distribution System, San Diego, California, 1891
- Sweetwater Park and Race Track, National City, California 1891
- Zuniga Jetty, San Diego, 1904
- Lower Yellowstone Project, Montana 1904
- Huntley Project, Montana, 1907
- Williston Project, North Dakota, 1907
- Buford-Trenton Project, North Dakota, 1907
- Sun River Project, Montana, 1908
- Flathead Irrigation Project, Montana, 1908
- Shoshone Project, Wyoming, 1908-1910
- Milk River Project, Montana, 1910
- St. Mary Diversion Dam, Montana, 1915
- Sweetwater Dam Enlargement Project, San Diego County, California 1917
- Lower Otay Dam (Savage Dam), San Diego County, California 1919
- Morena Dam Enlargement Project, San Diego County, California 1923
- Barrett Dam, San Diego County, California 1922
- El Capitan Reservoir Complex, San Diego County, California 1932-1934

NRHP and CRHR Significance Evaluation

NRHP Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.

CRHR Criterion 1: Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

The El Capitan Reservoir Complex was constructed in 1935 during a significant period in San Diego source water development history: Post St. Francis Dam Disaster Development (1928-1947). This significant period of water infrastructure development in San Diego is clearly defined by two events, the St. Francis Dam Disaster in 1928 and the Importation of Colorado River Water in 1947. In 1928 the St. Francis Dam in Santa Clara Valley outside Los Angeles failed, killing 430 people, destroying 1,250 buildings and 7,900 acres of farmland, to become one of the greatest dam failure disasters of the 20th century. Between 1929 and 1931, the State engineer examined 827 dams and found near one third of them to require significant repairs according to new safety guidelines. In San Diego, this St. Francis Dam Disaster and subsequent dam study prompted major improvements to several dams including: reservoir capacity and spillway enlargement at Morena Dam; spillway enlargement and a new pipeline and filtration system at Lower Otay Dam; enlargement of reservoir capacity at Chollas Dam; crack monitoring, buttress modification, and spillway retrofit at Lake Hodges Dam; and the height increase and spillway retrofit at Barrett Dam.

Another major event occurred in 1928 in response to the St. Francis Dam Disaster: the City of San Diego re-hired Hiram Newton Savage back into his role as the City's Hydraulic Engineer. After firing him in 1923, the City Council re-hired Savage to complete the State Engineer's recommended changes. In addition to implementing the required repairs ordered by the State engineer, Savage was also the designer and water department lead for El Capitan Dam, until his death in 1934. Fred Pyle, Savage's Assistant, brought the El Capitan Dam to completion in 1935.

The remainder of this period is characterized by preparation for the importation of Colorado River water including the completion of Boulder Dam (later, the Hoover Dam) in 1935, the Colorado River Aqueduct in 1939, the All American Canal in 1941, the San Vicente Dam in 1943, and the construction of the San Diego Aqueduct starting in 1945. The San Diego Aqueduct, when complete, would serve as the eventual link to the City's Colorado River water and end reliance on local reservoirs as San Diego's sole water source.

The El Capitan Dam, constructed from 1931-1935 was the then-largest unit in the City-owned water system at the time of its completion. The dam's construction openly acknowledged that the City of San Diego could "safely" increase their population with their newly assured water supply.

In addition to its role in the development of San Diego's water history, the litigation associated with the El Capitan Reservoir Complex links the site with an important turning point in the City's water history. Two major legal battles were fought over the El Capitan Dam. The first was the over the displacement of the Capitan Grande tribe from their reservation, when the City of San Diego applied to purchase and flood reservation land for the El Capitan Reservoir Complex from the Department of the Interior. Despite protests at the time and years of demonstrations and civil disobedience in the following years, the Department of the Interior approved the purchase, and the decision was held up in court. Another case involved the City suing the Cuyamaca Water Company, the La Mesa, Lemon Grove and Spring Valley Irrigation District, and various riparian rights-holders for water rights to the San Diego River. During the course of litigation, the City was able to establish and prove their paramount water rights to the San Diego River. The controversy and lawsuits associated with that dam gave it wide-reaching publicity and represent one of only two times that pueblo water rights were upheld over two riparian water rights of individual owners. This court battle was decided by the US Supreme Court who upheld the City's water rights in 1934.

The El Capitan Dam also has significance during this period of development because of its position in the San Diego water system's El Capitan Pipeline, which had the largest capacity in the City reservoir system until as recently as 2015. The dam was part of a system of City-owned water infrastructure that supplied a burgeoning city with water during the early twentieth century. It played an intricate role on the development of the system at the end of the 1920s when the City of San Diego sought sole control over water rights.

For the reasons discussed above, the El Capitan Reservoir Complex appears eligible under Criterion A/1 as both a contributing element of the City of San Diego Source Water System, and as an individual property.

NRHP Criterion B: Associated with the lives of significant persons in our past.

CRHR Criterion 2: Associated with the lives of persons important in our past.

The El Capitan Reservoir Complex does have connections to noted individuals, including legal opponent Colonel Ed Fletcher. Despite this association, the complex is not connected with Fletcher in a way that demonstrates a significant association with the lives of persons important in our past. Therefore, the El Capitan Reservoir Complex does not appear eligible under NRHP/CRHR Criterion B/2.

NRHP Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

CRHR Criterion 3: Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

The El Capitan Dam was designed specifically with its environment and foundation in mind. Because of the local geological conditions, a traditional rockfill embankment dam and the City-preferred concrete gravity dam designs were deemed unsafe for the El Capitan Dam. Multiple prominent engineers disputed possible solutions and designs, but eventually settled on a hybrid design that included elements of both hydraulic rockfill dams and concrete gravity dams. The El Capitan Dam embodies distinctive characteristics of a hydraulic rock-filled embankment dam with rockfill embankments upstream and downstream. This dam shows how versatile City Hydraulic Engineer Hiram N. Savage could be with his designs in conforming to what the situation called for. The El Capitan Reservoir Complex's period of significance with regard to Criterion C/3 is limited to its year of completion in 1935.

The El Capitan Dam is also significant for its association with City Hydraulic Engineer Hiram Newton Savage, as this was the final project Savage would work on for the City. Hiram N. Savage's career began with the Bureau of Reclamation and ended in San Diego. In San Diego, Savage worked on Sweetwater Dam (repair), Morena Dam (height increase, spillway repair), Lower Otay Dam (design/rebuild), Barrett Dam (design/build), and El Capitan Reservoir Complex (design/build). Savage was dismissed from his role as the City's Hydraulic Engineer in 1923, amidst ongoing antagonism from the City Council and poor public image. The City, however, invited Savage to return specifically to work on securing water rights to the San Diego River and to design and oversee construction of El Capitan Reservoir Complex. Savage resigned from his role as City Hydraulic engineer in 1933 amidst new hostility from the City and personal health issues. Assistant Engineer Fred D. Pyle assumed Savage's management role after his resignation. The El Capitan Dam is Savage's last designed dam project as the City of San Diego's hydraulic engineer, before he died. El Capitan was completed just a few months later. Therefore, El Capitan Reservoir Complex was significant in shaping the overall career of Savage.

In summary, the El Capitan Dam is a unique example of the hybridization of different dam designs, tailored to its specific site. The hydraulic rock-filled embankment dam also represents a notable engineering achievement for the City of San Diego and is the final work of master engineer Hiram N. Savage. Therefore, the subject property appears eligible under NRHP/CRHR Criterion C/3 as both a contributing element of the City of San Diego Source Water System, and as an individual property.

NRHP Criterion D: Have yielded, or may be likely to yield, information important in history or prehistory.

CRHR Criterion 4: Has yielded, or may be likely to yield, information important in prehistory or history.

Archaeological survey was not conducted for this project. At this time there is no indication that the El Capitan Reservoir Complex has the potential to yield information important to state or local history. Therefore, the property appears not eligible under NRHP/CRHR Criterion D/4.

City of San Diego Significance Evaluation

Criterion A: Exemplifies or reflects special elements of the City's, a community's, or a neighborhood's historical, archaeological, cultural, social, economic, political, aesthetic, engineering, landscaping, or architectural development.

As stated above in the NRHP/CRHR A/1 criterion discussion above, the El Capitan Reservoir Complex reflects special elements of City of San Diego's source water infrastructure development, as well as elements of the City's political development as it established legal cases for the City's paramount water rights to the San Diego River. Construction of the El Capitan Reservoir Complex made a significant contribution to the history of water development in the San Diego region and was a milestone in the City's quest to achieve source water independence. The reservoir complex is part of a post-1916 Flood push for increased water storage infrastructure that is responsible for the construction of many other important dams that serve the City of San Diego. The El Capitan Dam, constructed from 1931-1935 was the then-largest unit in the City-owned water system at the time of its completion. The reservoir complex's construction openly acknowledged that the City of San Diego could "safely" increase their population with their newly assured water supply.

As stated above, the complex's construction brought about two major legal battles. The first was over the displacement of the Capitan Grande tribe from their reservation, when the City of San Diego applied to purchase and flood reservation land for the El Capitan Dam from the Department of the Interior. The Department of the Interior approved the purchase, and the decision was upheld in court. Another case involved the City suing the Cuyamaca Water Company, the La Mesa, Lemon Grove and Spring Valley Irrigation District, and various riparian rights-holders for water rights to the San Diego River. The City was able to establish and prove their paramount water rights to the San Diego River. The controversy and lawsuits associated with that reservoir complex gave it wide-reaching publicity, and represent one of only two times that pueblo water rights were upheld over two riparian water rights of individual owners. Therefore, the El Capitan Reservoir Complex appears eligible under City Criterion A.

Criterion B: Is identified with persons or events significant in local, state, or national history.

Persons: Although the subject property does have connections to noted individuals, the subject property is not connected with noted historical individuals in a way that directly represents their contributions within the local historic context.

Events: As described in the NRHP/CRHR A/1 criterion discussion above(, the El Capitan Reservoir Complex is associated with events significant in local, state, and national history. Construction of the El Capitan Reservoir Complex was a major undertaking in a remote part of San Diego County that required significant planning and coordination, and was an important event at the time construction began. The complex is directly associated with important events related to water development in the San Diego region, namely with the City gaining source water independence, its incredibly important legal battles which established City of San Diego's paramount water rights, and being a critical component to the water infrastructure that supported the City's growth and development. Therefore, the El Capitan Reservoir Complex appears eligible under City Criterion B.

Criterion C: Embodies distinctive characteristics of a style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship.

As described under NRHP/CRHR Criterion C/3 (see full discussion above), El Capitan Dam was designed specifically with its environment and foundation in mind. Because of the local geological conditions, a traditional rockfill embankment dam and the City-preferred concrete gravity dam designs were deemed unsafe for the El Capitan dam site. Multiple prominent engineers disputed possible solutions and designs, but eventually settled on a hybrid design that included elements of both hydraulic rockfill dams and concrete gravity dams. The settled design was a hydraulic rock-filled embankment dam with rockfill embankments upstream and downstream. It is a unique example of the hybridization of different dam designs, tailored to its specific site. The dam's period of significance spans the start of the sites development in 1924 and ends at the dams opening in 1936. Therefore, the El Capitan Reservoir Complex appears eligible under City Criterion C.

Criterion D: Is representative of the notable work or a master builder, designer, architect, engineer, landscape architect, interior designer, artist, or craftsman.

As described under NRHP/CRHR Criterion C/3 (see full discussion above), the El Capitan Dam is a notable work of master engineer Hiram N. Savage The design of El Capitan Dam displays the ingenuity and adaptability of Savage at the end of his engineering career as he fiercely promoted for the good of the City of San Diego.

Hiram N. Savage's career began with the Bureau of Reclamation and ended in San Diego. In San Diego, Savage worked on Sweetwater Dam (repair), Morena Dam (height increase, spillway repair), Lower Otay Dam (design/rebuild), Barrett Dam (design/build), and El Capitan Dam (design/build).

Savage was dismissed from his role as the City's Hydraulic Engineer in 1923, amidst ongoing antagonism from the City Council and poor public image. The City, however, invited Savage to return specifically to work on securing water rights to the San Diego River and to design and oversee construction of El Capitan Dam. Savage resigned from his role as City Hydraulic engineer in 1933 amidst new antagonism from the City and personal health issues. Assistant Engineer Fred D. Pyle assumed Savage's management role after his resignation. The El Capitan Dam is Savage's last designed reservoir complex project as the City of San Diego's hydraulic engineer, before he died after a long bout with illness. El Capitan was completed just a few months later. Therefore, El Capitan Dam was incredibly important to shaping the overall career of Hiram N. Savage. Therefore, the El Capitan Reservoir Complex appears eligible under City Criterion D.

Criterion E: Is listed or has been determined eligible by the National Park Service for *listing on the National Register of Historic Places or is listed or has been determined eligible by the State Historical Preservation Office for listing on the State Register of Historical Resources.*

The El Capitan Reservoir Complex is not known to be on any local, state, or national list of significant properties, nor is it known to have been determined eligible for listing on any register. Concurrence of eligibility by the State Historic Preservation Office is pending. Therefore, at this time the El Capitan Reservoir Complex appears not eligible under City Criterion E.

Criterion F: Is a finite group of resources related to one another in a clearly distinguishable way or is a geographically definable area or neighborhood containing improvements which have a special character, historical interest, or aesthetic value, or which represent one or more architectural periods or styles in the history and development of the City.

As described under NRHP/CRHR Criteria A/1 and C/3 (see full discussion above),the El Capitan Reservoir Complex is significant for it role, function, and design within the larger City of San Diego Source Water System, of which it is a contributing resource to. The City of San Diego Source Water System includes ten (10) impounding reservoir complexes owned/operated by the City that function as part of the City’s municipal water-supply system. These resources and their related infrastructure (e.g., dams, outlet towers, conduits, flumes, and pipelines) constitute a finite group of resources related to one another in a clear way, steeped in historical interest and representative of significant engineering achievements. Taken as a whole, these resources (including the El Capitan Reservoir Complex) are significant for their role in the City’s source water system, starting with the earliest efforts to establish privatized water in the 1880s soon followed by construction of the earliest reservoirs, Lake Cuyamaca (1887) and Sweetwater Reservoir (1888). The period of significance ends with construction of the San Diego Aqueduct, and the importation of Colorado River Water for the first time into the San Vicente Reservoir (1947), which forever changed the composition of City’s source water supply. Therefore, the El Capitan Reservoir Complex appears eligible under City Criterion F.

Integrity Assessment

Overall the El Capitan Reservoir Complex retains integrity of location, setting, materials, workmanship, association, and feeling and a slightly diminished integrity of design. While some secondary elements of the complex (e.g. Keeper’s house) suffer from a lack of integrity, the complex as a whole retains requisite integrity, as described below:

Location: The complex retains integrity of location. The location of the complex, a portion of the land being Federal land and the site of the Capitan Grande Reservation, was constructed between El Capitan and Lakeside. The complex’s location is highly important given the role of the location as the feeder to the El Capitan Pipeline, which extends approximately 30 miles to the city and therefore one of the feeder reservoirs to San Diego. The complex has never been shifted or relocated. As such, the El Capitan Reservoir Complex retains integrity of location.

Setting: The complex retains integrity of setting. Unlike some of the other components of the City’s source water system, the El Capitan Reservoir Complex has had very little development around it and the majority of the surrounding land remains open as it was when the dam was constructed. As such, the El Capitan Reservoir Complex retains integrity of setting.

Design: The El Capitan Dam, outlet tower, and auxiliary spillway retain integrity of design. Though there have been minor repairs to all structures, there are no significant alterations or incompatible departures from H. N. Savage's 1931 design. The dam structure still operates as intended and originally designed, as a hydraulic rock-filled embankment dam. While other sections of the larger complex have diminished integrity of design, the complex as a whole retains the requisite integrity of design.

Materials: Similarly, the El Capitan Dam and associated engineering structures retain integrity of materials. No new materials have been introduced to the dam, outlet tower, or auxiliary spillway. All minor repairs have been completed with in-kind materials.

Workmanship: The El Capitan Dam and associated engineering structures retain integrity of workmanship. The evidence of the craftsmanship of the workers who built the dam and engineering structures is evident in the still-visible concrete board forms on the dam, auxiliary spillway, and outlet tower.

Association: The El Capitan Dam, outlet tower, auxiliary spillway, and associated features and buildings retain integrity of association. They were designed, built, and operated by city employees for the purpose of supplying water to the City of San Diego. The association to the City of San Diego is especially strong insofar that the dam still operates as intended by the City as it did the day it was dedicated in 1935.

Feeling: The El Capitan Reservoir Complex retains integrity of feeling. The original feeling of an early-twentieth century dam and reservoir operating as an extension of the City of San Diego outside of city limits is retained by the lack of modern buildings around it. The set of hills to the north and south of the complex, keep it isolated from modern residential developments and the sightline from the dam remains open.

B12. References (Continued):

Andrus, Patrick W. and Rebecca H. Shrimpton. 2002. "How to Apply the National Register Criteria for Evaluation." Bulletin 15. U.S. Department of the Interior, National Park Service. Accessed July 1, 2018. https://www.nps.gov/nr/publications/bulletins/pdfs/nrb15.pdf

BOR (Bureau of Reclamation). 2018. "Projects and Facilities." *Reclamation: Managing Water in the West.* Accessed July 12, 2018.

Bryan, R.P. 1933. "El Capitan Water Supply Dam for San Diego." *Western Construction News and Highway Builder.* December 1933. On file at the City of San Diego Public Utilities Department Archives.

Caltrans (California Department of Transportation) and JRP Historical Consulting Services. 2000. *Water Conveyance Systems in California: Historic Context Development and Evaluation Procedures*. Sacramento, California: California Department of Transportation. Accessed June 2018. http://www.dot.ca.gov/ser/downloads/cultural/CanalsDitches.pdf

City of San Diego. 1935. *El Capitan Feature Histories*. Volumes I-VI. On file at the City of San Diego Public Utilities Department Archives.

Crawford, Richard. 2011. *The Way We Were in San Diego*. Charleston, South Carolina: History Press.

DOI (US Department of the Interior). 1931. "Memorandum for the Press." July 20, 1931. Hiram N. Savage Papers, 1905-1933 Collection. Water Resources Collections and Archives, University of California Riverside.

Engineering News Record (ENR). 1924. "San Diego Votes Bonds for El Capitan Dam." *Engineering News Record*. December 11, 1924. On file at the San Diego Public Utilities Department Archive.

Evening Tribune 1923. "Discharge of Savage by City Manager Has Approval of Council." *San Diego Evening Tribune*. June 18, 1923. On file at the San Diego Public Utilities Department Archives.

Evening Tribune. 1926. "Campaign Committee Asks Voters to Make Water Bonds Unanimous." Genealogybank.com: *The Evening Tribune* (San Diego, CA), October 11, 1926 pg. 14.

Evening Tribune. 1934. "Savage Still at Work in Interest of City When Heart Ends Task" *The Evening Tribune*. June 25, 1934. Accessed July 11, 2018 from geneologybank.com.

Evening Tribune. 1935. "El Capitan Dedicated as Thousands Look on; Tribute Paid to Savage" Genealogybank.com: *The Evening Tribune* (San Diego, CA) February 22, 1935, pgs. 1-2.

Fowler, L. 1953. "A History of the Dams and Water Supply of Western San Diego County." Thesis; University of California. On file at the City of San Diego Water Utilities Department Archives.

Freeman, John R. 1924. "Brief Summary of Freeman Telegraphic Recommendations (dated February 28, 1924)." Hiram N. Savage papers collection, 1905-1933, Water Resources Collections and Archives, University of California, Riverside.

Hennessey, Gregg. R. 1978. "The Politics of Water in San Diego 1895–1897." *The Journal of San Diego History,* Summer 1978, 24(3). Accessed June 2018. http://www.sandiegohistory.org/journal/1978/july/water/.

Hillcrest News (HN). 1923. "Mayrhofer Scores Mayor Bacon on Water Controversy." *Hillcrest News.* February 8, 1923. On file at the City of San Diego Water Utilities Department Archives.

HN. 1932. "Ground is Broken at El Capitan." *Hillcrest News*. January 1, 1932. On file at the City of San Diego Water Utilities Department Archives.

Hill, Joseph. 2002. "Dry Rivers, Dammed Rivers and Floods: An Early History of the Struggle Between Droughts and Floods in San Diego" *The Journal of San Diego History,* Winter, 2002, 48. Accessed June 2018. https://sandiegohistory.org/journal/2002/january/hill-2/.

Los Angeles Times (LAT). 1896. "San Diego County." *Los Angeles Times.* Feb 15, 1896. Page 13. Accessed on May 11, 2018 on Newspapers.com.

LAT. 1922. "City to Employ Special Engineer." *Los Angeles Times*. May 30, 1922. On file at the San Diego Public Utilities Department Archive.

LAT. 1930. "Conservation and Control: The Romance of Dam Building in the Southwest." *Los Angeles Times*. January 1, 1930. Clipping on file at the San Diego Public Utilities Department Archive.

LAT. 1933. "Dam Deadlock Action Delayed." *Los Angeles Times*. April 13, 1933. On file at the San Diego Public Utilities Department Archive.

McGlashan, H.D., and F.C. Ebert. 1918. "Southern California Floods of 1916." *Water Supply Paper* 426. U.S. Department of the Interior. Accessed June 2018. http://pubs.usgs.gov/wsp/0426/report.pdf.

McGrew, Clarence Alan. 1922. "City of San Diego and San Diego County: The Birthplace of California," Volume II. Chicago, Illinois, and New York, New York: The American Historical Society. Accessed June 2018. https://ia800200.us.archive.org/8/items/cityofsandiegosa01mcgr/cityofsandiegosa01mcgr.pdf.

Meixner, G. Donald. 1951. "Historical Development of Water Utilization." Draft. On file at the San Diego Public Utilities Department Archive.

Ormsby, Burke. 1966. "The Lady Who Lives by the Sea." *The Journal of San Diego History* 12(1). Accessed June 2018. http://sandiegohistory.org/journal/1966/january/ladybysea/.

Pyle, Fred D. 1935a. "February –Second Ten Day Period Report" in <u>El Capitan Feature Histories, Volume VI</u>, pg. 3565-3566. On file at the City of San Diego Public Utilities Department Archives..

Pyle, Fred D. 1935b. "February –Third Ten Day Period Report" in <u>El Capitan Feature Histories, Volume VI</u>, pg. 3567-3570. On file at the City of San Diego Public Utilities Department Archives.

Pyle, Fred D. 1935c. "El Capitan Dam and Reservoir." *The Municipal Employee*, Volume III, No. 8, February 1935. Pg. 1-7. On file at the City of San Diego Public Utilities Department Archives.

Pyle, Fred D. 1936. "History of the San Diego City Water System." April 10, 1936. Inventory of Fred D. Pyle Papers, 1926-1947. Water Resources Collections and Archives, University of California, Riverside.

San Diego History Center. 2018a. "Biography: John D. Spreckels (1853–1926)." Accessed June 2018. http://www.sandiegohistory.org/archives/biographysubject/spreckels/.

San Diego History Center. 2018b. Photograph Collection Accessed In Person 2018.

SDS (The San Diego Sun). 1919a. "Fletcher Protests El Capitan Action." *San Diego Sun.* August 19, 1919. On file at the City of San Diego Public Utilities Department Archives.

SDS. 1919b. "El Capitan Water Fight Opens Here." *San Diego Sun.* August 25, 1919. On file at the City of San Diego Public Utilities Department Archives

SDS. 1923. "Leaks Found in Lower Otay Dam; City Water Engineer Savage Fired." *The San Diego Sun*, June 15, 1923, pg. 1.

SDS. 1931a. "800 Men Will Get Work on Project; Bonds are Okayed." *San Diego Sun*. December 16, 1931. On file at the City of San Diego Public Utilities Department Archives.

SDS. 1931b. "Mayor Turns First Earth at Dam Site." *San Diego Sun*. December 23, 1931. On file at the City of San Diego Public Utilities Department Archives.

SDS. 1932a. "Crew Salutes El Capitan." *San Diego Sun*. April 25, 1932. On file at the City of San Diego Public Utilities Department Archives.

SDS. 1932b. "City Manager Ousts Savage." *San Diego Sun*. August 15, 1932. On file at the City of San Diego Public Utilities Department Archives.

SDS. 1933. "Savage to Quit Engineer's Port in Row over Capitan." *San Diego Sun*. May 15, 1933. On file at the City of San Diego Public Utilities Department Archives.

SDS. 1935a. "Dam Engineers Seek $683,303." *San Diego Sun*. January 12, 1935. On file at the City of San Diego Public Utilities Department Archives.

SDS. 1935b. "Contractors Get $683,303 Final Check for Capitan." *San Diego Sun*. January 13, 1935. On file at the City of San Diego Public Utilities Department Archives.

SDS. 1935c. "Dam Engineers Paid in Full." *San Diego Sun*. January 14, 1935. On file at the City of San Diego Public Utilities Department Archives.

SDS. 1935d. "El Capitan Water Used by La Mesa." *San Diego Sun*. July 16, 1935. On file at the City of San Diego Public Utilities Department Archives.

SDU (San Diego Union). 1918. "H.N. Savage Holds Brilliant Record for Past Work." *San Diego Union.* January 1, 1918. On file at the San Diego Public Utilities Department Archive.

SDU. 1926. "Demands Surrender of Dam Site: San Diego to Undertake All Development Work Under Proposal Submitted to La Mesa Directors." *San Diego Union.* April 15, 1926. On file at the City of San Diego Public Utilities Department Archives.

SDU. 1933. "Engineer Seeks El Capitan Job." *San Diego Union*. May 3, 1933. On file at the City of San Diego Public Utilities Department Archives.

SDU. 1934a. "H.N. Savage, City Dam Builder, Dies on Duty In San Diego Service" *San Diego Union*. June 25, 1934. Accessed July 11, 2018 from geneologybank.com

SDU. 1934b. "Officials Confer on Water Issues" *San Diego Union*. November 15, 1934. On file at the City of San Diego Public Utilities Department Archives.

SDU. 1934c. "Contractors Ask Court ruling on Excavation Cost." *San Diego Union*. November 20, 1934. On file at the City of San Diego Public Utilities Department Archives.

SDU. 1934d. "El Capitan Dam Proper, Completed, May be Accepted by City Tuesday." San Diego Union. November 29, 1934. On file at the City of San Diego Public Utilities Department Archives.

SDU. 1935a. "City Pays for Dam; Litigation Ends." *San Diego Union.* January 13, 1935. On file at the City of San Diego Public Utilities Department Archives.

SDU. 1935b. "City to Dedicate El Capitan Dam in Mid-February." *San Diego Union*. January 16, 1935. On file at the City of San Diego Public Utilities Department Archives.

SDU. 1935c. "Billion Gallons of Water Due In Capitan at Dedication Friday." *San Diego Union.* February 17, 1935, p1. Genealogybank.com. Accessed August 17, 2018.

SDU. 1935d. "Plans Complete for Ceremonies at Capitan Dam." Genealogybank.com: *San Diego Union* (San Diego, CA) February 21, 1935.

SDU. 1935e. "El Capitan Dedicated with Ceremony." Genealogybank.com: *San Diego Union* (San Diego, CA), February 22, 1935. Pg. 1.

SDU. 1935f. "El Capitian Dam Now supplying District Water." *San Diego Union*. July 16, 1935. On file at the City of San Diego Public Utilities Department Archives.

SDU. 1935g. "Revised Pipeline Pact is Approved." Genealogybank.com: *San Diego Union* (San Diego, CA). August 7, 1935, p5.

SDU. 1935h. "Dam Aid Request Wins Approval." Genealogybank.com: *San Diego Union* (San Diego, CA). October 20, 1935.

SDU. 1936a. "Capitan Pipe Line Job Let; Work to Start at Once." Genealogybank.com: *San Diego Union* (San Diego, CA). February 19, 1936, p2.

SDU. 1936b. "Completion Near As Last Section of Pipe Line Laid." Genealogybank.com: *San Diego Union* (San Diego, CA). October 16, 1936, p15.

SDU. 1936c. "Hodges Project In Last Stages; Water Total Up." Genealogybank.com: *San Diego Union* (San Diego, CA). November 28, 1936, p2.

SDU. 1938. "City Prison Camp Rehabilitates While Punishing: Shattered Nerves Repaired While Men Gain in Weight." Genealogybank.com: *San Diego Union* (San Diego, CA). April 10, 1938, p3.

SDU. 1939. "Peterson May Junk Prison Camp, Put 2 Officers in each Radio Car." Genealogybank.com: *San Diego Union* (San Diego, CA). July 27,1939, p9.

Savage, Hiram N. 1923. "San Diego River Project: El Capitan Reservoir Basin." Hiram N. Savage papers collection, 1905-1933, Water Resources Collections and Archives, University of California, Riverside.

Savage, Hiram N. 1932. "Drawings, El Capitan Reservoir Dam, Spillway, and Outlet Works." City of San Diego, California: Bureau of Water Development. On file at the San Diego Public Utilities Department Archive.

Scientific American. 1923. "A Rush Job In Dam Construction." *Scientific American* April 1923. On file at the San Diego Public Utilities Department Archive.

Sholders, Mike. 2002. "Water Supply Development in San Diego and a Review of Related Outstanding Projects." *The Journal of San Diego History*, Winter 2002, 48(1). Accessed June 2018. http://sandiegohistory.org/journal/2002/january/sholders/.

Smythe, William Ellsworth. 1908. "History of San Diego (1542–1908)." In *An Account of the Rise and Progress of the Pioneer Settlement on the Pacific Coast of the United States,* Volume II, *The Modern City*. San Diego, California: The History Company. Accessed June 2018. https://ia902300.us.archive.org/26/items/historyofsandieg02smyt/historyofsandieg02smyt.pdf.

Thorne, Tanis C. 2010. "The Removal of Indians of El Capitan to Viejas: Confrontation and Change in San Diego Indian Affairs in the 1930s." *The Journal of San Diego History,* Winter, 2010, Volume 56, Number 1 and 2. Accessed August2018. https://sandiegohistory.org/journal/v56-1/v56-1thorne.pdf/

UCSB. 2018. Aerial image of Savage Dam and Lower Otay Reservoir. Image ID: cas-sd_5-178, April 7, 1964. Accessed July 16, 2018. http://mil.library.ucsb.edu/ap_indexes/FrameFinder/

WRCA (Water Resources Collections and Archives). 2005. "Biographical summary: Hiram Newton Savage, M. Am. Soc. C. E." Hiram N. Savage papers collection, Water Resources Collections and Archives, University of California, Riverside. Accessed July 12, 2018. http://pdf.oac.cdlib.org/pdf/ucr/wrca/savagehn.pdf

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3B; 3CB, 5B

Other Listings
Review Code Reviewer Date

Page 1 **of** 33 ***Resource Name or #:** (Assigned by recorder) San Vicente Reservoir Complex
P1. Other Identifier:

***P2. Location:** ☐ **Not for Publication** ■ **Unrestricted**
***a. County** San Diego County **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad** San Vicente Reservoir **Date** 1996 (2001 ed.) **T** 14S; **R** 1E; NW **¼ of Sec** 31; San Bernardino **B.M.**
c. Address City Lakeside Zip 92040
d. UTM: (Give more than one for large and/or linear resources) Zone 11S , 507013 mE/ 3641561 mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
Latitude: 32°54'44.1"N, Longitude: 116°55'30.0"W

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
The San Vicente Reservoir Complex consists of several buildings and structures associated with the San Vicente Dam. These include: the dam structure itself, including incorporated outlet tower and spillway; ice house; Keeper’s House; Keeper’s Office, a concrete platform, the San Diego Aqueduct outlet structure, and the Mussey Grade Road. **(See Continuation Sheet)**

***P3b. Resource Attributes:** (List attributes and codes) HP21. Dam; HP 22. Reservoir; HP11. Engineering structure; HP2. Single-family property; HP4. Ancillary Building

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)

***P4. Resources Present:** ■ Building ■ Structure ☐ Object ☐ Site ☐ District ■ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #) San Vicente Dam, view to northwest, June 14, 2018, IMG_3249

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
1943 (SDU 1943d)

***P7. Owner and Address:**
Public Utilities Dept.
City of San Diego
9192 Topaz Way
San Diego, CA 92123

***P8. Recorded by:** (Name, affiliation, and address)
S. Corder and K. Kaiser, Dudek
605 Third Street
Encinitas, CA 92024

***P9. Date Recorded:**
June 14, 2018

***P10. Survey Type:** (Describe)
Pedestrian

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") Dudek. 2020. City of San Diego Source Water System Historic Context Statement.

***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 33 ***Resource Name or #** (Assigned by recorder) San Vicente Reservoir Complex
***Map Name:** San Vicente Reservoir, CA ***Scale:** 1:24,000 ***Date of map:** 1996 (2001 ed.)

BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) San Vicente Reservoir Complex ***NRHP Status Code** 3B; 3CB, 5B

B1. Historic Name: San Vicente Dam and Reservoir
B2. Common Name:
B3. Original Use: Municipal water source B4. **Present Use:** Municipal water source, recreation
***B5. Architectural Style:** Straight Axis Gravity Dam
***B6. Construction History:** (Construction date, alterations, and date of alterations)

The construction of the dam began in 1941 and was completed and dedicated on March 17, 1943 (SDU 1943d). In 1947 Colorado River water filled the reservoir from the San Diego Aqueduct. A dam raise project began in 2009 and was completed in 2014.

***B7. Moved?** ■No ☐Yes ☐Unknown **Date:** **Original Location:**
***B8. Related Features:**
B9a. Architect: Hinds and Pyle (engineers) b. Builder:
***B10. Significance: Theme** Post St. Francis Dam Disaster Development **Area** San Diego
Period of Significance 1928-1947 **Property Type** Dam
Applicable Criteria NRHP/CRHR: A/1; City: A, B, F
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Historic Context

(See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)
***B12. References: (See Continuation Sheet)**
B13. Remarks:

***B14. Evaluator:** S. Corder, MFA, and K. Kaiser, MSHP
***Date of Evaluation:** June 30, 2020

(This space reserved for official comments.)

***P3a. Description (Continued):**

The San Vicente Dam is a straight axis gravity dam built of reinforced concrete (Figures 1, 2, 3). The dam was upgraded between 2009 and 2014 as part of an "Emergency and Carryover Storage Project." As part of this project, the dam's downstream face was expanded and resurfaced to accommodate a height increase of 117 feet and doubling of the thickness of the base of the dam and increasing the reservoir capacity from 90,000 acre-feet to almost 250,000 acre-feet of water.

Figure 1. Overview of San Vicente Dam, looking northeast (IMG_2945)

Figure 2. San Vicente Dam, downstream view. (IMG_3249)

Figure 3. San Vicente Dam, upstream side, view from Marina. (IMG_3274)

Today, the dam is approximately 1,440 feet long at the crest, 337 feet in height above the streambed, 22 to 28 feet wide at the crest, and 276 feet wide at the base. Historically, the dam measured 960 feet long at the crest, 220 feet in height above the foundation (199 feet above the streambed), 20 feet wide at the crest, and 169 feet wide at the base (Dolan 2004).

Original construction photographs indicate that the dam was constructed in sections in board-formed molds and had a board-formed concrete appearance. Atop the original dam, roller-compacted concrete was used to add to the height and face of the dam, changing its appearance on the downstream side. The crest features a wide pathway along its length, allowing maintenance vehicles easy access to the outlet tower. The dam has a sheer vertical upstream face with tarpaulin coverings for erosion protection.

Rather than being separate structures, the outlet tower and the spillway are both incorporated into the body of the dam. The outlet tower is part of the new 2014 construction and is located on the upstream side of the dam and shares its southeast elevation wall with the dam (Figure 4). The outlet tower height rises approximately 35 feet above the height of the dam crest and is approximately 40 feet wide by 50 feet long. The tower features two platforms with metal railings at the dam crest and at the roof of the building. Fenestration consists of metal doors, and louvered metal ventilation openings.

Figure 4. View to Outlet Tower along crest. (IMG_2987)

The tower currently functions as the dam operations center as well as controlling the outlet works. The outlet tower is equipped with 36-inch outlet pipes, which appear to drain into the San Diego municipal water system. The interior of the outlet tower has been recently updated and contains the controls for the outlet of the dam. Historical dimensions of the outlet tower were not available.

The dam spillway is also incorporated into the dam itself, in roughly the center of the dam structure (Figures 5 and 6). The spillway crest is 312 feet above the streambed, approximately 15 feet shorter than the height of the dam. The spillway crest extends 215 feet in length along the downstream slope of the dam. Historically, the original spillway's crest was at 190 feet and measured 275 feet X 10 feet and had parapet walls 3.5 feet in height along the crest on either side of the spillway that directed the overflow. The energy dispersal mechanism is provided by the concrete descending angular steps which contour the downstream face of the dam. These linear stepped structures run the width of the dam's downstream face. The crest of the spillway has a slim railed walkway, approximately 3-feet wide and a height of 4-feet. The railing consists of inset posts with metal cable suspended between the posts.

Figure 5. Overview of outlet tower, view to west. (JFC 0512)

Figure 6. Spillway crest view to the east, with SDCWD Service Road in the background. (IMG_3080)

On the eastern side of the downstream canyon is a platform along the SDCWD Service Road. It is a poured concrete platform structure with two bays at the road level (Figure 7). The structure is currently has no discernable use, but originally, this was the foundation for the concrete mixer and batching plant (Figure 8). It was originally constructed in January 1942. The platform height is approximately 10 feet X 16 feet and built into the side of the canyon. All of the original machinery associated with the mixer and batching planter were removed after the completion of the dam in 1941. Upslope from the platform, approximately 60 feet, is a switchback stairwell cut into the face of the slope. This path leads up to the eastern end of the dam.

Figure 7. Spillway crest looking at downstream side. (IMG_3097)

Figure 8. Concrete foundations on downstream canyon slope, looking northeast. (IMG_3107)

The San Diego Aqueduct connects to the San Vicente Reservoir on the west side of the dam. The concrete outlet structure for the aqueduct is fully enclosed by chain-link fence (Figure 9). What is visible consists of a concrete faced tunnel, marked "1947" and a concrete-lined basin leading east to the reservoir's edge. Several debris catchment fences and grates are in the basin. A concrete ramp has been constructed to access the tunnel opening.

Figure 9. Historical photograph of concrete mixer and batching plant foundation. (City of San Diego Public Utility Department records)

In the downstream valley, a complex of historic-aged buildings are also associated with the dam. The first of these is a small, storage building, of unknown age (Figure 10). The building features random rubble and concrete mortar construction, a dirt foundation, and a corrugated metal, barrel vault roof, supported by thick metal straps. The individual rocks show evidence of machine bores to shape them. The top of the roof is finished with poured concrete and on the front elevation there is a short rubble rock masonry parapet. The doorway appears to have two iron chain anchors in the doorway but does not appear to have hardware put in place for a hinged door. The door opening measures approximately 6 feet tall by 30 inches wide. No other fenestration was present.

Figure 10. San Diego Aqueduct outlet, looking northeast. (IMG_2913)

The Keeper's House was built between 1941 and 1953, and is a one-story, side-gabled Minimal Traditional Style building (Figure 11, 12). The building is rectangular in plan, with a shed roofed screen porch addition on the west elevation. The building is clad with stucco on the main body and wood and stucco on the porch addition, and the roof is clad with composition shingles. Fenestration throughout consists of horizontal sliding sash aluminum windows, and a wood front door with aluminum one-over-one single hung window. The main elevation features a minimalist, covered stoop porch, with roof extending off the main roof, simple wood supports, and concrete steps and stoop pad. A small covered carport is attached to the east elevation. The building has a central chimney made of brick. While the enclosed porch on the west elevation is larger than the one on the main (south) elevation, it appears to be a later addition as it is constructed of different materials and features a sliding glass door, rather than a formal door for access to the main building. Observed alterations include replacement roofing, replacement cladding, ventilation structures added to roofline, carport addition, and enclosed porch addition.

Figure 11. Historical photograph of concrete mixer and batching plant foundation. (IMG_3151)

Figure 12. Keeper's House, main and side elevation. (IMG_0251)

Historic Massey Road (now called Moreno Avenue) originally passed through the dam's present-day location, providing access to the towns of Foster, Massey Grove and Fernbook. While the road remained open for most of San Vicente Dam's construction, via a tunnel through the base of the dam, the road was officially closed in late 1942 so the dam could be completed. The road is constructed of asphalt, and visibly varies in width between 12 and 20 feet wide. A portion of the original roadway is still present and in moderate repair. It has been impacted by utility renovations and usual wear and tear. The road on the upstream side of the San Vicente Dam is completely submerged in the reservoir and only visible when the reservoir is dry. It was not visible on the date of survey.

***B10. Significance (Continued):**

Phase 1: Planning and Funding (1925-1942)

On October 5, 1925 the City leased the complete San Dieguito Water Company system including the existing Pamo and Sutherland reservoirs, which was the proposed watershed for the San Vincente Reservoir Complex. The next year, in 1926, a $2,000,000 bond issue passed to acquire specific water rights that would allow the City to build the San Vincente Dam, the Sutherland Dam, and Sutherland Aqueduct. While some of these projects were held up, such as the Sutherland Dam (Fowler 1953; Dolan 2004).

During this same time, the City applied to the Division of Water Resources of the State of California, which was responsible for the State's management and regulation of water usage, for rights to the Colorado River water that was going to be diverted to California. It was apparent by the 1920s that available local water supplies would not meet the population's requirement. In 1928, the Boulder Canyon Project Act authorized the construction of the All American Canal and Imperial Dam in Imperial County. The importation of water from the Colorado River was a developing idea overseen by Hiram N. Savage, the City's Hydraulic Engineer. Savage died in 1934 before this importation was realized leaving Fred D. Pyle who succeeded Savage to continue investigating new water sources for San Diego. Pyle considered both importation of water from the Colorado River and obtaining water from local sources, favoring the development of local water. Local water rights were a contentious issue during this period resulting in several legal battles before the Supreme Court in 1930. It was decided that through the rights of the pueblo of San Diego that the City had a prior and paramount right to the water of the San Diego River. This decision allowed the City to start further developing local water sources (Fowler 1953; Dolan 2004; Pourade 1970).

With the water rights decision made, the City was free to begin planning for the construction of the San Vicente Dam and reservoir. The new reservoir was needed to supplement runoff storage on the watershed in light of a rapidly growing population in San Diego. In 1930, M.M. O'Shaughnessy, consulting engineer for the city of San Francisco and for John D. Spreckels in San Diego declared that the plan to build the San Vicente and El Capitan Dams were "practical and comprehensible." O'Shaughnessy went on to say:

> By building San Vicente Dam and connecting it with El Capitan by a five-foot pipeline, a total of 20,000,000 gallons safe net yield per day can be obtained from both reservoirs by gravity flow to the city of San Diego, and the unit cost per 1,000 gallons for this amount of water will be the lowest it is possible to obtain (SDET 1930).

The primary purpose for constructing the San Vicente Dam was to provide water storage, while an important secondary purpose was flood control. During the years of 1936 and 1937, San Diego had an unusual amount of rain that caused flooding throughout the county and damage to the San Vicente Creek area. By building the San Vicente Dam, it would help to prevent further flood damage and safeguard San Diego's claim to Colorado River water, by abiding by the original agreement and federal storage stipulations.

The estimated cost of the San Vicente Dam changed several times after the City expressed interest in receiving funding from the federal government. In August 1938, the Dam's construction was set to be placed on the ballot for the primaries and soon thereafter $100,000 was appropriated from the City for preparation of plans for the Dam. The bond issue was not listed in August and was pushed back to April 1939 when it fell short of the two-thirds vote needed to pass it (SDU 1937; Dolan 2004; SDU 1939a).

In addition to the ballot measure related to San Vicente Dam in 1939, the City was encouraged to put another important water infrastructure bond measure on the ballot for the ratification of the All-American Canal contract. The contract for the All-American Canal would protect San Diego's right to 100,000,000 gallons of Colorado River water daily. The United States Bureau of Reclamation constructed the All-American Canal in the 1930s as an 82-mile gravity flow canal beginning at the Imperial Dam on the Colorado River moving water into the Imperial Valley. Through ratifying this contract, San Vicente Dam would be allowed to store up to an additional 500,000,000 gallons a day from the Colorado River being pumped underground from the All-American Canal. For the City of San Diego, the All American Canal contract and the construction of San Vicente Dam, meant that a new water source was assured for the future growth of the City. Though the bond issue for San Vicente failed in April 1939, the All American Canal ballot measure passed (Boulter 1940; Dolan 2004).

After the bond for the San Vicente Dam did not pass, the City sought different channels to fund the Dam through using $500,000 of the remaining $630,000 from the construction of the Sutherland Dam in conjunction with federal funding. There was some protest from the local construction industry stating that there was not enough room for the unskilled laborers employed by the federal program. Despite this, the City applied for federal funding for the $2,000,000 estimated cost of the San Vicente Dam. Another issue arose quickly when the State of California noted that with the construction of the San Vicente Dam that State Highway 198 would be covered in water once its reservoir was filled. The federal government refused to provide funds until the City could find a new location for the road, which was left open during construction to allow ample time for its relocation. Relocating the road contributed to the increased cost of the overall San Vicente Dam project raising the price to $3,550,000 (Fowler 1953; Dolan 2004; SDU 1940).

The need for water reached a tipping point when the United States engaged in World War II in 1941. The population of Southern California, and especially San Diego, began to increase exponentially with the expansion of war industries and military installations. Studies on the population growth made in the 1930s became increasingly obsolete as estimates made at that time were exceeded by 50 percent in 1946. While past studies had stated that water from the Colorado River would not be needed until 1950, this was found to be false as the use of local water sources doubled in the five-year period between 1940 and 1945. Due to the start of the war, the potential federal funding for the construction of the Dam was in jeopardy. The project resumed despite this and on November 5, 1940, Propositions 1 and 2 were put up for election to provide a total of $4,300,000 in bonds for the construction of the San Vicente Dam with the remainder for improvements to the water distribution system. The bond issue finally received sufficient support and was passed with a majority of voters authorizing the contract to construct the San Vicente Dam (Fowler 1953; Dolan 2004; SDU 1940b).

Phase 2: Original Dam Construction (1941-1943)

In January 1941, California State engineer Ed Hyatt and city hydraulic engineer Fred Pyle, along with other state officials, inspected and approved the San Vicente Dam location. A consultant, Julian Hinds of the Metropolitan Water District (MWD) of Southern California, was retained to work with Fred Pyle as plans progressed for the Dam. Despite assistance from Hinds, plans for the San Vicente Dam were delayed until July 1941 due to a lack of available engineering specialists in the city. Plans also included replacing the Shady Dell-Foster section of the Lakeside-Ramona Highway, which was projected to be flooded by San Vicente Reservoir when full. Contracts went to bid in August, and by October 1941, Los Angeles-based contracting firm L.E. Dixon began preliminary creek diversion and foundation excavations began at the Dam Site (Figure 13) (Dolan 2004; SDU 1941a, 1941b, 1941c, 1941d, 1941e, 1941f, 1941g, 1941h, 1941i, 1941j).

Figure 13. Side and rear elevations, showing enclosed porch. (IMG_0263)

In December 1941, the United States entered World War II and the widespread rationing of metal and building materials, and drafting skilled laborers into military service, had an immediate, negative effect on the construction of San Vicente Dam, the Shady Dell-Foster bypass, and securing Colorado River water by aqueduct. Storms in winter 1941-1942 also delayed water infrastructure projects throughout Southern California. The City attempted to overcome these work delays by offering wartime jobs with the City to those aged over 62, citing wartime emergency conditions which left the San Vicente Dam incomplete. By spring 1942, work on San Vicente Dam moved to a 24-hour schedule to make up for delays, but war-time rationing and shortages of steel and cement continued interrupt and postpone the work. In the fall of 1942, the road that passed through a section of the dam was permanently closed and the final sections of concrete were poured (Figure 14). This was just in time, as the still-incomplete dam began impounding water as soon as the January rains began. The San Vicente Dam was completed in late February 1943 and passed all inspections (Dolan 2004; SDU 1942a, 1942b, 1942c, 1942d, 1942e, 1942f, 1943a).

Figure 14. Historic Massey Road leading north to the dam. (IMG_111558)

On March 17, 1943, the Dam was dedicated and went into service (Figure 15). Due to metal shortages at the time, the dam was commemorated with a wooden plaque, as bronze was not available at the time of the dedication. The San Vicente Dam stood at and 199-feet tall and 975- feet long, and the total cost of the project as of March 1, 1943 was $2,780,000. By October 1943, the Lakeside-Ramona bypass road was completed, leaving only the pipeline, by then named Alvarado Pipeline, connecting San Vicente to the rest of the City's water system incomplete (Dolan 2004; SDU 1943b, 1943c, 1943d, 1943e).

Figure 15. Excavation of east abutment, December 1941 (City of San Diego Public Utility Department records)

Phase 3: Post-Construction Development (1944-present)

After the completion of the San Vicente Dam, pipelines connecting the reservoir to the City water system were completed in succession, first connecting San Vicente Reservoir to El Capitan Dam, then from San Vicente Dam through the Alvarado Pipeline into the City (Figure 16). The next stage was to fulfill the City's contract with the United States Bureau of Reclamation and bring Colorado River water to San Diego. As the population of San Diego ballooned from 300,000 in 1940 to over 600,000 in 1944, even the new local water projects like San Vicente Dam were not sufficient to meet the demand. In 1945, construction finally began on the San Diego Aqueduct, which would bring MWD water from the Colorado River Aqueduct at the San Jacinto Tunnel to the San Vicente Reservoir. The United States involvement in World War II limited the City's ability to get steel and concrete to make any long enough pipeline or aqueduct on its own, and decided to simply branch off of the existing MWD Colorado River Aqueduct, which had been completed in 1939. To make this happen, the City of San Diego eventually ceded its rights to Colorado River water and control of the San Diego County Water Authority to the MWD, thereby becoming entitled to water from the MWD system (Crawford 2010; SDU 1944; USBR 2020).

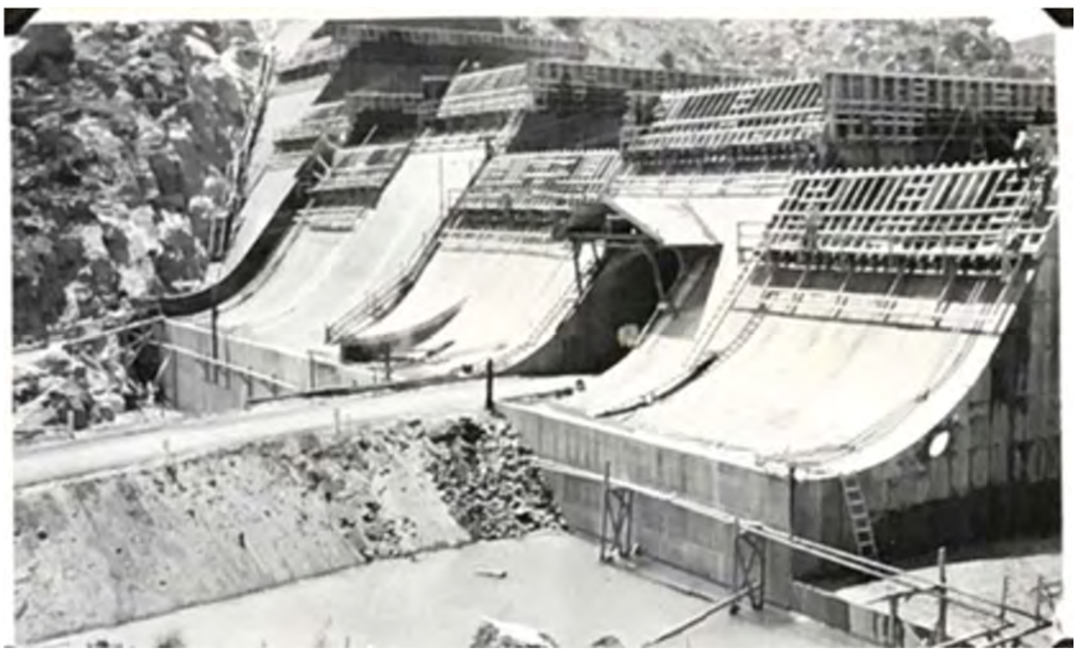


Figure 16. Dam construction showing tunnel through base of the dam, August 1942 (City of San Diego Public Utility Department records)

After the San Diego Aqueduct route was inspected, contracts for the San Diego Aqueduct were finally awarded and W.E. Callahan Construction Company and Gunther & Shirley Company of Los Angeles began work on the concrete San Diego Aqueduct. Given the fact that miners and steel could not be spared under the War Manpower restrictions until January 1946, concrete was chosen as the aqueduct material out of necessity. In the fall of 1946, the City of San Diego contracted reassigned the Colorado River water point of delivery from Imperial Dam to Parker Dam and to assign its Colorado River water rights to the MWD (Figure 17) (SDU 1945a, 1945b; USBR 2020).

Figure 17. Engineers at the dedication: from left to right: J.W. Williams, C. P. Williams, A. Cooper, Fred Pyle, Julian Hinds, and Paul Beerman, March 1943 (City of San Diego Public Utility Department records)

The San Diego Aqueduct was delayed by a worker's strike in 1946 and again in early 1947. Delays from steel production also set the project back by several months. Despite issues and delays, the project was completed in November 1947 under budget at only $14.1 million versus the $17 million estimated for the project. Water from the Colorado River flowed into San Vicente reservoir for the first time in late November 1947 (Figure 18). The San Diego Aqueduct was dedicated in December of 1947, the San Diego County Water Authority was formally annexed by the MWD, and became legally entitled to Colorado River water from the MWD system (Crawford 2010; SDU 1946, 1947a, 1947b, 1947c, 1947d).

Figure 18. San Vicente Dam after completion, November 1947 (City of San Diego Public Utility Department records)

San Diego continued to import water after the success of the first San Diego Aqueduct. Given this success, the second San Diego Aqueduct was completed in 1954. A 94-mile extension carrying water further south to the Otay reservoir opened in 1960. An additional pipeline was added in 1973 (Crawford 2010).

Despite the changes to the pipelines, the San Vicente dam remained relatively unaltered until 2009 when a project began to raise the dam 117-feet. This project was approved as part of an "Emergency and Carryover Storage Project" to deal with the increasingly severe drought conditions in Southern California. The increased capacity of the dam would largely be used as surplus in the event of future droughts and would serve as an emergency water storage for use in events like earthquakes (SDCWA 2018).

CONTINUATION SHEET

Property Name: San Vicente Reservoir Complex

How Colorado Funnels Precious Water Into San Diego Reservoirs

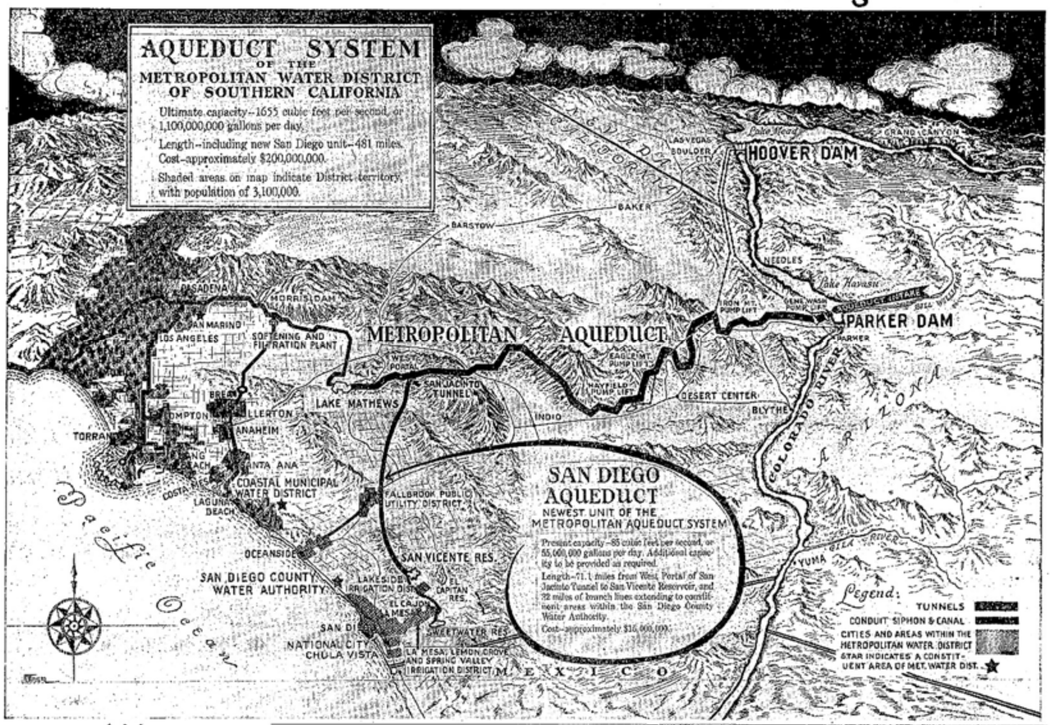
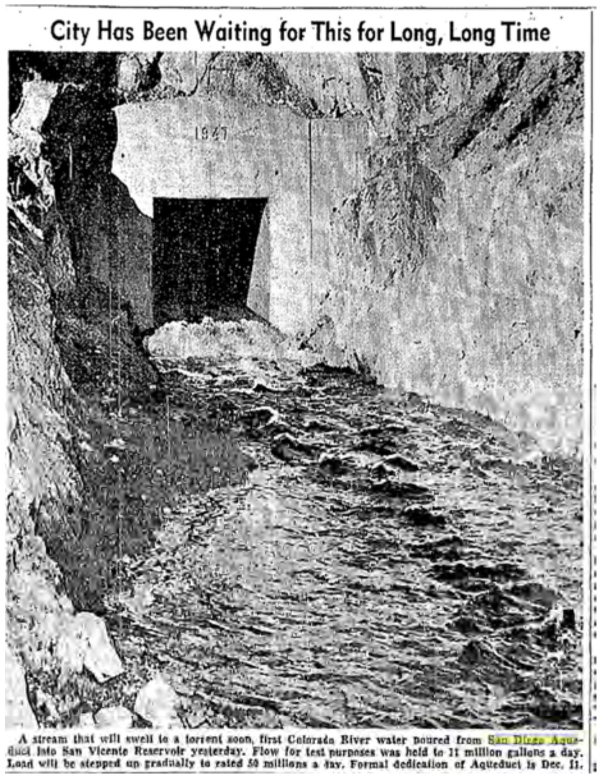


Figure 19. San Diego Aqueduct route (SDU 1947d)

CONTINUATION SHEET



City Has Been Waiting for This for Long, Long Time

A stream that will swell to a torrent soon, first Colorado River water poured from San Diego Aqueduct into San Vicente Reservoir yesterday. Flow for test purposes was held to 11 million gallons a day. Load will be stepped up gradually to rated 50 millions a day. Formal dedication of Aqueduct is Dec. 11.

Figure 20. Colorado River water entering the San Vicente reservoir for the first time, November 1947 (SDU 1947c)

<u>Engineer: Fred Dale Pyle (1882- 1950)</u>

Fred Dale Pyle (Oct 8, 1882-July 21. 1950) was born in Perry Township, Pennsylvania. He graduated in 1903 from Utah Agricultural College with a B.S. degree in Civil Engineering. Upon graduating, he took on various jobs, including at Utah Agricultural College conducting crop irrigation experiments, then as a surveyor for the Bureau of Reclamation (then called U.S. Reclamation Service) where he surveyed Bear Lake and Utah Lake. During the latter half of 1904, he conducted groundwater surveys for the U.S Geographic Survey at Utah Lake and Jordan Valleys. In 1905, he briefly worked for fellow classmate W.W. McLaughlin’s engineering practice in Utah. Immediately following that, from 1905-1912, he took on several different roles while working on the U.S. Reclamation Service’s North Platte Irrigation Project in Nebraska, where he worked in various roles such as Junior Engineer, Instrumentman, and Superintendent of Operation and Maintenance, before finishing his tenure there as the “Irrigation Manager in charge of all operations and maintenance work”. From 1913 to 1920, Pyle continued to work on various U.S Reclamation Service irrigation projects including the Belle Fourche Project, Grand Valley Project, and Uncompahgre Project in Colorado and South Dakota (Merrill et al. 1918, Pyle 1949, San Diego Union 1950, WRCA 1999).

Pyle arrived in California in 1922, where he initially took the position of Business Manager at Imperial Irrigation District in Calexico, California. While in that position, he organized the take over and operation, as well as the Rules and Regulations of 14 Mutual Water Companies, which until November 1st, 1922 handled all water deliveries in Imperial County. After the dissolution of these water companies, he became the Irrigation

Engineer at a different Imperial Irrigation District office in Imperial, California. There, Pyle was in charge of operations, collection, and maintenance of "1720 miles of canals, laterals, and waste ditches which delivered water to 3200 water users" (Pyle 1949). He remained in that position until April 1925. From 1925 until his hire by the City of San Diego in 1928, he inspected several water supply projects in San Diego and Yakima, Washington. From 1926 until October 1928, he was employed by Vista Irrigation District in Vista California, as the Engineer-Manager (Dowd 1956, Pyle 1949).

In October 1928, Pyle was hired by the City of San Diego as Assistant Hydraulic Engineer, working on the Otay Pipeline Plans, under City Hydraulic Engineer Hiram Savage. After the Savages' death in 1934, City Manager Fred Lockwood appointed Pyle as Chief Hydraulic Engineer for the City of San Diego. Pyle saw the completion El Capitan Dam and was instrumental in the development and building of San Vicente Dam (1941) and the San Diego Aqueduct. He was also responsible for the strengthening of Hodges Dam, the Morena Dam enlargement, San Dieguito Dam strengthening, and conduit work (Pyle 1949; San Diego Union 1928a, 1928b 1932, 1938, 1939a, 1939b, 1940a, 1940b, 1950).

Pyle's career as an engineer extended 45 years, from 1905 until his death in 1950. His work history includes:

- Instrumentman with Reclamation Service (July 1903-February 1904)
- Experiment Station at Logan, Utah (April-September 1904)
- U.S. Geographic Survey (October-December 1904)
- W.W. McLaughlin (January-April 1905)
- North Platte Project Junior Engineer (May 1905-March 1910)
- North Platte Project Irrigation Manager (March 1910-August 1912)
- Belle Fourche, North Platte, Grand Valley and Uncompahgre projects Operation and Maintenance Inspector (August 1912-March 1913)
- Uncompahgre Valley Project Irrigation Manager (March 1913-October 1913)
- Uncompahgre Project Manager (October 1913-June 1920)
- Colombia Irrigation District Secretary and Manager (August 1920-March 1922)
- Imperial Irrigation District Business Manager (March 1922-Novmeber 1922)
- Imperial Irrigation District Irrigation Engineer (November 1922-April 1925)
- Vista Irrigation District Engineer-Manager (February 1925-October 1928)
- City of San Diego Assistant Hydraulic Engineer (October1928-June 1932)
- City of San Diego Chief Hydraulic Engineer (June 1934-July 1950)

Engineer: Julian B. Hinds (1881-1977)

Julian Hinds was born in Warrenton, Alabama in 1881 and graduated from the University of Texas in 1908 with a B.S. in Civil Engineering. After briefly working as a draftsman for the railroad industry, Hinds worked for the United States Bureau of Reclamation from 1910 to 1926 and moved through the grades from surveyor to engineer, to chief draftsman, and "assistant chief designing engineer" (Chi Epsilon 2020). In a few short years, Hinds primarily worked on irrigation projects such as the Yakima Sunnyside Project in Washington, before transitioning to dam project, such as Elephant Butte Dam and Reservoir in New Mexico. By 1915, Hinds transferred to the Bureau's new central engineering office in Denver, Colorado, where he served as designer, chief draftsman, and assistant chief designing engineer on a wide variety of assignments. From 1926 to 1929, Hinds briefly worked for the J.G. White Engineering Corporation in Mexico on the Calles Project in Aguascalientes. Hinds then briefly consulted for the Rio Conchos Project and the Don Martin Dam, also in Mexico (Chi Epsilon 2020; Smithsonian Institute 2020).

In 1929, Hinds returned to the United States to work on the Colorado River Aqueduct, first for the Los Angeles Department of Water and Power, then for the MWD, after it was founded. As chief designing engineer for MWD, Hinds prepared numerous designs for all of the dams, reservoirs, pumping plants, tunnels, and over 300 miles of aqueduct between Boulder Dam and Lake Matthews. During the construction period of the Colorado River Aqueduct from 1933 to 1941, Hinds served as assistant chief engineer and handled nearly all of the administrative work on the Colorado River Aqueduct, including cataloging its progress, writing reports, and speaking engagements with various city officials from MWD, member cities, and agencies. From 1941 until his retirement from MWD in 1951, Hinds was the general manager and chief engineer at MWD. Post retirement (1951- 1971), Hinds worked on various engineering projects, consulting with the Bechtel Corporation, Department of the Army, United States Bureau of Reclamation, and the World Bank. It is estimated that he was employed on 150 dam projects on the Columbia and Colorado Rivers, in Mexico, and in the states of Montana, Utah, Colorado, New Mexico (Chi Epsilon 2020; Smithsonian Institute 2020).

NRHP and CRHR Significance Evaluation

NRHP Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.

CRHR Criterion 1: Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

The construction of the San Vicente Reservoir Complex occurred during a significant period in San Diego source water development history: Post St. Francis Disaster Development period (1928-1947). This significant period of water infrastructure development in San Diego and is clearly defined by two events, the St. Francis Dam Disaster in 1928 and the Importation of Colorado River Water in 1947. In 1928 the St. Francis Dam in Santa Clara Valley outside Los Angeles failed, killing 430 people, destroying 1,250 buildings and 7,900 acres of farmland, to become one of the greatest dam failure disasters of the 20th century. Between 1929 and 1931, the State engineer examined 827 dams and found near one third of them to require significant repairs according to new safety guidelines. In San Diego, this St. Francis Dam Disaster and subsequent dam study prompted major improvements to several dams including: reservoir capacity and spillway enlargement at Morena Dam; spillway enlargement and a new pipeline and filtration system at Lower Otay Dam; enlargement of reservoir capacity at Chollas Dam; crack monitoring, buttress modification, and spillway retrofit at Lake Hodges Dam; and the height increase and spillway retrofit at Barrett Dam.

Another major event occurred in 1928 in response to the St. Francis Dam Disaster: the City of San Diego re-hired Hiram Newton Savage back into his role as the City's Hydraulic Engineer. After firing him in 1923, the City Council re-hired Savage to complete the State Engineer's recommended changes. In addition to implementing the required repairs ordered by the State engineer, Savage was also the designer and water department lead for El Capitan Dam, until his death in 1934. Fred Pyle, Savage's Assistant, brought the El Capitan Dam to completion in 1935.

The remainder of this period is characterized by preparation for the importation of Colorado River water including the completion of Boulder Dam (later, the Hoover Dam) in 1935, the Colorado River Aqueduct in 1939, the All American Canal in 1941, the San Vicente Dam in 1943, and the construction of the San Diego Aqueduct starting in 1945. The San Diego Aqueduct, when complete, would serve as the eventual link to the City's Colorado River water and end reliance on local reservoirs as San Diego's sole water source.

While the planning for the San Vicente dam began prior to the St. Francis disaster, its history retains the important associations to the period of significance following the disaster as the City of San Diego officials began to consider construction of the San Vicente dam in 1925, but could not fund the project until 1941. The project was approved just months before the United States entered World War II. Despite wartime material shortages, strikes, laborers being drafted away from the dam, and rationing, the dam was completed and dedicated in March 1943.

The Sam Vicente Dam and reservoir are also closely related to the San Diego Aqueduct, the culmination of a multi-decade project to bring Colorado River water to San Diego. In 1923, six of the seven states in the Colorado Basin, including California, ratified a compact dividing the river's water between the upper and lower basins. The City applied, along with many cities in Southern California for access to Colorado River water, then, but waited another 25 years to see it arrive in San Diego. The final push was World War II. San Diego's coastal location and locus of military bases doubled the city's population in just a few short years, from nearly 300,000 in 1940 to over 600,000 by 1944. The shortfall of the existing water supply and concentrated war effort in the city sped the construction of the San Vicente Dam, the eventual outlet of the San Diego Aqueduct.

For the reasons discussed above, the San Vicente Reservoir Complex appears eligible under Criterion A/1 as both a contributing element of the City of San Diego Source Water System, and as an individual property.

NRHP Criterion B: Associated with the lives of significant persons in our past.

CRHR Criterion 2: Associated with the lives of persons important in our past.

To be found eligible under Criterion B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. Archival research indicates that San Vicente Reservoir Complex is not directly connected with any significant individuals important within a local, state, or national historic context. Therefore, the subject property does not appear eligible under NRHP/CRHR Criteria B/2.

NRHP Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

CRHR Criterion 3: Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

San Vicente Dam straight axis gravity dam completed in 1943. The dam was raised from 2009 to 2014 by 117 feet from its original height of 220 feet, increasing the reservoir holding capacity from 90,000 acre-feet of water to 157,000 acre-feet of water. The newly completed dam concrete was also stained tan to "blend in" with its surrounding landscape. While the dam raise did alter the appearance of the dam, the overall design and character defining features of the dam remained the same.

The dam was designed by both Fred Pyle, City of San Diego hydraulic engineer, and Julian Hinds, designer of the Colorado River Aqueduct and all associated dams, pumping stations, and aqueduct section, and chief engineer of the MWD. While Pyle was the City's hydraulic engineer, archival research and analysis of the body of his work indicated that he does not rise to the level of master engineer. According to National Register Bulletin 15:

> A master is a figure of generally recognized greatness in a field, a known craftsman of consummate skill, or an anonymous craftsman whose work is distinguishable from others by its characteristic style and quality. The property must express a particular phase in the development of the master's career, an aspect of his or her work, or a particular idea or theme in his or her craft. A property is not eligible as the work of a master, however, simply because it was designed by a prominent architect (NPS 2002).

Hinds, however, does rise to the level of master engineer, given the body of his work and the impact it continues to have on water infrastructure in Southern California. Hinds would have collaborated on the design of the San Vicente Dam in the first year of Hinds' role as chief engineer and general manager of MWD, after the completion of the Colorado River Aqueduct.

In summary, the 1943 San Vicente Dam was designed by both Fred Pyle and master engineer Julian Hinds, but has been altered from its original 1943 straight-axis gravity dam design. The change in appearance and design render the dam unable to embody the characteristics of a 1940s dam, and its association with master engineer Julian Hinds. Therefore, the subject property appears not eligible under NRHP/CRHR Criterion C/3 as a contributing element of the City of San Diego Source Water System and as an individual property.

NRHP Criterion D: Have yielded, or may be likely to yield, information important in history or prehistory.

CRHR Criterion 4: Has yielded, or may be likely to yield, information important in prehistory or history.

Archaeological survey was not conducted for this project. At this time there is no indication that the San Vicente Reservoir Complex has the potential to yield information important to state or local history. Therefore, the property is recommended not eligible under NRHP/CRHR Criterion D/4.

<u>City of San Diego Significance Evaluation</u>

Criterion A: Exemplifies or reflects special elements of the City's, a community's, or a neighborhood's historical, archaeological, cultural, social, economic, political, aesthetic, engineering, landscaping, or architectural development.

As described above, the San Vicente Dam is an excellent example of the City's water infrastructure development at a time when the city was transitioning from local-only reservoir water sources to importing water from the Colorado River and eventually elsewhere outside of the San Diego region. Construction of the dam, and its relationship to the San Diego Aqueduct made a significant contribution to the history of water development in the San Diego region and illustrates how the City of San Diego continued to expand its water system in order to accommodate the growing population post-1916 flood and post-WWII.

Therefore, the subject property appears eligible under City Criterion A.

Criterion B: Is identified with persons or events significant in local, state, or national history.

Persons: As described in the NRHP/CRHR B/2 criterion discussion above, (the San Vicente Reservoir Complex is not known to be identified with any person significant at the local, state of national history.

Events: As described in the NRHP/CRHR A/1 Criterion discussion above, the San Vicente Reservoir Complex is associated with events significant in local and state history. The San Vicente Reservoir Complex is associated with the safety protocols put in place following the St. Francis Dam Disaster, as well as, being the first entry point of Colorado River Water into the San Diego Source Water System in 1947. Therefore, the subject property appears eligible under City Criterion B.

Criterion C: Embodies distinctive characteristics of a style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship

As described under NRHP/CRHR Criterion C/3 (see full discussion above), the San Vicente Dam is a straight-axis gravity dam, however it's design was significantly altered in 2009-2014 when the city raised the dam height by 114 feet and significantly increased the size and holding capacity of the reservoir. The original dam and its integral components (outlet tower, and original spillway) are partially encased in the dam raise construction. Therefore, the San Vicente Reservoir Complex does not appear eligible under City Criterion C.

Criterion D: Is representative of the notable work or a master builder, designer, architect, engineer, landscape architect, interior designer, artist, or craftsman.

As described under NRHP/CRHR Criterion C/3 (see full discussion above), the San Vicente Dam is representative of the notable work of master engineer Julian Hinds. San Vicente Dam is representative of the period in Hinds' career when he worked as the chief engineer of MWD, after the completion of the Colorado River Aqueduct. The other engineer and collaborator, Fred Pyle, was the city's hydraulic engineer but did not rise to a level of master engineer given the body of his work. Despite these important associations, the subsequent dam raise project in 2009-2014 significantly altered the appearance and design of the dam, diminishing association with these engineers. Therefore, the subject property does not appear eligible under Criterion D for the loss of association with a master engineer.

Criterion E: Is listed or has been determined eligible by the National Park Service for listing on the National Register of Historic Places or is listed or has been determined eligible by the State Historical Preservation Office for listing on the State Register of Historical Resources.

The San Vicente Reservoir Complex is not known to be on any local, state, or national list of significant properties, nor is it known to have been determined eligible for listing on any register. Therefore, the subject property is not currently eligible under City Criterion E.

Criterion F: Is a finite group of resources related to one another in a clearly distinguishable way or is a geographically definable area or neighborhood containing improvements which have a special character, historical interest, or aesthetic value, or *which represent one or more architectural periods or styles in the history and development of the City.*

As described under NRHP/CRHR Criterion A/1 (see full discussion above), the San Vicente Reservoir Complex is significant for its role, function, and design within the larger City of San Diego Source Water System, of which it is a contributing resource to. The City of San Diego Source Water System includes ten (10) impounding reservoir complexes owned/operated by the City that function as part of the City's municipal water-supply system. These resources and their related infrastructure (e.g., dams, outlet towers, conduits, flumes, and pipelines) constitute a finite group of resources related to one another in a clear way, steeped in historical interest and representative of significant engineering achievements. Taken as a whole, these resources (including the San Vicente Reservoir Complex) are significant for their role in the City's source water system, starting with the earliest efforts to establish privatized water in the 1880s soon followed by construction of the earliest reservoirs, Lake Cuyamaca (1887) and Sweetwater Reservoir (1888). The period of significance ends with construction of the San Diego Aqueduct, and the importation of Colorado River Water for the first time into the San Vicente Reservoir (1947), which forever changed the composition of City's source water supply. Therefore, the San Vicente Reservoir Complex appears eligible under City Criterion F as a contributing resource to the City of San Diego Source Water System.

Integrity Assessment

Overall, the San Vicente Reservoir Complex retains integrity of location, setting, materials, workmanship, and feeling but does not retain integrity of design and association.

Location: The complex retains integrity of location, and remains in the location it was originally planned.

Setting: The complex's retains integrity of setting, as the physical conditions surrounding the dam have remained unchanged since its completion in 1943. The dam is still situated in a narrow canyon. The nearby City of Santee and its suburbs have not yet encroached northeast to the dam, so it retains a predominately rural setting.

Design: The San Vicente Dam does not retain integrity of design. The 220-foot dam was raised by 117 feet in a dam raise project spanning between 2009 and 2014. The dam raise project altered the downstream face of the dam, and introduced new materials, stained to blend with the surrounding hills. While the overall dam design is still a straight-axis gravity dam, the significant increase to the height of the dam diminish integrity of design.

Materials: The San Vicente Dam retains integrity of materials, as the new materials used in the dam raise match the originally available materials from 1943: steel and concrete. No new materials appear to have been introduced. Alterations to the dam did not have a large-scale effect on the materials and no subsequent alteration resulted in the removal of original materials.

Workmanship: The San Vicente Dam retains integrity of workmanship. The dam raise project in 2009-2014 covered the original workmanship of the dam, and the original 1943 workmanship are retained either in the reservoir or encased in the 2014 dam raise.

Feeling: The complex retains integrity of feeling. Though marginally larger and deeper, the complex still retains the feeling of an early-twentieth century dam and reservoir operating as an extension of the City of San Diego outside of City limits.

Association: The complex does not retain integrity of association, as its association with master engineer Julian Hinds and the then-chief hydraulic engineer of San Diego Fred Pyle was lost after the dam design and appearance were altered during a dam raise project.

***B12. References:**

Beck, Darrell. 2015. "On Memory's Back Trail: Pamo Valley." *Ramona Home Journal* (Ramona, CA), Accessed March 13, 2019. http://ramonajournal.com/on-memorys-back-trail-pamo-valley-p6657-271.htm

Boulter, Thornton. 1940. "S.D. Has Excellent Water Supply." Genealogybank.com: *The San Diego Union* (San Diego, CA), December 29, 1940, pg. 66.

City of Escondido. 2020. "History of Water Supply Development." City of Escondido website. Accessed May 19, 2020. https://www.escondido.org/history-of-water-supply-development.aspx.

Chi Epsilon. 2020. "Biography: Julian Hinds." Chi Epsilon Civil Engineering Honor Society: Conception, Design, Construction. Webpage. Accessed May 21, 2020. https://www.chi-epsilon.org/XEWebGeneral2/About/NHMBio.aspx?MemberId=13

Crawford, Richard. 2010. "The San Diego Aqueduct." *San Diego Yesterday*. Published August 19, 2010. Accessed May 21, 2020. http://www.sandiegoyesterday.com/wp-content/uploads/2010/08/San-Diego-Aqueduct.pdf

Crawford, Richard. 2011. *The Way We Were in San Diego*. Charleston, South Carolina: History Press.

Dolan, Chris C.V. 2004. *San Vincente Dam, HAER CA-2267*. EDAW, Inc. San Diego, CA. September 2004. https://www.loc.gov/item/ca3630/

Dowd, M.J. 1956. "IID: The First 40 Years." Accessed March 29, 2019. https://www.iid.com/home/showdocument?id=6000

DWR (Division of Water Resources). 1949. "San Dieguito and San Diego Rivers Investigation." Bulletin No. 55. Sacramento, California State of California, Department of Public Works, Division of Water Resources. http://wdl.water.ca.gov/waterdatalibrary/docs/historic/Bulletins/Bulletin_55/Bulletin_55__1949.pdf

Evening Tribune (ET). 1917. "Incorporation Costs $1,100." Genealogybank.com: *The Evening Tribune* (San Diego, CA), August 8, 1917, pg. 5.

ET. 1926a. "Rhodes and Council to Taken Up Davis Dam Plans This Afternoon. Geneaologybank.com: *The Evening Tribune*. August 23, 1926, pg. 1.

ET. 1926b. "Two Types of Dams for Sutherland Are Submitted to Council." Geneaologybank.com: *The Evening Tribune*. September 27, 1926, pgs. 1, 6.

ET. 1926c. "Campaign Committee Asks Voters to Make Water Bonds Unanimous." Geneaologybank.com: *The Evening Tribune*. October 11, 1926, pg. 14.

ET. 1926d. "Manager Files Plans for Dam." Geneaologybank.com: *The Evening Tribune*. December 4, 1926, pg. 6.

Fowler, L. 1953. "A History of the Dams and Water Supply of Western San Diego County." Thesis; University of California. On file at the City of San Diego Water Utilities Department Archives.

Hennessey, Gregg. R. 1978. "The Politics of Water in San Diego 1895–1897." *The Journal of San Diego History*, Summer 1978, 24(3). Accessed June 2018. http://www.sandiegohistory.org/journal/1978/july/water/.

Hill, Joseph. 2002. "Dry Rivers, Dammed Rivers and Floods: An Early History of the Struggle Between Droughts and Floods in San Diego" *The Journal of San Diego History,* Winter, 2002, 48. Accessed June 2018. https://sandiegohistory.org/journal/2002/january/hill-2/.

McGlashan, H.D., and F.C. Ebert. 1918. "Southern California Floods of 1916." *Water Supply Paper* 426. U.S. Department of the Interior. Accessed June 2018. http://pubs.usgs.gov/wsp/0426/report.pdf.

McGrew, Clarence Alan. 1922. "City of San Diego and San Diego County: The Birthplace of California," Volume II. Chicago, Illinois, and New York, New York: The American Historical Society. Accessed June 2018. https://ia800200.us.archive.org/8/items/cityofsandiegosa01mcgr/cityofsandiegosa01mcgr.pdf.

Meixner, G. Donald. 1951. "Historical Development of Water Utilization." Draft. On file at the San Diego Public Utilities Department Archive.

Merrill, M.C., O.W. Israelsen, and Byron Alder. 1918. A Day at the Utah Agricultural Experiment Station. Circulation No. 39. Logan, Utah: Utah Agricultural College.

NPS (National Park Service). 2002. *How to Apply the National Register Criteria for Evaluation.* Revised for Internet 1995, 2001, 2002. Accessed July 11, 2019. https://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_6.htm#crit%20c

Ormsby, Burke. 1966. "The Lady Who Lives by the Sea." *The Journal of San Diego History* 12(1). Accessed June 2018. http://sandiegohistory.org/journal/1966/january/ladybysea/.

Pourade, Richard F. 1977. The History of San Diego, Volumes 1–7. San Diego History Center. Accessed May 2020.

Pyle, Fred. 1949. "Experience Statement." Fred D. Pyle Papers, Water Resources Collections and Archives, University of California, Riverside).

San Diego Evening Tribune (SDET). 1930. "El Capitan, San Vicente Dam Plans Practical, Claims S.F. Engineer." Genealogybank.com: *The Evening Tribune* (San Diego, CA), November 24, 1930, pg. 2.

San Diego History Center. 2018a. "Biography: John D. Spreckels (1853–1926)." Accessed June 2018. http://www.sandiegohistory.org/archives/biographysubject/spreckels/.

San Diego History Center. 2018b. Photograph Collection Accessed In Person 2018.

SDCWA (San Diego Water County Authority). 2018. "San Vicente Dam Raise." Fact Sheet, February 2018. https://www.sdcwa.org/san-vicente-dam-raise

SDU (San Diego Union). 1917. "$15,000,000 to be expended on County Water Project." Genealogybank.com: *San Diego Union* (San Diego, CA), August 9, 1917, pg. 2.

SDU. 1922. "Fletcher Given Permit to Build Dam, Reservoir." Genealogybank.com: *San Diego Union* (San Diego, CA), September 22, 1922, pg. 1.

SDU. 1923a. "Let's Build Sutherland Dam." Genealogybank.com: *San Diego Union* (San Diego, CA), March 11, 1923, pg. 1.

SDU. 1923b. "Reasons Given Why Sutherland Dam should be built Before El Capitan." Genealogybank.com: *San Diego Union* (San Diego, CA), March 12, 1923, pg. 1.

SDU. 1925a. "Engineer Submits Report to Mayor on Dam Sites." Genealogybank.com: *San Diego Union* (San Diego, CA), August 1, 1925, pg. 7.

SDU. 1925b. "Manager Rhodes Seeks Engineer: Needs Man to Draw Plans, Estimates for Proposed Sutherland Dam." Geneaologybank.com: *The San Diego Union*. December 8, 2925, pg. 10.

SDU. 1925c. "Rush Plans for Sutherland Dam, Manager Rhodes Urges." Geneaologybank.com: *The San Diego Union*. December 20, 1925, pgs. 1, 4.

SDU. 1928a. "City Hall Notes." San Diego Union. October 1, 1928, Accessed March 29, 2019 from genealogybank.com

SDU. 1928b. "Council Names Otay Engineer." San Diego Union. October 9, 1928, Accessed March 29, 2019 from genealogybank.com

SDU. 1932. "City Hall Notes" San Diego Union. June 9, 1932. Accessed July 23, 2018 from genealogybank.com

SDU. 1937. "Build S.D. River Dam, Complete Sutherland Plea." Genealogybank.com: *The San Diego Union* (San Diego, CA), February 26, 1937, pg. 5.

SDU. 1938. "Pyle Named Emissary in Flood Control Parleys" San Diego Union. August 3, 1038. Accessed July 23, 2018 from genealogybank.com.

SDU. 1939a. "San Vicente Dam Viewed as Key Unit in City's System." Genealogybank.com: *The San Diego Union* (San Diego, CA), April 10, 1939, pg. 4.

SDU. 1939b. "Dam Foundation Test To Continue 2 Weeks" San Diego Union. September 30, 1938. Accessed July 23, 2018 from genealogybank.com.

SDU. 1939c. "San Diego River Flood Control Plan Approved" San Diego Union. Dec 20, 1939. Accessed July 23, 2018 from genealogybank.com.

SDU. 1940a. "Bond Election Proposed for Vicente Dam." Genealogybank.com: *The San Diego Union* (San Diego, CA), August 3, 1940, pg. 1.

SDU. 1940b. "The Unions Ballot." Genealogybank.com: *The San Diego Union* (San Diego, CA), November 5, 1940, pg. 1.

SDU. 1940c. "Pasqual Survey Asked for City Water Projects" San Diego Union. February 4, 1940. Accessed July 23, 2018 from genealogybank.com

SDU. 1940d. "Vicente Project Request Proposed." San Diego Union. March 10, 1940. Accessed July 23, 2018 from genealogybank.com.

SDU. 1941a. "Damsite Inspected by State Engineers." Geneaologybank.com: *San Diego Union* (San Diego, CA). January 16, 1941, pg. 13

SDU. 1941b. "Hinds Employed as Consultant on San Vicente." Geneaologybank.com: *San Diego Union* (San Diego, CA). March 27, 1941, pg. 10.

SDU. 1941c. "Colorado Water Legal Obstacles Cleared By Bill." Geneaologybank.com: *San Diego Union* (San Diego, CA). April 20, 1941, pg. 21

SDU. 1941d. "City to Study Best Means of Obtaining Colorado Water." Geneaologybank.com: *San Diego Union* (San Diego, CA). May 6, 1941, pg. 7.

SDU. 1941e. "Engineering Aid Scarcity Delays San Vicente Dam." Geneaologybank.com: *San Diego Union* (San Diego, CA). June 6, 1941, pg. 21.

SDU. 1941f. "State OK's Plans for San Vicente." Geneaologybank.com: *San Diego Union* (San Diego, CA). July 25, 1941, pg. 1

SDU. 1941g. "Bids Prepared for Vicente Dam." Geneaologybank.com: *San Diego Union* (San Diego, CA). July 29, 1941, pg. 13.

SDU. 1941h. "Council to Open San Vicente Dam Bids Tuesday." Geneaologybank.com: *San Diego Union* (San Diego, CA). August 24, 1941, pg. 19.

SDU. 1941i. "Council Awards Contract on Dam." Geneaologybank.com: *San Diego Union* (San Diego, CA). September 3, 1941, pg. 1.

SDU. 1941j. "Shovels Begin $1,744,000 Dam." Geneaologybank.com: *San Diego Union* (San Diego, CA). October 17, 1941, pg. 3.

SDU. 1942a. "Proposed San Vicente Road to Cost More Than Expected." Geneaologybank.com: *San Diego Union* (San Diego, CA). February 27, 1942, pg. 19.

SDU. 1942b. "U.S. Surveys Colorado River Water Plan for San Diego." Geneaologybank.com: *San Diego Union* (San Diego, CA). April 17, 1942, pg. 17.

SDU. 1942c. "Work Goes on Day and Night as San Vicente Dam Water Vital Need." Geneaologybank.com: *San Diego Union* (San Diego, CA). May 24, 1942, pg. 19.

SDU. 1942d. "U.S. Priorities Hit San Vicente Dam Project." Geneaologybank.com: *San Diego Union* (San Diego, CA). August 30, 1942, pg. 5.

SDU. 1942e. "Council Plans Limited Wartime Jobs with City." Geneaologybank.com: *San Diego Union* (San Diego, CA). September 12, 1942, pg. 5.

SDU. 1942f. "Army Relents, Leaves Vicente Dam Road Open." Geneaologybank.com: *San Diego Union* (San Diego, CA). November 21, 1942, pg. 6.

SDU. 1943a. "San Vicente Dam Closed to Catch Roaring Streams." Geneaologybank.com: *San Diego Union* (San Diego, CA). January 24, 1943, pg. 58.

SDU. 1943b. "New Dam Proves Storage Worth." Geneaologybank.com: *San Diego Union* (San Diego, CA). February 7, 1943, pg. 21.

SDU. 1943c. "San Vicente Dam Completion Due March 20." Geneaologybank.com: *San Diego Union* (San Diego, CA). March 3, 1943, pg. 16.

SDU. 1943d. "New San Vicente Reservoir Added to San Diego System." Geneaologybank.com: *San Diego Union* (San Diego, CA). March 17, 1943, pg. 1, 3.

SDU. 1943e. "San Vicente Bypass Now Open." Geneaologybank.com: *San Diego Union* (San Diego, CA). October 6, 1943, pg. 1.

SDU. 1944. "Water Shifted From El Capitan to San Vicente." Geneaologybank.com: San Diego Union (San Diego, CA). July 18, 1944, pg. 9.

SDU. 1945a. "Officials Inspect Route for New S.D. Aqueduct." Geneaologybank.com: San Diego Union (San Diego, CA). January 8, 1945, pg. 9.

SDU. 1945b. "First Contract on Aqueduct let." Geneaologybank.com: San Diego Union (San Diego, CA). May 21, 1945, pg. 7

SDU. 1946. "Voters to Wield Magic Key at Polls on Nov. 5." Geneaologybank.com: San Diego Union (San Diego, CA). October 27, 1945, pg. 19.

SDU. 1947a. "Aqueduct Strike Tie Up Spreads." Geneaologybank.com: San Diego Union (San Diego, CA). January 30, 1947, pg. 1.

SDU. 1947b. "Vast Aqueduct Insures New Growth for Cities of Southern California." Geneaologybank.com: San Diego Union (San Diego, CA). February 16, 1947, pg. 37.

SDU. 1947c. "Colorado River Water Pouring into Reservoir." Geneaologybank.com: San Diego Union (San Diego, CA). November 27, 1947, pg. 1.

SDU. 1947d. "How Colorado Funnels Precious Water into San Diego Reservoirs." Geneaologybank.com: San Diego Union (San Diego, CA). December 12, 1947, pg. 3

SDU. 1950. "Fred D. Pyle Mourned." *San Diego Union*. July 22, 1950. Accessed July 19, 2018 from genealogybank.com.

Scientific American. 1923. "A Rush Job in Dam Construction." *Scientific American* April 1923. On file at the San Diego Public Utilities Department Archive.

Sholders, Mike. 2002. "Water Supply Development in San Diego and a Review of Related Outstanding Projects." *The Journal of San Diego History*, Winter 2002, 48(1). Accessed June 2018. http://sandiegohistory.org/journal/2002/january/sholders/.

Smithsonian Institute. 2020. "Julian Hinds Collection." Finding Aid. Held at the National Museum of American history, Archives Center. Accessed May 21, 2020. https://sova.si.edu/record/NMAH.AC.0287

Smythe, William Ellsworth. 1908. "History of San Diego (1542-1908)." In *An Account of the Rise and Progress of the Pioneer Settlement on the Pacific Coast of the United States,* Volume II, *The Modern City*. San Diego, California: The History Company. Accessed June 2018. https://ia902300.us.archive.org/26/items/historyofsandieg02smyt/historyofsandieg02smyt.pdf.

USBR. 2020. "San Diego Project: History." Accessed May 20, 2020. https://www.usbr.gov/projects/index.php?id=389

State of California ♁ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 6Z

Other Listings
Review Code Reviewer Date

Page 1 **of** 29 ***Resource Name or #:** (Assigned by recorder) Sutherland Reservoir Complex

P1. Other Identifier:

***P2. Location:** ☐ **Not for Publication** ■ **Unrestricted**

***a. County** San Diego County **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** Ramona **Date** 1997 (2000 ed.) **T** 12S; **R** 2E; S21 ☐ **of Sec** ; San Bernardino **B.M.**

c. Address City Ramona Zip 92065

d. UTM: (Give more than one for large and/or linear resources) Zone 11S, 519889 mE/ 3664410 mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
Longitude: 33°07'05.5"N, Latitude: 116°47'12.5"W

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

Sutherland Dam is a concrete multiple-arch structure with an uncontrolled ogee channel spillway. The dam's ogee crest is set approximately three-feet below the scalloped crest walkway. Features of the Sutherland Reservoir Complex present consist of the dam, spillway, support structures, depth gauge, structure foundations, and bridge. The dam itself is 1,020 feet wide, and 1,240 feet wide when including the spillway. Its maximum height from streambed to the top of the parapet wall measures 161 feet (Fowler 1953). The dam's foundation below streambed is 16 feet deep with a spillway elevation above sea level of 2,057 feet. (**See Continuation Sheet**).

***P3b. Resource Attributes:** (List attributes and codes) HP21. Dam; HP22. Reservoir; HP11. Engineering Structure; HP04. Ancillary Building

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)

***P4. Resources Present:** ■ Building ■ Structure ☐ Object ■ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #) Sutherland Dam, looking upstream view to southeast, 6/7/2018, IMG 1467

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
1954(Fowler 1953, SDU 1954d)

***P7. Owner and Address:**
Public Utilities Dept.
City of San Diego
9192 Topaz Way,
San Diego, CA 92123

***P8. Recorded by:** (Name, affiliation, and address) Frank and Corder, Dudek
605 Third Street
Encinitas, CA 92024

***P9. Date Recorded:**
June 7, 2018

***P10. Survey Type:** (Describe)
Pedestrian

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")
Dudek. 2020. City of San Diego Source Water System Historic Context Statement

***Attachments:** ☐NONE ■ Location Map ■ Continuation Sheet ■ Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California ♁ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 29 ***Resource Name or #** (Assigned by recorder) Sutherland Reservoir Complex
***Map Name:** Ramona, California ***Scale:** 1:24,000 ***Date of map:** 1997 (2000 ed.)

State of California ♁ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
Primary #
HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) Sutherland Reservoir Complex ***NRHP Status Code** 6Z

Page 3 **of** 29

B1. Historic Name: Sutherland Dam and Reservoir

B2. Common Name:

B3. Original Use: Municipal water source B4. Present Use: Municipal water source

***B5. Architectural Style:** Multiple-arch dam

***B6. Construction History:** (Construction date, alterations, and date of alterations)

Sutherland Dam began construction in 1927-1928, construction ended in 1952-1954

***B7. Moved?** ■ **No** ☐**Yes** ☐**Unknown** **Date:** **Original Location:**

***B8. Related Features:**

B9a. Architect: Arthur Powell Davis (engineer) b. Builder:

***B10. Significance: Theme** n/a **Area** n/a

Period of Significance n/a **Property Type** n/a **Applicable Criteria** n/a

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Historical Context

(See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)

***B12. References:**

See Continuation Sheet.

B13. Remarks:

***B14. Evaluator:** Nicole Frank, MSHP

***Date of Evaluation:** June 30, 2020

(This space reserved for official comments.)

(Sketch Map with north arrow required.)

***P3a. Description (Continued):**

The dam's spillway encapsulates the regulatory machinery of the dam and is more consistent with a concrete embankment dam, which was formed by board-poured concrete supported by concrete trusses. The dam has a scalloped crest with the walkway contouring to the arches. This section connects the rectangular walled section to the spillway (Figures 1 and 2).

Figure 1. Overview of Sutherland Dam with spillway at far end, view to east, IMG_1471

Figure 2. Sutherland Dam, view from downstream to the south, IMG_1375

The spillway is an uncontrolled overflow ogee channel spillway that measures approximately 160-feet wide with a downstream length of approximately 162 feet. The downstream side of the spillway contains indentations at regular intervals. Their purpose is uncertain, but they may assist with energy dispersal. On either side of the spillway are elevated platforms, which contain associated pipework (Figure 3).

Figure 3. Overview of spillway in foreground, view to east, IMG_0961

An enclosed water level gauge station is located near the center of the dam's crest with a 24-inch diameter conduit running from the base of the station to the streambed floor (Figure 4). The gauge station contains a small desk, calendar for notations on water table height, and sounding line. The gauge descends to the downstream streambed at the base of the dam.

The base of the center arch of the dam has a small utility shed, constructed on a concrete slab, and composed of corrugated metal siding and a wooden door (Figure 5). The shed measures approximately 6 feet on each side, with peaked roof at a height of 10-feet. The shed is in good repair with a station marking of 18'+0' above its door. The shed is adjacent to a 36-inch buried pipeline encased in concrete with a meter read out above. Behind the shed, heading upstream is a chain-link fence line that has a swinging door on the right hand side.

The water outlet pipelines are located on the downstream streambed floor in the center arch of the dam (Figure 6). The two 36-inch pipelines are enclosed in two open square boxes made of board-formed concrete. The bays are approximately 10-feet and measured approximately 30-feet long and 20-feet wide. The bays were oriented north/south, perpendicular to the orientation of the dam itself. A monitoring platform was located on the northern end of the bays. The platform is equipped with an overhead light, electrical controls, and bulletin board. A large gear work valve protrudes above the boardwalk flooring (Figure 7). The two pipes that lead into the reservoir have labels spray-painted above them on the concrete arch; the eastern pipe labelled for Ramona, and the western pipe labelled for San Diego. Shotcrete was used on the lower portions of the walls to stabilize the soil. The shotcrete stabilizing continues along the western wall northward to the buttress.

Figure 4. Water gauge station with enclosed water pipe, looking west, IMG_0806

Figure 5. Utility shed with water gauge conduit descending on the right, IMG_1159

Figure 6. The southern access bay and contact point with the dam floor, IMG_1208

Figure 7. Electrical board on the control platform, IMG_1209

On the downstream side, adjacent to the buttresses near the center of the dam, is a bridge that traverses the streambed (Figure 8). The structure is approximately 20-feet wide and 60-feet long. The height is approximately 20-feet from the streambed. The bridge appears to have been added after either initial construction or a replacement for an earlier bridge.

Approximately 240 feet to the northwest of the western end of the dam is a cleared parking lot and concrete foundation (Figure 9). This area is approximately 60-feet long by 30-feet wide. The western slope is higher and has a short, coursed rubble rock wall with mortar. This small retaining wall is about 8-inches wide on average, with an average height of 1-foot. The northern end of the wall ends just before an underground utilities box access port, and the southern end terminates in a three-tiered terraced landscaping feature that contains a water trough at its peak, draining into the uppermost terrace. The landscaping feature is in poor repair with overgrown and unkempt plantings.

Figure 8. View of the bridge's foundations from the eastern end looking west, IMG_1347

Figure 9. Concrete foundation and parking area, with water tanks visible on the small hill, IMG_1494

The two steel water tanks located at the peak of the small hill are approximately 20-feet in diameter and approximately 14-feet tall, with low-pitched conical roofs. The two tanks have an overgrown access path on their northern side, which shares the entry road with the open concrete pad below. The tanks are surrounded by overgrowth, but the area appears to have been previously graded and cleared. An underground utility access box is located at the intersection of the two access road entries. These features are likely all that remain of either the original Keeper's House or Assistant Keeper's House.

Farther downstream to the north is a collection of multiple structures, including a large stair-stepped footing, a random rubble and mortar water feature/landscape feature, and a large concrete raised plinth/foundation. The stair-stepped footing feature stands approximately 8 feet tall and has three terraces, gaining in size as they lead to the lowest basin. It is unclear if the main basin has a concrete bottom, as there was too much debris and foliage for a clear view. This structure appears to be contemporaneous with the similarly constructed rock wall adjacent to the south.

The concrete raised plinth/foundation is situated with a small poured concrete stairwell on its south side, and a small retaining wall (Figure 10). The wall is two courses of rough faced stone. While the other random rubble features are of the same materials, this wall maintains a uniform height and thickness. The height of this small wall is approximately 24-inches tall with a thickness of approximately 80-inches.

Figure 10. Terraced water feature/ landscaping feature, view from upslope looking east, IMG_1530

The stair-stepped footing is constructed into the slope of the knoll, and has two vertical supports with exposed rebar (Figure 11). The height is approximately 8 feet to the top, with the two supports on top adding another 3 feet. The purpose of this structure is unknown.

Figure 11. Stair-stepped footing, looking south with Sutherland Lake in background, IMG_1434

***B10. Significance (Continued):**

Phase 1: Private Water Company Development and Ownership (1880s-1927)

The San Dieguito River area north of San Diego originally attracted land and water developers during the economic boom of the 1880s. Two companies emerged during this period that precipitated the water developments that led to the Sutherland, Pamo, San Dieguito, and Hodges dams and reservoirs. They were the San Luis Rey Flume Company (1887) and the Pamo Water Company (1888). San Luis Rey Flume Company diverted water from the San Luis Rey River, and delivered it via flume to customers but did not actually engage in building any dams.

The Pamo Water Company was funded with eastern-United States investor money and like the San Luis Rey Flume Company did not actually engage in building projects. Instead, the company focused on acquiring lands and water rights for the San Luis Rey River, San Dieguito River, Santa Ysabel Creek, Pamo Creek, and other streams and creeks in the 300-square-mile area (City of Escondido 2018; Fowler 1953; Meixner 1951; San Diego Union 1887).

The intensive interests of these water companies attracted several land speculators, including William Carney and J.M. Woods who bought much of the Pamo Valley with visions of building a dam and impounding water system for the growth of agriculture in the region. The initial intention was to divert water from the San Luis Rey River into the Pamo Valley, where a dam would be constructed to supply water to the southern San Diego County. As a result, the Pamo Water Company was organized March 1888, and by 1889, Woods had sold 800 acres to the newly founded water company (Beck 2015). The Pamo Water Company incorporated in 1917, changing the name to the Pamo Mutual Water Company. Upon incorporation, the company's investors put forth $1,750,000 to build two dams, one at Pamo Valley between Ramona and San Pasqual and one at the future Sutherland dam site between Ramona and Mesa Grande (SDU 1917). The articles of incorporation for the Pamo Mutual Water Company were filed in conjunction with the Warner Mutual Water Company and the San Dieguito Mutual Water Company, which were all under the management of Colonel Ed Fletcher and William G. Henshaw of the Santa Fe Railway (ET 1917).

In 1919, the City of San Diego attempted to obtain water from the San Dieguito Mutual Water Company, but the water company's owner, the Santa Fe Railroad, did not want the Railroad Commission delivering water to a municipality. The City, on January 26, 1920, entered into an agreement to receive 3,000,000 gallons of water a day, at 10 cents per 1,000 gallons, from the private development on the San Dieguito River by signing a 10-year contract with Ed Fletcher and W.G. Henshaw. Fletcher and Henshaw acted as middlemen, and contracted for this water with the San Dieguito Mutual Water Company at the price of 7 cents per 1,000 gallons (Fowler 1953). In 1922, Ed Fletcher was given a permit by the State Department of Public Works, Division of Water Rights, for the right to create the Sutherland Reservoir on the Santa Ysabel River and to develop hydroelectric power. This permit included construction of a 4.9-mile main line/canal and a dam (SDU 1922).

Throughout 1923, the San Diego City Council urged the construction of Sutherland Dam stating, "A dam at this point will produce twice the water available under the $4,500,000 development of El Capitan at half the cost" (SDU 1923). In 1923, the El Capitan dam site was tied up in litigation concerning ownership of the land. The argument was made that if the $4,500,000 was spent on the El Capitan Dam, less than 5,000,000 gallons net safe yield per day would be produced, and of that amount, the La Mesa District required a share. If Sutherland were to be constructed, it would be half the cost and produce twice the amount of water of El Capitan (SDU 1923). In 1924, Fletcher and Henshaw signed a contract with the City to the San Dieguito Water Company, which was organized to replace the San Dieguito Mutual Water Company (Fowler 1953).

On October 5, 1925, the City of San Diego leased the complete San Dieguito Water Company system, which included the reservoirs at Sutherland and Pamo. The lease was to extend for 30 years with an option to purchase the system for $3,750,000 at any point, subject to an option payment of $500,000 before January 1, 1926 (Fowler 1953). If dams were to be constructed at Sutherland and San Vicente, and as a direct consequence create reservoirs, San Diego would gain a daily supply of 15,000,000 gallons of water, which, if the City chose to buy the San Dieguito system, would pay for itself in water sales alone (SDU 1925a). The option payment was made on December 1, 1925, by using part of the money bonded in 1924 for the construction of the El Capitan Dam and Reservoir. Under this lease, the City was to make monthly payments to the San Dieguito Water Company and to assume responsibility for all previous commitments of the water system (Fowler 1953).

In December 1925, City Manager Fred Rhodes began to seek an engineer for the Sutherland Dam project and met with several southern and northern California hydraulic engineers. At the urging of Rhodes, Arthur P. Davis, a consulting engineer at East Bay Municipal District in Oakland and later consulting engineer for the Boulder (Hoover) Dam, recommended in a report that San Diego should employ a "buttressed type of Dam, with inclined face" as it was a cheap and safe option (ET 1926c: 14). Davis was formally recommended as consulting engineer in 1926, and designs for the Sutherland Dam and pipeline, plus alternates were submitted shortly after. The multiple arch dam design, recommended by Davis as the cheaper option, was selected and plans were filed with the City on December 4, 1926 (ET 1926 a, 1926b, 1926c, 1926d; SDU 1925b, 1925c).

Phase 2: Initial Sutherland Dam Construction (1927-1949)

Construction of the Sutherland Dam, named for local rancher John P. Sutherland, began in 1927. The intention of the dam was to capture rainfall from the San Dieguito watershed, which on average was 30 inches of rain a year. The resulting Sutherland Reservoir would preserve billions of gallons of water that normally flowed into the ocean. Joseph LaBar, engineer from the Foundation Company of New York, was named the first supervising engineer in early February 1927. The Los Angeles construction firm Edwards, Wildey & Dixon won the contract with a low bid of $886,742 and soon began constructing a road to the site. Edwards, Wildey, & Dixon were known to San Diego, however, having built the John D. Spreckels Building and the Pickwick Hotel. Unusually heavy rains washed out the new road in February 1927, which had to be rebuilt soon after (Crawford 2011; ET 1927a; Fowler 1953; SDU 1927a, 1927b). In the spring of 1927, construction began on the dam's foundation, although quickly it was realized that the borings for the dam's base would require deeper digging in order to hit sound bedrock. As a result, cost estimates began to rise and the City Hydraulic Engineer, J.W. Williams, warned that the total expense could increase to $3,700,000. By the summer of 1927, rumors began to spread that the dam's foundation was unstable and it could not be built at any cost. A panel of consulting engineers, including Louis Hill, A.J. Wiley, and C.R. Olberg, was called to inspect the site and make a determination on the next steps. They suggested relocating the project to a better foundation approximately 1,000 feet up the canyon. This relocation was recommended despite the $120,000 already spent on the project (Crawford 2011; ET 1927b; Fowler 1953; SDU 1927c, 1927d).

Verne Peugh, a City engineer succeeded LaBar as supervising engineer, in August 1927. That October, contractors Edwards, Wildey, & Dixon moved their operations to the new upper dam site. The upper dam site presented its own problems. Due to the shape of the reservoir, the new dam would need to be 300 feet wider in order to fit in the space. Engineers argued that the new dam would cost less because of the shallow bedrock, although this proved to be untrue as cost estimates began to rise into the two million dollar range. Peugh resigned as supervising engineer in February 1928, due to the repeated faltering of the dam's progress, and Orlando K. Parker of Los Angeles replaced him in April 1928 on the recommendation of the City Hydraulic Engineer. New plans were drawn by Los Angeles engineering firm Quinton, Code & Hill in 1928, with a young Paul Beerman as the listed draftsman. Seven buttresses were partially built on the new site and a portion of the spillway was excavated when the City found it necessary to discontinue work (Figure 12). Work stopped on July 1, 1928 when the slow-moving project was nearly bankrupt (Crawford 2011; ET 1927c, 1928; Walter L. Huber Papers Collection 1910-1950, WRCA, UC Riverside; SDU 1928).

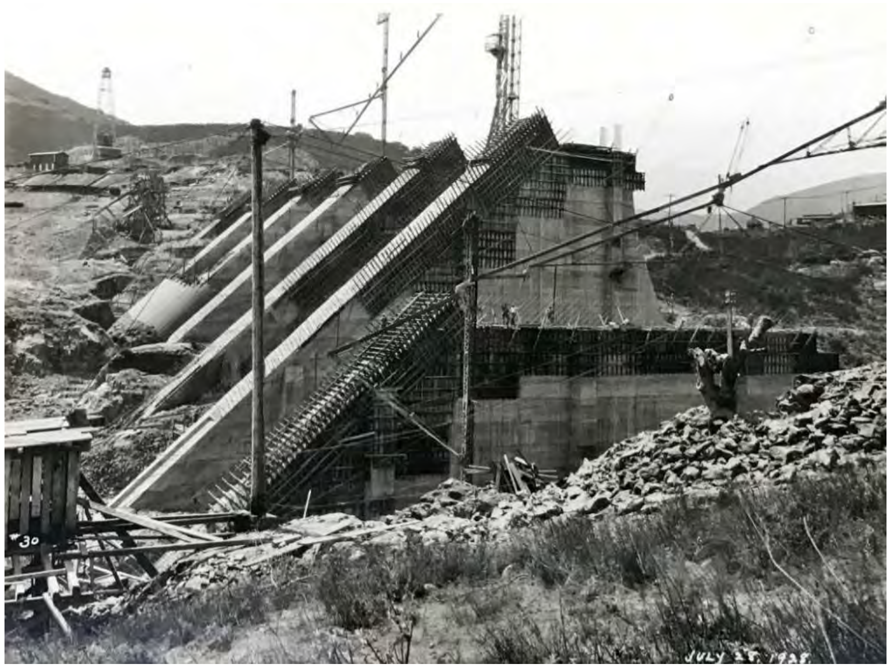


Figure 12. View of Sutherland Dam under construction, July 28, 1928, (Water Resources Center Archives, University of California Riverside).

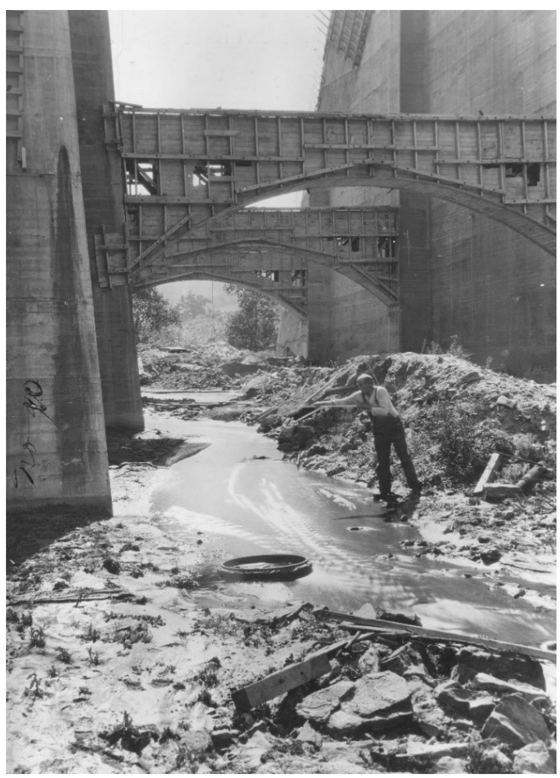


Figure 13. The abandoned Sutherland Dam Site in 1928 (Crawford 2011).

As a last act to salvage the project, the City Council turned to experienced hydraulic engineer Hiram N. Savage, who had built several of San Diego's large water projects. Savage's employment as Hydraulic Engineer for the City of San Diego lasted until 1923, when he was summarily dismissed after multiple disputes with the City Council and consulting hydraulic engineers J. B Lippincott and John R. Freeman. Savage, upon inspection of the Sutherland project, was very critical of the multiple-arch design and on August 13, 1928, advised the Council that only $100,000 in bond funds remained while an additional $700,000 would be required to complete the dam project. In 1929, a wildfire went through the Sutherland basin ending any chance that the Sutherland Dam project would restart. It was reported, "all that remains of the City's Sutherland venture are some concrete buttresses uprearing at the damsite, a pile of reinforced steel shapes rusting on a hillside, and an engineer's camp nestled on a hillside" (Crawford 2011).

There were also legal considerations that resulted in the termination of the Sutherland Dam project. Escondido wanted to claim the water rights due to the fact that the natural course of the water would flow west and out into the ocean, not towards San Diego and the City's filtration plant at Lake Murray. This battle between the City of San Diego and Escondido lasted decades and ensured that the Sutherland Dam project would progress no further (Figure 13) (Fowler 1953).

Phase 3: Final Sutherland Dam Construction (1949-1954)

After the stalling of the Sutherland Dam project, the City took on other water projects, including the El Capitan Dam (1932-35), the San Vicente Dam (1943), and the delivery of Colorado River via an aqueduct from San Jacinto (1939) (Crawford 2011). Despite these projects, the population and industry of San Diego rose sharply after WWII, and the City planned to restart construction of the Sutherland Dam to help meet the increased demand for water. The California Division of Water Resources issued a special report in 1949 entitled "Bulletin No. 55: San Dieguito and San Diego Rivers Investigation." This report recommended the completion of the Sutherland Dam, as well as the construction of the Super Hodges Dam, to meet the new water demands and fully conserve runoff from the San Diego River. Cost estimates made in the Bulletin showed it would be less expensive to finish the partially constructed multiple-arch dam than to build an earth-fill embankment, which under ordinary circumstances would be the most economical option (DWR 1949; Fowler 1953; WDCSD 1957).

In February 1952, San Diego voters passed a bond for $6.5 million to restart work on the old foundations of the Sutherland Dam. A second proposition also passed, which paid for the construction of the second pipeline for the San Diego Aqueduct. Council Resolution No. 106940 sold the bond issue designated as "Water Works Bond 1952" on May 27, 1952, to Bank of America National Trust. In June 1952, the contract was awarded to the George Daley Corporation and the Bent Construction Company under the direction of George Daley for a joint bid of $2,896,485 (SDU 1952). Construction of the dam resumed (Figure 14). A few weeks later, in July 1952 Hjalmar Gericke was selected from the Water Department engineering staff to be the Resident Engineer (WDCSD 1957). Comparative studies were conducted which included various types of dam designs that would be suitable for the site, concluding that the original multiple-arch type would be best. Water Department engineers Hjalmar Gericke (Resident Engineer) and William C. Brown (Principal Civil Engineer) modified the original 1927 Arthur Powel Davis design under the review of Carl Rankin and W. A. Perkins, Consulting Engineers (SDU 1953, 1952; WDCSD 1957).

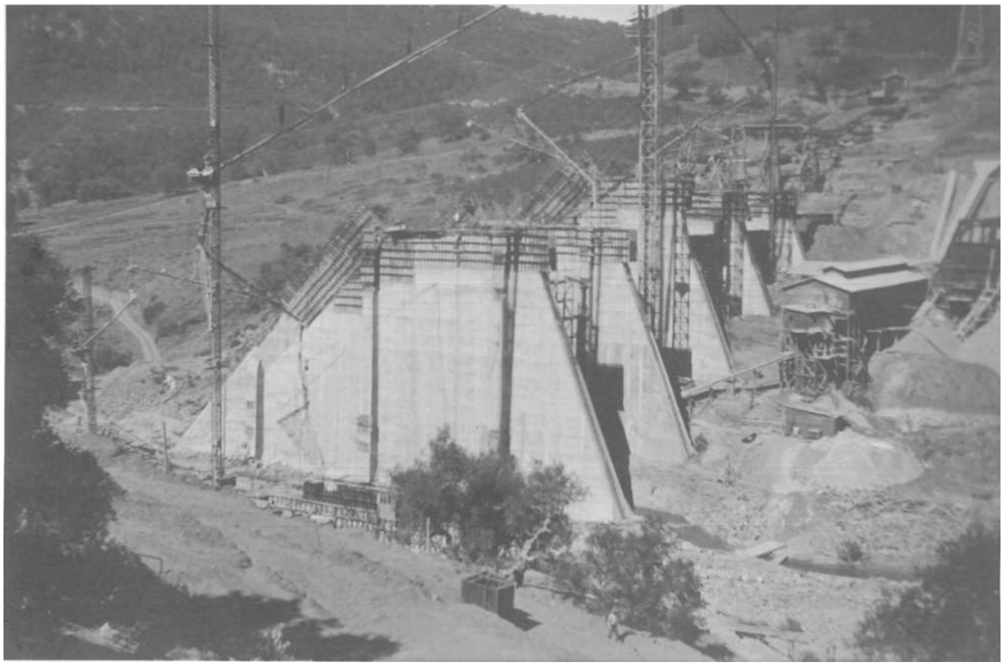


Figure 14. Construction resumes, circa 1952 (City of San Diego, Public Utility Department)

The largest modification from the 1927 dam design was the addition of reinforced concrete diaphragms, additional struts between buttresses in certain bays, and the omission of struts in other bays. The purpose of these changes was to provide increased seismic stability in the direction of the dam's axis and conform to current practices and requirements of the State Department of Water Resources, Division of Dams. Through dividing the dam into rigidly connected groups of buttresses, diaphragms, struts, and arches, separated by more flexible arches in the bays where bracing was omitted, the dam could adapt to higher seismic forces (WDCSD 1957). Upon completion, the dam measured 1,020 feet wide for the dam proper and 1,240 feet including the spillway. Its maximum height from streambed to the top of the parapet wall measured 161 feet (Fowler 1953; WDCSD 1957).

The arches of the dam sloped 45 degrees on the upstream face and were supported by eighteen heavily-reinforced concrete buttresses, spaced sixty feet on-center, and numbered consecutively 1 to 18 from east to west (Figure 15). Each buttress was similar in profile except buttresses 1 and 18; number 1 was integrated into the spillway and number 18 was poured with the west gravity section as a monolith. Each buttress measured 3 feet. 4 inches thick at the top and 10 feet thick at the streambed. The structure's stability came from both the two levels of horizontal connecting struts and the roadway on the crest of the dam. Upon completion in 1954, the dam featured seventeen arches, three gravity sections, fifteen arched struts, six rectangular struts, six diaphragms, a spillway weir and apron, two spillway piers, outlet works, and a continuous concrete cutoff wall along the upstream outline of the structure running entirely across the dam and spillway (Figure 16) (WDCSD 1957; Fowler 1953).

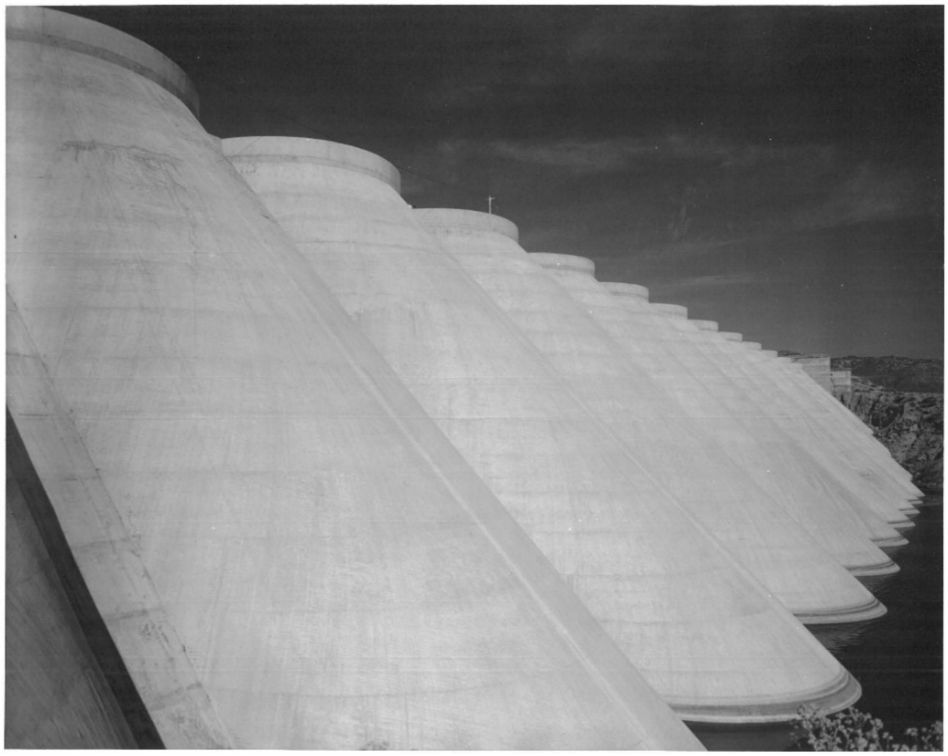


Figure 15. Sutherland Dam upstream face, photo #56-10-13-G, 1954 (courtesy San Diego History Center).

The spillway section of the dam was concrete-lined and cut into the left abutment on the downstream side, with a hollow reinforced control section 6 feet above the floor of the channel. The design of the spillway provided for the future installation of radial spillway gates, which would raise the maximum water surface 13 feet and increase the maximum storage by about 7,750 acre-feet. The total channel's width was 164 feet, with a clear width of 150 feet. There were two central piers constructed to support a bridge across the spillway. Upon completion, the estimated spillway capacity was 37,000 cubic feet per second and was expected to withstand overflow without damage (WDCSD 1957; Fowler 1953).

To provide the large quantities of concrete needed for dam construction, contractors installed a fully automatic concrete batching plant, designed to be operated by one person, complete with a 2-cubic-yard mixer, located about 200 feet downstream of the dam. The cement used was Portland Type II, supplied by the Riverside Cement Company located near the Crestmore area of Riverside, California. The aggregate used came from a fluvial sedimentary deposit containing granitic and dioritic grains (sand-, gravel-, and cobble-sized) with a maximum diameter of six inches, quarried from the Caudell & Johnson Poway Pit in nearby Poway Valley. During batching, an admixture known as Possolith Type III and supplied by Master Builders Corporation was added to all of the concrete. Specifications required that the concrete be a "dense, watertight, workable homogeneous mixture of cement, aggregate, admixture, and water… to attain a compressive strength of 3,000 pounds per square inch within 28 days" (WDCSD 1957).

Along with the construction of the Sutherland Dam, the bond issue also provided money for the construction of the Sutherland-San Vincente Pipeline. An estimated $1,800,000 of the

1952 bond was allocated for the conduit. Construction of the pipeline was divided into several contracts. The Shea Company built the Black Canyon tunnel, with Harry L. Foster acting as contractor on the conduit from the lower end of the tunnel to the San Vincente reservoir. Engineering Constructors were responsible for installing the pipeline from the Sutherland Dam to the tunnel (SDU 1953). Water from Sutherland Reservoir was to be passed through the pipeline to the San Vincente Reservoir and then to the City of San Diego (Fowler 1953).

Prior to the dam's completion, the question was raised as to whether the final name of the dam should be changed from the Sutherland Dam to the Fletcher Dam, after Ed Fletcher who played an intricate role in the early development of water in San Diego County. This name change was denied by the City Council, stating their decision "was not based on the merits of the two names, but on a City policy which is against the naming of such public monuments for living persons" (SDU 1954a). The name Sutherland, as one citizen put it, "was named for a man who has given much for the building of the community in this area as well as support the program for building the dam…he was a much respected and loved citizen" (SDU 1954b).

Phase 4: Dam and Reservoir Completion and Post-Construction Developments, 1954-1990

The Sutherland Reservoir Complex was completed June 5, 1954, a 24-year span between starting the original dam and completing the final structure. A dedication ceremony held at the dam brought 300 local citizens, then-Mayor John D. Butler, and City officials to view the structure. Mayor Butler stated that the Sutherland Dam "is important to San Diego's future…further industrial development on Kearny Mesa depends on the coast and availability of water" (SDU 1954c). During the ceremony, Mayor Butler's wife and Mrs. Stanley Bent Sr., whose late husband had worked on the original dam and resulting reservoir, unveiled a plaque bearing the names of the officials, advisers, and contractors who finished the dam. Upon its dedication, the reservoir was one-twentieth full, awaiting rains in order to be a substantial contributor to the City's water system (SDU 1954c). When full, the Sutherland Reservoir covered 556.8 surface-acres, had a maximum water depth of 145 feet and 5.25 shoreline miles, with a water storage capacity of 29,508 acre-feet (Fowler 1953).

In 1960, a report requested by the City of San Diego to study possible developments in the City's water supply recommended that spillway gates and an underground basin be installed at Sutherland Dam. The gate had the potential to be raised or lowered to control the amount of water flowing through the dam, and potentially stop flooding in the areas downstream from the reservoir. The report estimated that the construction cost to develop the spillway gates, as well as the recommended underground basin, would be $6,162,700 and have an annual operating cost of $316,000 (Ribbel 1960). Despite this proposition, there is no indication that the spillway gates were ever constructed at Sutherland.

In 1964, the Ramona Municipal Water District (RMWD) signed an agreement with the City of San Diego to purchase water that was being sent from Sutherland to San Vincente then repay the City with credit for a like amount of Ramona's share of Colorado River water. In order to filter this water voters overwhelmingly approved a $2 million water bond issue in December 1971 for the construction of two water filtration plants. The first filtration plant was constructed for the northwest portion of the 68-square-mile Ramona Water District that processed and purified water from the Sutherland Reservoir. Some of the bond money was also used to modify the outlet system of the reservoir and construct new pipes to transport the water to the new plant and distribute it into the existing system. The Bargar Water Treatment Plant on Black Canyon Road had a daily pumping capacity of four million gallons of water (Beck 2012).

The Sutherland Reservoir spilled over for the first time in April 1978, sending the overflow downstream to Lake Hodges and from there into the Pacific Ocean (Figure 16). This was the direct result of heavy winter rains and was the first time the reservoir was more than halfway up the 145-foot-tall dam since its completion in 1954 (LAT 1978). The dam reportedly spilled over again in the 1990s, but the exact year is unknown. This represented the last major event or change made to the site, both ownership wise and structurally. The dam and reservoir remain relatively similar to its original appearance upon completion in 1954.

Figure 16. 1978 Aerial View of Lake Sutherland (courtesy City of San Diego).

Initial Phase Engineer: Arthur Powell Davis (1861-1933)

Arthur Powell Davis was born in 1861 in Decatur, Illinois, but was raised near Junction City, Kansas. Davis was the nephew of John Wesley Powell, one of the foremost explorers of the Western United States. Davis went into engineering, graduating from George Washington University in 1882 and finding work with the United States Geological Survey (USGS). He left the USGS and worked as a Hydrographer beginning in 1894. From 1897-1901 he was Hydrographer in Charge of Examination of Hydrologic Work for Interoceanic Canals in Nicaragua and Panama (SNAC Cooperative 2019).

In 1902, Davis joined a new branch of the U.S. Department of the Interior, the Reclamation Service as Assistant Chief Engineer. Just five years later, Davis was promoted to chief engineer of the Reclamation Service. In 1914, Davis again was promoted, this time to the Director of the Reclamation Service, effectively leading the department branch. During his tenure from 1914 to 1923, Davis worked on or approved many significant early dam infrastructure projects throughout the western United States, including the Roosevelt, Shoshone and Boulder (Hoover) Dams, and the All-American Canal. Davis was instrumental in outlining the development of the Colorado River from 1902 when he first surveyed Black Canyon to his presentation before Congress in 1922. However, the expected expenditure of the Boulder Dam, several scandals within the department, mounting dissention from private power companies, and the then-current political climate led to the reorganization of the Reclamation Service into the Bureau of Reclamation in 1923 and the dismissal of Davis from his director role (Gressley 1968; SNAC Cooperative 2019).

After the Reclamation Service, Davis became the Chief Engineer and General Manager of the East Bay Municipal Utility District in Oakland, California and occasionally consulted on western dam projects like Sutherland Dam. In 1929, Davis left Oakland for the U.S.S.R, to work as chief consulting engineer for irrigation in Turkestan and Transcaucasia until 1931. Davis returned to the United States in 1931. In an interesting turn of events, Davis resumed work on a project he had helped shape a decade before with the Reclamation Service—working as Consulting Engineer for the Boulder (Hoover) Dam project in 1933. Just a few months after this appointment Davis died in Oakland, California (SNAC Cooperative 2019).

NRHP and CRHR Significance Evaluation

NRHP Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.

CRHR Criterion 1: Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

While the Sutherland Reservoir Complex is a component of the larger City of San Diego Source Water System, it was constructed outside the established significant periods of development associated with the system, 1887-1947, and is therefore a non-contributing component.

Construction on the Sutherland Dam began in 1927 after five years of the San Diego City Council urging for its development. It was expected that if the Sutherland Dam were to be constructed, it would cost half the expense and produce twice the amount of water of the El Capitan Dam. After encountering multiple problems, including too high of an expense and legal issues, construction stopped on the dam in July 1928. San Diego continued to build large water infrastructure projects throughout the twentieth-century, but with the rising population of the City during and after WWII, plans for the construction of the Sutherland Dam restarted to help meet the increased demand for water. The dam was completed June 5, 1954, after a 24-year span between the initial construction of the lower part of the dam and the completion of the dam.

Given the fact that the Sutherland Dam was not completed until 1954, the entire complex falls outside of the established periods of significance for the City of San Diego Source Water System. Despite the planning efforts falling within the earlier periods of significance, the function and use of the dam shifted since the original planning in 1927. Instead of being a component of the Post St. Francis Disaster Development period spanning 1928-1947, the dam's completion proved to be a vital task in ensuring that the City would have enough water with the rising population following World War II. The California Division of Water Resources issued a special report in 1949 entitled Bulletin 55, which recommended the completion of the Sutherland Dam to meet the new water demands and fully conserve runoff of the San Diego River.

Given the date of construction of 1954 and stronger association with Post-war population booms than earlier development periods for the San Diego Source Water System, the

Sutherland Reservoir Complex appears not eligible under Criterion A/1 as both a contributor to the City of San Diego Source Water System and as an individual property.

NRHP Criterion B: Associated with the lives of significant persons in our past.
CRHR Criterion 2: Associated with the lives of persons important in our past.

The Sutherland Dam Site has connections to noted individuals, including Colonel Ed Fletcher and William G. Henshaw who were early developers and notable capitalists in the County and City of San Diego. Despite this connection with Fletcher and Henshaw, the subject property is not connected with any of these individuals in a way that demonstrates their contributions were demonstrably important within a local, state, or national historic context. Therefore, the subject property does not appear eligible under NRHP/CRHR Criteria B/2.

NRHP Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

CRHR Criterion 3: Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

The Sutherland Reservoir Complex appears not eligible under NRHP/CRHP Criterion C/3. While it embodies the distinctive characteristics of the multiple-arch concrete dam, which was commonly employed between 1910 and 1928, the Sutherland Dam itself was completed long after the typical period this dam type was in use. Further contributing to its lack of eligibility under Criterion C/3 is the fact that while associated with master Engineer Arthur Powell Davis, the original design was modified multiple times and the dam was not completed until 1954, 21 years after Davis's death.

Master engineer Arthur Powell Davis designed the initial plans for Sutherland Dam in 1927, however, the plans were redesigned twice to accommodate changes in location and resuming work after a 24-year delay. Davis who is considered "a figure of generally recognized greatness in [his] field" was instrumental in bringing about the Boulder (Hoover) Dam, and worked on major engineering achievements of the early twentieth-century including the All American Canal and the Panama Canal, as well as working internationally as a consulting engineer in U.S.S.R. Davis's prowess as a hydraulic engineer led to him heading the Reclamation Service from 1914-1923, until his dismissal for suggesting one of the greatest engineering achievements in the western United States: the Boulder Dam. The Sutherland Dam design would have been situated in the years after Davis was working for the East Bay Municipal Utility District for Oakland, California (1923-1929), after he was dismissed from the Reclamation Service. Contextualized within his greater career, the Sutherland Dam does not serve as a good representation of Davis's career when he was working for East Bay Municipal Utility District, nor of the period when he was accepting consulting work before finally accepting a prestigious international consultation job in the U.S.S.R. Davis's design was adjusted, but never outright changed, rejected, or redone, despite the long break between construction periods and critiques by another master engineer and City Hydraulic Engineer, Hiram N. Savage. The dam was completed in 1954, retaining the multiple-arch design after conducting several studies, which included various types of dam designs that would be suitable for the site.

Despite the fact that Sutherland Dam retains elements typically seen on multiple-arch dams, including a slim profile, delicate buttresses, multiple repeating arches, and steeply sloping arches on the upstream face, the original design of the dam was modified multiple times prior to its completion in 1954. Further impacting the significance of the design of the dam are the modifications that included the addition of reinforced concrete diaphragms, additional struts between buttresses in certain bays, and the omission of struts in other bays. The purpose of these changes was to provide increased seismic stability in the direction of the dam's axis. Because of these alterations to the original design, and delay in the dam's completion, the Sutherland Reservoir Complex cannot be said to embody a distinctive period, type, or method of construction.

In summary, the Sutherland Dam was designed by master engineer Arthur Powell Davis in 1927 but does not serve as a good representation of his work. Additionally, the dam's date of completion in 1954, falls far outside the typical date range for its typology. There are many examples of the multiple-arch dam in California which do embody the distinctive period of popularity for this dam type, and the typology of the dam detracts from its eligibility for being a significant piece of engineering history. Furthermore, the modifications to the dam's original design further and its late date of construction in 1954 also prevent it from rising to the level of significance required under Criterion C/3. Therefore, the Sutherland Reservoir Complex appears not eligible under NRHP/CRHR Criterion C/3 as both a contributor to the City of San Diego Source Water System and as an individual property.

NRHP Criterion D: Have yielded, or may be likely to yield, information important in history or prehistory.

CRHR Criterion 4: Has yielded, or may be likely to yield, information important in prehistory or history.

Archaeological survey was not conducted for this project. At this time there is no indication that the Sutherland Reservoir Complex has the potential to yield information important to state or local history. Therefore, the property is recommended not eligible under NRHP/CRHR Criterion D/4.

<u>City of San Diego Significance Evaluation</u>

Criterion A: Exemplifies or reflects special elements of the City's, a community's, or a neighborhood's historical, archaeological, cultural, social, economic, political, aesthetic, engineering, landscaping, or architectural development.

The Sutherland Reservoir Complex does not exemplifies special elements of San Diego's historical development. Construction on the Sutherland Dam began in 1927 after five years of the San Diego City Council urging for its development. It was expected that if the Sutherland Dam were to be constructed, it would cost half the expense and produce twice the amount of water of the El Capitan Dam. After encountering multiple problems, including too high of an expense and legal issues, construction stopped on the dam in July 1928. Given the fact that the Sutherland Dam was not completed until 1954, the entire complex falls outside of the established periods of significance for the City of San Diego Source Water System (1887-1947). Despite the planning efforts falling within the earlier periods of significance, the function and use of the dam shifted since the original planning in 1927.

The Sutherland Reservoir Complex also fails to reflect special elements of San Diego's engineering development. Multiple arch dams are constructed of a series of upright, concrete arches, supported by buttresses and distributing the weight of the reservoir water across the stable arch forms. This dam type required fewer materials and was thinner in form than embankment dams or gravity dams. However this design fell out of favor with the public and the engineering community after the 1928 St. Francis Dam disaster, because of a lack of trust in thin and cheaply produced dams. More confidence could be inspired by a dense earthen or massive concrete gravity dam, and these design trends resume as the popular dam type after 1928. Given the 27-year gap between the upper Sutherland Dam's original design (1927), initial construction (1927-1928) and its completion (1954), the design no longer accurately reflected the historical context of any of these periods, or accurately reflected the City's need for local water sources for the City of San Diego in the early twentieth century. Therefore, the subject property does not appear eligible under City Criterion A.

Criterion B: Is identified with persons or events significant in local, state, or national history.

Persons: Although the Sutherland Reservoir Complex had connections to noted individuals, including Colonel Ed Fletcher and William G. Henshaw who hold importance within the history of development in San Diego, the subject property is not connected with any of these individuals in a way that directly represents their contributions within the local historic context.

Events: As described in the NRHP/CRHR A/1 criterion discussion above , the Sutherland Reservoir Complex does not have a strong association or can be identified with events significant in local and state history. The Sutherland Dam was designed in 1927, but construction was halted in 1928 and not resumed until the 1950s. The dam was finally brought to completion in 1954, to support the post-WWII population boom. However, it is not associated with any major events that necessitated increasing the water infrastructure in San Diego, and sits outside the period of major water infrastructure development for the City of San Diego, which spanned from 1887 to 1947. Therefore, the Sutherland Reservoir Complex does not appear eligible under City Criterion B.

Criterion C: Embodies distinctive characteristics of a style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship

As described under NRHP/CRHR Criterion C/3 discussion above, the Sutherland Dam is a fair and relatively unaltered example of the multiple-arch dam type that retains elements of the original design's character defining features, including a slim profile, delicate buttresses, repeating arches, and steeply sloping arches on the upstream face. However, because it was constructed 27 years after its original design, it no longer embodies the characteristics of the original style or period of design, instead representing an anachronistic design from a period before the City of San Diego began importing the majority of its water. Therefore, the subject property does not appear eligible under City Criterion C.

Criterion D: Is representative of the notable work or a master builder, designer, architect, engineer, landscape architect, interior designer, artist, or craftsman.

As described under NRHP/CRHR Criterion C/3 (see full discussion above), the Sutherland Dam is not a notable work of master engineer Arthur Powell Davis. Sutherland Dam was a one-time consulting project Davis agreed to during the period when he worked for East Bay Municipal Utility District for Oakland, California (1923-1929). During this period, he accepted multiple consulting engineer contracts outside of Oakland before accepting an international consulting engineer position in the U.S.S.R. In addition, the Sutherland Reservoir Complex's multiple arch type design was not fully realized until 27 years after the original design and 24 years after construction was halted.

While interesting that the City of San Diego continued Davis's design, Davis's credit is diminished as the dam was completed 21 years after his death, and arguably without his design input. Therefore, the Sutherland Reservoir Complex does not appear eligible under City Criterion under Criterion D.

Criterion E: Is listed or has been determined eligible by the National Park Service for listing on the National Register of Historic Places or is listed or has been determined eligible by the State Historical Preservation Office for listing on the State Register of Historical Resources.

The Sutherland Reservoir Complex is not known to be on any local, state, or national list of significant properties, nor is it known to have been determined eligible for listing on any register. Therefore, the Sutherland Reservoir Complex is not currently eligible under City Criterion E.

Criterion F: Is a finite group of resources related to one another in a clearly distinguishable way or is a geographically definable area or neighborhood containing improvements which have a special character, historical interest, or aesthetic value, or which represent one or more architectural periods or styles in the history and development of the City.

As described under NRHP/CRHR Criteria A/1 and C/3 (see full discussion above),the Sutherland Reservoir Complex is not significant for it role, function, and design within the larger City of San Diego Source Water System, because its completion date of 1954 falls outside the period of significance for the City of San Diego Source Water System. The period of significance for this system started with the earliest efforts to establish privatized water in the 1880s soon followed by construction of the earliest reservoirs, Lake Cuyamaca (1887) and Sweetwater Reservoir (1888). The period of significance ends with construction of the San Diego Aqueduct, and the importation of Colorado River Water for the first time into the San Vicente Reservoir (1947), which forever changed the composition of City's source water supply. Therefore, the Sutherland Reservoir Complex does not appear eligible under City Criterion F.

Integrity Assessment

Overall, the Sutherland Reservoir Complex retains high integrity of retain integrity of location, setting, design, materials, workmanship, and feeling. While some secondary elements of the complex (e.g., Keeper's houses) suffer from a lack of integrity, the complex as a whole retains requisite integrity, as described below:

Location: The complex retains integrity of location. The location of the Sutherland Reservoir Complex was altered once in 1927, while foundation work was still being completed. The dam location off Sutherland Dam Road in San Diego selected in October 1927 has been retained. The additional engineering structures and support buildings have never been shifted or relocated. As such, the Sutherland Reservoir Complex retains its integrity of location.

Setting: The complex retains integrity of setting. The physical conditions surrounding the dam have remained relatively similar since its completion in 1954. There are still large areas of open land to the subject property's north, south, east, and west, and the surrounding property has remained predominately rural. As such, the Sutherland Reservoir Complex retains its integrity of setting.

Design: The Sutherland Dam and spillway retain integrity of design. Engineer Arthur Powell Davis originally designed the Sutherland Dam in 1927 as a multiple arch dam. Despite a 24-year gap in construction, when dam construction resumed in 1952, Davis's design was carried through to its completion in 1954. The dam retains the form, plan, space, structure, and style of a multiple arch type dam and has not undergone any significant alterations since its completion. While other sections of the larger Reservoir Complex have a diminished integrity of design, the complex as a whole retains the requisite integrity of design.

Materials: The Sutherland Dam and spillway retain integrity of materials, while the remains of the Keeper's and Assistant Keeper's houses do not. The dam has undergone alterations since its construction in 1954, including modification of the outlet system and the construction of new pipes to transport water out of the reservoir. No subsequent alteration resulted in the removal of original materials. The spillway has remained relatively the same since its construction with no major removals or additions of materials. Other sections of the larger Reservoir Complex have a diminished integrity of materials due to alterations and demolition, the complex as a whole retains the requisite integrity of design.

Workmanship: Similar to materials, the Sutherland Dam and spillway retain integrity of workmanship. The original workmanship, including visible board forms, delicate buttresses, and thin arches, are still visible and operate as intended. The alterations to the dam's design do not obscure or alter original workmanship. Similarly, the dam's spillway has not undergone any major alterations that would obscure the structure's workmanship. The remains of the Keeper's and Assistant Keeper's houses do not retain integrity of workmanship, having collapsed since their construction any evidence of workmanship can no longer be identified.

Feeling: The complex retains integrity of feeling. Since the dam was completed in 1954, there have been minor additions on the shores of the reservoir and within sight of the dam, spillway, and remains of the Keeper's and Assistant Keeper's houses. These additions are small and do not affect the original feeling of an mid-twentieth century dam and reservoir operating as an extension of the City of San Diego outside of City limits.

Association: The Sutherland Reservoir Complex does not retain integrity of association. The dam was originally designed to be a part of the City's growing water infrastructure during the early twentieth century. However, completion of dam was put on hold for 24 years, and the dam was not finished until 1954. When it opened, the dam opened under the supervision of the City of San Diego, who originally provided for its design and construction, however the dam lost its association with the early twentieth century demand for water in San Diego, and the San Diego City engineers who pushed for its construction, as its completion came after the City began importing over 70% of its water from non-local sources.

***B12. References:**

Beck, Darrell. 2015. "On Memory's Back Trail: Pamo Valley." *Ramona Home Journal* (Ramona, CA), Accessed March 13, 2019. http://ramonajournal.com/on-memorys-back-trail-pamo-valley-p6657-271.htm

City of Escondido. 2018. "History of Water Supply Development." City of Escondido website. Accessed August 1, 2018. https://www.escondido.org/history-of-water-supply-development.aspx

DWR (Division of Water Resources). 1949. "San Dieguito and San Diego Rivers Investigation." Bulletin No. 55. Sacramento, California State of California, Department of Public Works, Division of Water Resources. http://wdl.water.ca.gov/waterdatalibrary/docs/historic/Bulletins/Bulletin_55/Bulletin_55__1949.pdf

Evening Tribune (ET). 1917. "Incorporation Costs $1,100." Genealogybank.com: *The Evening Tribune* (San Diego, CA), August 8, 1917, pg. 5.

ET. 1926a. "Rhodes and Council to Taken Up Davis Dam Plans This Afternoon. Geneaologybank.com: *The Evening Tribune*. August 23, 1926, pg. 1.

ET. 1926b. "Two Types of Dams for Sutherland Are Submitted to Council." Geneaologybank.com: *The Evening Tribune*. September 27, 1926, pgs. 1, 6.

ET. 1926c. "Campaign Committee Asks Voters to Make Water Bonds Unanimous." Geneaologybank.com: *The Evening Tribune*. October 11, 1926, pg. 14.

ET. 1926d. "Manager Files Plans for Dam." Geneaologybank.com: *The Evening Tribune*. December 4, 1926, pg. 6.

ET. 1927a. "Delay Work on City Dam." Geneologybank.com: *The Evening Tribune*. February 23, 1927, pg. 6.

ET. 1927b. "Call Special Meeting of Council." Geneologybank.com: *The Evening Tribune*. August 31, 1927, pg. 26.

ET. 1927c. "Remove Building Plant to New Sutherland Dam Site Agreement Filed." Geneologybank.com: *The Evening Tribune*. October 13, 1927, pg. 1.

ET. 1928. "Engineer Resigns City Dam Position." Geneologybank.com: *The Evening Tribune*. February 3, 1928, pg. 19.

Fowler, L. 1953. "A History of the Dams and Water Supply of Western San Diego County." Thesis; University of California. On file at the City of San Diego Water Utilities Department Archives.

Gressley, Gene M. 1968. "Arthur Powell Davis, Reclamation, and the West." *Agricultural History* Volume 24, No. 3 (July 1968). Pgs. 241-257. Accessed July 11, 2019. https://www.jstor.org/stable/3741701

Los Angeles Times (LAT). 1978. "Water Worth $3.2 Million Lost at 2 San Diego Dams." Newspapers.com: *The Los Angeles Times* (Los Angeles, CA), April 8, 1978.

McClelland, Linda F. 1997. *How to Complete the National Register Registration Form*. National Register Bulletin 16a. Accessed April 10, 2019. https://www.nps.gov/nr/publications/bulletins/pdfs/nrb16a.pdf

Meixner, G. Donald. 1951. "Historical Development of Water Utilization." Draft. On file at the San Diego Public Utilities Department Archive.

NPS (National Park Service). 2002. *How to Apply the National Register Criteria for Evaluation*. Revised for Internet 1995, 2001, 2002. Accessed July 11, 2019. https://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_6.htm#crit%20c

Ribbel, Arthur. 1960. "More Underground Water Use Urged." Genealogybank.com: *San Diego Union* (San Diego, CA), January 13, 1960.

San Diego Union (SDU). 1887. "The San Luis Rey Flume." Genealogybank.com: *San Diego Union* (San Diego, CA), August 11, 1887, pg. 1.

SDU. 1917. "$15,000,000 to be expended on County Water Project." Genealogybank.com: *San Diego Union* (San Diego, CA), August 9, 1917, pg. 2.

SDU. 1922. "Fletcher Given Permit to Build Dam, Reservoir." Genealogybank.com: *San Diego Union* (San Diego, CA), September 22, 1922, pg. 1.

SDU. 1923a. "Let's Build Sutherland Dam." Genealogybank.com: *San Diego Union* (San Diego, CA), March 11, 1923, pg. 1.

SDU. 1923b. "Reasons Given Why Sutherland Dam should be built Before El Capitan." Genealogybank.com: *San Diego Union* (San Diego, CA), March 12, 1923, pg. 1.

SDU. 1925a. "Engineer Submits Report to Mayor on Dam Sites." Genealogybank.com: *San Diego Union* (San Diego, CA), August 1, 1925, pg. 7.

SDU. 1925b. "Manager Rhodes Seeks Engineer: Needs Man to Draw Plans, Estimates for Proposed Sutherland Dam." Geneaologybank.com: *The San Diego Union*. December 8, 2925, pg. 10.

SDU. 1925c. "Rush Plans for Sutherland Dam, Manager Rhodes Urges." Geneaologybank.com: *The San Diego Union*. December 20, 1925, pgs 1, 4.

SDU. 1926d. "Rhodes to Urge Immediate Construction of Sutherland Dam: City Councilmen Ready to Unite for Water Plan." Geneaologybank.com: *The San Diego Union*. June 13, 1926, pg. 63

SDU. 1927a. "$885,506 is Low Bid on Sutherland Dam Construction." Geneologybank.com: *The San Diego Union*. January 25, 1927, pg. 7.

SDU. 1927b. "Sutherland Dam Engineer Arrives." Geneologybank.com: *The San Diego Union*. February 6, 1927, pg. 26.

SDU. 1927c. "Sutherland Site Conditions Unfavorable, Engineer Finds." Geneologybank.com: *The San Diego Union*. August 18, 1927, pg. 22.

SDU. 1927d. "Contractor Will Move to New Site." Geneologybank.com: *The San Diego Union*. October 11, 1927, pg. 1.

SDU. 1928. "Council Agrees to Concentrate Funds to Build Sutherland Dam." Geneologybank.com: *The San Diego Union*. April 3, 1928, pg. 1.

SDU. 1952. "Sutherland Dam to Cost $2,896,485." Genealogybank.com: *San Diego Union* (San Diego, CA), June 20, 1953.

SDU. 1953. "Work on City Dam Project on Schedule." Genealogybank.com: *San Diego Union* (San Diego, CA), August 9, 1953.

SDU. 1954a. "Sutherland Dam Name Unchanged." Genealogybank.com: *San Diego Union* (San Diego, CA), February 12, 1957.

SDU. 1954b. 'Let's Not Forget Change in Dam Name." Genealogybank.com: *San Diego Union* (San Diego, CA), March 3, 1954.

SDU. 1954c. "Another Link Added to City Water Chain." Genealogybank.com: *San Diego Union* (San Diego, CA), June 6, 1954.

SNAC Cooperative. 2019. "Arthur Powell Davis, 1861-1933." Accessed July 11, 2019. https://snaccooperative.org/view/74546757

Water Department City of San Diego California (WDCSD). 1957. Feature History: Sutherland Dam, Volume 1. On file at the San Diego Public Utilities Department Archive. December 1957.

Walter L. Huber Papers, 1910-1950 Collection, held at Water Resources Collection and Archives (WRCA), University of California Riverside. 1928. Sutherland Dam sheet set, sheets 1-6. Quinton, Code & Hill, Cons. Engrs., Los Angeles California.

State of California ♁ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 6Z

Other Listings
Review Code ___ Reviewer ___ Date ___

Page 1 **of** 17 ***Resource Name or #:** (Assigned by recorder) Miramar Reservoir Complex

P1. Other Identifier:

***P2. Location:** ☐ **Not for Publication** ■ **Unrestricted**

***a. County** San Diego County **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** Poway **Date** 1996 (2001 ed.) **T** 14S; **R** 2W; 32 ☐ **of Sec** San Bernardino **B.M.**

c. Address ___ City San Diego Zip 92131

d. UTM: (Give more than one for large and/or linear resources) Zone 11S , 490028 mE/ 3641748 mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
Latitude: 32°54'50.1"N, Longitude: 117°06'23.9"W

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

The Miramar Dam is an earth-filled embankment dam. The crest measures 1,290 feet long with a paved access road along the crest. The height of the dam, from streambed, is approximately 163 feet and 840 feet thick at its base upon completion. The dam displays an engineered berm beginning on the southeast side of the Miramar Reservoir, and trending into the crest as it crosses the valley. The embankment of the dam has a slope on both sides of approximately 43 degrees. **(See Continuation Sheet)**

***P3b. Resource Attributes:** (List attributes and codes) HP21. Dam; HP 22. Reservoir; HP11. Engineering structure

***P4.Resources Present:** ■Building ■ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #) Miramar Dam, view to northwest, June 2, 2018, IMG 0158

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
1960 (SDU 1960b)

***P7. Owner and Address:**
Public Utilities Dept.
City of San Diego
9192 Topaz Way
San Diego, CA 92123

***P8. Recorded by:** (Name, affiliation, and address) Kate Kaiser, MSHP
Dudek
605 Third Street
Encinitas, CA 92024

***P9. Date Recorded:**
June 4, 2018

***P10. Survey Type:** (Describe)
Pedestrian

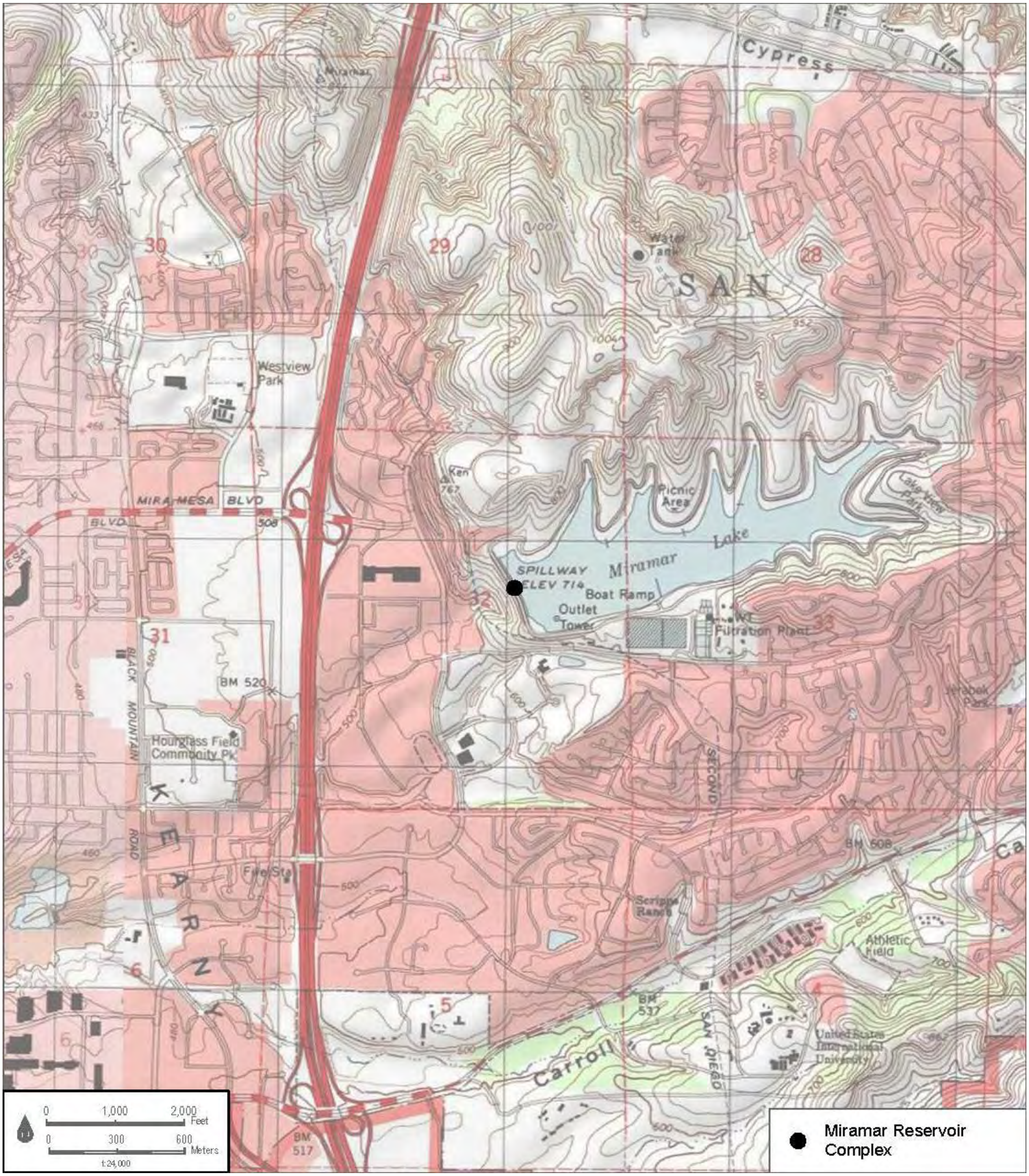
***P11. Report Citation**: (Cite survey report and other sources, or enter "none.")
Dudek. 2020. City of San Diego Source Water System Historic Context Statement.

***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record
☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record
☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California ♁ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 17 ***Resource Name or #** (Assigned by recorder) Miramar Reservoir Complex
***Map Name:** Poway, CA ***Scale:** 1:24,000 ***Date of map:** 1996 (2001 ed.)



State of California ♁ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
Primary #
HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) Miramar Reservoir Complex ***NRHP Status Code** 6Z

B1. Historic Name: Miramar Dam and Reservoir
B2. Common Name:
B3. Original Use: Municipal water source B4. Present Use: Municipal water source, recreation
***B5. Architectural Style:** Earth-filled Embankment Dam
***B6. Construction History:** (Construction date, alterations, and date of alterations)

Miramar Dam, Overflow Spillway Culvert, Outlet Tower and associated structures and buildings were built between 1958 and 1960. In 1962 the Miramar Filtration Plant was added to the site.

***B7. Moved?** ■No ☐Yes ☐Unknown **Date:** **Original Location:**
***B8. Related Features:**
B9a. Architect: City of San Diego Engineers (engineers)
b. Builder: Einer Brothers Co. and Charles E. McCammon Co.
***B10. Significance: Theme** n/a **Area** n/a
Period of Significance n/a **Property Type** **Applicable Criteria** n/a
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Historic Context (See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)
***B12. References: (See Continuation Sheet)**

B13. Remarks:

***B14. Evaluator:** S. Corder, MFA and N. Frank, MSHP
***Date of Evaluation:** June 30, 2020

(This space reserved for official comments.)

(Sketch Map with north arrow required.)

***P3a. Description (Continued):**

The dam (figure 1) does not have a concrete spillway, due to the water from the outlet tower being channeled into the municipal water system. Instead, the overflow spillway culvert is a shallow cut in the earth-filled embankment dam and measures approximately 20 feet wide, directing water towards Scripps Lake Drive (Figure 2). The spillway culvert is located at the southeastern corner of the dam and denotes the beginning of the crest of the dam, which extends north from the spillway nearly to a housing subdivision at the northwest corner. The culvert goes under the paved roadway on the crest of the dam and is fenced on the west (downstream) side.

Figure 1. Overview of Miramar Dam from the eastern shore (IMG_0093)

Figure 2. Overflow spillway culvert, looking southwest from lakeshore (IMG_0135)

The outlet tower is located near the southeastern shore of Lake Miramar (Figure 3). It is an octagonal structure with a pergola top. The top of the concrete tower features a reinforced concrete operating deck that regulates the outer gates. Each gate contains a screen cover to keep fish, trash, and other debris from entering into the 24-inch-diameter pipes. The pipes run through the eastern wall of the embankment dam and into a regulator that connects to the municipal water system.

Figure 3. Miramar Reservoir Outlet tower, view to the west (IMG_0111)

The downstream face of the earth-filled embankment dam is at a 43-degree slope. It had numerous testing holes placed along the slope, with a graded access path on the eastern side (Figure 4). The downstream monitoring area has a concrete contoured drainage area leading to a seepage drain and storm drain (Figure 5).

Figure 4. Downstream face of the dam, view to the west (IMG_0157)

Figure 5. Contoured concrete drainage (JFC_0091)

The southeastern portion of the reservoir has an inlet pipe with concrete flashing. This inlet pipe is adjacent to a wooden flight of stairs that lead down to the water from the roadside. To the pipe's right is a set of angled concrete retaining walls protecting a pipeline (Figure 6).

Figure 6. Concrete flashing adjacent to the inlet pipe, view to the southwest, JFC_0041

***B10. Significance (Continued):**

Phase 1: Construction of the Miramar Reservoir Complex, 1958-1960

At the end of the 1950s, San Diego's population was on the rise and there was an urgent need for new water distribution facilities to keep pace with the City's growth (SDHC 2019). The primary purpose of constructing the Miramar Reservoir Complex and Filtration Plant was to provide water to the City's newly annexed area north of Miramar Naval Air Station (SDU 1960). In June 1958, City of San Diego voters approved an $ 11 million bond issue, which allowed for the sale of $6 million in San Diego Water Department revenue bonds (SDU 1959b). New Water Department facilities north of the San Diego River, including a dam at Miramar and a filtration plant were to be constructed over the next 30 months with the six million dollars sold in bonds. The remaining five million dollars in revenue bonds would finance other Water Department capital improvements (SDU 1959a). As a project for the Water Department, archival research failed to indicate a lead engineer for the Miramar project. Given the fact that this was a project undertaken by the City's Water Department it is likely because this project was a collaborative design by a team of engineers employed by the department and not like the other dam projects seen throughout the history of water infrastructure in San Diego. Engineers approximated that the construction of the Miramar Dam would cost $1,513,663 and received sixteen bids for the project. Of these, a joint venture of Escondido construction firms Einer Brothers Co. and Charles E. McCammon Co. submitted the lowest bid of $1,348,591 and subsequently won (SDU 1959c). Upon approval by the City Council, the joint venture had 60 days to begin construction, and was estimated to take about a year to complete (SDHC 2019; SDU 1959a, 1959b, 1959c, 1960).

City officials and contractors broke ground for the Miramar Dam on September 29, 1959 with a ceremony held on the future dam site at the Miramar Ranch east of U.S. Highway 395 (SDU 1959c). Mayor Dail started the movement of almost a million yards of earth for the dam's construction by detonating dynamite at the groundbreaking ceremony (SDU 1959d). The dam's location was at the mouth of an unnamed canyon on the old Scripps Ranch at the site of Sur Dam, a small earth-filled embankment dam built to serve the ranch (Martin 1960). This was one mile east of US Route 395 and 1.5 miles north of Miramar Road. The earth-filled embankment dam was designed to be 1,180 feet long, 150 feet high and 20 feet wide at the top receiving water through an aqueduct from the Colorado River (SDU 1959c). Along with the construction of the earth-filled embankment dam, an independent concrete outlet tower was constructed to the dam's southeast. It consisted of 36-saucer inlet valves for selective level draft control. Water would be released from the outlet tower through a 48-inch conduit located at the base of the tower with a maximum draft rate of 100 million gallons a day to the Miramar Water Treatment Plant (Martin 1960; SDU 1959c, 1959d). Construction ended on September 15, 1960, the dam measuring 1,290 feet long, 163 feet high, and 840 feet thick at its base upon completion. Approximately 700,000 yards of dirt went into its construction to make the earthen embankment sides (Martin 1960). The construction of the dam created a reservoir with the capacity of 7,300 acre feet of water intended to be on stand-by in the event of a breakdown in the City of San Diego's water system. Water in the reservoir would be enough for six months usage in winter months, and enough to maintain supplies if the water infrastructure required repairs (Martin 1960). Due to the dam's location, it helped eliminate the danger of northern San Diego's water supply being cut off if a flood occurred in the San Diego River (Brooks 1960; Martin 1960).

The dam's dedication ceremony was attended by Mayor Dail, city, county, and civic leaders as well as 100 members of the public. Paul Beermann, City Operations Director, addressed the audience stating, "The facilities will provide water for all of San Diego north of the San Diego River, including Claremont, La Jolla and University City" (Brooks 1960). During the ceremony, Mayor Dail unveiled a plaque mounted in stone atop the dam and turned a value that allowed water to start flowing into the reservoir. Water was added to the reservoir at a rate of approximately 2,000 acre-feet a month in order to slowly "cure" the dams walls (Figure 7) (SDU 1962). Water was able to get to the Miramar Dam due to the construction of the second San Diego Aqueduct that received approval by the Water Authority's Board of Directors on January 10, 1957 (SDU 1959a; USBR 2018).

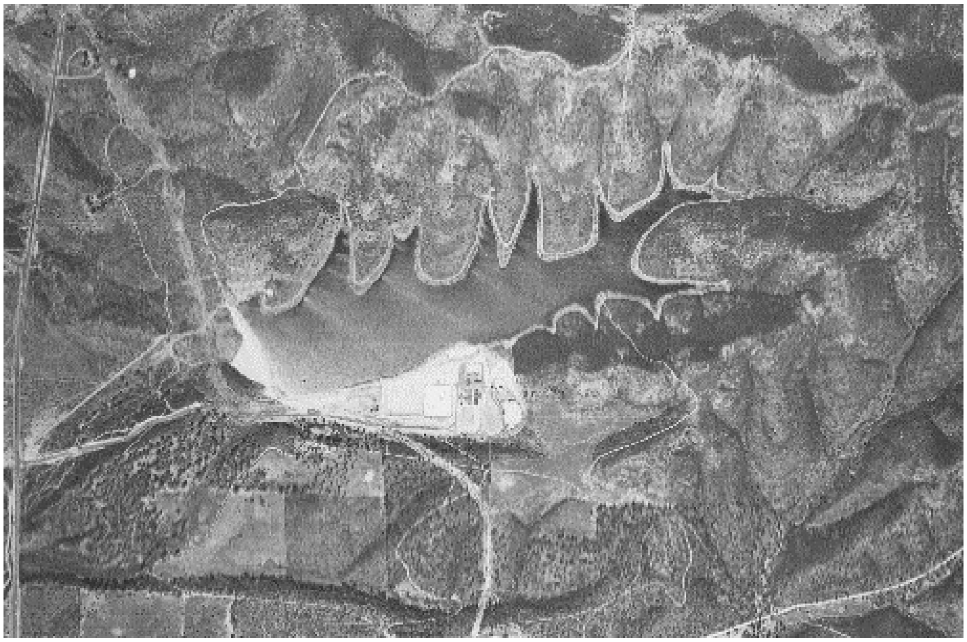


Figure 7. Aerial of the Miramar Dam, Reservoir and Filtration Plant, 1963
(University of Santa Barbra Frame Finder)

The second aqueduct consisted of Pipelines 3 and 4, which operated separately despite sharing the same right-of-way for most of their length. Pipeline 3 ran from the Metropolitan Water District's Colorado River Aqueduct near Hemet, California, to San Diego's Lower Otay Reservoir. Pipeline 4 also began at the Metropolitan Water District's Colorado River Aqueduct but terminated at San Diego's Alvarado Treatment Plant near Lake Murray (SDU 1959a; USBR 2018). Paul Beerman, City Operations Director, stated that the aqueduct's two clear-water basins would eliminate the need for "unsightly water storage tanks at various location in North San Diego" (Martin 1960; SDU 1959a; USBR 2018).

Phase 2: Post-Construction Upgrades and Alterations, 1961-2019

In addition to the construction of the Miramar Dam and reservoir the 11-million-dollar water bond issue approved by voters in 1958 allotted $3,600,000 to build a filtration plant to filter the water coming from Miramar. Following the dedication of the dam in September 1960, construction of the Miramar Filtration Plant began soon after by the County Water Authority and the Metropolitan Water District of Southern California (Figure 8) (Martin 1960). The plant's construction was estimated to take 18 months and upon its completion approximately 300,000 San Diegans would have their water needs served. The F.E. Young Construction Co. of San Diego was the lowest bid of eight for construction of the plant at $3,139,922 (Brooks 1960). Despite the project looking to be on schedule in the summer of 1961, the filtration plant was not completed until April 8, 1962 (Figure 9), due to rainy weather and a fire (SDU 1961). Upon completion, the plant served an estimated 500,000 customers in the northern section of San Diego with 140 million gallons of drinking water a day (City of San Diego 2009; Martin 1960; Brooks 1960; SDU 1961).

Figure 8. Miramar Filtration Plant Under Construction, September 1961 (City of San Diego Public Utilities Department Archives)

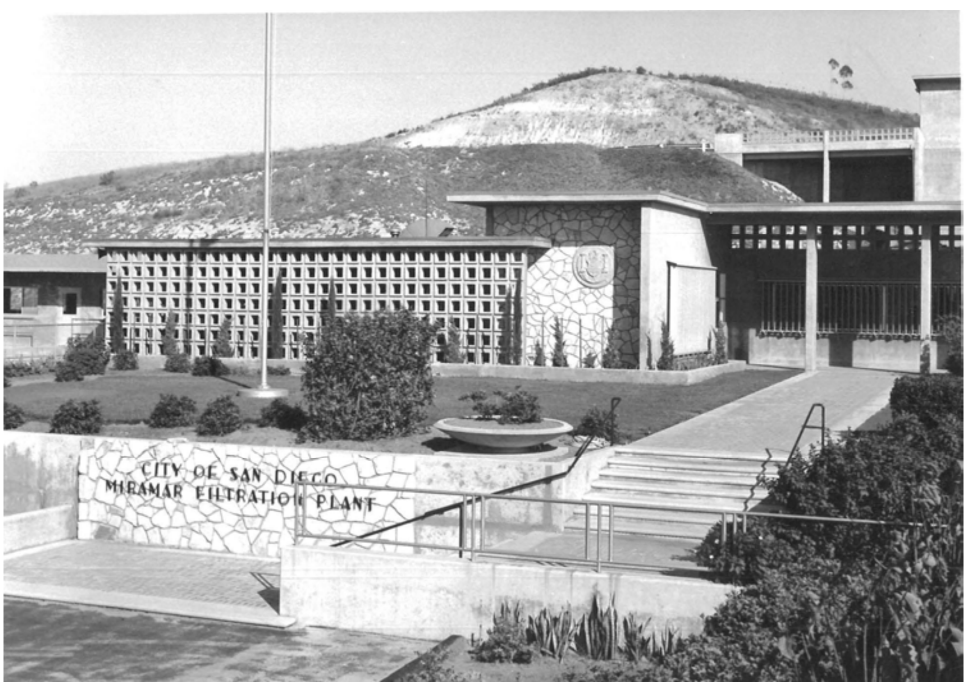


Figure 9. Miramar Filtration Plant, c. 1970, (City of San Diego Public Utilities Department Archives)

The Miramar Dam had its pipeline system expanded in 1969 in three phases as part of a $30 million bond issue passed in 1968. Phase I was the construction of 10.5 miles of pipeline, the second San Diego aqueduct, between the Metropolitan Water District delivery point 6.5 miles within San Diego County and the Miramar Dam. The lowest bid of $7,779,352 made by Vido Artukovich and Son, Inc. of El Monte was accepted, which was $200,000 below what city engineers had estimated the cost of the project. This pipeline was to have the largest capacity of any in use, carrying more than 3,000 gallons of water a second when completed. Upon completion, Phase I cost $10.2 million including costs for the pipeline, rights of way, and the engineering. The remaining bond balance of $19.8 million was used for Phase II and III, which constructed a 22.6-mile long pipeline from the Rainbow area south of Twin Oaks Valley, near San Marcos to Escondido then from Escondido south to the Miramar Reservoir (SDU 1969). This pipeline expansion allowed for another one million persons to be served with water in the North County area of San Diego (SDU 1969, 1972).

In 1998, the Miramar Filtration Plant underwent a $171 million upgrade and expansion project to increase the capacity and reliability of the system. This was done as a direct result of San Diego’s increasing population, which would overcome the needs of the plant if it was not expanded. The work increased the plant’s daily filtering capacity by 285,000 cubic meters, to 815,000 cubic meters a day. This project was implemented in six phases including “constructing a new rapid mix facility, deaeration basins and chemical facilities, new and refurbished administration buildings, flocculation and sedimentation basins, wash-water recovery systems and water filters” (WT 2019). Additionally, new distribution pipelines, valve vault and tunnel, along with modifications to the raw water pumping station were part of the improvements. The project had six constituent elements with two phases which spanned from 1998-2005, followed by four further contracts completed in 2013 (WT 2013, 2019).

A project is currently underway for several alterations to the Miramar Filtration Plant and is expected to be completed in 2020. These improvements include the construction of a new chlorine chamber with adjoining lift station, a new operation and maintenance building, a new small security guard building, a new pump station electrical building, a pre-fabricated storage building, miscellaneous vaults and structures, and the installation of a one megawatt solar power system (AECOM 2019).

NRHP and CRHR Significance Evaluation

NRHP Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.

CRHR Criterion 1: Associated with events that have made a significant contribution to the broad patterns of California’s history and cultural heritage.

While the Miramar Reservoir Complex is a component of the larger City of San Diego Source Water System, it was constructed outside the significant periods of development associated with the system, 1887-1947, and is therefore a non-contributing component.

While many of the earlier elements of the system represent the growth and development of the larger system of source water, Miramar Reservoir Complex was constructed largely in response to population pressures. By the end of the 1950s, San Diego’s population was on the rise and there was an urgent need for new water distribution facilities to keep pace with the City’s growth. The primary purpose of constructing the Miramar Dam and Filtration Plant was to provide water to the City’s newly annexed area north of Miramar Naval Air Station. Ground broke for the construction of the Miramar Dam on September 29, 1959 on the future dam site at the Miramar Ranch. Construction ended on September 15, 1960.

Given its date of completion in 1960, which falls outside of the established periods of significance for the larger water system, Miramar Reservoir Complex does not rise to the level of significance required for associations with the larger water system, nor does it merit individual designation. Therefore, the Miramar Reservoir Complex appears not eligible under Criterion A/1 as an individual property and or a contributor to the larger City of San Diego Source Water System.

NRHP Criterion B: Associated with the lives of significant persons in our past.

CRHR Criterion 2: Associated with the lives of persons important in our past.

To be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. Archival research did not reveal the Miramar Reservoir Complex to have any connections to noted individuals. There is no indication that the subject property illustrates a person's important achievements rather was part of the natural expansion of the City of San Diego's water system and thus not associated with any one individual.

NRHP Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

CRHR Criterion 3: Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

Miramar Dam is representative of a common dam type used throughout the western United States, the earth filled embankment dam. Further contributing to its lack of significance is the fact that its period of construction falls outside of the significant periods of development for the City of San Diego Source Water System, which span 1887-1947.

Construction ended on September 15, 1960, the dam measuring 1,290 feet long, 163 feet high, and 840 feet thick at its base upon completion. Approximately 700,000 yards of dirt went into its construction to make the earth embankment sides. Miramar Dam retains elements of its original 1960 character defining features, including earthen sides, wide profile, gently sloping edges and flat crest. These features have been retained since its construction and the dam has undergone very few alterations since this point. The largest alteration to the dam was undertaken in 1969 as an expansion of the pipeline system, although the nature of this alteration did not affect the visible portions of the structure and were undertaken below the reservoir.

Despite the lack of visible alterations to the Miramar dam, earthen embankment dams are the most prevalent type of dam because they can be built from locally available materials that require a minimum of processing, saving money on the construction process. While part of the larger water system, and representative a dam type no longer found in San Diego, it falls outside the period of significance of dam construction and does represent a unique or innovative engineering achievement. Further, archival research failed to indicate a specific engineer for this project. Therefore, while the Miramar Reservoir Complex is a component of the larger water system, its common design, lack of a notable engineer, and its date of construction in 1960 prevent it from conveying any significance. As such, the Miramar Reservoir Complex appears not eligible under NRHP/CRHR Criteria C/3 as an individual property and as a contributor to the larger City of San Diego Source

Water System.

NRHP Criterion D: Have yielded, or may be likely to yield, information important in history or prehistory.

CRHR Criterion 4: Has yielded, or may be likely to yield, information important in prehistory or history.

Archaeological survey was not conducted for this project. At this time there is no indication that the Miramar Reservoir Complex has the potential to yield information important to state or local history. Therefore, the property is recommended not eligible under NRHP/CRHR Criterion D/4.

City of San Diego Significance Evaluation

Criterion A: Exemplifies or reflects special elements of the City's, a community's, or a neighborhood's historical, archaeological, cultural, social, economic, political, aesthetic, engineering, landscaping, or architectural development.

As described in NRHP/CRHR A/1 and C/3 Criterion discussions above, the Miramar Reservoir Complex fails to rise to the level of significance required under City Criterion A, as it is not associated within any of the significant periods of local source water history. It is associated with the postwar population boom that was seen throughout the United States and let to an expansion of infrastructure, and a period where the City had stopped relying on local sources and began importing the vast majority of its water.

Criterion B: Is identified with persons or events significant in local, state, or national history.

Persons: Archival research did not indicate that the Miramar Reservoir Complex had any connections to noted individuals who hold importance within the history of development in San Diego. There is no indication that the subject property illustrates a person's important achievements rather was part of the natural expansion of the system and not associated with one individual.

Events: As described in the evaluation of NRHP/CRHR A/1 Criterion discussion above, the subject property was completed in 1960 and is outside of the period of significance for the larger water system and does not have any associations with significant events in local and state history. The Miramar Reservoir Complex is associated with the statewide post-World War II population boom that required an increase of City constructed water infrastructure, and to facilitate the importation of water from the Colorado River and State Water Project. Therefore, the Miramar Reservoir Complex appears not eligible under City Criterion B.

Criterion C: Embodies distinctive characteristics of a style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship

As described under NRHP/CRHR Criterion C/3 (see full discussion above), the Miramar Dam is a good example of the earth-filled embankment dam type that retains elements of the original design's character defining features, including earthen sides, wide profile, gently sloping edges and flat crest. However, the earth-filled embankment dam is a common dam type. Therefore, while the Miramar Reservoir Complex is a component of the larger water system, its common design and its date of construction in 1960 prevent it from conveying any significance. Therefore, the Miramar Reservoir Complex appears not eligible under City Criterion C.

Criterion D: Is representative of the notable work or a master builder, designer, architect, engineer, landscape architect, interior designer, artist, or craftsman.

As described under NRHP/CRHR Criterion C/3 (see full discussion above), the Miramar Dam is not representative of a notable work of a master engineer. A joint venture of Escondido firm Einer Brothers Co. and Charles E. McCammon Co. constructed the Miramar Dam in 1960. Archival research did not reveal that any of the engineers that designed the dam would meet the threshold of being considered notable or having reached recognized greatness in the field of engineering. Therefore, the Miramar Reservoir Complex appears not eligible under City Criterion D.

Criterion E: Is listed or has been determined eligible by the National Park Service for listing on the National Register of Historic Places or is listed or has been determined eligible by the State Historical Preservation Office for listing on the State Register of Historical Resources.

Miramar Reservoir Complex is not known to be on any local, state, or national list of significant properties, nor is it known to have been determined eligible for listing on any register. Therefore, the Miramar Reservoir Complex appears not eligible under City Criterion E.

Criterion F: Is a finite group of resources related to one another in a clearly distinguishable way or is a geographically definable area or neighborhood containing improvements which have a special character, historical interest, or aesthetic value, or which represent one or more architectural periods or styles in the history and development of the City.

As previously discussed, the Miramar Reservoir Complex was constructed in 1960, well outside of the established period of significance for the City of San Diego Source Water System (1887-1947). Therefore, the Miramar Reservoir Complex appears not eligible under City Criterion F.

Integrity Assessment

The Miramar Reservoir Complex retains integrity of location, design, materials, workmanship, and association, but does not retain integrity of feeling or setting as discussed below:

Location: The complex retains integrity of location. The location of the complex one mile east of US Route 395 and 1.5 miles north of Miramar Road has been retained. The contributing features to the site have never been shifted or relocated. As such, the complex retains its integrity of location.

Design: The complex retains integrity of design. Since its construction, the dam has undergone no major alterations. The elements of form, plan, space, structure, and style have all been retained and the dam can easily be recognized as an earth-filled embankment dam type.

Setting: The complex no longer retains integrity of setting. The physical conditions surrounding the dam since its construction in 1960 have been heavily altered. Upon its construction in 1960, primarily open land, dirt roads, and US Route 395 surrounded the dam. Since the dam's construction, surrounding development of residential and commercial neighborhoods has increased exponentially.

Materials: The complex retains integrity of materials. The dam and outlet tower have undergone no major alterations since their construction in 1960, thus their original construction materials remain intact.

Workmanship: Similar to materials, the complex retains integrity of workmanship. The original slope and profile of the dam have been retained, and no alterations have been undertaken to obscure or alter original workmanship.

Feeling: The complex does not retain integrity of feeling. The dam has not undergone any major alterations since its construction, and retains the majority of its original physical features. Despite this, the site no longer retains enough integrity in its setting to fully represent the appearance of a 1960s dam constructed in rural San Diego. Upon construction, the dam was primarily surrounded by open land with very little development aside from the Alvarado Filtration Plant. Comparing the dam's historic sense to its current appearance all of the open land seen in the 1960s has been developed with residential communities therefore the complex no longer retains integrity of feeling.

Association: The complex retains integrity of association. The complex was associated with the accommodation in water infrastructure for the growth of the City of San Diego in the late 1950s. Miramar Dam was originally designed to be one of the final pieces that fit into the City's water infrastructure system and serve the Miramar Naval Air Station residential communities. Since its construction, the dam has remained a part of the City-owned water system and continues to service the northern portion of San Diego. Therefore, the complex retains integrity of association. However, its association with water development is not significant.

***B12. References:**

AECOM. 2019. "Miramar Water Treatment Plant Clearwell Improvements." Accessed April 29, 2019. https://www.aecom.com/projects/miramar-water-treatment-plant-clearwell-improvements/

Brooks, Joe. 1960. "Miramar Dam Water Turned on at Rites." Genealogy.com: *San Diego Union* (San Diego, CA), September 16, 1960.

City of San Diego. 2009. "The City of San Diego Miramar Water Treatment Plant Upgrade an Expansion Project Construction Overview." Accessed April 29, 2019. https://www.sandiego.gov/sites/default/files/legacy/cip/projectinfo/pdf/miramaroverview.pdf

City of San Diego. 2015. "Description of the Source Water System." Accessed May 3, 2019. https://www.sandiego.gov/sites/default/files/2015wss-chap2.pdf

City of San Diego. 2018. "City of San Diego Water History." Accessed May 2019. https://www.sandiego.gov/water/gen-info/overview/history.

Crawford, Richard. 2011. *The Way We Were in San Diego*. Charleston, South Carolina: History Press.

Fowler, L. 1953. "A History of the Dams and Water Supply of Western San Diego County." Thesis; University of California. On file at the City of San Diego Water Utilities Department Archives.

Hennessey, Gregg. R. 1978. "The Politics of Water in San Diego 1895–1897." *The Journal of San Diego History,* Summer 1978, 24(3). Accessed May 2019. http://www.sandiegohistory.org/journal/1978/july/water/.

Hill, Joseph. 2002. "Dry Rivers, Dammed Rivers and Floods: An Early History of the Struggle Between Droughts and Floods in San Diego" *The Journal of San Diego History*, Winter, 2002, 48. Accessed May 2019. https://sandiegohistory.org/journal/2002/january/hill-2/.

LAT (Los Angeles Times). 1896. "San Diego County: Election to Vote Water Bonds." Newspapers.com *Los Angeles Times* (Los Angeles, California). May 9, 1896, 12.

McGrew, Clarence Alan. 1922. "City of San Diego and San Diego County: The Birthplace of California," Volume II. Chicago, Illinois, and New York, New York: The American Historical Society. Accessed May 2019. https://ia800200.us.archive.org/8/items/cityofsandiegosa01mcgr/cityofsandiegosa01mcgr.pdf.

Martin, E. G. 1960a. "Dedication Slanted for Miramar Dam." Genealogy.com: *San Diego Union* (San Diego, CA), September 11, 1960.

Meixner, G. Donald. 1951. "Historical Development of Water Utilization." Draft. On file at the San Diego Public Utilities Department Archive.

Ormsby, Burke. 1966. "The Lady Who Lives by the Sea." *The Journal of San Diego History* 12(1). Accessed May 2019. http://sandiegohistory.org/journal/1966/january/ladybysea/.

Pourade, Richard F. 1977. *The History of San Diego,* Volumes 1–7. San Diego History Center. Accessed May 2019. http://www.sandiegohistory.org/archives/books/risingtide/ch3/. Preston, W.L., 2002. "Portents of Plague from California's Protohistoric Period." *Ethnohistory* 49(1):69–121.

San Diego County Water Authority. 2016. "History." Accessed May 3, 2019. https://www.sdcwa.org/history

San Diego History Center. 2019. "Timeline of San Diego History: 1930-1959."

SDU (San Diego Union). 1959a. "Council to Get Water Bond Sale Request." Genealogybank.com: *San Diego Union* (San Diego, CA), April 21, 1959.

SDU. 1959b. "Miramar Dam Bids Open." Genealogybank.com: *San Diego Union* (San Diego, CA), September 2, 1959.

SDU. 1959c. "Ground-Breaking Rites Set Tuesday for Miramar Dam." Genealogybank.com: *San Diego Union* (San Diego, CA), September 27, 1959.

SDU. 1959d. "Rites Mark Start of Miramar Dam." Genealogybank.com: *San Diego Union* (San Diego, CA), September 30, 1959.

SDU. 1960a. "A System Grows." Genealogybank.com: *San Diego Union* (San Diego, CA), September 15, 1960.

SDU. 1960b. "Miramar Dam Water Turner on at Rites." Genealogybank.com: *San Diego Union* (San Diego, CA), September 16, 1960. Pg. 21.

SDU. 1961. "Miramar Filtration Plant Work Slows." Genealogybank.com: *San Diego Union* (San Diego, CA), December 25, 1961.

SDU. 1962a. "New Filtration Plant Nearing Completion." Genealogybank.com: *San Diego Union* (San Diego, CA), March 12, 1962.

SDU. 1962b. "Miramar Water Plant Almost Done." Genealogybank.com: *San Diego Union* (San Diego, CA), March 27, 1962.

SDU. 1969. "$7.7 Million Bid Winds San Diego Aqueduct Job." Genealogybank.com: *San Diego Union* (San Diego, CA), April 18, 1969.

SDU. 1972. "Pipeline Project in Final Phase." Genealogybank.com: *San Diego Union* (San Diego, CA), January 6, 1972.

Sholders, Mike. 2002. "Water Supply Development in San Diego and a Review of Related Outstanding Projects." *The Journal of San Diego History*, Winter 2002, 48(1). Accessed May 2019. http://sandiegohistory.org/journal/2002/january/sholders/.

Smythe, William Ellsworth. 1908. "History of San Diego (1542-1908)." In *An Account of the Rise and Progress of the Pioneer Settlement on the Pacific Coast of the United States,* Volume II, *The Modern City*. San Diego, California: The History Company. Accessed May 2019. https://ia902300.us.archive.org/26/items/historyofsandieg02smyt/historyofsandieg02smyt.pdf.

United States Bureau of Reclamation. 2018. "San Diego Project, California." Accessed April 23, 2019. https://www.usbr.gov/dataweb/html/sandiego.html.

Water Technology. 2019. "Miramar WTP Upgrade and Expansion Project, San Diego." Accessed April 29, 2019. https://www.water-technology.net/projects/miramar/

Appendix B

Resumes of Key Personnel

Samantha Murray, MA

Historic Built Environment Lead / Senior Architectural Historian

Samantha Murray is a senior architectural historian with 14 years' professional experience in in all elements of cultural resources management, including project management, intensive-level field investigations, architectural history studies, and historical significance evaluations in consideration of the California Register of Historical Resources (CRHR), the National Register of Historic Places (NRHP), and local-level evaluation criteria. Ms. Murray has conducted hundreds of historical resource evaluations and developed detailed historic context statements for a multitude of property types and architectural styles, including private residential, commercial, industrial, educational, medical, ranching, mining, airport, and cemetery properties, as well as a variety of engineering structures and objects. She has also provided expertise on numerous projects requiring conformance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Education

California State University, Los Angeles
MA, Anthropology, 2013

California State University, Northridge
BA, Anthropology, 2003

Professional Affiliations

California Preservation Foundation

Society of Architectural Historians

National Trust for Historic Preservation

Registered Professional Archaeologist

Ms. Murray meets the Secretary of the Interior's Professional Qualification Standards for both Architectural History and Archaeology. She is experienced managing multidisciplinary projects in the lines of transportation, transmission and generation, federal land management, land development, state and local government, and the private sector. She has experience preparing environmental compliance documentation in support of projects that fall under the California Environmental Quality Act (CEQA)/National Environmental Policy Act (NEPA), and Sections 106 and 110 of the National Historic Preservation Act (NHPA). She has also prepared numerous Historical Resource Technical Reports (HRTRs) for review and approval by the City of San Diego's Historical Resources Board (HRB).

San Diego Project Experience (2014-present)

City of Coronado Citywide Historic Context Statement and Historic Resources Inventory Update (in progress). Dudek is currently in the process of preparing an updated historic context statement and historic resources inventory (HRI) survey for all properties at least 50 years or older within city limits. Following current professional methodology standards and procedures developed by the California Office of Historic Preservation and the National Park Service (NPS), Dudek will: (1) develop a detailed historic context statement for the City that identifies and discusses the important themes, patterns of development, property types, and architectural styles prevalent throughout the city; and (2) conduct a reconnaissance-level survey of all properties within city limits that are at least 50 years old to identify individual properties and groupings of properties (i.e., historic districts) with potential for historical significance under City Criterion C (properties that possess distinctive characteristics of an architectural style; are valuable for the study of a type, period, or method of construction; and have not been substantially altered). Ms. Murray is serving as the Project Manager.

Imperial Avenue Bikeway Project, City and County of San Diego, California (2019). The San Diego Association of Governments' (SANDAG) Imperial Avenue Bikeway Project (proposed project) was overseen by the California Department of Transportation (Caltrans) District 11 and required compliance with the National Environmental Policy Act (NEPA) and Section 106 of the NHPA. Dudek prepared a Finding of No Adverse Effect (FNAE) document and Historic Property Survey Report (HPSR) in accordance with Caltrans' most recent edition of Standard Environmental Reference, Volume 2, Cultural Resources. The study included the results of a California Historical Resources Information System (CHRIS) records search, as well as an intensive-level historical resources survey, and completion of Caltrans documentation. Ms. Murray served as the Principal Architectural Historian on the project and oversaw all final deliverables.

Department of General Services Historical Resource Evaluation for the Normal Street Department of Motor Vehicles Site at 3960 Normal Street, San Diego, California (2017). Dudek was retained by the State of California Department of General Services to complete a Historical Resources Technical Report for a project that proposes demolition and replacement of the Department of Motor Vehicles (DMV) building located at 3960 Normal Street in the City of San Diego. To comply with Public Resources Code Section 5024(b), DGS must submit to the State Historic Preservation Officer (SHPO) an inventory of all structures over 50 years of age under DGS's jurisdiction that are listed in or that may be eligible for inclusion in the National Register of Historic Places (NRHP), or that may be eligible for registration as a California Historical Landmark (CHL). The DMV was found not eligible. Ms. Murray provided QA/QC of the historical resource technical report.

MiraCosta Community College District Oceanside Campus, San Diego County, California (2017). Dudek was retained by the MiraCosta Community College District (MCCCD) to conduct a cultural resources study for the proposed Oceanside Campus Facilities Master Plan. Of the original 11 buildings constructed in the early 1960s, nine are still extant and required evaluation for historical significance. The campus was ultimately found ineligible for designation due to a lack of important historical associations and integrity issues. Ms. Murray provided QA/QC of the final cultural report.

SDSU Tula Pavilion and Tenochca Hall Renewal/Refresh, San Diego, California (2017). Dudek was retained by the San Diego State University (SDSU) to evaluate potential impacts to historical resources associated with the proposed Tula Pavilion and Tenochca Hall Renewal/Refresh project located in San Diego, California. The historic resources technical memorandum provides the results of that evaluation. Ms. Murray provided quality assurance/quality control of the final work product and provided input on impacts to historical resources.

City of San Diego PUD Morena Reservoir Outlet Tower Replacement Project, City of San Diego, California (2016). Ms. Murray evaluated the 1912 Morena Dam and Outlet Tower for NRHP, CRHR, and local level eligibility and integrity requirements. The project entailed conducting extensive archival research and development research at City archives, libraries, and historical societies, and preparation of a detailed historic context statement on the history of water development in San Diego County.

City of San Diego 69th and Mohawk Pump Station Project, City of San Diego, California (2015). Ms. Murray served as architectural historian and lead author of the Historical Resource Technical Report for the pump station building on 69th and Mohawk Street. Preparation of the report involves conducting extensive building development and archival research on the pump station building, development of a historic context, and a historical significance evaluation in consideration of local, state, and national designation criteria and integrity requirements.

City of San Diego Pump Station No. 2 Power Reliability and Surge Protection Project, City of San Diego, California (2015). Ms. Murray served as architectural historian and prepared an addendum to the existing cultural resources report in order to evaluate the Pump Station No. 2 property for NRHP, CRHR, and local level eligibility and integrity requirements. This entailed conducting additional background research, building development research, a supplemental survey, and preparation of a historic context statement.

San Diego State University (SDSU) Open Air Theater Renovation Project, SDSU and Gatzke Dillon & Balance, LLP, San Diego, California (2015). Ms. Murray served as architectural historian and prepared a technical memorandum that analyzed the project's potential to impact the OAT theater (a contributing property to the San Diego State College NRHP Historic District). This included conducting a site visit, reviewing proposed site and design plans, and preparing a memorandum analyzing the project's conformance with the Secretary of the Interior's Standards for the Treatment of Historic Properties.

San Diego State University (SDSU) Engineering and Sciences Facilities Project, SDSU and Gatzke Dillon & Balance, LLP, San Diego, California (2014). Ms. Murray served architectural historian, archaeologist, and lead author of the Cultural Resources Technical Report for the SDSU Engineering and Interdisciplinary Sciences Building Project. The project required evaluation of 5 historic-age buildings in consideration of NRHP, CRHR, and local designation criteria and integrity requirements, an intensive level survey, Native American coordination, and a records search. The project proposes to demolish four buildings and alter a fifth as part of the university's plan to update its engineering and science facilities.

City of San Diego Normal Street Project, City of San Diego, San Diego County, California (2014). Ms. Murray served as architectural historian and co-author of the Historical Resources Technical Report for properties located at 3921-3923; 3925-3927; 3935 Normal Street for the City of San Diego's Development Services Department Ms. Murray assisted with the final round of comments from the City and wrote the historical significance evaluations for all properties included in the project.

The Cove: 5th Avenue Chula Vista Project, E2 ManageTech Inc., City of Chula Vista, San Diego County, California (2014). Ms. Murray served as architectural historian and co-author of the CEQA report. The project involved recordation and evaluation of several properties functioning as part of the Sweetwater Union High School District administration facility, proposed for redevelopment, as well as an archaeological survey of the project area.

J-135I Electrical Distribution and Substation Improvements and J-600 San Dieguito Pump Station Replacement Project, Santa Fe Irrigation, San Diego County, California (2014). Ms. Murray served as architectural historian and prepared the Department of Parks and Recreation (DPR) forms and associated memo concerning replacement of the original 1964 San Dieguito Pump Station. Ms. Murray recorded and evaluated the pump house for state and local significance and integrity considerations. As part of this effort she conducted background research, prepared a brief historic context, and a significance evaluation.

San Carlos Library Historical Resource Technical Report, City of San Diego, California (2014). Ms. Murray served as architectural historian and author of the Historical Resource Technical Report for the San Carlos Library. Preparation of the report involved conducting extensive building development and archival research on the library building, development of a historic context, and a historical significance evaluation in consideration of local, state, and national designation criteria and integrity requirements. The project proposes to build a new, larger library building.

Otay River Estuary Restoration Project (ORERP), Poseidon Resources, South San Diego Bay, California (2014). Ms. Murray served as architectural historian for the documentation of Pond 15 and its associated levees. The project proposes to create new estuarine, salt marsh, and upland transition habitat from the existing salt ponds currently being used by the South Bay Salt Works salt mining facility. Because the facility was determined eligible for listing in the NRHP, the potential impacts caused by breeching the levees, a contributing feature of the property, had to be assessed.

LOSSAN San Luis Rey River and Second Track Project, Oceanside, San Diego County, California (2011). Ms. Murray served as primary author for the technical report and conducted the intensive-level cultural resources field survey. The project proposes to construct a new 0.6-mile section of double-track to connect two existing passing tracks, and replace the existing San Luis Rey River Bridge. She prepared the cultural resources technical report and evaluated the bridge for NRHP, CRHR, and local level criteria and integrity requirements. Client: HNTB Corporation.

LOSSAN Control Point San Onofre to Control Point Pulgas Double Track Project, San Diego County, California (2011). Ms. Murray served as field director for the archaeological and architectural history survey and co-authored the technical report. She conducted a survey and evaluation of cultural resources in support of the Los Angeles to San Diego, California (LOSSAN) Control Point (CP) San Onofre to CP Pulgas Double Track Upgrade Project. The project is located within the boundaries of the Marine Corps Base (MCB) Camp Pendleton in Northern San Diego County, on federal land that is part of a long-term lease to the rail operator. Client: HNTB Corporation.

Presentations

***Historical Resources and CEQA: An Overview of Identification, Evaluation, Impacts Assessment, and Mitigation*. Prepared for the Gilroy Historic Heritage Committee. Presented by Samantha Murray, Dudek. May 15, 2019.** Ms. Murray delivered a 1.5-hour PowerPoint presentation to the City of Gilroy's Historic Heritage Committee during one of their monthly public hearings. The presentation provided an overview of the CEQA process, how historical resources are treated under CEQA, as well as the process for identification, evaluation, impacts assessment, and options to consider for mitigation. The presentation also included examples from CEQA Case Law and included an extensive question and answer session with the audience.

***Historical Resources under CEQA*. Prepared for the Orange County Historic Preservation Planner Working Group. Presented by Samantha Murray, Dudek. December 1, 2016.** Ms. Murray delivered a one-hour PowerPoint presentation to the Orange County Historic Preservation Planner Working Group, which included planners from different municipalities in Orange County, regarding the treatment of historical resources under CEQA. Topics of discussion included identification of historical resources, assessing impacts, avoiding or mitigating impacts, overcoming the challenges associated with impacts to historical resources, and developing effective preservation alternatives.

***Knowing What You're Asking For: Evaluation of Historic Resources*. Prepared for Lorman Education Services. Presented by Samantha Murray and Stephanie Standerfer, Dudek. September 19, 2014.** Ms. Murray and Ms. Standerfer delivered a one-hour PowerPoint presentation to paying workshop attendees from various cities and counties in Southern California. The workshop focused on outlining the basics of historical resources under CEQA, and delved into issues/challenges frequently encountered on preservation projects.

Relevant Training

- CEQA and Historic Preservation: A 360 Degree View, CPF, 2015
- Historic Designation and Documentation Workshop, CPF, 2012
- Historic Context Writing Workshop, CPF, 2011
- Section 106 Compliance Training, SWCA, 2010
- CEQA Basics Workshop, SWCA, 2009
- NEPA Basics Workshop, SWCA, 2008
- CEQA, NEPA, and Other Legislative Mandates Workshop, UCLA, 2008

Sarah Corder, MFA

Senior Architectural Historian

Sarah Corder is an architectural historian with more than 15 years of professional experience throughout the United States in all elements of cultural resources management, including project management, intensive-level field investigations, architectural history studies, and historical significance evaluations in consideration of the California Register of Historical Resources (CRHR) Register, and the National Register of Historic Places (NRHP), and local-level evaluation criteria. Ms. Corder has conducted numerous historical resource evaluations and developed detailed historic context statements for a multitude of property types and architectural styles, including private residential, commercial, industrial, educational, and agricultural properties. She has also provided expertise on numerous projects requiring conformance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Education

Savannah College of Art and Design
MFA, Historic Preservation, 2004

Bridgewater College
BA, History, 2002

Professional Affiliations

National Trust for Historic Preservation

Los Angeles Conservancy

California Preservation Foundation

Society for Architectural Historians

Ms. Corder meets the Secretary of the Interior's Professional Qualification Standards for both Architectural History and History. She has experience preparing environmental compliance documentation in support of projects that fall under the California Environmental Quality Act (CEQA)/National Environmental Policy Act (NEPA), and Sections 106 and 110 of the National Historic Preservation Act (NHPA).

Dudek Project Experience (2017-Present)

San Diego Dam and Reservoir Citywide Inventory, City of San Diego Public Utilities Department, San Diego, California (January 2017 – present). Dudek is currently in the process of preparing a historic context statement and significance evaluation of all dam infrastructure owned by the City's Public Utilities Department. The project involves evaluation of at least 10 dam complexes for historical significance in consideration of NRHP, CRHR, and City designation criteria and integrity requirements. While the project is still in progress, Ms. Corder has contributed extensively to archival research and has authored individual historic resource reports for Lower Otay Dam and El Capitan Dam.

City of Coronado Citywide Historic Context Statement and Survey, City of Coronado, Gilroy, California (2019 – present). Dudek is currently in the process of preparing a historic context statement and historic resources inventory (HRI) survey for all properties at least 50 years or older within city limits. Following current professional methodology standards and procedures developed by the California Office of Historic Preservation and the National Park Service (NPS), Dudek will: (1) develop a detailed historic context statement for the City that identifies and discusses the important themes, patterns of development, property types, and architectural styles prevalent throughout the city; and (2) conduct a reconnaissance-level survey of all properties within city limits that are at least 50 years old to identify individual properties and groupings of properties (i.e., historic districts) with potential for historical significance under City Criterion C (properties that possess distinctive characteristics of an architectural style; are valuable for the study of a type, period, or method of construction; and have not been substantially altered). To date, Dudek has conducted a public kick-off meeting, conducted local stakeholder outreach meetings, and submitted a draft historic context statement to the City for review. As a Senior Architectural Historian, Ms. Corder is responsible for coordinating and leading the citywide field survey component of the project and will provide QA/QC for all field data and co-author the final survey report.

City of Coronado As-needed Historic Research Consultant, Coronado, California (2019 – present). Dudek is currently in a three-year contract with the City of Coronado Community Development Department to provide historic preservation services on an as-needed basis. Services scoped under the current contract include historic resources surveys; archival research; preparation of evaluation reports in consideration of NRHP, CRHR, and City of Coronado designation criteria; attendance at Historic Resource Commission and City Council hearings; and reviewing projects for conformance with the Secretary of the Interior's Standards for Rehabilitation. Dudek was also recently awarded a citywide survey and historic resources inventory contract by the City of Coronado that will begin within the coming months. Since January 2019, Dudek has completed nearly 15 Work Orders for the City. As a Senior Architectural Historian, Ms. Corder is responsible for QA/QC of survey reports.

Village Three Active Recreation Area, Chula Vista, California (2017). Dudek was retained to prepare a constraints analysis and HRTR for a historic age farmstead. The land development project proposed to develop approximately 100 acres of land south of the Otay River as an active recreation site. Ms. Corder's responsibilities for the project included background research and co-authoring the report.

Department of General Services Historical Resource Evaluation for the Normal Street Department of Motor Vehicles Site at 3960 Normal Street, San Diego, California (2017). Dudek was retained by the State of California Department of General Services to complete a Historical Resources Technical Report for a project that proposes demolition and replacement of the Department of Motor Vehicles (DMV) building located at 3960 Normal Street in the City of San Diego. To comply with Public Resources Code Section 5024(b), DGS must submit to the State Historic Preservation Officer (SHPO) an inventory of all structures over 50 years of age under DGS's jurisdiction that are listed in or that may be eligible for inclusion in the National Register of Historic Places (NRHP), or that may be eligible for registration as a California Historical Landmark (CHL). The DMV was found not eligible. Ms. Corder's responsibilities for the project included background research for the historical resource technical report.

Relevant Training

- *Practitioner's Implementation of the U.S. Secretary of the Interior's Standards and Guidelines, 2019*
- *A Commissioner and Planner's Primer to the California Environmental Quality Act, CPF, 2018*
- *Innovative Approaches to Section 106 Mitigation, ACRA, 2018*
- *Crowdfunding Historic Preservation: Direct Public Offerings and Other Ways to Raise Funds, CPF, 2018*
- *From Nuclear Waste to Manholes – the What, Why and How of Surveys, CPF, 2018*
- *Historic Districts: New Processes, SOI Standards for Districts, Infill Construction, Additions & ADU's, CPF, 2017*
- *Focus on Modernism: Design, Materials Conservation & Review, CPF, 2017*
- *Certified Historic Preservation Consulting Commonwealth of Virginia, 2004*

Nicole Frank, MSHP

Architectural Historian

Nicole Frank is an architectural historian with 3 years' professional experience as an architectural historian conducting historic research, writing landmark designations, performing conditions assessments and working hands-on in building restoration projects throughout the United States. Ms. Frank also has governmental experience with the City of San Francisco's Planning Department and the City of Chicago's Landmark Designations Department. She meets the Secretary of the Interior's Professional Qualification Standards for Architectural History.

Education

The School of the Art Institute of Chicago, MS
Historic Preservation, 2018
The College of Charleston, BA, Historic Preservation and Art History, 2016

Professional Affiliations

California Preservation Foundation
Association for Preservation Technology (APT)

Select Project Experience

Mira Mesa Community Plan Area Historic Context Statement and Mira Mesa Community Plan Area Focused Reconnaissance Survey, City of San Diego Planning Department, San Diego California (In Progress). Dudek was retained by the City of San Diego (City) to prepare a historic context statement identifying the historical themes and associated property types important to the development of Mira Mesa, accompanied by a reconnaissance-level survey report focused on the master-planned residential communities within the Mira Mesa Community Plan Area (CPA). This study was completed as part of the comprehensive update to the Mira Mesa CPA and Programmatic Environmental Impact Report (PEIR). While the historic context statement addressed all development themes and property types within the community, the scope of the survey was limited to residential housing within the CPA constructed between 1969 and 1990. Acting as architectural historian the historic context statement and survey document and all associated archival research efforts was co-authored/completed by Ms. Frank.

University Community Plan Area Historic Context Statement and University Community Plan Area Focused Reconnaissance Survey, City of San Diego Planning Department, San Diego California (In Progress). Dudek was retained by the City of San Diego (City) to prepare a historic context statement identifying the historical themes and associated property types important to the development of University, accompanied by a reconnaissance-level survey report focused on the master-planned residential communities within the University Community Plan Area (CPA). This study was completed as part of the comprehensive update to the University CPA and Programmatic Environmental Impact Report (PEIR). While the historic context statement addressed all development themes and property types within the community, the scope of the survey was limited to residential housing within the CPA constructed between the 1960s and 1990s. Acting as architectural historian the historic context statement and survey document and all associated archival research efforts was co-authored/completed by Ms. Frank.

As Needed Historic Research Consulting Services, City of Coronado, Coronado, California (In Progress). Acting as architectural historian, Ms. Frank was the primary writer of the historical resource evaluation reports for 936 J Avenue, 310 2nd Street, 718 B Avenue, 1027-1029 Orange Avenue, 735 Margarita Avenue, 519 Ocean Boulevard, 1901 Monterey Avenue, 269 Palm Avenue, 1113 Adella Avenue, 1519 4th Street, 745 A Avenue, 451-

55 Alameda Boulevard, and 503 19th Street. Each evaluation involved the creation of an occupancy timeline, supplemental research on occupants, architect/builder, and property, building development research, a pedestrian survey of the project area, a description of the surveyed resource, and completion of a historical significance evaluation report in consideration of designation criteria and integrity requirements.

Historical Resources Technical Report for the Enclave at Ivanhoe Ranch Project, Rancho San Diego, San Diego County, California (In Progress). Dudek was retained by Vance & Associates to complete a Historical Resources Technical Report (HRTR) in support of the proposed Enclave at Ivanhoe Ranch Project (project). The proposed project is a residential development project. The project site totals approximately 121.9 acres in an unincorporated San Diego County, south of the City of El Cajon, California. Included in the 121.9-acre project site is a historic-era complex of horse ranch buildings and accompanying residences, located at 3256, 3261, 3263, 3267, and 3269 Ivanhoe Ranch Road (APNs 518-030-41, 518-030-43, 518-030-44, and 518-030-45) which was evaluated for historical significance. This study was conducted in accordance with Section 15064.5(a)(2)-(3) of the CEQA Guidelines, and the project site was evaluated in consideration of National Register of Historic Places (NRHP), California Register of Historical Resources (CRHR), and County of San Diego Historic Preservation Ordinance and RPO requirements. Acting as architectural historian, Ms. Frank co-authored the technical report and conducted a pedestrian survey of the site.

Historic Resources Review for the Shawnee/CG7600 Master Plan Redevelopment Project, San Diego, California (2020). Dudek was retained by Palmer Mission Gorge Properties, LP. to conduct a Potential Historical Resource Review (in accordance with Information Bulletin 580) for four properties over 45 years old within the City of San Diego. Ms. Frank acted as architectural historian and conducted a photographic survey of the four properties within the project site. Ms. Frank updated three 2011 Department of Parks and Recreation Series 523 Forms (DPR forms) and created a new DPR form for a previously unrecorded property within the project site.

Historical Resources Technical Report for Jacumba Valley Ranch Solar Energy Park, Jacumba, California (2019). Dudek was retained by BayWa to complete a historical resources technical report for a project that proposed to develop a solar energy project consisting of up to 90 megawatts (MW) of alternating current (ac) and a 20 MW energy storage facility. Acting as architectural historian, Ms. Frank authored a cultural resources technical report evaluating a complex of twenty dairy buildings, the Mountain Meadow Dairy and Creamery's Sunshine Ranch Complex for historical significance.

Jefferson La Mesa Project, La Mesa, California (2018). Ms. Frank served as architectural historian and co-author of the historical resources evaluation report for the Jefferson La Mesa Project. Ms. Frank contributed archival research and historical context development for three automotive buildings. The project proposed to demolish three industrial automotive buildings in order to redevelop the property.

Historical Resources Impact Assessment for Maintenance on the Morena Dam Spillway, City of San Diego, California (2019). Ms. Frank acted as the primary author for an impacts assessment of proposed project activities including maintenance to the Morena Dam, which is considered an historical resource under CEQA and an historic property under Section 106 of the NHPA.

Kate Kaiser, MSHP

Architectural Historian

Kate Kaiser is an architectural historian with 8 years' professional experience as a cultural resource manager specializing in California Environmental Quality Act (CEQA) compliance, National Historic Preservation Act Section 106 compliance, reconnaissance and intensive level surveys, archival research, cultural landscapes, and GIS. Ms. Kaiser meets the Secretary of the Interior's Professional Qualification Standards for architectural history and archaeology.

Education

University of Oregon
MS, Historic Preservation, 2017

Boston University
BA, Archaeology, 2009

Professional Affiliations

Association for Preservation Technology – Southwest

California Preservation Foundation

Vernacular Architecture Forum

Society for California Archaeology

Relevant Dudek Project Experience

San Diego Dam and Reservoir Citywide Inventory, City of San Diego Public Utilities Department, San Diego, California (January 2017 – present). Dudek is currently in the process of preparing a historic context statement and significance evaluation of all dam infrastructure owned by the City's Public Utilities Department. The project involves evaluation of at least 10 dam complexes for historical significance in consideration of NRHP, CRHR, and City designation criteria and integrity requirements. While the project is still in progress, Ms. Kaiser has contributed extensively to archival research and has authored multiple individual historic evaluations.

Olympic Well Field Restoration and Arcadia Water Treatment Plant Expansion Project, City of Santa Monica, Los Angeles County, California. Served as architectural historian and author of the Historic Resources Technical Report. The report evaluated the Arcadia Water Treatment Plant and a well along Olympic Boulevard. The project proposed to demolish several underutilized buildings and structures as part of a multi-component project to add new wells to the Olympic Well Field, construct a new 16-inch pipeline connecting the Olympic Well Field to a new Olympic Advanced Water Treatment Facility, and expand the Arcadia water Treatment.

Modelo Project Environmental Impact Report, City of Commerce, Los Angeles County, California. Served as architectural historian and co-authorfor the Cultural Resources Technical Report and EIR cultural resources chapter. The report evaluated the Veterans Memorial Park located within the proposed Project area. The project proposed to demolish and redevelop the Project site to accommodate a mixed-use development and park.

Arroyo Seco Canyon Project, City of Pasadena, Los Angeles County, California. Served as architectural historian and co-author for the Cultural Resources Technical Report. The report evaluated six historic-aged engineering buildings and infrastructure systems within the proposed project area. Dudek recommended that all buildings and structures were ineligible for listing in the NRHP or CRHR with the exception of the Behner Water Treatment Plant, and provided impacts analysis for City of Pasadena Arroyo Seco Stone Wall design elements present in the proposed Project Area.

Silent Ranch Hillside Subdivision Project, City of Glendora, Los Angeles County, California. Served as architectural historian and author of the Historic Resources Technical Report. The report evaluated Charles Silent's Rancho Los Alisos property, Girl Scout Camp Aventura, Forest Service flood control dams, and a segment of the MWD Upper Feeder Pipeline. The project proposed indirect impacts to the setting of the pipeline and provided for protection against damage or overloading as the pipeline is an MWD public utility.

City of Irwindale Speculative Concrete Tilt-Up Building Project. Irwindale, Los Angeles County, California. Kaiser served as architectural historian and author of the Cultural Resources Technical Report. The report evaluated a hollow-core concrete panel manufacturing plant in southeast Irwindale. The project proposed to demolish all buildings and structures in the project site and construct a 528 710 s.f., tilt-up concrete warehouse on the parcel.

LADWP Valley Generating Station Project, Los Angeles Department of Water and Power, California. Served as architectural historian and author of the Cultural Resources Technical Report for the Valley Generating Station Project. The report evaluated the historical significance for each building and structure in the study area. The project proposed to remove the 1953 steam generating plant, as well as the four stacks, SPRR rail spur, and underground fuel tanks.

Judicial Council of California Historical Resource Evaluation Report for the Stanley Mosk Courthouse, City of Los Angeles, Los Angeles County, California. Served as architectural historian and author of the Historical Resource Evaluation Report. Dudek was retained by the Judicial Council of California (JCC) to prepare an evaluation of the Stanley Mosk Los Angeles County Courthouse building, located at 111 N. Hill Street in the City of Los Angeles, California, in order to comply with Public Resources Code Section 5024(b). The report concluded the Stanley Mosk Courthouse was eligible for designation as a historic property in the NRHP, CHL, CRHR, and Los Angeles Historic Cultural Monument list under Criterion A/1 and C/3.

Phillips 66 and Kinder Morgan Relocation Project, Berths 150-151, Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS), Port of Los Angeles, California. Served as architectural historian and co-author of the Updated Historical Resources Evaluation. Preparation of the report involved reviewing previous evaluations for Union Oil Terminal Berths 150-151 and writing an updated significance evaluation. The project proposed to remove and replace the original wharfs with new concrete loading platform, mooring and breasting dolphins, access ramps, catwalks, and an underwater bulkhead.

Globemaster Corridor Specific Plan, City of Long Beach, Los Angeles County, California. Served as architectural historian and author of the Draft EIR-EIS Cultural Resources Chapter. The project includes rezoning portions of the GCSP area, and a mobility plan that implements new streets and pedestrian connectors. Since the GCSP does not directly propose changes to the buildings or structures in the Plan area, the cultural resources report takes a programmatic overview and offers potential impacts analysis and mitigation measures for future development.

LADWP De Soto Tanks Project, Los Angeles Department of Water and Power, California. Served as architectural historian and author of the Historic Properties Identification Report. The report evaluated a 1941 reservoir and associated buildings. The project proposed to replace them with modern underground storage tanks, as well as connections to other trunk lines. The project also analyzed the potential project impacts to the Chatsworth Momonga/Mission Trail, a City of Los Angeles Historic-Cultural Monument (HCM) adjacent to the Project area.

Campus-wide Historic Context Statement for California State University Long Beach, City of Long Beach, Los Angeles County, California. Served as architectural historian and co-author of the historic context statement analyzing the effect of master architect Edward Killingsworth on the development of the campus. Preparation of the historic context statement involved extensive archival research, in-person interviews of architects who worked on-campus, review of CSU Long Beach building and landscape records, and coordination with local heritage groups.

Kaiser Permanente Los Angeles Medical Center Project, Los Angeles, Los Angeles County, California. Served as architectural historian and co-author of the Draft EIR Cultural Resources Chapter and the author of the cultural resources technical report. The report evaluated six buildings greater than 45 years in age that are proposed for demolition as part of the multiphase project. The DEIR chapter also analyzed potential indirect impacts on two other National Register listed or eligible sites: the Aline Barnsdall Complex and the Hollywood Presbyterian Medical Center.

Appendix D

DPR 523 Forms Associated with the CSDSWS Historic District on file at SCIC

State of California — The Resources Agency DEPARTMENT OF PARKS AND RECREATION **CONTINUATION SHEET**	**Primary #** ____ **HRI #** ____ **Trinomial** CA-SDI-11605H UPDATE **NRHP Status Code** 3S

Page 1 **of** 3 ***Resource Name or #** **SDI-11605H - Dulzura Conduit**

Recorded by: Shelby Gunderman **Date:** 17 May 2010

☐ Continuation ■ Update

The segment of the Dulzura Conduit being addressed in this update is located on the USGS 7.5' Quad Barrett Lake, T17S; R 3E; E½ of SW¼, SW¼ of NE¼, and SE¼ of NW¼ of Sec 28; S.B. B.M. The UTM coordinates are Zone 11, Southern End 529667.21 mE/ 3613010.87 mN; Northern End 529774.86 mE/ 3614054.17 mN, within APNs: 60208004, 60208001, and 60215013. The section of the Dulzura Conduit within the project area is 1/8 of a mile west of Lake Barrett Road.

Description: The Dulzura Conduit was first recorded in 1989 by Steve Van Wormer who recommended that the flume was eligible to the CRHR. Van Wormer completed formal documentation of the wooden flumes on the conduit as mitigation of impacts resulting from their replacement. In 2002 the Barrett Fire burned approximately one mile of the conduit, outside of the current survey area. Mary Robbins-Wade completed a survey of that section following the fire and found that while the concrete section of the conduit were unaffected by the fire Flume 12 had been destroyed.

Within the current survey area (see sketch map) the Dulzura Conduit is generally an open channel concrete water conduit with several short tunnels. An approximately 15 feet long section of the conduit is contained within a metal pipe resting on metal trestles. A metal walkway is adjacent to the conduit. The majority of this segment of the Dulzura Conduit is an open trapezoidal concrete-lined aqueduct. The concrete conduit is approximately 4 feet wide at the base, 6 feet wide at the mouth, and 5 feet deep. The poured concrete walls are approximately 1 foot thick. The majority of the Dulzura Conduit, in the current survey area, consists of the original poured concrete. In several places the conduit has been patched with modern materials. The original Flume 5 has been removed and replaced with a modern metal flume resting on metal trestles. Debris shields cover approximately 10% of the Dulzura Conduit. The debris shields consist of simple 6 inch concrete slab coverings which rest on the walls of the conduit. Both original poured concrete debris shields and modern concrete debris shields are present. One metal flow gate is present in this section of Dulzura Conduit. The metal panel of the gate reads “CALCO / Model No 173 / California Corrugated / Culvert Company / Los-Angeles / West Berkeley”. The flow gate controls water running out of a poured concrete spillway. Several small stone and cement retaining walls are also present within this section of the conduit.

B10. Significance **Theme:** Early water infrastructure development **Area:** San Diego **Period:** 1909
Property Type: Water conduit **Appicable Criteria**: 1/A
The Dulzura Conduit extends from the outlet tower at Barrett Lake to Dulzura Creek and from that point the water follows a natural drainage course to Otay Reservoir. The Dulzura Conduit was part of the larger Otay-Cottonwood water storage system, developed by the Southern Mountain Water Companies, which were owned by John D. Spreckles and Elisha Babcock from 1895. Construction of the Dulzura Conduit was completed in January 1909. The system consisted of over 13 miles of channel with 17 tunnels, 57,000 feet of concrete-lined aqueduct and 4,490 feet of wooden flume (Van Wormer 1990). In 1912-13 the City of San Diego purchased the Otay-Cottonwood water storage system. The Dulzura Conduit has been determined eligible for the CRHR under Criterion 1/A for the key role it played in the development of San Diego. The segment of the Dulzura Conduit within the current survey area is a trapezoidal concrete flume. One section has been replaced by a metal pipe supported on a metal trestle. However, with the exception of this short section, this segment of the conduit retains sufficient integrity to convey its significance. The Dulzura Conduit, including the segment present within the current survey area, is recommended eligible to the NRHP under Criterion A/1.

Photograph or Drawing

Description of Photo:
012.jpg, 5/17/2010, Overview of Dulzura Conduit, facing north east.

Recorded by:
Shelby Gunderman
ASM Affiliates, Inc.
2034 Corte del Nogal
Carlsbad, CA 92011

Date Recorded: May 17, 2010

Survey Type: Historic Building Survey – Intensive

Report Citation: Sinéad Ní Ghabhláin, Michael P. Pumphrey, Sarah Stringer-Bowsher, and Shelby Gunderman (2010), *Assessment of Indirect Visual Impacts on the Historic Built Environment Properties within the Area of Potential Effect of the Approved San Diego Gas & Electric Sunrise Powerlink Final Environmentally Superior Southern Route, San Diego and Imperial Counties, California.* ASM Affiliates, Inc. Submitted to San Diego Gas and Electric and the Bureau of Land Management.

*Attachments: ☐ NONE ☐ Location Map ☒ Sketch Map ☒ Continuation Sheet ☐ Building, Structure, and Object Record ☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record ☐ Artifact Record ☐ Photograph Record ☐ Other (List):

State of California — The Resources Agency DEPARTMENT OF PARKS AND RECREATION **CONTINUATION SHEET**	**Primary #** ______ **HRI #** ______ **Trinomial** CA-SDI-11605H UPDATE

 ***Resource Name or #** **SDI-11605H - Dulzura Conduit**

Recorded by: Shelby Gunderman **Date:** 17 May 2010

■ Continuation ■Update

Description of Photo: 031.jpg, 5/17/2010, Overview of the remains of Flume 5, facing south west.

Description of Photo: 048.jpg, 5/17/2010, Flow gate along the Dulzura Conduit, facing South.

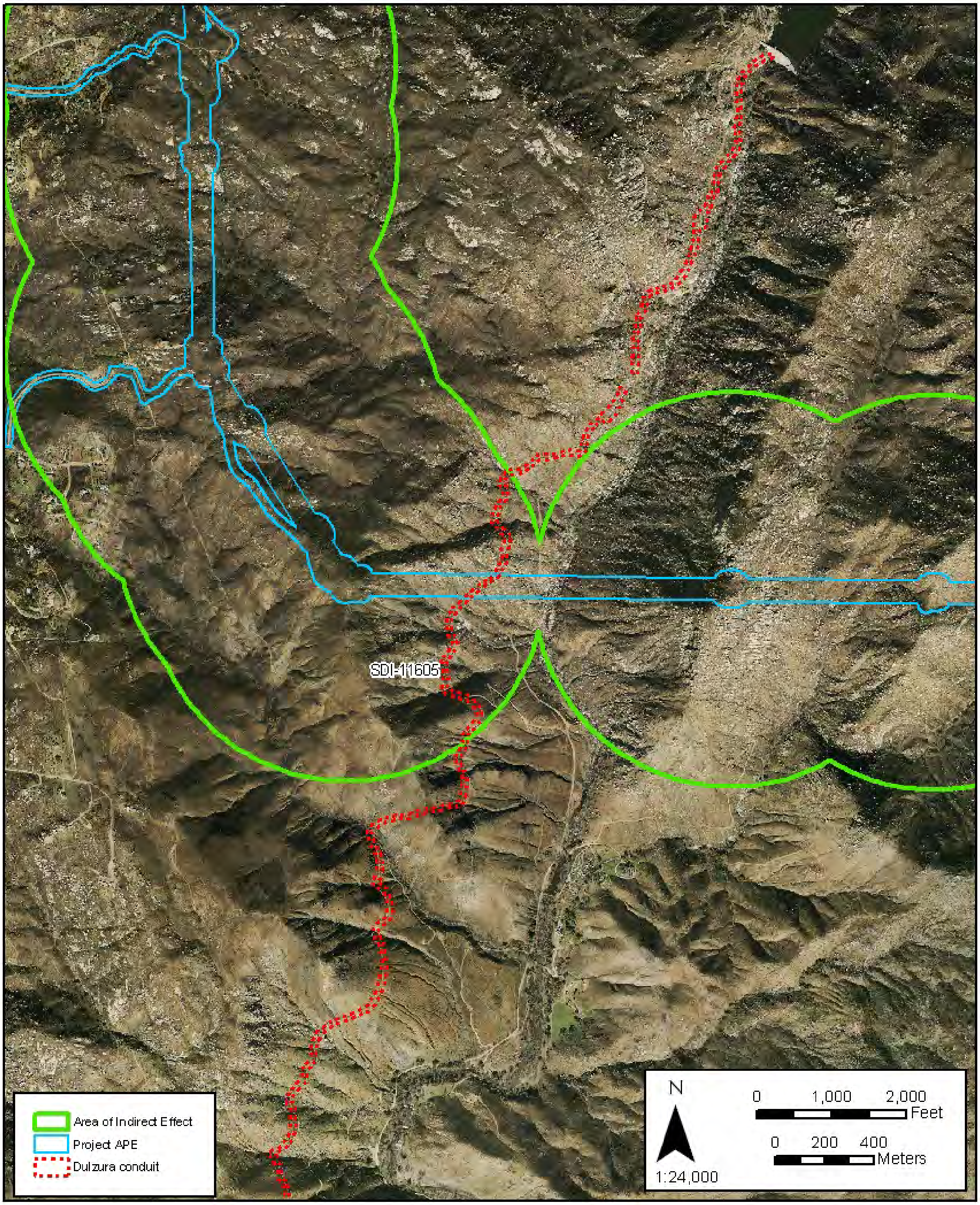
Description of Photo: 047.jpg, 5/17/2010, Overview of the Dulzura Conduit and a stone retaining wall, facing northeast.

Description of Photo: 064.jpg, 5/17/2010, A section of the Dulzura Conduit with modern concret patching facing north.

State of California — The Resources Agency DEPARTMENT OF PARKS AND RECREATION **SKETCH MAP**	**Primary #** ____ **HRI #** ____ **Trinomial** CA-SDI-11605H UPDATE

Page 3 **of** 3 — *Resource Name or #: **SDI-11605H - Dulzura Conduit**

Drawn by: Alice Brewster Linlor — **Date:** 2010



State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

Primary # ______________________
HRI# ______________________
Trinomial______________________

***Resource Name or #:** (Assigned by recorder) CA-SDI-11605 UPDATE

***Recorded by:** R. Droessler

***Date:** 10-9-2013 ☐ Continuation ☒ Update

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
CA-SDI-11605 is the Historic Dulzura Conduit and was originally recorded by Stephen Van Wormer in 1990 in order to mitigate impact from the removal of most of the flume boxes for improvements. The approximately 8-mile-long concrete and wood conduit was built between 1907-1910 to convey water from Barrett Lake to Lower Otay Reservoir and consists of open channels, short segments of tunnels, timber boxes, steel pipes, and wooden flume portions (Van Wormer 1989). The site was updated by Mary Robbins-Wade in 2002 after the Barrett Fire affected about one mile of the Dulzura Conduit. The concrete portions of the conduit remained unharmed, but the wooden flume #12 was destroyed by the fire. A southern portion of the site was updated in 2007 by K. Tsunoda and M. Deviovine of ICF Jones & Stokes as not affected by the 2002 fire, but upgrades/improvements were made to the resource by replacing the wooden flumes with concrete and metal. The last update was in 2009 by Dave Iversen of ASM Affiliates, Inc. who relocated the site in the recorded location and in relatively the same condition as previously indicated.

A small (0.2 mile) section of the Dulzura Conduit was updated by AECOM during a monitoring effort for the installation of an anchor for pole Z571488 (UTM: 11N 529628mE/ 3612956mN). This portion of the conduit is located 4 miles north of the Campo Road/Barrett Lake Road junction and 0.25 miles west up an access road from Barrett Lake Road. The conduit measures approximately 5 feet tall from surface to bottom and 7.8 feet across. Most of the conduit contains a 9 inch wall of two 4.5 inch tall x 6 inch thick concrete cinder blocks stacked on top of the other along each side of the conduit. The concrete blocks appear to be newer than the concrete encasement for the conduit. There are two distinct water line marks in the conduit; the darkest water line is 2-2.5 feet from the bottom of the conduit and the lighter water mark measures approximately 5 feet from the bottom. Recent improvements to the conduit, including concrete slabs and an access/drainage area, have been installed. Using the time lapse on Google Earth, the installation of these additions are estimated between July of 2009 and September of 2010. The surveyed conduit section ended at “Tunnel 6” (UTM: 11N 529611mE/ 3612851mN).

The recent improvements to the Dulzura Conduit involved the placement of large concrete covers (approximately 8 feet long x 2-4 feet wide x 6 inches thick) and placing sandbags over three drainage areas along the hillside. The sandbags appear to have been filled with soils from the immediate areas, as evidenced by shallow pits near the new concrete slabs. A new “drainage” area or escape area for animals caught in the conduit was also built into the side of the Dulzura Conduit just northeast of Tunnel 6. Concrete from the original conduit was removed and replaced with new concrete to create this access area and the #3 concrete slab area. The original concrete has been stacked nearby.

IMG_1530: Concrete cover #1 and pole Z571488, facing southwest.

<u>Drainage/access location</u>: UTM 11N 529610mE/ 3612849mN

<u>Concrete cover locations from north to south</u> (UTMs, 11N):
#1: 529631mE/ 3612958mN
#2: 529619mE/ 3612931mN
#3: 529603mE/ 3612889mN

***P8. Recorded by:** Rachel Droessler
AECOM
1420 Kettner Blvd. Ste. 500
San Diego, CA 92101

***P10. Survey Type:** Intensive Pedestrian

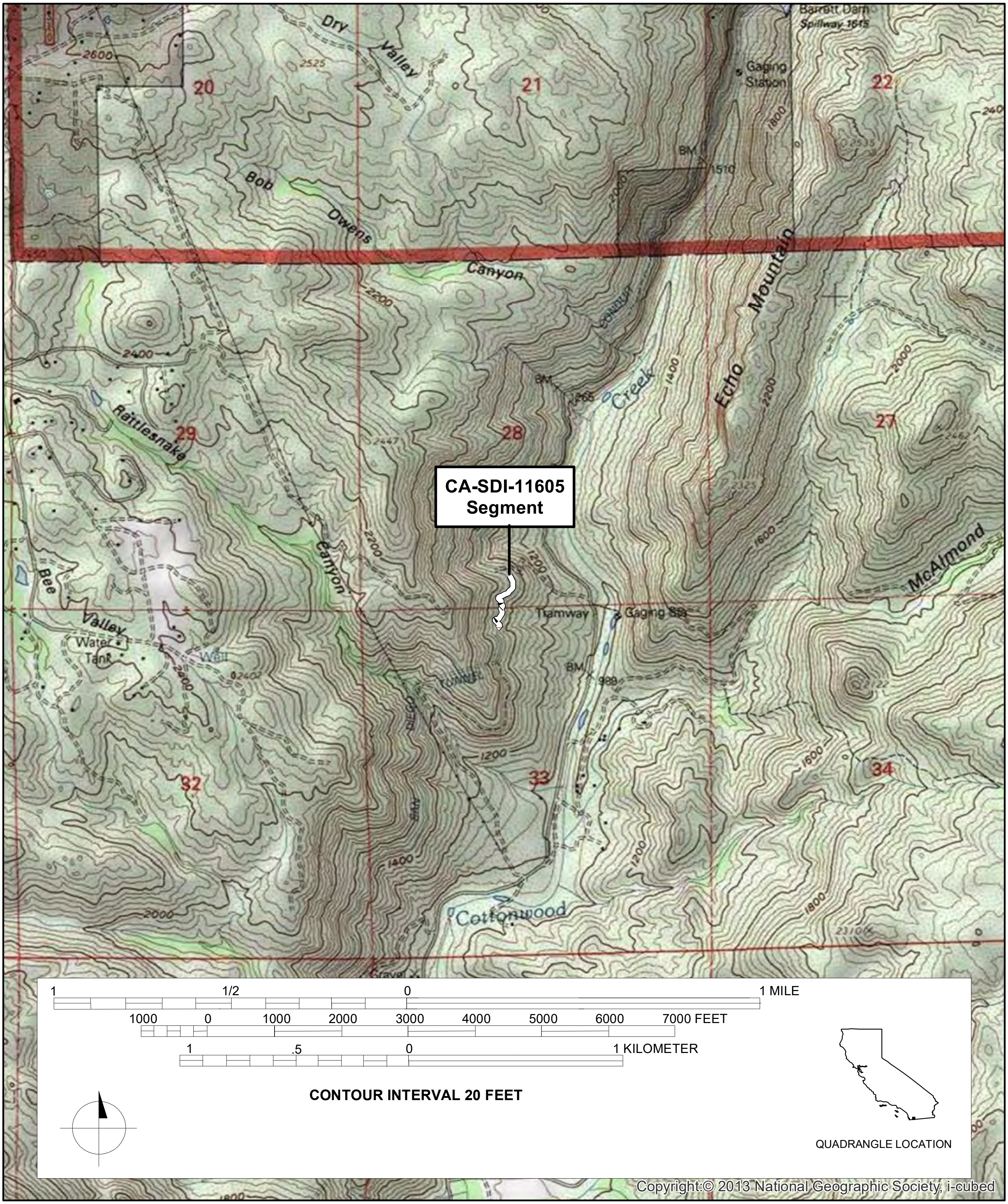
***P11. Report Citation:**
R. Droessler
2013 Letter Report: eTS 25511 – Cultural Resources Monitoring Report for TL 6923 Z571488 Anchor Installation, Dulzura, County of San Diego, California. Submitted to SDG&E.

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI #
Trinomial CA-SDI-11605 UPDATE

Page 2 of 3 * Resource Name or # (Assigned by recorder) CA-SDI-11605 UPDATE

* Map Name: USGS 7.5' Barrett Lake * Scale: 1:24,000 * Date of Map: 1966 (Rev 1973)



State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #
HRI #
Trinomial CA-SDI-11605 UPDATE

Page 3 **of** 3 *** Resource Name or #** (Assigned by recorder) CA-SDI-11605 UPDATE

*** Drawn By:** AECOM *** Date:** 10/08/13

Note: Include bar scale and north arrow.

DPR 523K (1/95) ***Required Information**

UPDATE

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

Primary # ______
HRI # ______
Trinomial CA-SDI-11605

Resource Name or # SDI-11605

Recorded by: Dave Iversen

Date: 06 July 2009

☐ Continuation ■ Update

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
Van Wormer documented the Historic Dulzura Conduit in 1989, and Robbins-Wade updated a portion of the site subsequent to the Barrett Fire in 2002. During the present survey, ASM relocated the site in the recorded location and in relatively the same condition as indicated in the original recordation.

***P8. Recorded by:**
Dave Iversen
ASM Affiliates, Inc.
2034 Corte del Nogal
Carlsbad, CA 92011

***P10. Survey Type:**
Intensive Pedestrian

***P11. Report Citation:**
Arleen Garcia-Herbst, David Iversen, Brian Williams and Don Laylander
2009 *Class III Inventory of the Cultural Resources along the Approved San Diego Gas & Electric Sunrise Powerlink Final Environmentally Superior Southern Route, San Diego and Imperial Counties, California*. ASM Affiliates, Inc. Submitted to SDG&E.

UPDATE

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary Number:
HRI Number:
Trinomial: **CA-SDI – 11605H UPDATE**
NRHP Status Code:
Other Listings:
Review Code: Reviewer: Date:

Resource Name: CA-SDI-11605H UPDATE

P1. Other Identifier: Dulzura Conduit.

P2. **Location:** ■ Not for Publication Unrestricted **a. County:** San Diego
b. **USGS 7.5' Quad:** Tecate Date: 1960 (Photoinspected 1975) T 18S; R 2E; S 1/2 of Sec 12; S.B.B.M.
c. Address: City: Zip:
d. UTM: Zone 11; NAD 83; from 524788mE/ 3608678mN to 525588mE/ 3609219mN (portions near current survey area, southwest and northeast ends respectively); (Lat 32° 36' 55.301", Long -116° 44' 8.843" to Lat 32° 37' 12.805", Long -116° 43' 38.093", respectively)
e. Other Locational Data: This section of the resource is located at the easternmost end of Dulzura, CA, just before Barrett Junction, CA, at the bend known as Gasoline Curve. It is located on the westbound side of SR 94 approximately 210 feet away from the highway. The portion of the conduit surveyed begins at post mile marker 32.5, running northeast and terminating at post mile marker 33. The Conduit is north of SR 94 from PM 32.5 - 32.995 and south of SR 94 from PM 32.5-32.4. The Conduit crosses SR 94 at PM 32.5. The elevation at this section is approximately 1475 feet above mean sea level and roughly 100 feet above the highway.

P3a. **Description:** The Dulzura Conduit (CA-SDI-11605H) was originally recorded by Van Wormer in 1989. The conduit was built in the early part of the 20th Century to convey water from Barrett Lake to Lower Otay Reservoir via Dulzura Creek and is about 8 miles long. Mary Robbins-Wade performed a site visit in 2002 to the eastern/northern end of the resource and discovered that the Barrett Fire affected one mile of the Conduit. This update concerns a section further down-grade (west/south) of the previous update. There appears to be no adverse impacts or changes to the resource since upgrades/improvements were made to the resource, replacing the wooden flumes with concrete and metal flumes. Portions of the segment are open; others are closed off at the top with concrete. The conduit is dry and leaf litter and occasional modern trash are within the resource.

P3b. **Resource Attributes:** AH6. Water conveyance system.

P4. **Resources Present:** Building ■Structure Object Site District Element of District Other (Isolates, etc.)

P5a. Photograph or Drawing: Digital frame DSCF0037
P5b. Description of Photo: Resource view facing east. Photo taken August 16 2007

P6. **Age and Sources:** ■Historic Prehistoric Both

P7. **Owner and Address:**
City of San Diego
Real Estate Assets Department
1200 Third Ave, Suite 1700 (MS 51A)
San Diego, CA 92101

P8. **Recorded by:**
K. Tsunoda and M. DeGiovine
ICF Jones & Stokes
9775 Businesspark Avenue, Suite 200
San Diego, CA 92131

P9. **Date Recorded:** August 16 2007

P10. **Survey Type:** Intensive Pedestrian Survey

P11. **Report Citation:** Archaeological Survey Report for the State Route 94 Operational Improvement Project, 11-SD-94, PM 20.69-38.9, EA 251200. MS on file at Caltrans, San Diego. (ICF Jones & Stokes 2009)

Attachments: ■NONE Location Map Sketch Map Continuation Sheet Building, Structure, and Object Record Archaeological Record District Record Linear Feature Record Milling Station Record Rock Art Record Artifact Record Photograph Record Other (List):

UPDATE

CONTINUATION SHEET

Primary # P-37-
HRI #
Trinomial CA-SDI-11,605H **UPDATE**

Page 1 **of** 5 ***Resource Name or #** (Assigned by recorder) Dulzura conduit
*Recorded by Mary Robbins-Wade **Date** 8/1/2002 ☐ Continuation ☒ Update

USGS 7.5' Quad Barrett Lake **Date** 1960 (1988) **T** 17S; **R** 3E ; SW¼ **of** NW¼ **of Sec** 33; SBM **B.M.**
UTM: (Give more than one for large or linear resources) Zone 11; 529 320 **mE/** 3612 000 **mN from original site record**
Other Locational Data (e.g., parcel #, directions to resource, elevation, etc., as appropriate): Dulzura Conduit is located along Barrett Lake Road and Highway 94, running from Barrett Lake to Barrett Junction, just east of Dulzura. Flume 12 is on the west side of Barrett Lake Road, west of Cottonwood Creek, south of Barrett Lake and north of Highway 94.

The Dulzura Conduit (CA-SDI-11,605H) was documented by Van Wormer (1989). The conduit was built in the early part of the 20^{th} century to convey water from Barrett Lake to Lower Otay Reservoir via Dulzura Creek. The entire conduit is about 8 miles long. Six wooden flumes were drawn, photographed, and documented by Van Wormer (1989), in order to mitigate impacts from removal of most of the flume boxes for improvements to the conduit system. The wooden Flume 12 remained in place; the new section of flume was routed around it.

In February 2002, the Barrett Fire affected about one mile of the Dulzura Conduit. Mary Robbins-Wade field checked the site in July 2002. While the concrete portions of the conduit remained unharmed, the wooden Flume 12 was destroyed by the fire. The attached photographs illustrate the earlier condition of this flume and its current state.

References: Van Wormer, S.R., 1989. *Historical and Architectural Assessment of Six Timber Box Flumes on the Dulzura Conduit*. Stephen R. Van Wormer, Historical Consultant, National City, California. Report submitted to City of San Diego, Water Utilities Department.

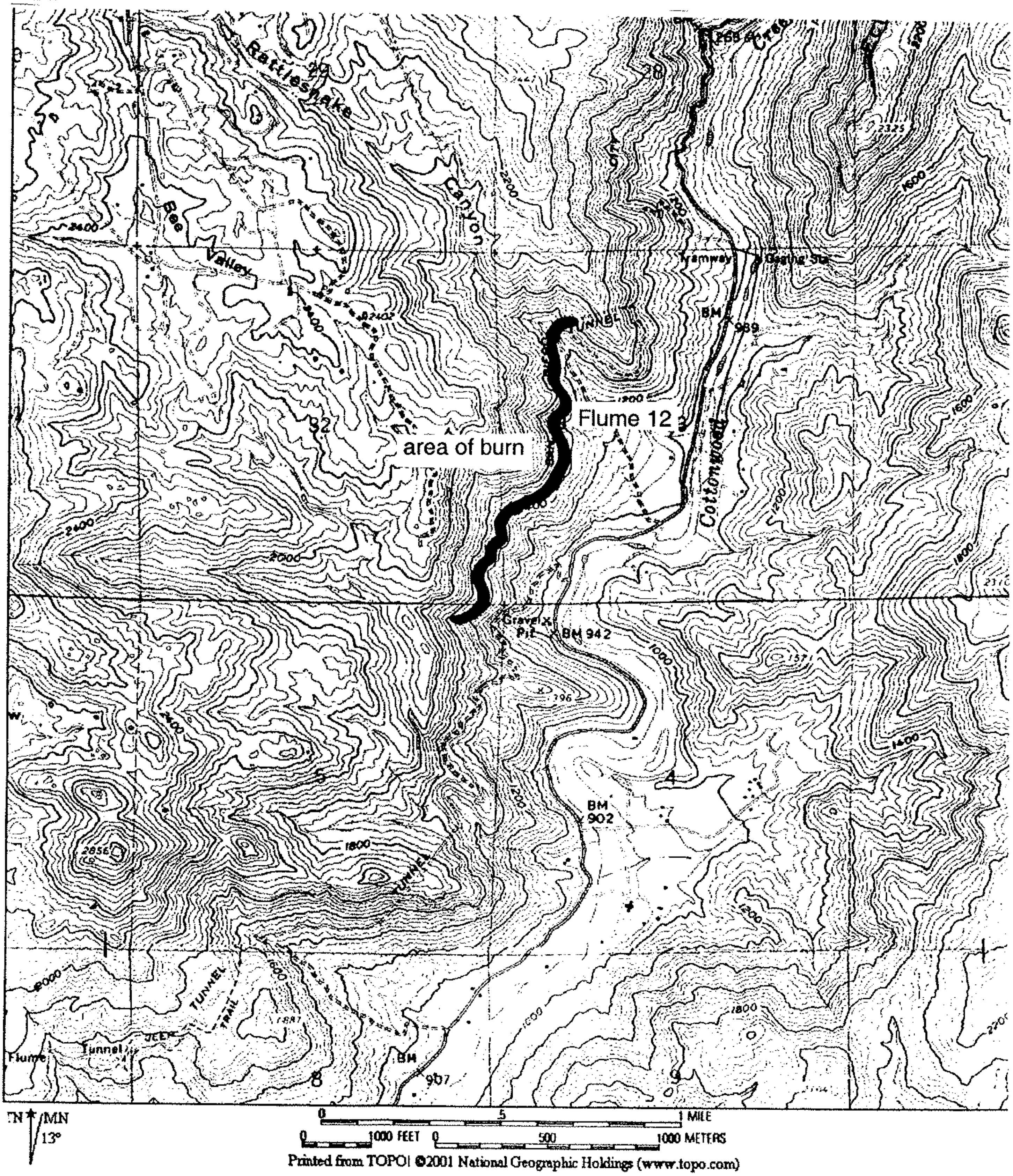
State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary # P-37-
HRI#
Trinomial CA-SDI-11,605H **UPDATE**

Page 2 of 5 Resource Name or #:(Assigned by recorder) Dulzura Conduit

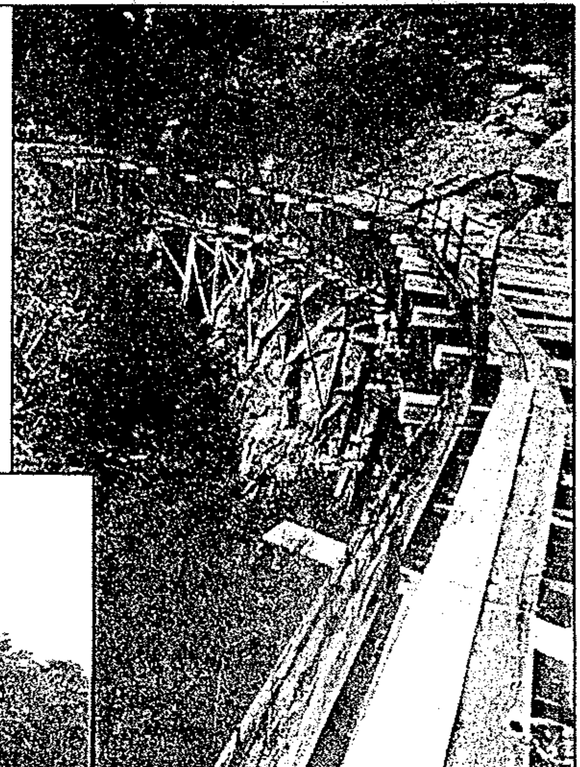
*Map Name: Barrett Lake *Scale: 1:24,000 (1"=2000') *Date of Map: 1960 (1988)



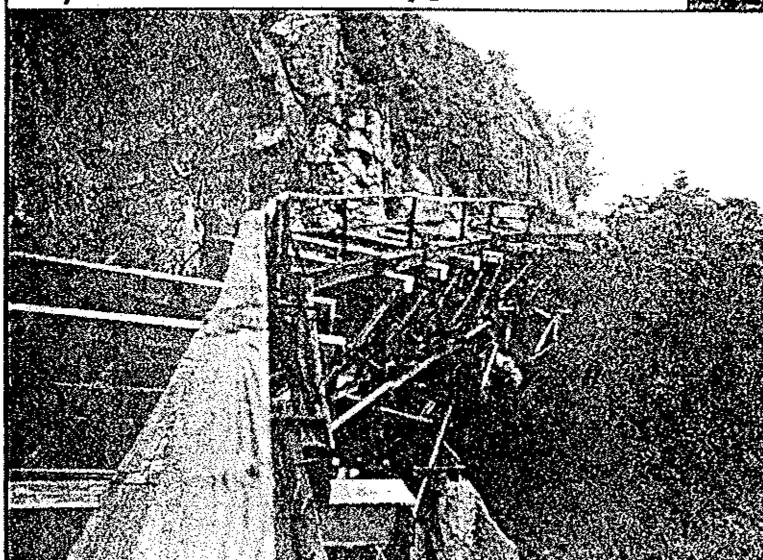
Printed from TOPO! ©2001 National Geographic Holdings (www.topo.com)

11605

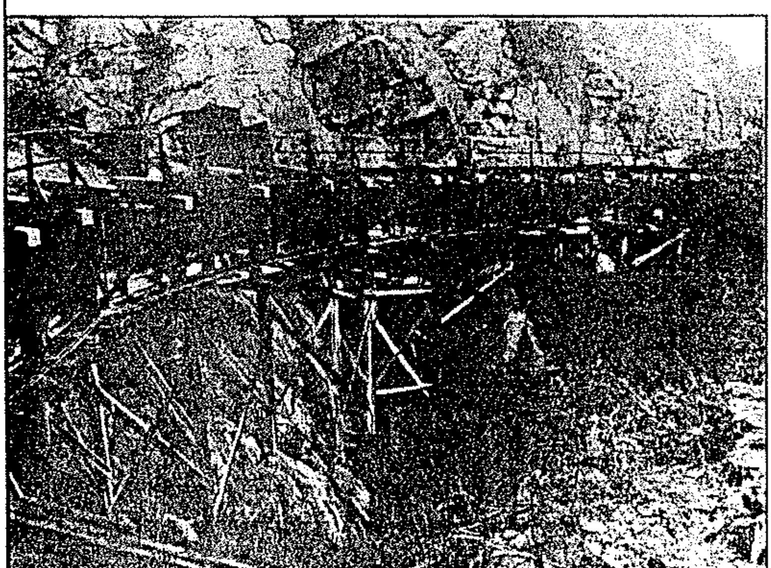
From the top looking south



Top midsection looking north



source: Van Wormer 1989: Figure 19



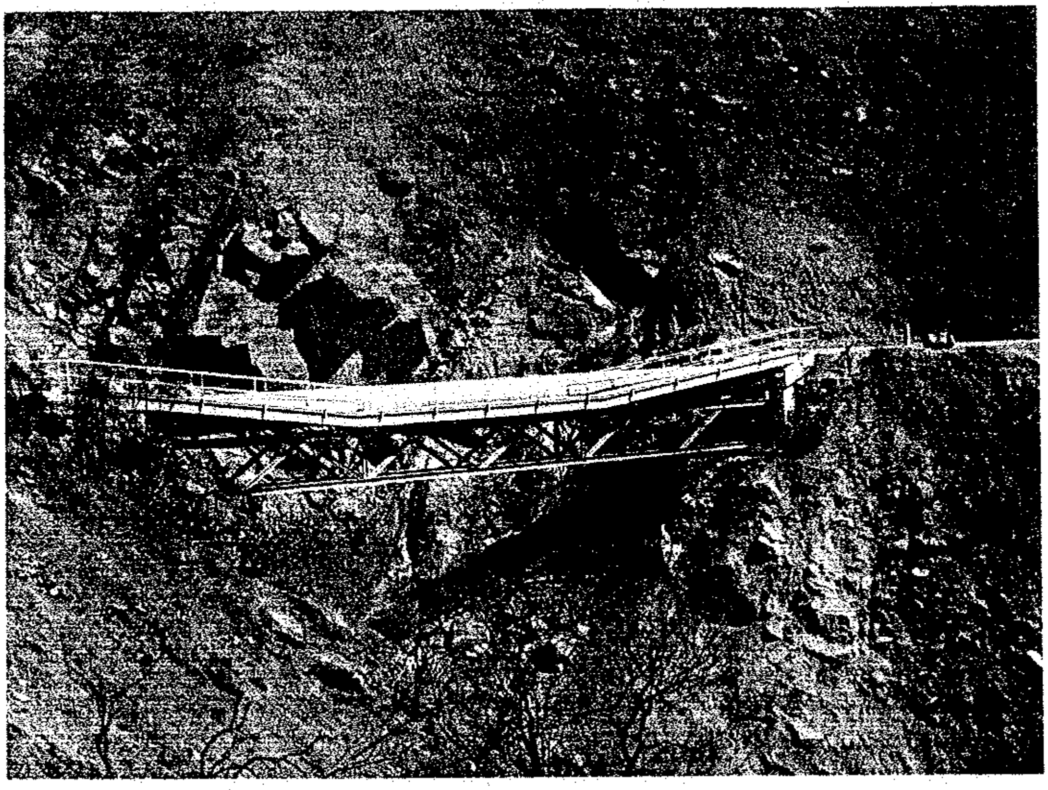
Side view from the south end

Affinis
Shadow Valley Center
847 Jamacha Road
El Cajon, CA 92019

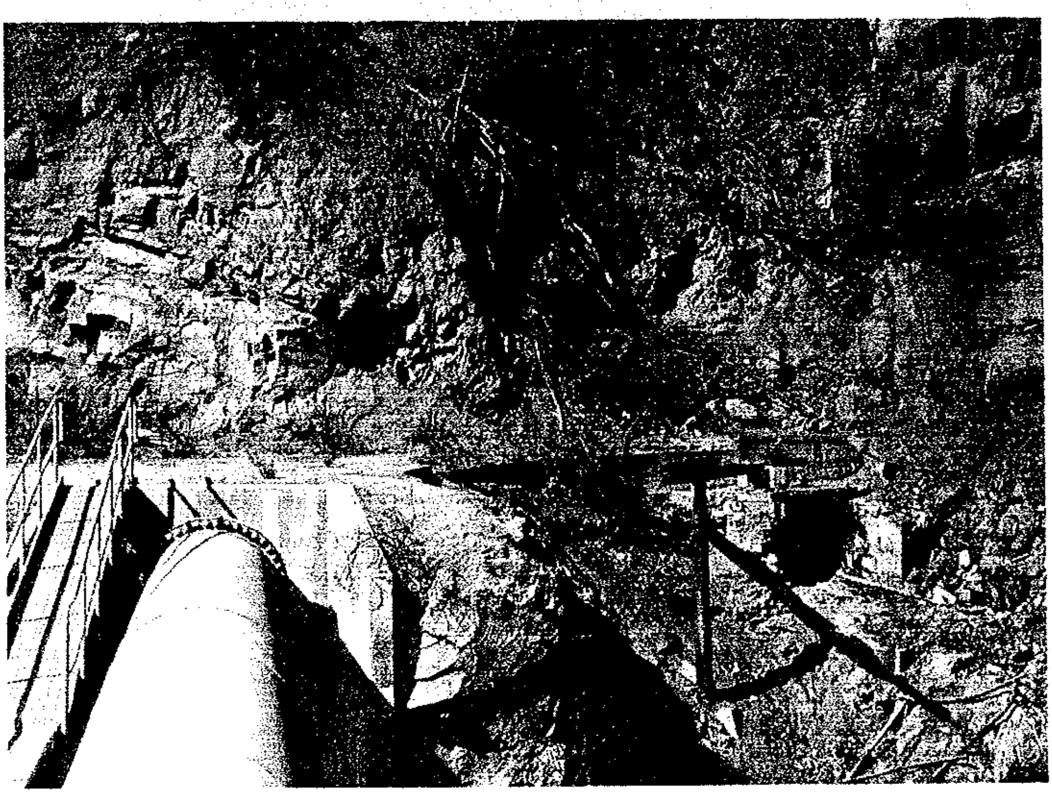
Old views of original Flume 12

Figure 4

11605



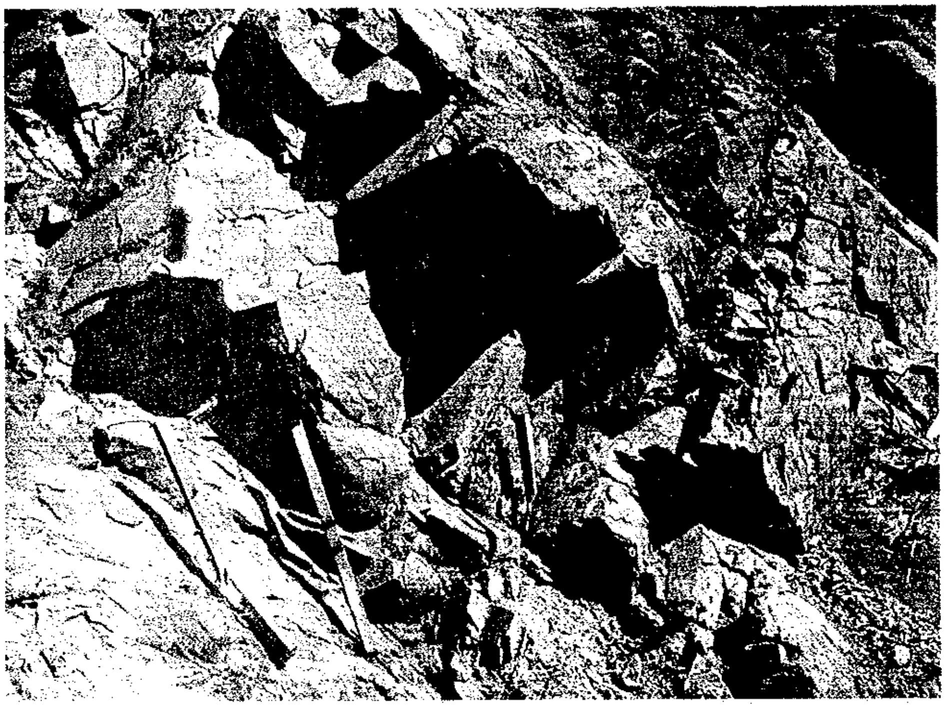
New Flume 12 and remnants of old Flume 12, looking north



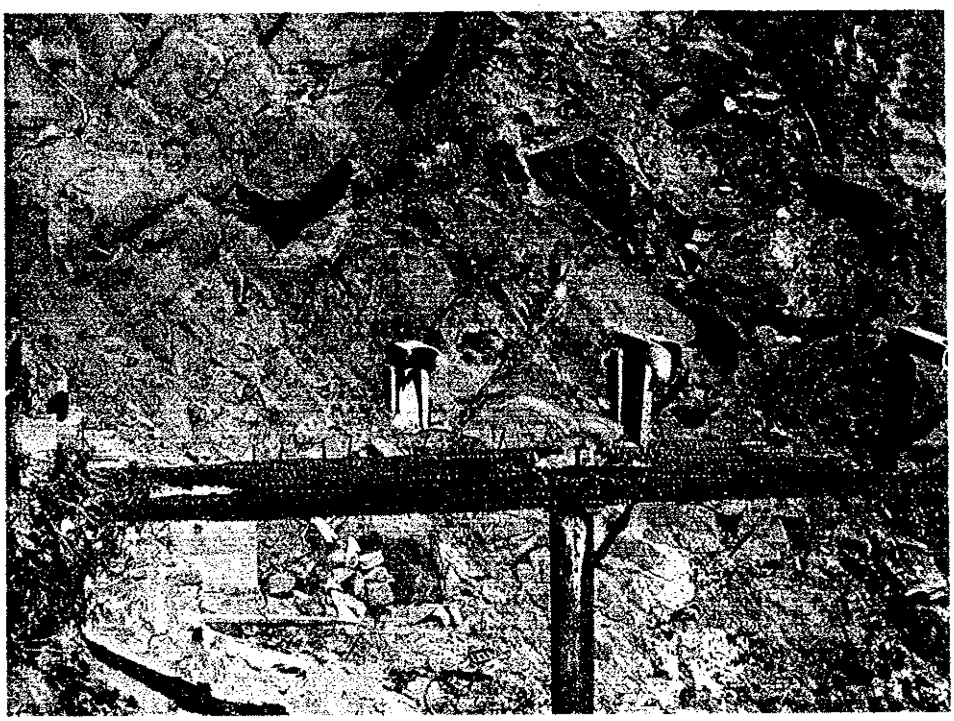
New Flume 12 on left, old Flume 12 on right, looking west

Affinis Shadow Valley Center 847 Jamacha Road El Cajon, CA 92019	Views of Flume 12	Figure 5

11605



Remnants of Flume 12, looking northerly



Remnants of Flume 12, burned lumber, looking north

Affinis Shadow Valley Center 847 Jamacha Road El Cajon, CA 92019	Views of old Flume 12	Figure 6

CA-SDi-11605 H

State of California - The Resources Agency
Department of Parks and Recreation
ARCHEOLOGICAL SITE RECORD
Permanent Trinomial: SDi-
Other Designation: Dulzura Conduit

1. **County:** San Diego

2. **USGS Quad:** Otay Mountain and Barrett Lake (7.5) 1960

3. **UTM Coordinates:** Zone 11 / (NA) m Easting/ (NA) m Northing
a: 11/530900/3615560; b: 11/528000/3609580; c: 11/524800/3608320; d: 11/520160/3609020

4. **Township** 17/18S **Range** 2/3E; **1/4 of 1/4 of 1/4 of 1/4 of Section** 22, 23, 28, and 33 **Base Mer.** SBM

5. **Map Coordinates:** (NA) mmS / (NA) mmE (from NW corner of map)

6. **Elevation:** 1480 to 1580 feet AMSL

7. **Location:** The conduit runs along the steep slope of a mountain range, extedning from approximately 8 miles southwest of Barrett Dam to Dulzura Creek, crossing Highway 94 just east of Dulzura Summit.

8. **Prehistoric** **Historic** X **Protohistoric**

9. **Site Description:** An open channel, concrete water conduit with short segments of tunnels, timber boxes, and steel pipe.

10. **Area:** approximately 8 miles long by 2 meters wide

11. **Depth** (NA) cm Method of Determination

12. **Features:** Timber boxes, tunnels, and concrete open canal segments.

13. **Artifacts:** NA

14. **Non-Artifactual Constituents and Faunal Remains:** NA

15. **Date Recorded:** 2/90 16. **Recorded by:** S. Van Wormer for ASM

17. **Affiliation and Address:** Historical consultant, 2940 Baker Place, National City, CA 92050

18. **Human Remains:** NA

19. **Site Disturbances:** Since construction repairs have been made, but these don't actually constitute disturbance.

20. **Nearest Water** (type, distance, and direction): NA

21. **Vegetation Community** (site vicinity): Mixed chaparral

11605

22. **Vegetation** (on site): Mixed chaparral

23. **Site Soil:** Soild granitic rock and decomposed granite

24. **Surrounding Soil:** Same as above

25. **Geology:** Mesozoic granitic

26. **Landform:** mountain slope

27. **Slope:** 45-60 degrees 28. **Exposure** south-southeast

29. **Landowner and Address:** City of San Diego Water Utilities Department, 401 B Street, Suite 600, San Diego, CA 92101

30. **Remarks:** The flume was built between 1907-1910 to convey water from Barrett Lake to Lower Otay Reservior.

31. **References:** Historical and Architectural Assessment of Six Timber Box Flumes on the Dulzura Counduit, Stephen Van Wormer, June 1990.

32. **Name of Project:** Dulzura Conduit Renovation Project

33. **Type of Investigation:** Survey, archival research, and architectural assessment

34. **Site Accession Number:** NA **Curated At:** NA

35. **Photos:** See report by Van Wormer.

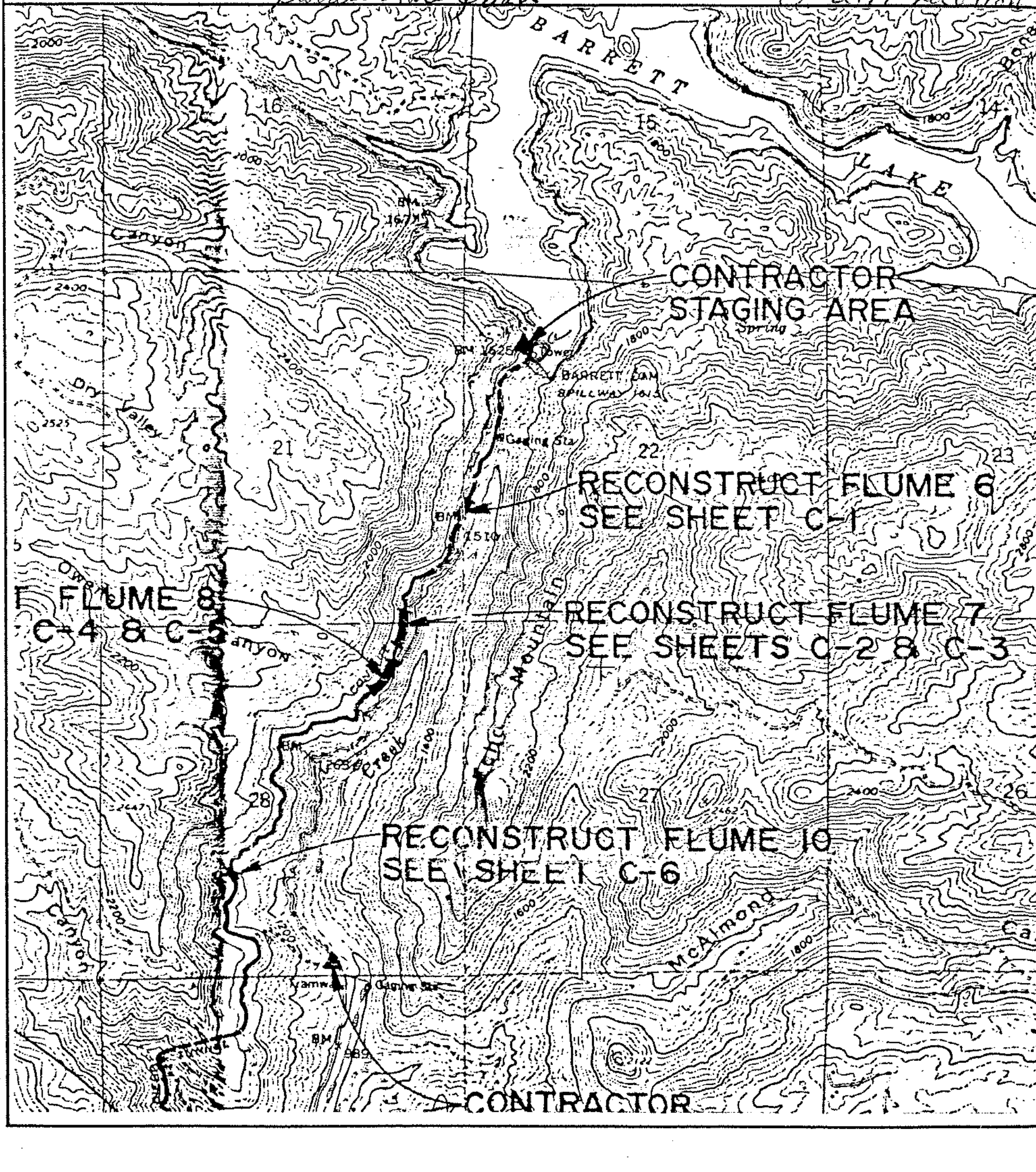
ARCHEOLOGICAL SITE LOCATION MAP

Permanent Trinomial: SDi - 11605 ____ Mo. Yr.

Other Designations: ____

Page 3 of 5

Barrett Lake Quad   O = UTM Location



ARCHEOLOGICAL SITE LOCATION MAP

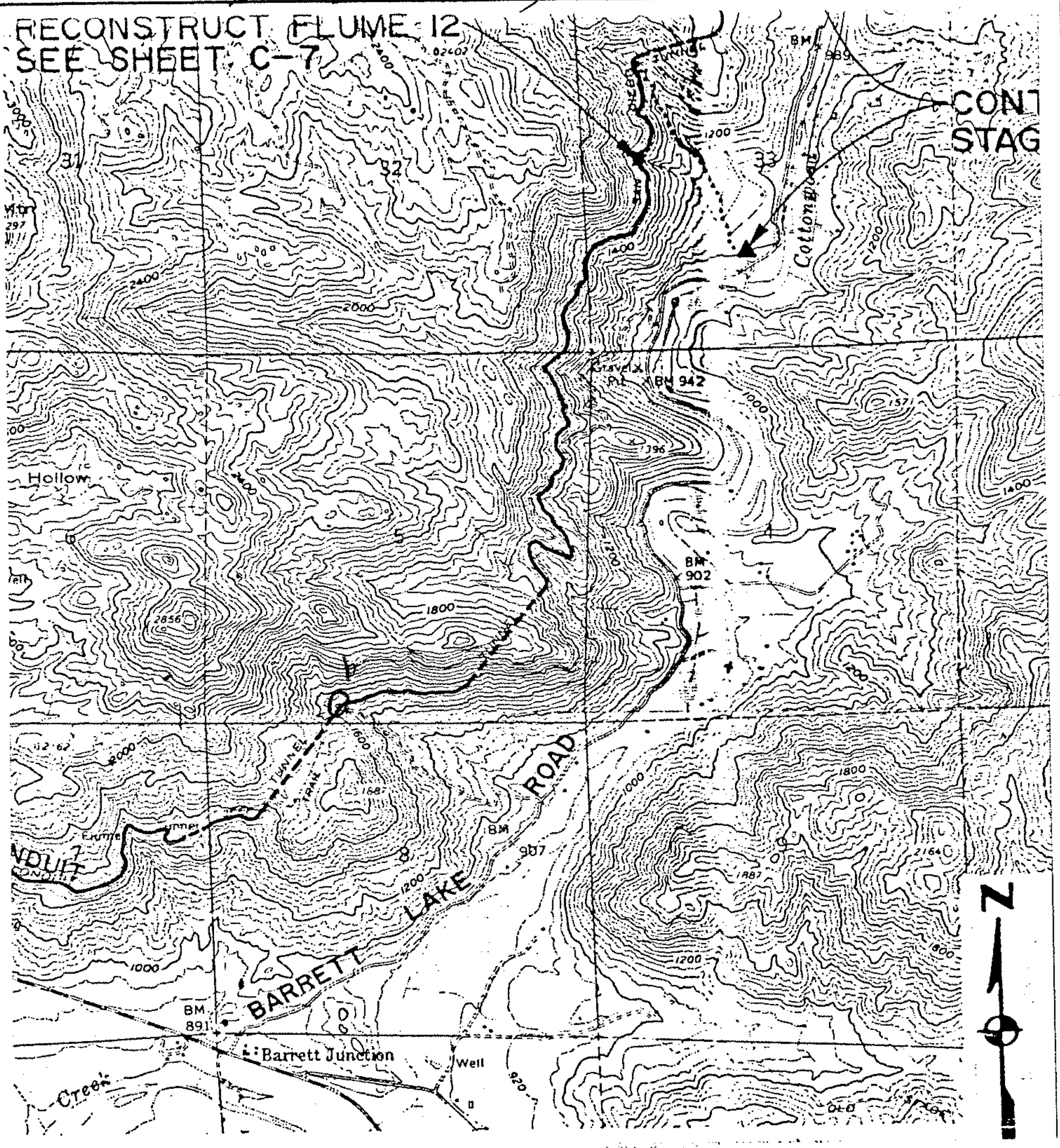
Permanent Trinomial: SDI-11605 ___ Mo. ___ Yr.

Other Designations: ___

Page 4 of 5

Barrett Lake + Tecate Quads

O = UTM Location



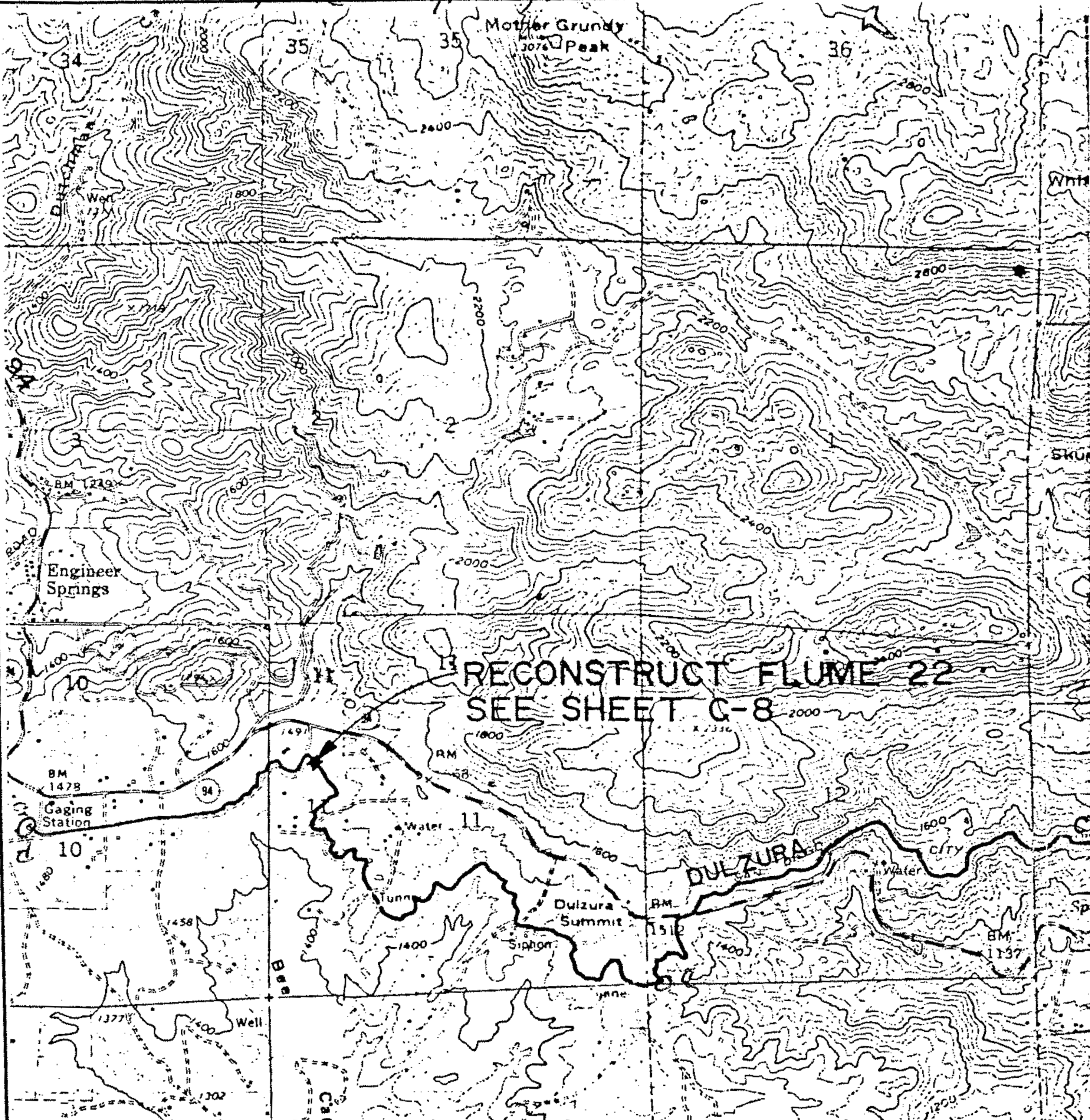
ARCHEOLOGICAL SITE LOCATION MAP

Permanent Trinomial: SDI-11605 Mo. Yr.

Other Designations:

Page 5 of 5

Tecate & Otay Mtn Quads O = UTM Locations



State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # P-37 015585
HRI #
Trinomial CA-SDI 14331H
NRHP Status Code
Other Listings
Review Code Reviewer Date

Page 1 of 5 | *Resource Name or #: (Assigned by recorder) LH-2

P1. Other Identifier:

***P2. Location:** ☒ Not for Publication ☐ Unrestricted *a. County San Diego
and P2c, P2e, and P2b or P2d. (Attach Location Map as necessary.)
*b. USGS 7.5' Quad Rancho Santa Fe Date 1968 T 13S; R 2W: SE ¼ of NW ¼ of Sec 18; SB B.M.
c. Address City Zip
d. UTM: (Give more than one for large and/or linear resources) Zone: 11 ; 488270 mE/ 3656300 mN
*e. Other Locational Data: (E.g., parcel #, directions to resource, elevation, etc., as appropriate.)
The site is located on the northern shore of Lake Hodges. From Rancho Felicita Road, head south on Del Dios Road. Follow Del Dios Road for 5.0 km until the road curves to the southwest. The site is 100 meters south of the road and 250 meters east of the dam.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries.)

The site is situated on a steep slope along the lakes northern shoreline. The site appears to be the remains of a residence dating to the early 20th Century. Features include stone walls, cement stairs and walkways, and a variety of landscaping plants. A date of "August 6, 1927" is inscribed in cement at the base of a stairway.

***P3b.** Resource Attributes: (See attributes and codes) AH2.-Foundations; AH3.-Landscaping; AH11.-Walls
***P4.** Resources Present: ☐ Building ☐ Structure ☐ Object ☒ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5a. Photo or Drawing (Photo required for buildings, structures, and objects.)

P5b. Description of Photo: (View, date, accession #)

***P6. Date Constructed / Age and Sources:** ☒ Historic ☐ Prehistoric ☐ Both

***P7. Owner and Address:**
City of San Diego

***P8. Recorded by:** (Name, affiliation, and address) A. York, and J. Mullen, KEA Environmental, Inc. 1420 Kettner Blvd. Ste. 620, San Diego, CA 92101

***P9. Date Recorded:** 7/7/96

***P10. Survey Type:** (Describe)
Intensive survey

***P11. Report Citation:** (Cite Survey report and other sources, or enter "none.") Letter report to Mr. Doug Gillingham, Boyle Engineering, September 13, 1996.

*Attachments: ☐ None ☒ Location Map ☒ Sketch Map ☒ Continuation Sheet ☐ Building, Structure, and Object Record ☐ Linear Resource Record ☒ Archaeological Record ☐ District Record ☐ Milling Station Record ☐ Rock Art Record ☐ Artifact Record ☐ Photograph Record ☐ Other (List)

*Required Information

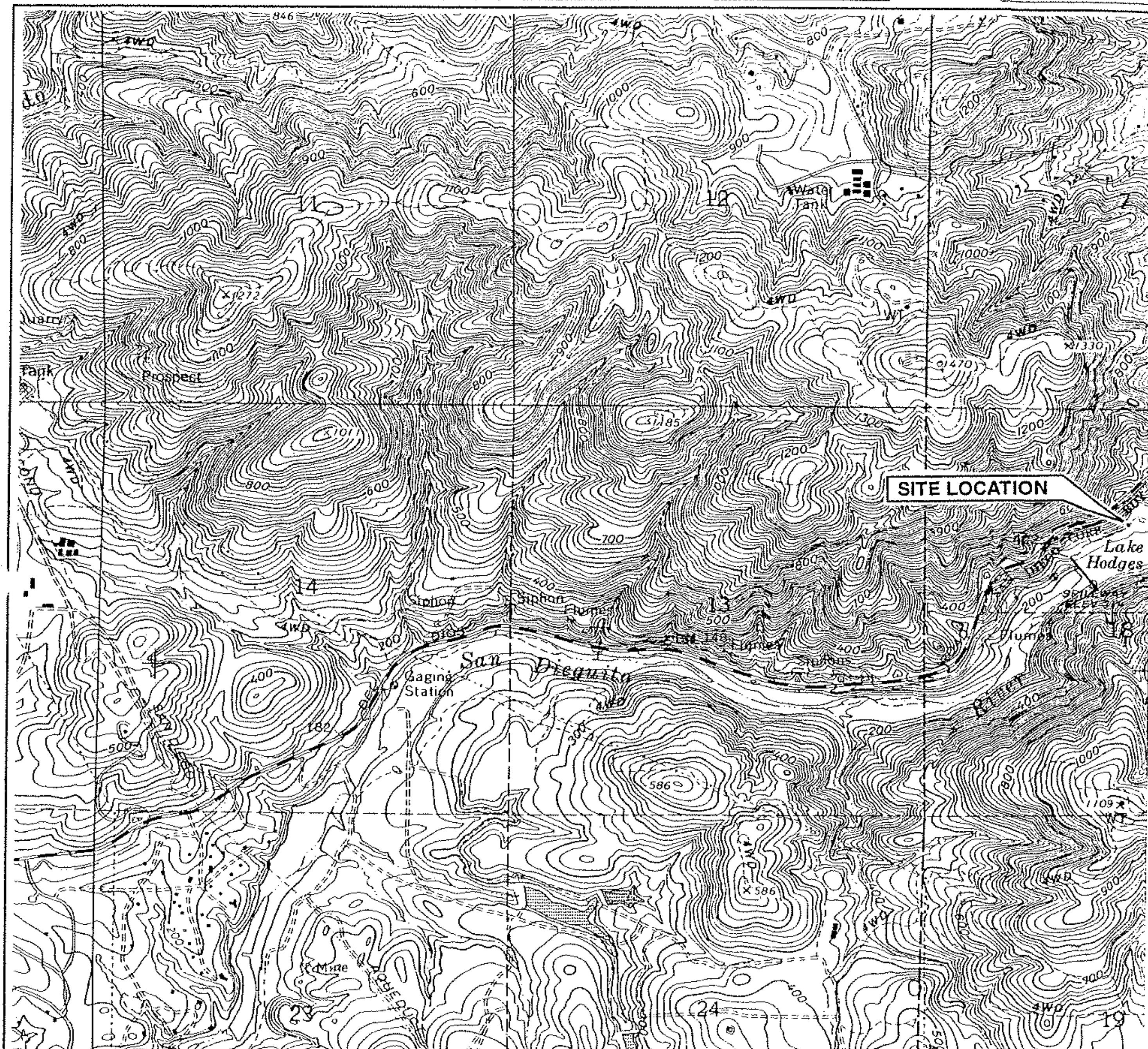
State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary # 015585
HRI#
Trinomial CA-SDI 14331H

Page 2 of 5 *Resource Name or # (Assigned by recorder) LH-2

*Map Name: RANCHO SANTA FE QUADRANGLE *Scale: 1:24,000 *Date of Map: 1968



1 1/2 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET

CALIF
QUADRANGLE LOCATION

SOURCE: U.S.G.S. 7.5 QUADRANGLE - RANCHO SANTA FE, CALIF. 1968 (PHOTOREVISED 1983)

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
ARCHAEOLOGICAL SITE RECORD

Primary # P-37 015585
Trinomial CA-SDI 14331H

*Resource Name or # Assigned by recorder) LH-2

*A1. Dimensions: a. Length 100m (EW) × b. Width 90m (NSEW)
Method of Measurement: ☒ Paced ☐ Taped ☐ Visual estimate ☐ Other:
Method of Determination (Check any that apply.): ☒ Artifacts ☒ Features ☐ Soil ☐ Vegetation ☒ Topography ☐ Cut bank ☐ Animal burrow ☐ Excavation ☐ Property boundary ☐ Other (Explain):

Reliability of Determination: ☒ High ☐ Medium ☐ Low Explain:

Limitations (Check any that apply): ☐ Restricted access ☐ Paved/built over ☒ Site limits incompletely defined ☒ Disturbances ☒ Vegetation ☐ Other (Explain): Dense vegetation occurs throughout site.

A2. Depth: ☐ None ☒ Unknown Method of Determination:

*A3. Human Remains: ☐ Present ☒ Absent ☐ Possible ☐ Unknown (Explain):

*A4. Features (Number, briefly describe, indicate size, list associated cultural constituents, and show location of each feature on sketch map.):

Eleven features were identified: Feature 1 - a four-chamber rectangular cement cistern measuring 7'long x 4'8"wide x 4'7"deep; Feature 2 - a concrete slab measuring 3'10"wide and 6"thick; Feature 3 - a concrete stairway with 20 steps; Feature 4 - a small milled lumber retaining wall, two boards high; Feature 5 - a decorative concrete feature, measuring 5' wide, may have been a pond or fountain; Feature 6 - a rectangular stone and cement structure, measuring 38'long x 28'wide, built around a 23" diameter metal pipe; (See continuation sheet)

*A5. Cultural Constituents (Describe and quantify artifacts, ecofacts, cultural residues, etc., not associated with features.):

No artifacts noted.

*A6. Were Specimens Collected? ☒ No ☐ Yes (If yes, attach Artifact Record or catalog and identify where specimens are curated.)

*A7. Site Condition: ☐ Good ☐ Fair ☒ Poor (Describe disturbances.): Post-occupational disturbances.

*A8. Nearest Water (Type, distance, and direction.): Lake Hodges is immediately south of the site.

*A9. Elevation: 310 feet

A10. Environmental Setting (Describe vegetation, fauna, soils, geology, landform, slope, aspect, exposure, etc., as appropriate.):

On site vegetation consists of reeds, oak trees, and introduced eucalyptus and jade plant. The site is on a steep slope above the northern shoreline of Lake Hodges. The soil is San Miguel-Exchequer rocky silty loam underlain by Jura-Trias metavolcanic rock. The slope is 9-70% and the exposure is open to the south.

A11. Historical Information: The steps inscribed with the "August 6, 1927" date were constructed eight years after completion of the dam.

*A12. Age: ☐ Prehistoric ☐ Protohistoric ☐ 1542-1769 ☐ 1769-1848 ☐ 1848-1880 ☐ 1880-1914 ☒ 1914-1945 ☐ Post 1945 ☐ Undetermined **Describe position in regional prehistoric chronology or factual historic dates if known:**

A13. Interpretations (Discuss data potential, function(s), ethnic affiliation, and other interpretations):

This site may have served as the residence for the damkeeper.

A14. Remarks:

A15. References (Documents, informants, maps, and other references):

A16. Photographs (List subjects, direction of view, and accession numbers or attach a Photograph Record.):

Original Media/Negatives Kept at: KEA Environmental, Inc., San Diego

*A17. Form Prepared by: A. York/J. Mullen Date: 9/96
Affiliation and Address: KEA Environmental, Inc.
1420 Kettner Boulevard, Suite 620, San Diego, California 92101

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

Primary # P-37 015585
HRI #
Trinomial CA-SDI 14331H

 *Resource Name or # (Assigned by recorder) LH-2

*Recorded by: A. York/J. Mullen *Date: 7/96 ☒ Continuation ☐ Update

A4. Features: Feature 7 - a 21" diameter metal pipe extending vertically 7" above the ground; Feature 8 - a concrete pad measuring 34"long x 23" wide; Feature 9 - four cement footings, each 8½" wide x 39" long, spaced 70" apart; Feature 10 - a 10" diameter riveted metal pipe; and Feature 11 - a disconnected utility pole with four switch boxes. Also present are several unmortared stone retaining walls between 1' and 10' high, as well as several types of non-native landscape plants.

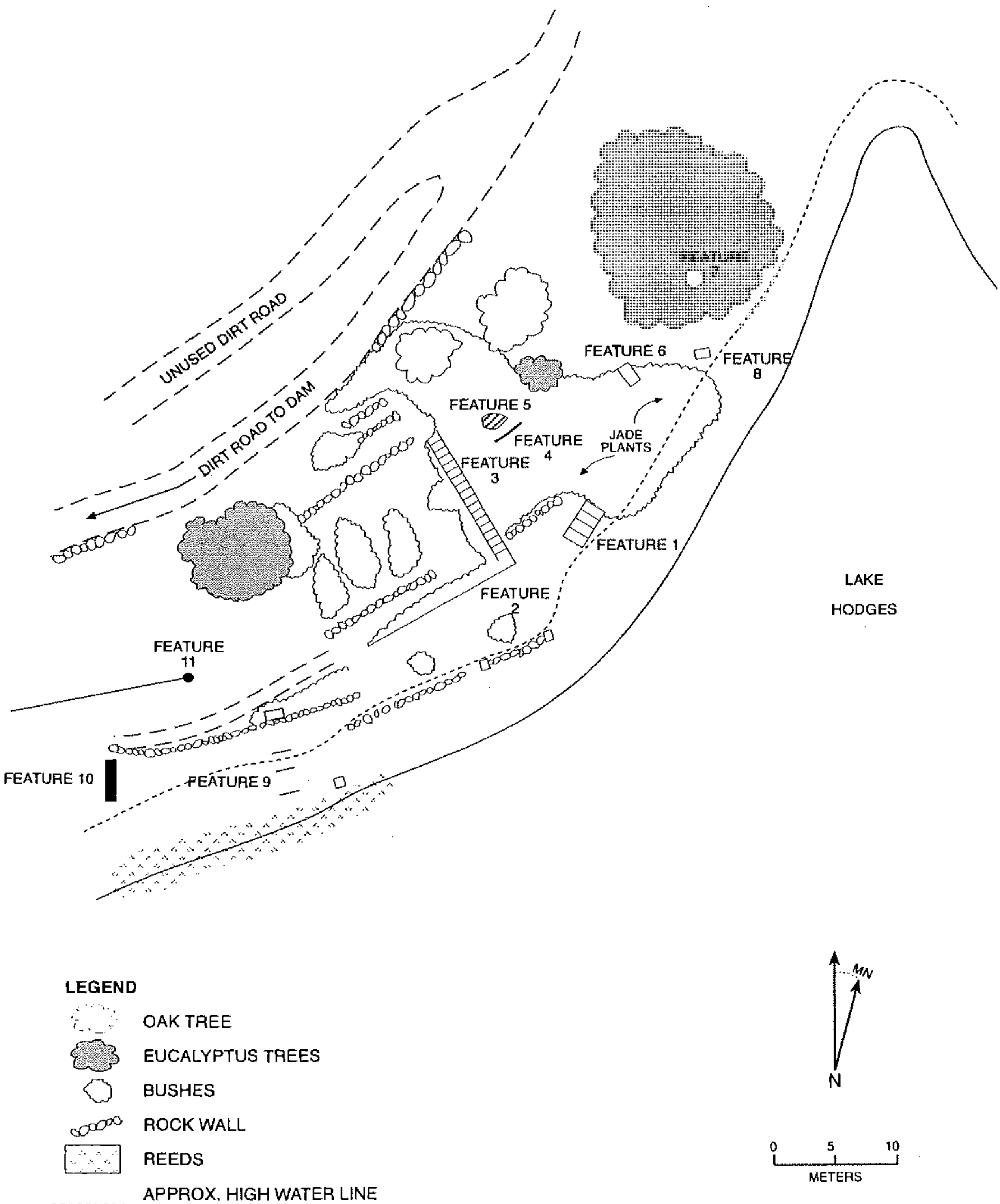
*Required Information

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary # 015585
HRI#
Trinomial CA-SDI 14331H

Page 5 of 5 | *Resource Name or # (Assigned by recorder) LH-2

*Drawn By: A. YORK | *Date: 8-1-96



State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #: 37-019224
HRI #:
Trinomial:
NRHP Status Code:

Other Listings
Review Code Reviewer Date

Page 1 of 5 ***Resource Name or #:** ASM5560-3

P1. Other Identifier:

***P2. Location:** ■ **Not for Publication** ☐ **Unrestricted** ***a. County:** San Diego
and (P2b and P2c or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** Rancho Santa Fe **Date:** 1968 Photo Revised: 1983 **T** 13 S ; **R** 2 W ;
NE ¼ of NW ¼ of SW ; ¼ of Sec 18 ; San Bernardino **B.M.**

c. Address: City: Zip:

d. UTM: (Give more than one for large and/or linear resources) Zone 11 ;
0487665 ME/ 3655729 MN
0487720 ME/ 3655790 MN
0487715 ME/ 3655770 MN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate) The site is located on the north side and adjacent to a dirt road in the bottom of San Dieguito River Canyon approximately ¼ mile below (SW of) Lake Hodges Dam. The site can be accessed via a gated dirt road and pull-out along Del Dios Highway ¼ mile west of Lake Hodges Dam or approximately 4.8 miles east of the intersection of county roads S8 and S9 in Rancho Santa Fe. Follow the switchbacks to the canyon bottom to reach the site.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
The site consists of three historic structures located along a bench or terrace adjacent to a dirt road above and on the north side of the San Dieguito River approximately ¼ mile below Lake Hodges Dam. Structures 1 and 2 are constructed of locally available rock masonry with mud mortar and plastered interiors. Structure 3 is a concrete pad poured onto a rock rubble base. Structures 1 and 2 are likely associated with construction of Lake Hodges Dam or irrigation flume. Structure 3 is of unknown age.

*P . **Resource Attributes:** (List attributes and codes) Structure foundation pad and walls. AH2

*P **Resources Present:** ☐Building ■Structure ☐Object ■Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5b. Description of Photo (View, date, accession #) View of southwest wall of structure 2, showing construction.

***P6. Date Constructed/Age and Sources:**
■Historic ☐ Prehistoric ☐Both
Circa 1917-1919

***P7. Owner and Address:**
Rancho Santa Fe Irrigation District,
5920 Linea Del Cielo, Rancho Santa Fe, CA, 92067

***P8. Recorded by:** (Name, affiliation, and address)
Ken Moslak, ASM Affiliates, Inc.
543 Encinitas Blvd., Ste 114
Encinitas, CA 92024

***P9. Date Recorded:** Sept. 19, 2000

***P10. Survey Type: (Describe):**
Intensive Pedestrian Survey

. **Report Citation:** (Cite survey report and other sources, or enter "none") Report in Preparation

*A chments: NONE ■ Location Map ■ Sketch Map ■ Continuation Sheet ☐ Building, Structure, and Object Record ■ Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐Other (List):

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
ARCHAEOLOGICAL SITE RECORD

Primary #: 37-019224
Trinomial: ____________

Resource Name or #: ASM5560-3

*A **Dimensions: a. Length:** 250ft (NW-SE) x **b. Width:** 120ft (SW-NE)
Method of Measurement: ■ Paced ☐ Taped ☐ Visual estimate ☐ Other:
Method of Determination: (check any that apply) ☐ Artifacts ☐ Features ☐ Soil ☐ Vegetation ☐ Topography ☐ Cut bank ☐ Animal burrow ☐ Excavation ☐ Property boundary ■ Other (Explain): Historic structure locations

Reliability of Determination: ☐ High ■ Medium ☐ Low Explain: Ground visibility is generally poor. Also, if structures are associated with construction of Hodges Dam and water flumes, the site may be considered to be much larger to incorporate those structures

Limitations (check any that apply): ☐ Restricted access ☐ Paved/built over ☐ Site limits incompletely defined ☐ Disturbances ☐ Vegetation ☐ Other (Explain):

A2. **Depth:** ☐ None ■ Unknown Method of Determination:
*A3. **Human Remains:** ☐ Present ■ Absent ☐ Possible ☐ Unknown (Explain):

*A4. **Features** (Number, briefly describe, indicate size, list associated cultural constituents, and show location of each feature on sketch map.):
Three historic structures:

Structure 1 is a rectangular semi-subterranean masonry structure constructed of locally available, large, blocky, metavolcanic cobbles and boulders. Interior walls have been plastered with what appears to be locally available silty mud with numerous, well sorted granules up to 0.4mm in diameter. The sorting suggests the material was screened to remove rocks and pebbles. Mortar is of the same material as the plastering. The structure has a dirt floor and has been set into a southwest-facing hillside to a depth of about 4ft against the back wall while the front wall is at the level of the ground surface. Wall plastering is generally well preserved and maximum wall height is 58" but original height is unknown. Interior dimensions are 14' 3" X 7' and wall thickness ranges from 7" to 22". Pieces of galvanized sheet steel and a few pieces of milled lumber, probably the original roof, lie on the west side of the structure. The pieces measure 36" X 96", were affixed by wire nails and have been tarred on one side. A probable doorway measuring approximately 62" wide is in the east wall adjacent to the southeast corner. No door, sill or hardware were noted. (See continuation)

*A5. **Cultural Constituents** (Describe and quantify artifacts, ecofacts, cultural residues, etc., not associated with features.):
None Noted

*A6. **Were Specimens Collected?** ■No ☐Yes (If yes, attach Artifact Record or catalog and identify where specimens are curated.)

*A7. **Site Condition:** ☐Good ■Fair ☐Poor (Describe disturbances.): Wooden superstructures have been removed or salvaged. Structure 1 has partially collapsed walls.

*A8. **Nearest Water** (Type, distance, and direction.): The San Dieguito River is located approximately 250ft southeast of the site.

*A9. **Elevation:** 230ft AMSL

A10. **Environmental Setting:** (Describe culturally relevant variables such as vegetation, fauna, soils, geology, landform, slope, aspect, exposure, etc.) The site is located on the lower slopes of the canyon formed by the San Dieguito River, on a terrace about 80ft above the level of the river and about ¼ mile below Hodges Dam. Aspect is SSW with slope varying from 5-20 degrees. Modern vegetation consists of eucalyptus groves with open areas occupied by introduced grasses and coastal scrub.

A11. **Historical Information:**

*A12. **Age:** ☐ Prehistoric ☐ Protohistoric ☐ 1542-1769 ☐ 1769-1848 ☐ 1848-1880 ☐ 1880-1914 ■ 1914-1945 ☐ Post 1945 ☐ Undetermined (Describe position in regional prehistoric chronology or factual historic dates if known):

A13. **Interpretations:** (Discuss data potential, function(s), ethnic affiliation, and other interpretations)

A14. **Remarks:**

A15. **References:** (Documents, informants, maps, and other references)

A16. **Photographs:** (List subjects, direction of view, and accession numbers or attach a Photograph Record.):

*Original Media/Negatives Kept at

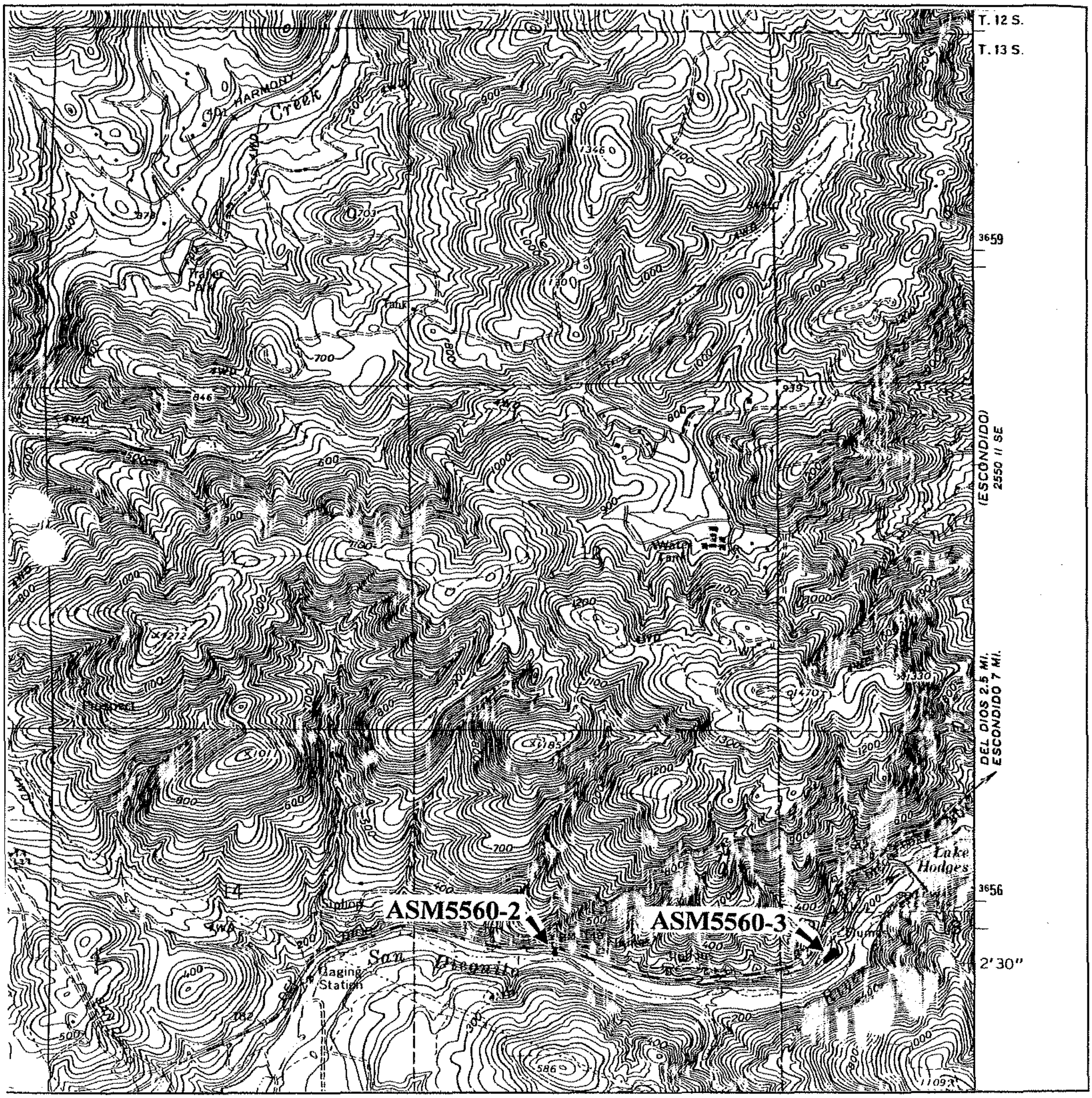
*A17. **Form Prepared by:** Ken Moslak **Date:** Sept. 26, 2000
Affiliation and Address: ASM Affiliates, Inc. 543 Encinitas Blvd., Ste 114, Encinitas CA 92024

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #: 37-019224
Trinomial:

Resource Name or #: ASM5560-3

Ma[p Nam]e: Rancho Santa Fe, USGS 7.5' Quad **Scale:** 1:24,000 **Date of Map:** 1968 Photo revised: 1983



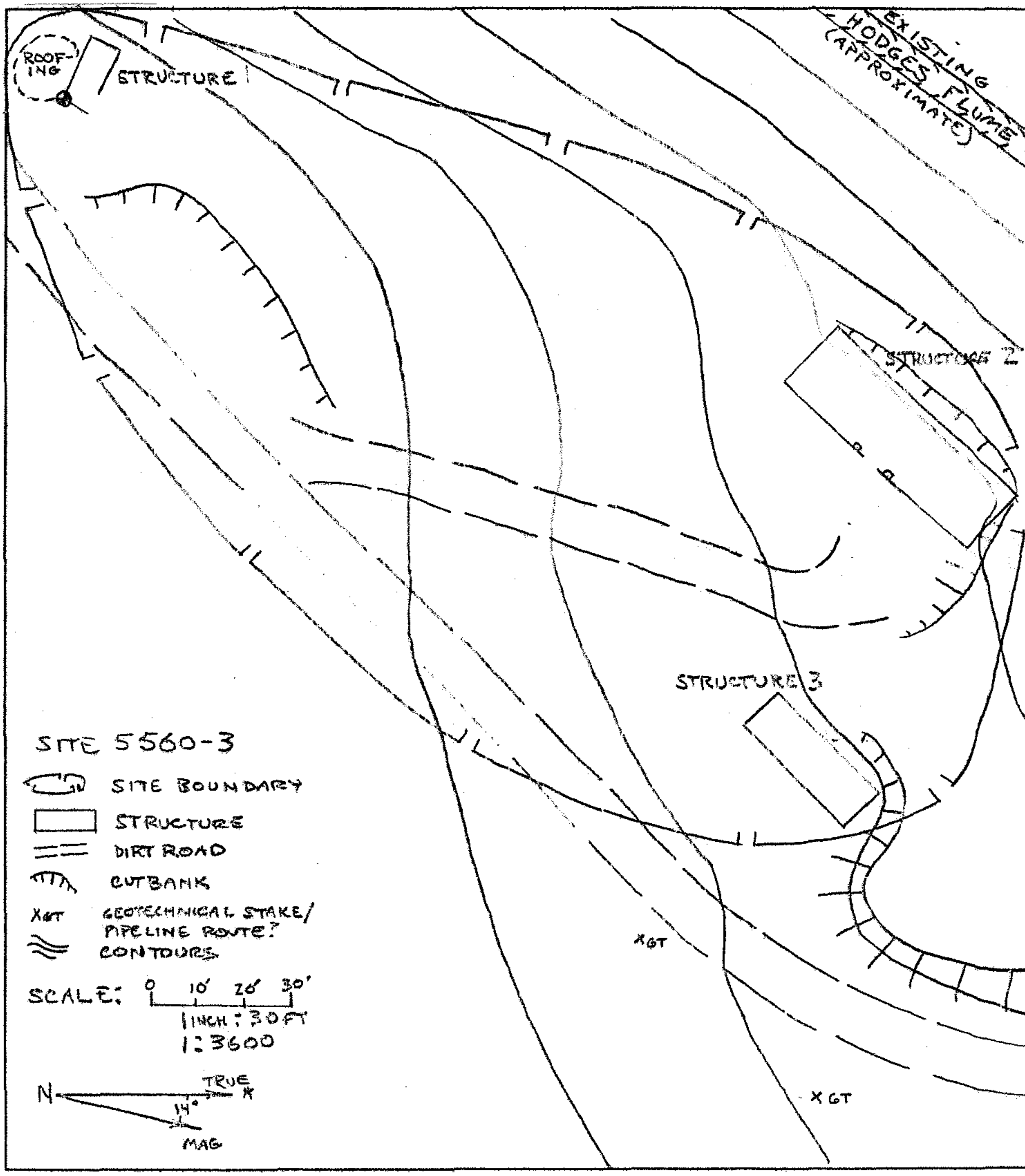
*Required information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #: 37-019724
Trinomial:

Page 4 of 5
Drawn By: Ken Moslak

Resource Name or #: ASM5560-3
Date: Sept. 19, 2000



*Required information

***Resource Name or #:** ASM5560-3
Recorded by: Ken Moslak
Date: Sept. 19, 2000
■ Continuation ☐ Update

*A4. Features (continued)

Structure 2 is located 180 ft southeast of structure 1 and shows construction very similar to structure 1 with locally available rocks mortared and plastered with silty mud and small granules. Structure 2 is also semi-subterranean having been built into a hillside to an approximate depth of 6ft against the back while the front is at approximate ground surface. The structure is large with interior dimensions of 50ft by 16ft. The back and side wall are almost completely standing and probably measured 6ft tall from the interior dirt floor. Large amounts of vegetation, leaf litter and sediment now fill the structure. A concrete sill with three interior reinforcing bars and measuring 7½" by 3" caps the western wall, helping to preserve it. Cement and rebar are the same variety as seen in the construction of nearby Hodges flume and it is clear that the sill was manufactured for use in the structure and not recycled from the flume. The front wall is constructed of rock with mud mortar to an approximate height of 18-24" and was capped with a coursing of cement into which a wooden sill (now missing) was set. An opening 58" wide is centered on the front wall. Any original superstructure for the structure has been completely removed or salvaged.

Structure 2 appears to have been reused. Modifications include the placement of two posts on the inside interior front wall spaced 104" apart on either side of the original opening and anchored with large cobbles at their base. One post is a railroad tie and the other is a round milled creosote-treated post. One modern steel fence post has been placed on the interior front wall midway between the railroad tie and the southeast corner and another placed on the exterior at the southwest corner. Stainless steel braided cable and 1-inch hex (chicken) wire fragments adhere to an original post and later added milled lumber at the southwest corner.

Structure 3 is located 70ft south of structure 2 and consists of a concrete pad built in at least two and possibly three episodes or pours. Construction sequence appears as follows: a wooden form using 2" and 4" wide planks and measuring 120" by 262" was constructed and filled with locally available cobbles and gravel with larger stones on the bottom and finer stones on top. Concrete was poured and leveled. A second pour expanded the pad 102" to the southeast. New forms were set 4" out from three sides of the original pours. The new form was filled with cement to form a sill with ¼" bolts placed at random spacings from 32" to 49" apart. Structure 3 shows no clear indications as to it's age.

If associated with Hodges Dam, these may be significant structures related to the construction phase of either the Dam or Hodges Flume. One possible function for structure 1 might be explosives storage, although more solid bunkers usually served this function such as one located by Sweetwater Dam rock quarry. Given the size and construction structure two might have served as a draft horse stable or machinery storage.

State of California — The Resources Agency Primary # ______________________

DEPARTMENT OF PARKS AND RECREATION HRI # ______________________

PRIMARY RECORD Trinomial ______________________

NRHP Status Code ______________________

Other Listings ______________________

Review Code __________ Reviewer __________ Date __________

Page 1 of 7 ***Resource Name or #:** P-37-023709

P1. Other Identifier:

***P2. Location: ■ Not for Publication ☐ Unrestricted**

***a. County: San Diego**

***b. USGS 7.5′ Quad: Rancho Santa Fe Date: 1968 (Rev 1983) T 13S; R 3W: SW ¼ of Sec 14 N ½ of N ½ of Sec 22; S.B.B.M.**

c. Address: Vicinity City: Rancho Santa Fe Zip: 92067

d. UTM: Zone 11: 484845 mE/ 3655555 mN (NAD83) Feature A, 484706 mE/ 3655482 mN (NAD83) Feature B, 483489 mE/ 3655160 mN (NAD83) Feature C

***e. Other Locational Data:** The flume proceeds west from Lake Hodges Dam to the San Dieguito Reservoir, and parallels Del Dios Highway. From northbound Interstate 5, exit on to Via de la Valle and turn right (east). Proceed for approximately 5.3 miles until the intersection of Via de la Valle and Del Dios Highway. Turn right on to Del Dios Highway and drive approximately 2.5 miles until the intersection with Bing Crosby Boulevard. Turn left and drive up the dirt access road to the transmission line pole (pole 12409).

***P3a. Description:** P-37-023709 is the historic Hodges Flume which was built from 1917 to 1919 to transport water from Lake Hodges to the San Dieguito Reservoir. The flume was recorded in September 2000 by Schaefer and Moslak, and was described as a 4.6-mile long concrete lined ditch with 22 associated trestles and 6 siphons. The flume was noted as being covered by a series of 19 concrete slab coverings/debris shields whose purpose was to prevent sediment from washing into the trench system.

P-37-023709 was revisited in July 2011 by AECOM for the TL616 Wood to Steel Pole Replacement Project. Prior to the commencement of construction activities, three new features (A, B, C) were observed within the project Area of Potential Effect. Feature A consists of a portion of the flume which is visible within a graded access road leading east from pole 12409 to 12410. A portion of the flume was also discovered within the immediate subsurface adjacent to pole 12409, and appears to be an extension of Feature A. Feature B consists of a concrete culvert, and is located approximately 20 feet southeast of pole 12408. Feature C consists of a linear portion of the flume visible within a graded access road which leads west to pole 12397. In an in-field conference, San Diego Gas & Electric engineers along with AECOM cultural monitors agreed to have the features capped with dirt so as to prevent any negative impacts. A portion of Feature C was also flagged for avoidance by construction crews. Monitoring activities during excavation following the capping of the features resulted in no new cultural resources being identified at poles 12408, 12409, and 12410.

***P3b. Resource Attributes:** HP20 Canal/Aqueduct

***P4. Resources Present:** ☐ Building ☐ Structure ☒ Object ☐Site ☐ District ☒ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: DSCN2092, Overview of P-37-023709 Feature C, View to the West

***P6. Date Constructed / Age and Sources:** ☒ Historic ☐ Prehistoric ☐ Both

***P7. Owner and Address:**
Private Owner

***P8. Recorded by:**
AECOM
1420 Kettner Boulevard, Suite 500
San Diego, California 92101

***P9. Date Recorded:** July 22, 2011

***P10. Survey Type:**
Intensive Pedestrian

***P11. Report Citation:** AECOM
2011 *Letter Report: eTS – Cultural Resources Monitoring Activities Summary for Thirteen Wood to Steel Pole Replacements Along TL616, Rancho Santa Fe to South Lake Hodges and into the 4S Ranch Area of Central San Diego County, California – IO 2000406251*

*Attachments: ☐ None ☐ Location Map ☐Sketch Map ☐ Continuation Sheet ☐ Building, Structure, and Object Record ☐ Linear Resource Record ☐ Archaeological Record ☐ District Record ☐ Milling Station Record ☐ Rock Art Record ☐ Artifact Record ☐ Photograph Record ☐ Other (List)

State of California — The Resources Agency	Primary #
DEPARTMENT OF PARKS AND RECREATION	HRI #
LINEAR FEATURE RECORD	Trinomial

 Resource Name or #: P-37-023709

L1. Historic and/or Common Name: Lake Hodges Flume

L2 a. Portion Described: ☐ Entire Resource ☒ Segment ☐ Point Observation **Designation:** Feature A

b. Location of point or segment: From northbound Interstate 5, exit on to Via de la Valle and turn right (east). Proceed for approximately 5.3 miles until the intersection of Via de la Valle and Del Dios Highway. Turn right on to Del Dios Highway and drive approximately 2.5 miles until the intersection with Bing Crosby Boulevard. Turn left and drive up the dirt access road to the transmission line pole (pole 12409).

L3. Description: P-37-023709 is the historic Hodges Flume which was built from 1917 to 1919 to transport water from Lake Hodges to the San Dieguito Reservoir. The flume was recorded in September 2000 by Schaefer and Moslak, and was described as a 4.6-mile long concrete lined ditch with 22 associated trestles and 6 siphons. The flume was noted as being covered by a series of 19 concrete slab coverings/debris shields whose purpose was to prevent sediment from washing into the trench system.

P-37-023709 was revisited in July 2011 by AECOM for the TL616 Wood to Steel Pole Replacement Project. Prior to the commencement of construction activities, three new features (A, B, C) were observed within the project Area of Potential Effect. Feature A consists of a portion of the flume which is visible within a graded access road leading east from pole 12409 to 12410. A portion of the flume was also discovered within the immediate subsurface adjacent to pole 12409, and appears to be an extension of Feature A. In an in-field conference, San Diego Gas & Electric engineers along with AECOM cultural monitors agreed to have the features capped with dirt so as to prevent any negative impacts. Monitoring activities during excavation following the capping of the features resulted in no new cultural resources being identified at poles 12408, 12409, and 12410.

L4. Dimensions:

a. Top Width: approx 1.5 – 3.0 feet

b. Bottom Width: n/a

c. Height or Depth: n/a

d. Length of Segment:

L5. Associated Resources: none

L6. Setting: The feature is located upon a south-facing hillside which shows signs of being extensively mitigated for vegetation control. The surrounding area contains a mix of coastal sage scrub and chaparral, although most of the vegetation has been trimmed or mowed. Soils consist of a brown/reddish-brown silty sand with numerous medium and small-sized volcanic and metavolcanic rocks.

L7. Integrity Considerations: The portion of the flume contained within the access road appears to retain a good integrity as the majority of the feature lies below the surface. The feature's integrity will be bolstered by the capping of the access road with dirt.

L8b. Description of Photo, Map, or Drawing
DSCN2075, Overview of P-37-023709 Feature A, View to the west.

L9. Remarks: none

L10. Form Prepared by:
AECOM
1420 Kettner Blvd. Suite 500
San Diego, CA, 92101

L11. Date: 10/14/2011

State of California — The Resources Agency	Primary #
DEPARTMENT OF PARKS AND RECREATION	HRI #
LINEAR FEATURE RECORD	Trinomial

 Resource Name or #: P-37-023709

L1. Historic and/or Common Name: Lake Hodges Flume

L2a. Portion Described: ☐ Entire Resource ☒ Segment ☐ Point Observation **Designation:** Feature C

b. Location of point or segment: From northbound Interstate 5, exit on to Via de la Valle and turn right (east). Proceed for approximately 5.3 miles until the intersection of Via de la Valle and Del Dios Highway. Turn right on to Del Dios Highway and drive approximately 1.2 miles until the intersection with El Camino Del Norte. Proceed on Del Dios Highway for an additional 0.3 miles and turn right onto a small paved access road. Drive up the access road approximately 75 feet and then turn left onto the dirt access road that leads to pole 12397. Park and hike along the access road approximately 575 feet to the feature's location.

L3. Description: P-37-023709 is the historic Hodges Flume which was built from 1917 to 1919 to transport water from Lake Hodges to the San Dieguito Reservoir. The flume was recorded in September 2000 by Schaefer and Moslak, and was described as a 4.6-mile long concrete lined ditch with 22 associated trestles and 6 siphons. The flume was noted as being covered by a series of 19 concrete slab coverings/debris shields whose purpose was to prevent sediment from washing into the trench system. P-37-023709 was revisited in July 2011 by AECOM for the TL616 Wood to Steel Pole Replacement Project. Prior to the commencement of construction activities, three new features (A, B, C) were observed within the project Area of Potential Effect. Feature C consists of a linear portion of the flume visible within a graded access road which leads west to pole 12397. The exposed portions of the feature consist of a narrow strip of concrete along the eastern-side of the dirt access road leading to the pole. The linear portion measures approximately 160 feet in total length, and proceeds south-east within the access road, ending at a series of five concrete slabs that lie perpendicular to the access road. These five slabs are aligned southwest-northeast, and may be debris shields similar to those originally recorded by Schaefer and Moslak. Prior to access being granted to construction crews, the slab area was flagged for avoidance.

L4. Dimensions: **a. Top Width:** approx 1.5 – 3.0 feet

b. Bottom Width: n/a

c. Height or Depth: n/a

d. Length of Segment: approximately 215 feet

L5. Associated Resources: none

L6. Setting: The feature is located upon a hillside with a north-northeasterly aspect. The surrounding area has been extensively mitigated for vegetation control. The feature lies within a dirt access road that is bordered by several residential structures to the south and southwest. Vegetation consists of a mix of coastal sage scrub and chaparral, although most of the vegetation has been trimmed or mowed. Much of the remaining vegetation consists of small and medium-sized peppertrees and some ornamental vegetation. Soils consist of a brown/reddish-brown silty sand with medium and small-sized volcanic and metavolcanic rocks.

L7. Integrity Considerations: The portion of the flume contained within the access road appears to retain a good integrity as the majority of the feature lies below the surface. The feature's integrity will be maintained by flaggin the exposed portions of the concrete slabs for avoidance by construction crews.

L8b. Description of Photo, Map, or Drawing
DSCN2089, Overview of P-37-023709 Feature C, View to the west

L9. Remarks: none

L10. Form Prepared by:
AECOM

L11. Date: 10/14/2011

*Resource Name or # P-37-023709 Update

*Recorded by: AECOM

*Date: 2011

☒ Continuation ☒ Update

Plate 1. Close-up of Feature C Concrete Slab.

Plate 2. Overview of Feature C. View to the west.

*Resource Name or # P-37-023709 Update

*Recorded by: AECOM

*Date: 2011

☒ Continuation ☒ Update

Plate 3. Overview of Feature A from pole 12409 following capping procedure. View to the east.

Plate 4. Overview of Feature A on access road to pole 12410 following capping procedure. View to the east.

*Resource Name or # P-37-023709 Update

*Recorded by: AECOM

*Date: 2011

☒ Continuation ☒ Update

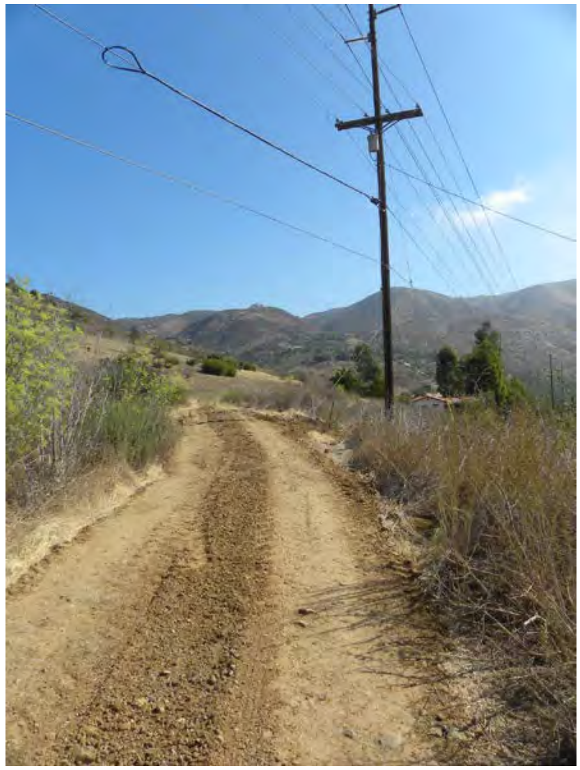


Plate 5. Overview of Feature A and pole 12410, post-capping procedure. View to the northeast.

Plate 6. Overview of Feature A and end of capped portion of feature. View to the northeast.

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

Primary # P-37-023709
HRI #
Trinomial

Page 1 **of** 2

***Resource Name or #** (Assigned by recorder) Lake Hodges Flume

***Recorded by:** C. Gregory and C. Bowden-Renna

***Date:** 05/21/2007 ☐ Continuation ☒ Update

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries.)
The Lake Hodges Flume was recorded as a historic structure by Mr. Jerry Schaefer and Mr. Ken Moslak of ASM and Affiliates (ASM) in 2000. The Lake Hodges Flume is a 4.6-mile long water conveyance system built from 1917 to 1919 to transport water from Lake Hodges to San Dieguito Reservoir via ditches, canals, and elevated trellises. It is significant for its association with agricultural and residential development of the north coastal area, its association with the activities of Colonel Ed Fletcher, and its method of construction. It was evaluated as eligible for the California Register of Historical Resources and National Register of Historic Places. ASM has completed a Historic American Engineering Record (HAER) for the flume, which is on file with the Library of Congress (HAER 2001).

This 2007 survey did not relocate this resource at the intersection of Del Dios Highway (County Route 6) and El Camino de Norte. EDAW contacted the Rancho Santa Fe Irrigation District, owner of the flume. It was confirmed that the portion of the flume in the vicinity of this intersection is deep underground.

The attached location map shows the section this update discusses in a solid line, while the rest of the flume is represented by a dashed line. The UTM points of the segment are as follows: north end, 3655077 mN / 482895 mE; south end, 3655064 mN / 482971 mE.

***P7. Owner and Address:**
Rancho Santa Fe Irrigation District
5920 Linea del Cielo
P.O. Box 409
Rancho Santa Fe, CA 92067-0409

***P8. Recorded by:** (Name, affiliation, and address)
C. Gregory and C. Bowden-Renna
EDAW, Inc.
1420 Kettner Boulevard, Suite 620
San Diego, California 92101

***P9. Date Recorded:** 05/21/2007

***P10. Survey Type:** (Describe)
Intensive Pedestrian

***B12. References:**

Historic American Engineering Record (HAER) 2001. Lake Hodges Flume, San Diego County, California. Electronic document, http://memory.loc.gov/ammem/collections/habs_haer/, accessed May 23, 2007.

Schaefer, Jerry, and Ken Moslak 2000. *A Cultural Resource Inventory and Evaluation for the San Dieguito Reservoir Rehabilitation and lake Hodges Flume Replacement Project.* Prepared for Project Design Consultants. Prepared by ASM Affiliates, Inc. On file at the South Coastal Information Center, San Diego, California.

***P11. Report Citation:** (Cite Survey report and other sources, or enter "none.") Gregory and Hirsch 2007. *Historical Resources Evaluation Report for the Rancho Santa Fe Roundabouts Project, San Diego County, California.* Prepared for the County of San Diego, Department of Public Works.

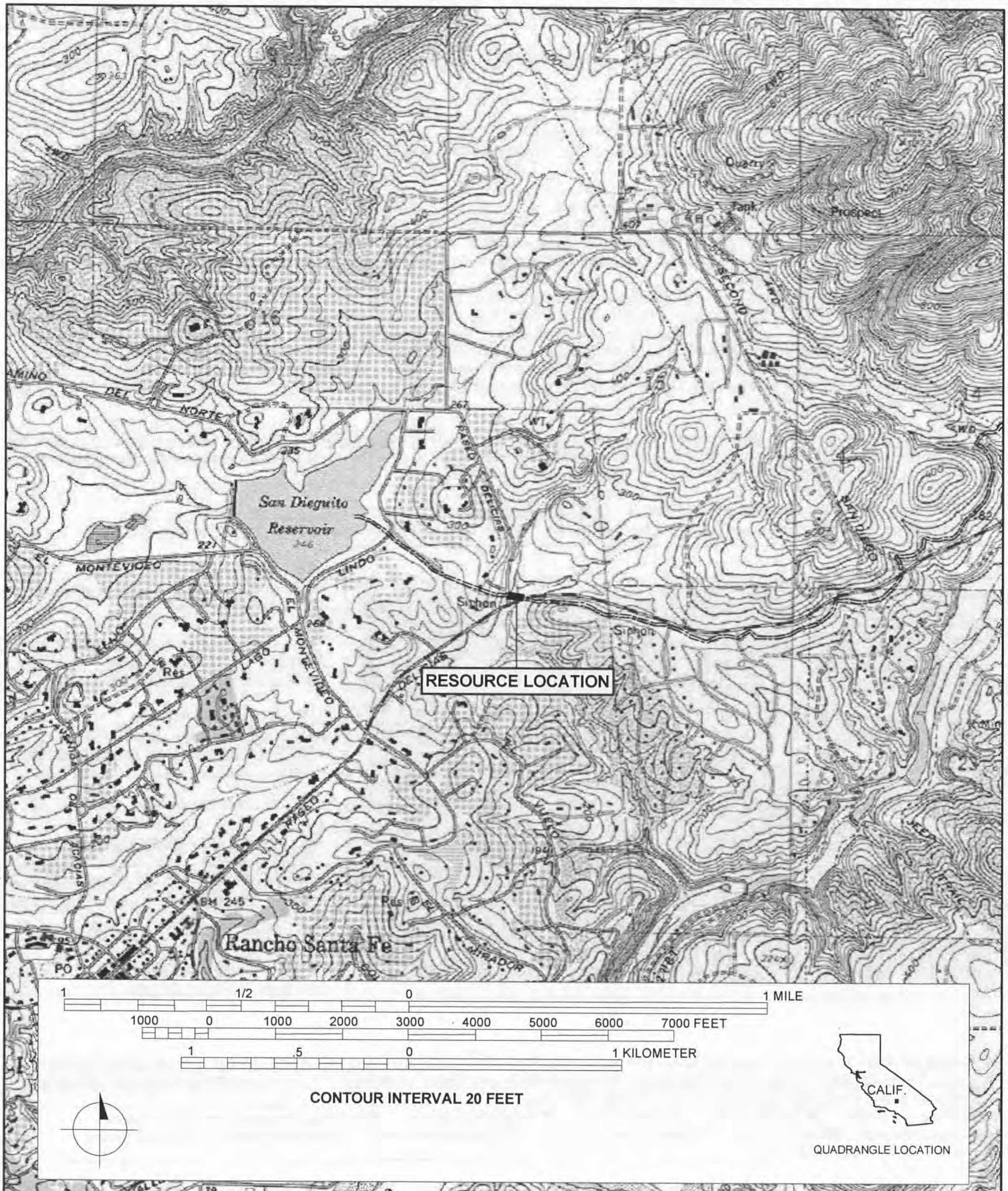
*Attachments: ☐ None ☒ Location Map ☐ Sketch Map ☐ Continuation Sheet ☐ Building, Structure, and Object Record ☐ Linear Resource Record ☐ Archaeological Record ☐ District Record ☐ Milling Station Record ☐ Rock Art Record ☐ Artifact Record ☐ Photograph Record ☐ Other (List)

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # P-37-023709 Update
HRI #
Trinomial

Page 2 of 2   * Resource Name or # (Assigned by recorder)

* Map Name: Rancho Santa Fe, Calif. 7.5' Quadrangle   * Scale: 1:24,000   * Date of Map: 1983



State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #: 37-023709
HRI #:
Trinomial:
NRHP Status Code:

Other Listings
Review Code Reviewer Date

***Resource Name or #:** Lake Hodges Flume (ASM5560-4)

P1. Other Identifier: Lake Hodges Flume

***P2. Location:** ■ **Not for Publication** ☐ **Unrestricted** ***a. County:** San Diego
and (P2b and P2c or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** Rancho Santa Fe **Date:** 1968 Photo Revised: 1983 **T** 13 S ; **R** 2 W ; **Sec** 18 ;
T 13 S ; **R** 3 W ; **Sections** 13, 14, 16, 22, 23 ; San Bernardino **B.M.**

c. Address: City: Zip:

d. UTM: (Give more than one for large and/or linear resources) Zone 11 ; 488040 mE/ 3656155 mN (East end); 487610 mE/ 3655720 mN; 485320 mE/ 3655900 mN; 484190 mE/ 3654910 mN; 482350 mE/ 3655360 mN (West end)

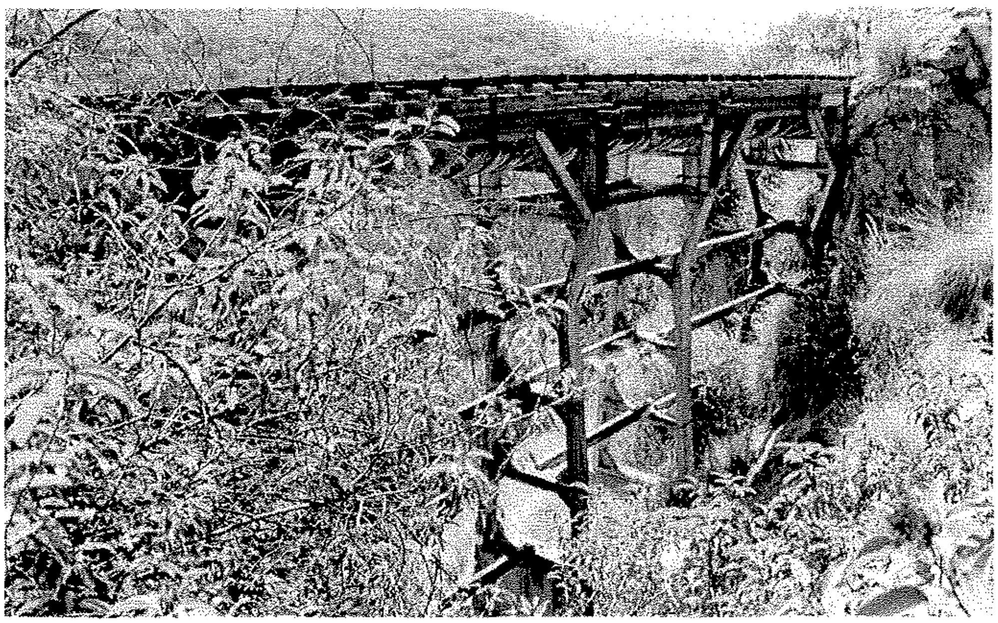
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)
The flume flows west from Lake Hodges Dam to the San Dieguito Reservoir following natural contours north of the San Dieguito Reservoir at an elevation of around 255 ft AMSL.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
The Hodges Flume is a 4.6 mile long water conveyance system built from 1917 to 1919 to transport water from Lake Hodges to San Dieguito Reservoir via a concrete lined ditch. The flume exits Lake Hodges at an elevation of ~275 feet and traverses steep canyon walls north of the San Dieguito River following natural contours. Three miles west of the dam, the flume enters the rolling hills and mesa lands northeast of Rancho Santa Fe. In addition to simple concrete-lined ditch, the flume system originally included 26 trestles to convey water across ravines or drainages and five siphons where such crossings are too high or long to be crossed by trestles. Currently the system includes 22 trestles and six siphons.

A substantial portion of the flume is covered by a series of 19 concrete slab coverings or debris shields whose purpose is to prevent sediment washing into the trench or to direct small surface drainages over the top of the trench. The western portion of the trench was originally covered by wood planks although sections still exist that may represent replacements.

***P3b. Resource Attributes:** (List attributes and codes) HP20. Canal/Aqueduct

***P4. Resources Present:** ☐Building ■Structure ■Object ■Site ☐District ■Element of District ☐Other (Isolates, etc.)



P5b. Description of Photo (View, date, accession #) Trestle 15, view southwest, 9/20/00, Roll3, Frame 7

***P6. Date Constructed/Age and Sources:**
■Historic ☐ Prehistoric ☐Both
July 5, 1917-January 29, 1919

***P7. Owner and Address:**
Rancho Santa Fe Irrigation District,
5920 Linea Del Cielo, Rancho Santa Fe, CA, 92067

***P8. Recorded by:** (Name, affiliation, and address)
Jerry Schaefer and Ken Moslak,
ASM Affiliates, Inc.
543 Encinitas Blvd., Ste 114
Encinitas, CA 92024

***P9. Date Recorded:** Sept. 19, 2000

***P10. Survey Type: (Describe):**
Intensive Pedestrian Survey

***P11. Report Citation:** (Cite survey report and other sources, or enter "none") Schaefer, Jerry and Ken Moslak 2000 *A Cultural Resources Inventory and Evaluation for the San Dieguito Reservoir Rehabilitation and Lake Hodes Flume Replacement Project.* Prepared by ASM Affiliates for PDC/Lettieri-re Assocaites and the Santa Fe Irrigation District, Rancho Santa Fe.

***Attachments:** NONE ■ Location Map ☐ Sketch Map ■ Continuation Sheet ■ Building, Structure, and Object Record ■ Archaeological Record ■District Record ■Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ■Photograph Record ☐Other (List):

Resource Name or #: Lake Hodges Flume (ASM5560-4)

*A1. **Dimensions: a. Length:** 4.6miles (E-W) x **b. Width:** 20ft (N-S)
Method of Measurement: ☐ Paced ☐ Taped ☐ Visual estimate ■ Other: Measured from USGS 7.5' quadrangle
Method of Determination: (check any that apply) ☐ Artifacts ☐ Features ☐ Soil ☐ Vegetation ☐ Topography ☐ Cut bank ☐ Animal burrow ☐ Excavation ☐ Property boundary ■ Other (Explain): Extant surface flume and related structures
Reliability of Determination: ■ High ☐ Medium ☐ Low Explain:

Limitations (check any that apply): ☐ Restricted access ☐ Paved/built over ☐ Site limits incompletely defined
■ Disturbances ☐ Vegetation ☐ Other (Explain):

A2. **Depth:** ■ None ☐ Unknown Method of Determination:

*A3. **Human Remains:** ☐ Present ■ Absent ☐ Possible ☐ Unknown (Explain):

*A4. **Features** (Number, briefly describe, indicate size, list associated cultural constituents, and show location of each feature on sketch map.):

*A5. **Cultural Constituents** (Describe and quantify artifacts, ecofacts, cultural residues, etc., not associated with features.):
None

*A6. **Were Specimens Collected?** ■No ☐Yes (If yes, attach Artifact Record or catalog and identify where specimens are curated.)

*A7. **Site Condition:** ☐Good ■Fair ☐Poor (Describe disturbances.):

*A8. **Nearest Water** (Type, distance, and direction.): San Dieguito River to south.

*A9. **Elevation:** 195-275ft AMSL

A10. **Environmental Setting:** (Describe culturally relevant variables such as vegetation, fauna, soils, geology, landform, slope, aspect, exposure, etc.) The eastern sections of the flume route crosscut steep canyon slopes of Jurassic or Triassic metavolcanic bedrock north of and paralleling the San Dieguito River. The western sections divert to the northwest over coastal mesa and tablelands of uplifted quaternary marine sandstones and enter San Dieguito Reservoir.

A11. **Historical Information:**

*A12. **Age:** ☐ Prehistoric ☐ Protohistoric ☐ 1542-1769 ☐ 1769-1848 ☐ 1848-1880 ☐ 1880-1914 ■ 1914-1945 ☐ Post 1945 ☐ Undetermined (Describe position in regional prehistoric chronology or factual historic dates if known):
The flume was constructed between July 5, 1917 and January 29, 1919 by Bent Brothers Construction Company of Los Angeles, CA

A13. **Interpretations:** (Discuss data potential, function(s), ethnic affiliation, and other interpretations) Evaluated as significant for association with historic processes, life of Colonel Ed Feltcher, and method of construction.

A14. **Remarks:** The flume will be replaced by a proposed subsurface pipeline. The eastern portion on the slope north of Del Dios Highway will be abandoned in place. The western portion will be filled or removed. Documentation of the flume is being prepared for submission to the Historic American Engineering Record (HAER).

A15. **References:** (Documents, informants, maps, and other references) Fletcher, Ed. 1952. *Memoirs of Ed Fletcher.* Pioneer Printers, San Diego. Ed Fletcher Archives, San Diego Historical Society and UC San Diego.

A16. **Photographs:** (List subjects, direction of view, and accession numbers or attach a Photograph Record.):

Original Media/Negatives Kept at ASM Affiliates, Inc. 543 Encinitas Blvd., Ste 114, Encinitas CA 92024

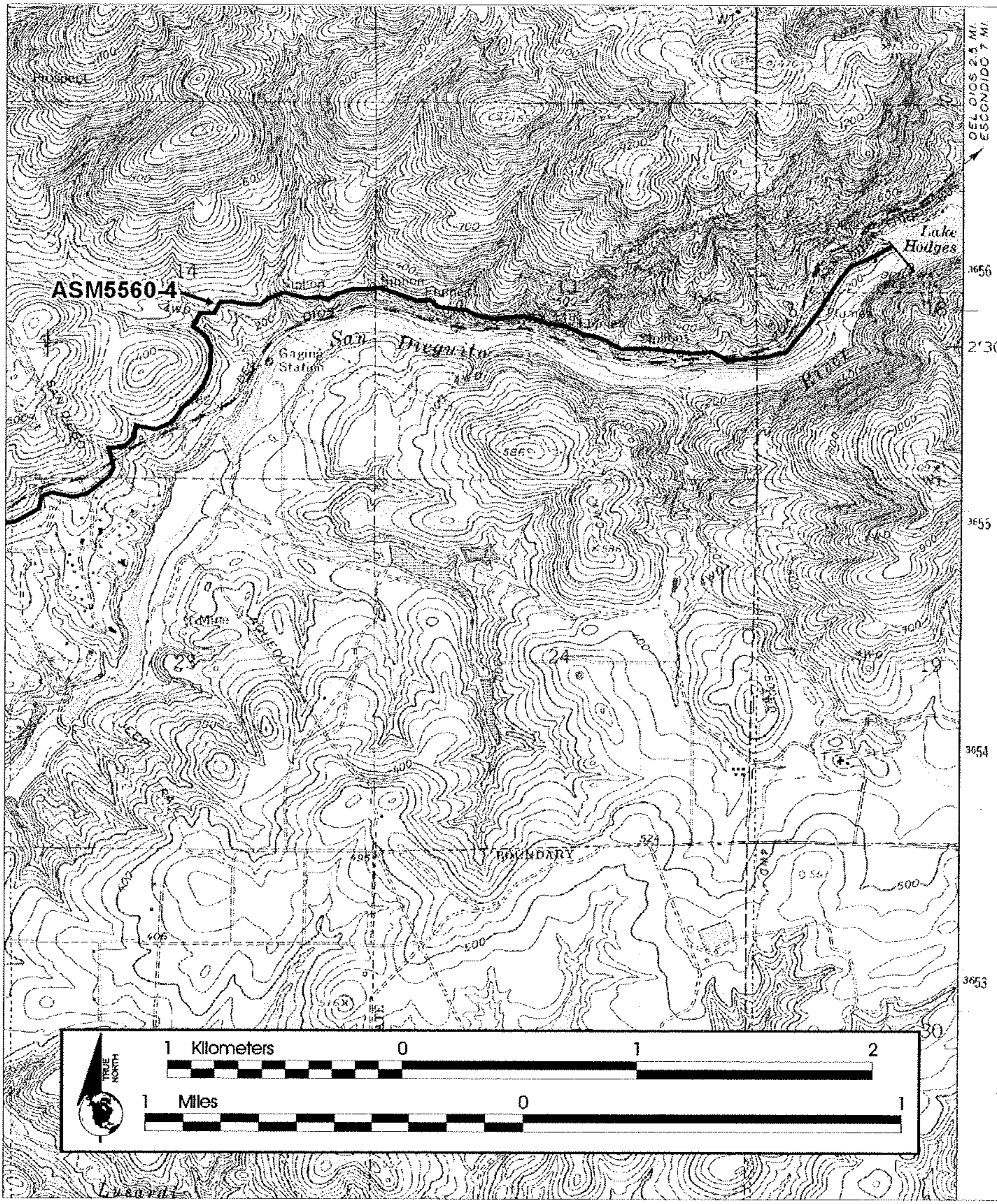
*A17. **Form Prepared by:** Jerry Schaefer and Ken Moslak **Date:** November, 2000
Affiliation and Address: ASM Affiliates, Inc. 543 Encinitas Blvd., Ste 114, Encinitas CA 92024

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #: 37-023709
Trinomial: ___

Resource Name or #: ASM5560-4

Map Name: Rancho Santa Fe, USGS 7.5' Quad **Scale:** 1:24,000 **Date of Map:** 1968 Photo-revised: 1983



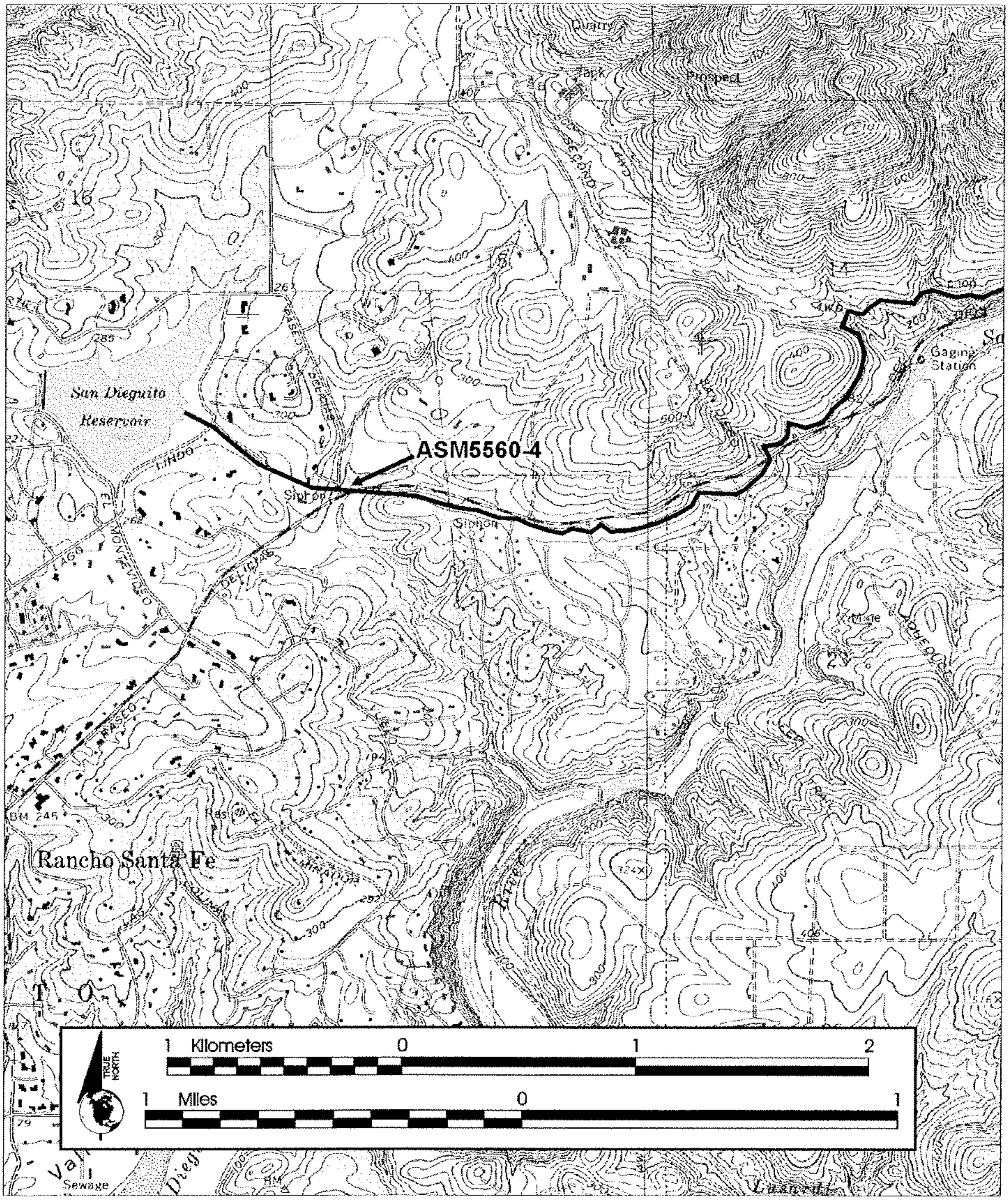
*Required information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #: 37-023709
Trinomial:

Resource Name or #: ASM5560-4

M Name: Rancho Santa Fe, USGS 7.5' Quad **Scale:** 1:24,000 **Date of Map:** 1968 Photo-revised: 1983



Resource Name or #: (Assigned by recorder): Lake Hodges Flume (ASM5560-4)

Recorded by: Jerry Schaefer and Ken Moslak ***Date:** Sept. 19, 2000 ■ Continuation ☐Update

Table 1. Hodges Flume- Inventory of Elements

Element New No.	Photo No.	Easting	Length	Original No.	Comments
Trestle 1	1-17,18	487930		Trestle 1	Steel post and beam supporting closed pipe replaces original trestle.
Shield 1	1-19	487950			Shield type B, possibly a replacement.
Flow gate	1-19	487950			Modern.
Trestle 2	1-20	487812		Trestle 2	Replacement trestle of wood post and truss construction supporting open half-pipe. Replaces trestle seen in 1919 photo.
New siphon	1-21	487720		Trestle 3	Replaces an original trestle as seen in 1919 photo.
Flush valve 1	None	487700			Not photographed
Shield 2	2-1	487674			Shield type B.
Shield 3	2-3	487545			Shield type A.
Trestle 3	2-4	487520		Trestle 4	Replacement trestle. Steel post and beam supporting closed corrugated pipe.
Shield 4	2-6	487360			Shield type B.
Trestle 4	2-7	487340		Trestle 5	Type A construction, 2 tiers high. Steel I-beam added.
Shield 5	2-8	487271			Shield type A.
Flush valve 2 and Trestle?	2-9	487224	Probably trestle 6		Buried by leaves and sediment
Trestle 5	2-10	487143		Trestle 7	Type A construction, 2 tiers high.
Trestle 6	2-11	487110		Trestle 8	Type A construction, 4 tiers high.
Trestle 7	2-12,13	487065		Trestle 9	Type A construction, 1? tier high.
Trestle 8	2-14	487040		Trestle 10	Type A construction, 1 tier high on concrete piles.
Siphon1	2-15,16,17	487000-486925		Trestle11	Probably replaces large trestle seen in 1919 photo. Closed concrete pipe.
Flush valve 3	2-16	486965			
Trestle 9	2-16	486965		Trestle 11	At bottom of siphon 1. Probably replaces large trestle seen in 1919 photo. Concrete pipe supported directly on concrete piles.
Siphon 2	2-18, 19,20, 21, 22, 23	486860-486780		Trestle 12	
Flush valve 4	2-19	486845			
Trestle 10	2-19, 20, 21,	486845-486805		Trestle 12	Trestle is original but there may be more that one at the bottom of siphon 2. Type B construction, closed concrete pipe on 1 tier.
Shield 6	2-24	486745	230ft		Type A construction. Inscription at east end: "8-15-1918 EWC, JRM, B?D".
Trestle 11	3-1	486690			Type A construction, 1? tier high.
Shield 7	3-2	486650	170ft		Shield type A.
Trestle 12	3-3	486636			Obscured by vegetation.
Shield 8	3-3	486631	30ft		Shield type A.
Trestle 13	3-3	486626			Obscured by vegetation.
Shield 9	3-3, 4	486572	273ft		Shield type A.
Structure	3-4	486572			
Trestle 14	3-5	486537			Type A construction, 3 tiers high.

Resource Name or #: (Assigned by recorder): Lake Hodges Flume (ASM5560-4)

Recorded by: Jerry Schaefer and Ken Moslak ***Date:** Sept. 19, 2000 ■ Continuation ☐Update

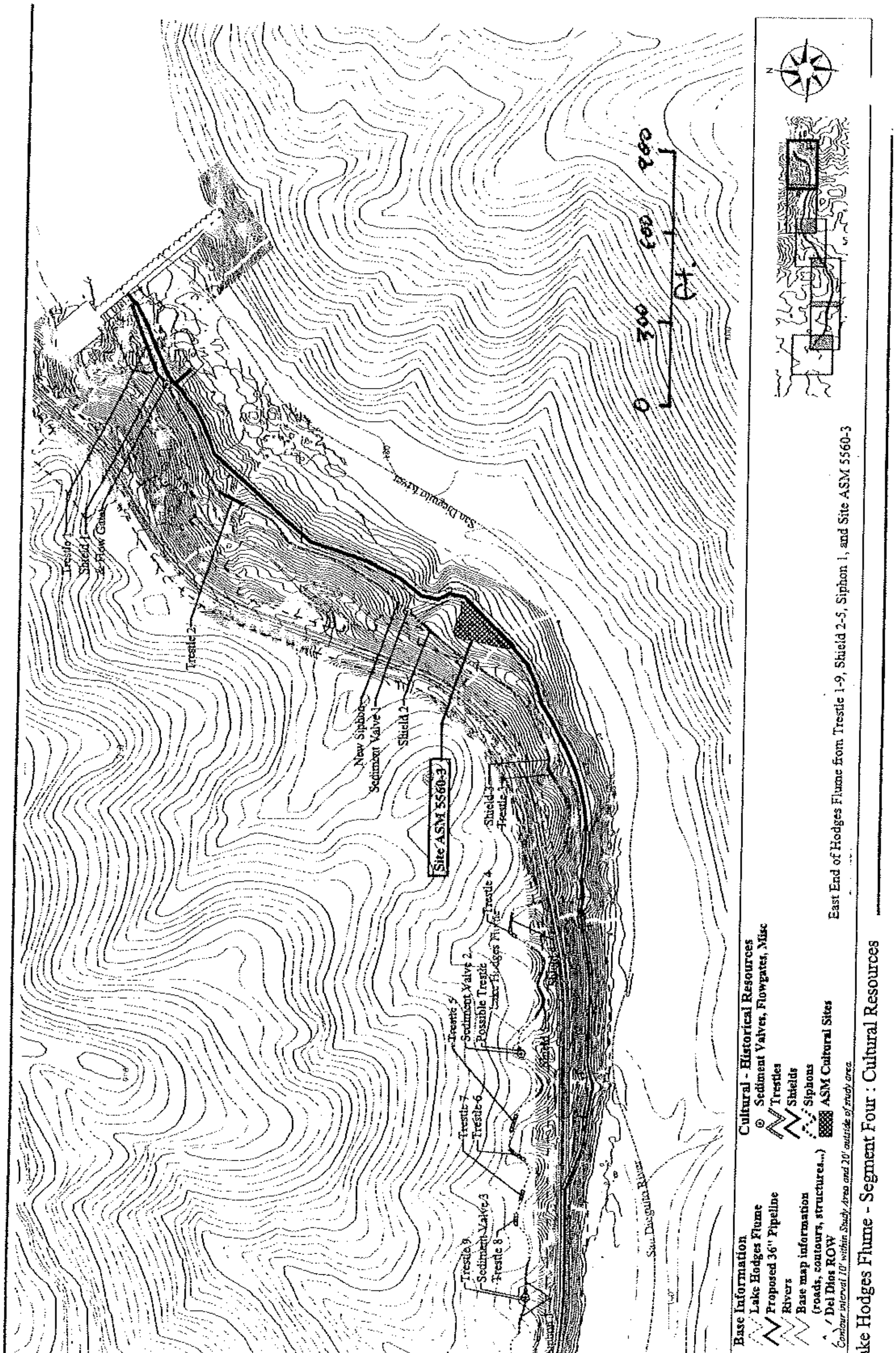
Shield 10	3-6	486500	200ft		Shield type A.
Trestle 15	3-7, 8 4-6	486450			Type A construction, 5 tiers high. Steel I-beams added at a later date to stabilize.
Flush valve 5	3-8, 9	486450			
Shield 11	3- 8,10,11	486440-486250		710ft	Shield type A. Very long section of covered ditch partially covered with rock fall. Unique retaining wall to construct ditch on a very steep slope.
Siphon 3	3-12, 13,	486190-486130			
	14; 4-5				
Flush valve 6	3-14	486183			
Trestle 16	3-13, 4-5	486183		Trestle 21	Type B construction, 5 tiers high.
Trestle 17	3-15	486075			Type A construction, 2 tiers high.
Shield 12	3-16	485885	10ft		Shield type B.
Trestle 18	3-17	485840			Type A construction, 3 tiers high.
Trestle 19	3-18	485740			Type A construction, 2 tiers high.
Shield 13	3-19	485682	10ft		Shield type B.
Siphon 4	3-20, 21	485400			
Flush valve 7	3-20	485400			
Trestle 20	3-21	485400		Trestle 27	Type B construction, 3 tiers high
Shield 14	3-22	485390	70ft		Shield type A.
Trestle 21	3-24	485180		Trestle 28	Type A construction, 1 tier high
Trestle 22	4-1	458140		Trestle 29, 30	Very recent replacement of original trestles 29&30
Shield 15	4-3	485025	12ft		Shield type B.
Shield 16	4-4	484703	10ft		Shield type B.
Shield 17	4-14	484430	40ft		Shield type B. Obscured by sediment.
Shield 18	4-16	484190	6ft		Shield type B.
Shield 19	4-17	484030	50ft		Unknown. Obscured by sediment.
End Siphon	4-18, 21, 22, 23	483120-482580	1890 ft		
Flush valve 8	None				Presence inferred but not found
Manhole	4-20	482770			At same elevation as siphon ends.
Flush valve 9	None				Presence inferred but not found
Flow gate	4-21,22	482580			Modern.

Resource Name or #: (Assigned by recorder): Lake Hodges Flume (ASM5560-4)

Recorded by: Jerry Schaefer and Ken Moslak

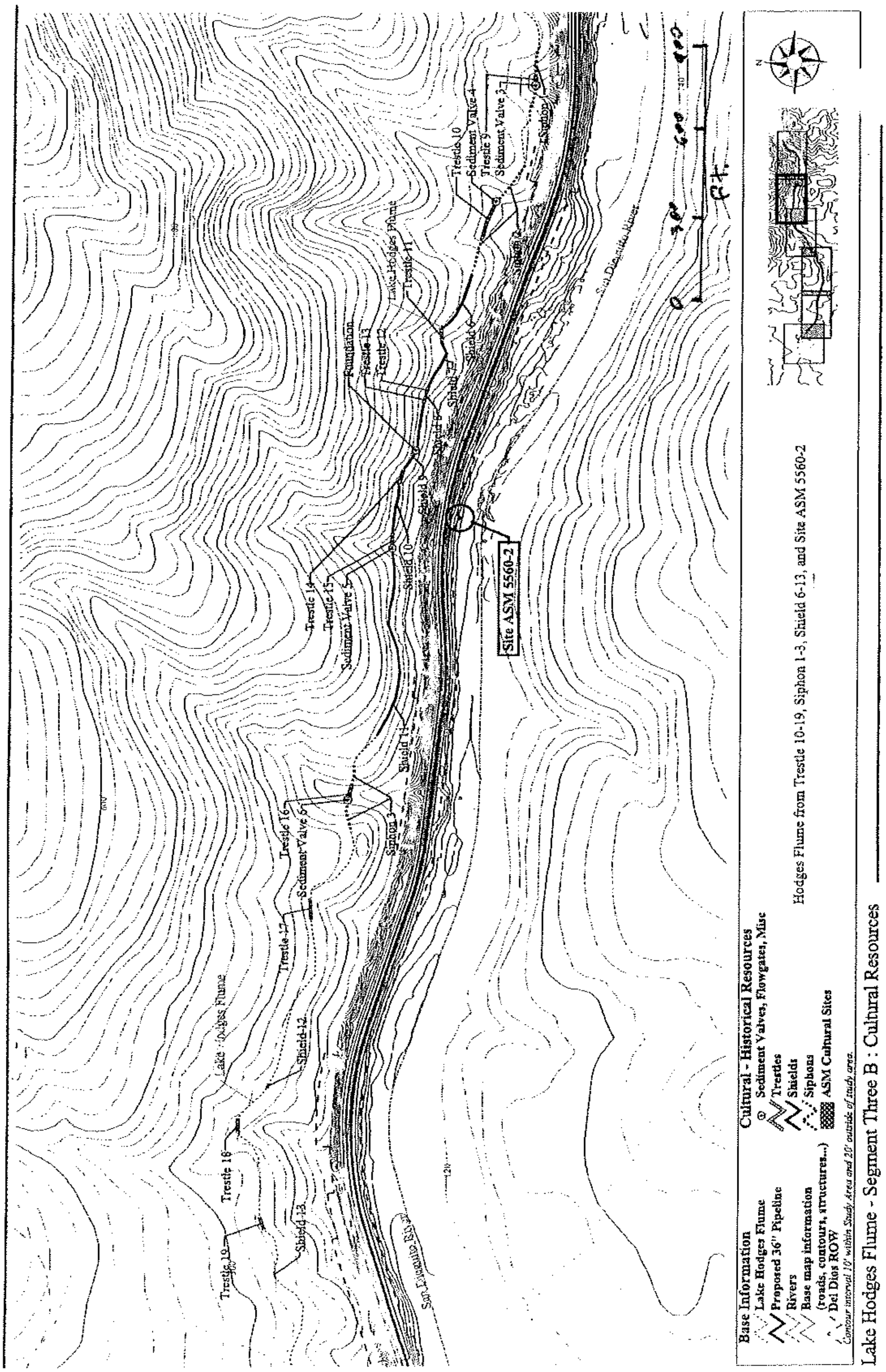
***Date:** Sept. 19, 2000

■ Continuation ☐Update



Resource Name or #: (Assigned by recorder): Lake Hodges Flume (ASM5560-4)

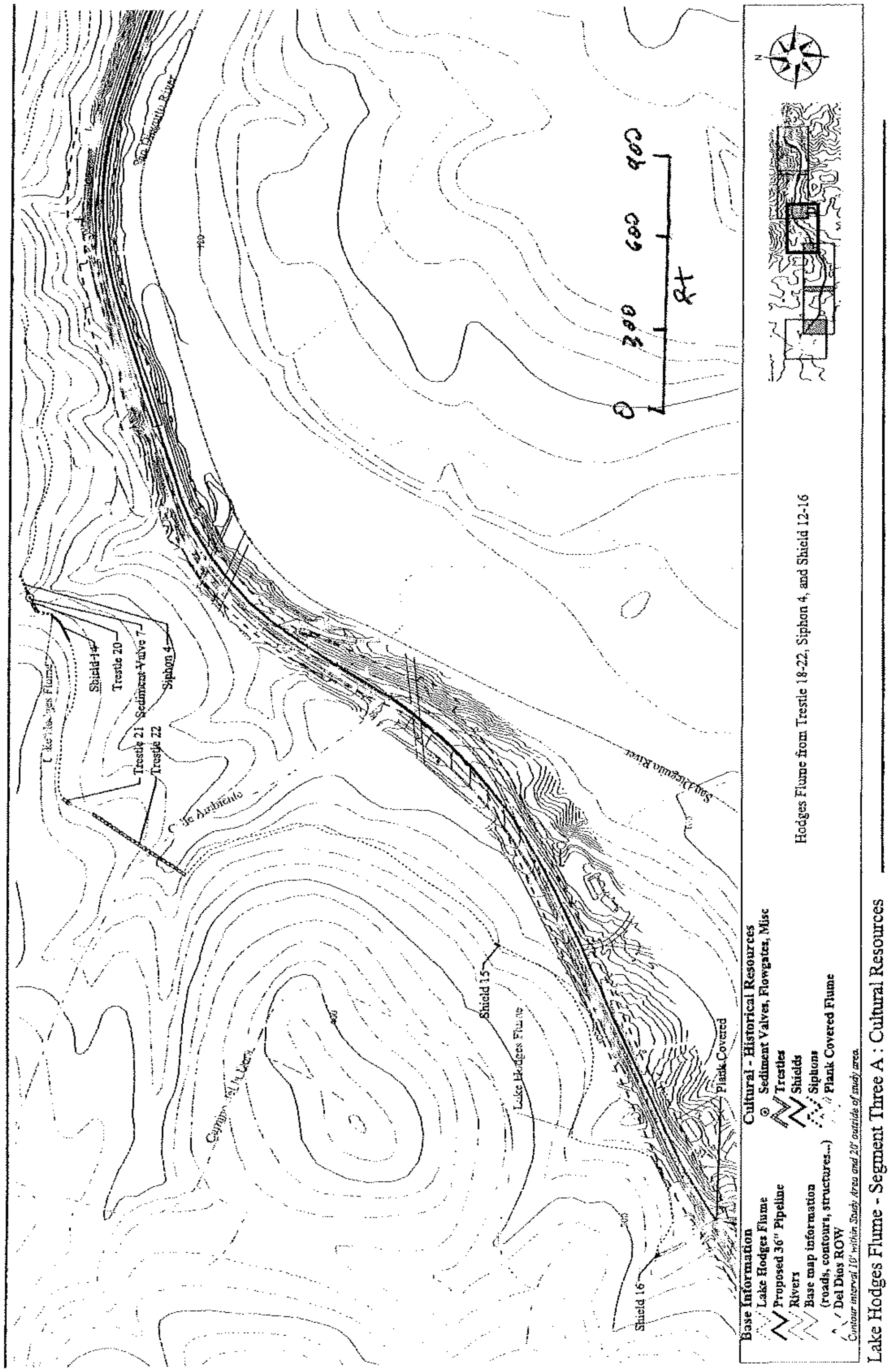
Recorded by: Jerry Schaefer and Ken Moslak ***Date:** Sept. 19, 2000 ■ Continuation ☐Update



Lake Hodges Flume - Segment Three B : Cultural Resources

Resource Name or #: (Assigned by recorder): Lake Hodges Flume (ASM5560-4)

Recorded by: Jerry Schaefer and Ken Moslak ***Date:** Sept. 19, 2000 ■ Continuation ☐Update



CONTINUATION SHEET

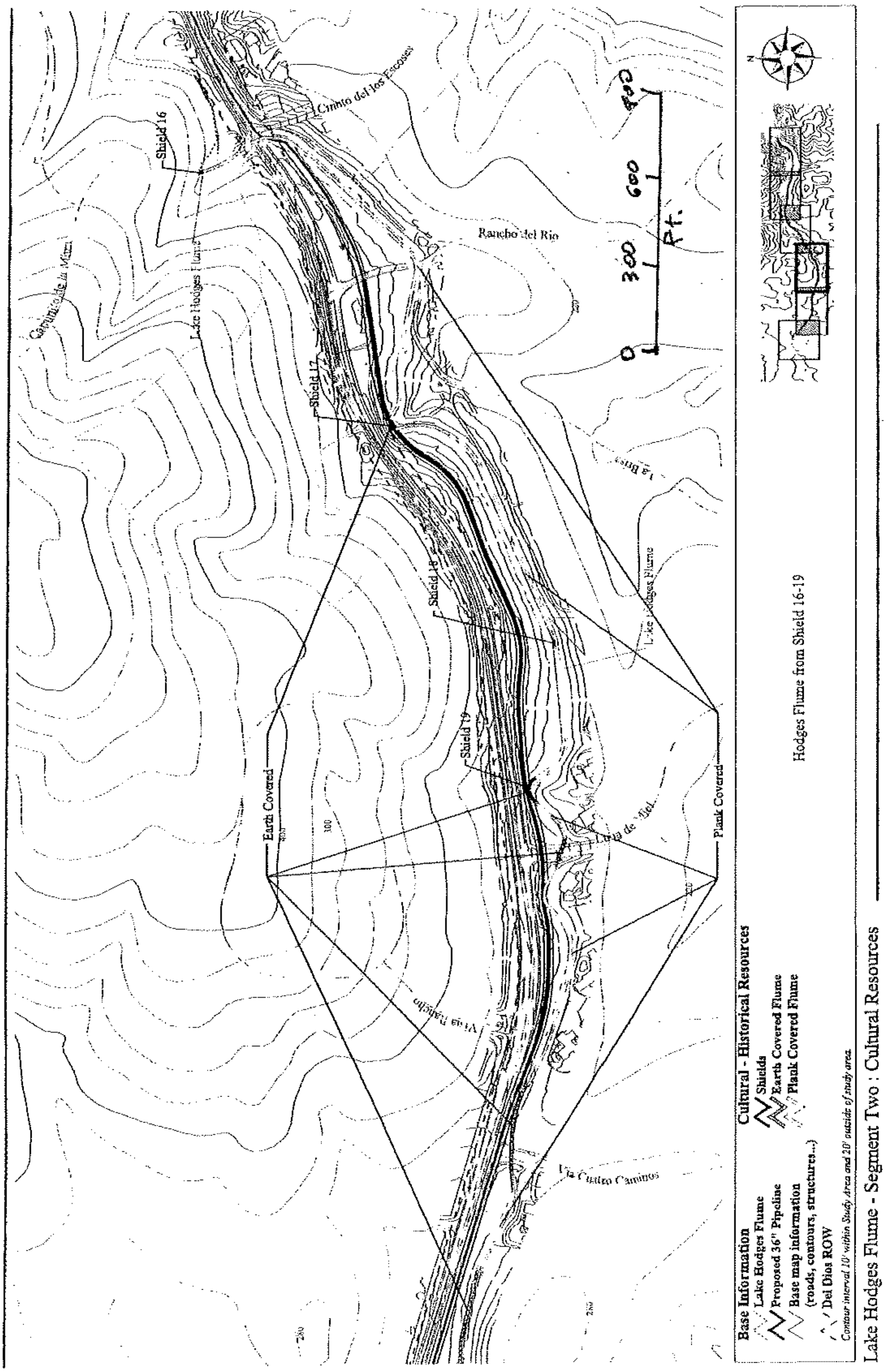
Primary #: 37-023709
HRS#:
Trinomial:

Resource Name or #: (Assigned by recorder): Lake Hodges Flume (ASM5560-4)

Recorded by: Jerry Schaefer and Ken Moslak

***Date:** Sept. 19, 2000

■ Continuation ☐Update



*Required information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

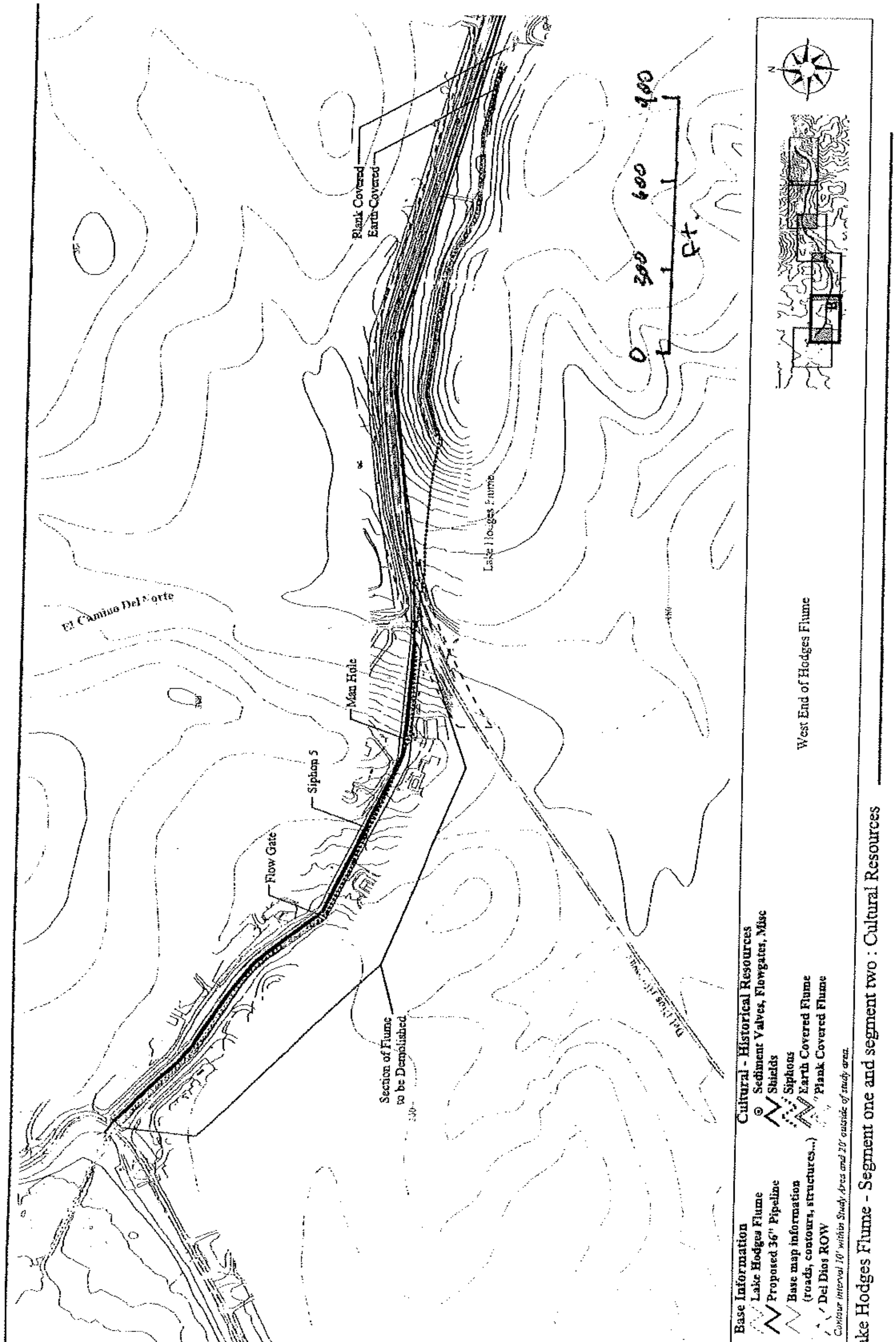
Primary #: 37-023709
HRS#:
Trinomial:

Resource Name or #: (Assigned by recorder): Lake Hodges Flume (ASM5560-4)

Recorded by: Jerry Schaefer and Ken Moslak

***Date:** Sept. 19, 2000

■ Continuation ☐Update



State of California -- The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

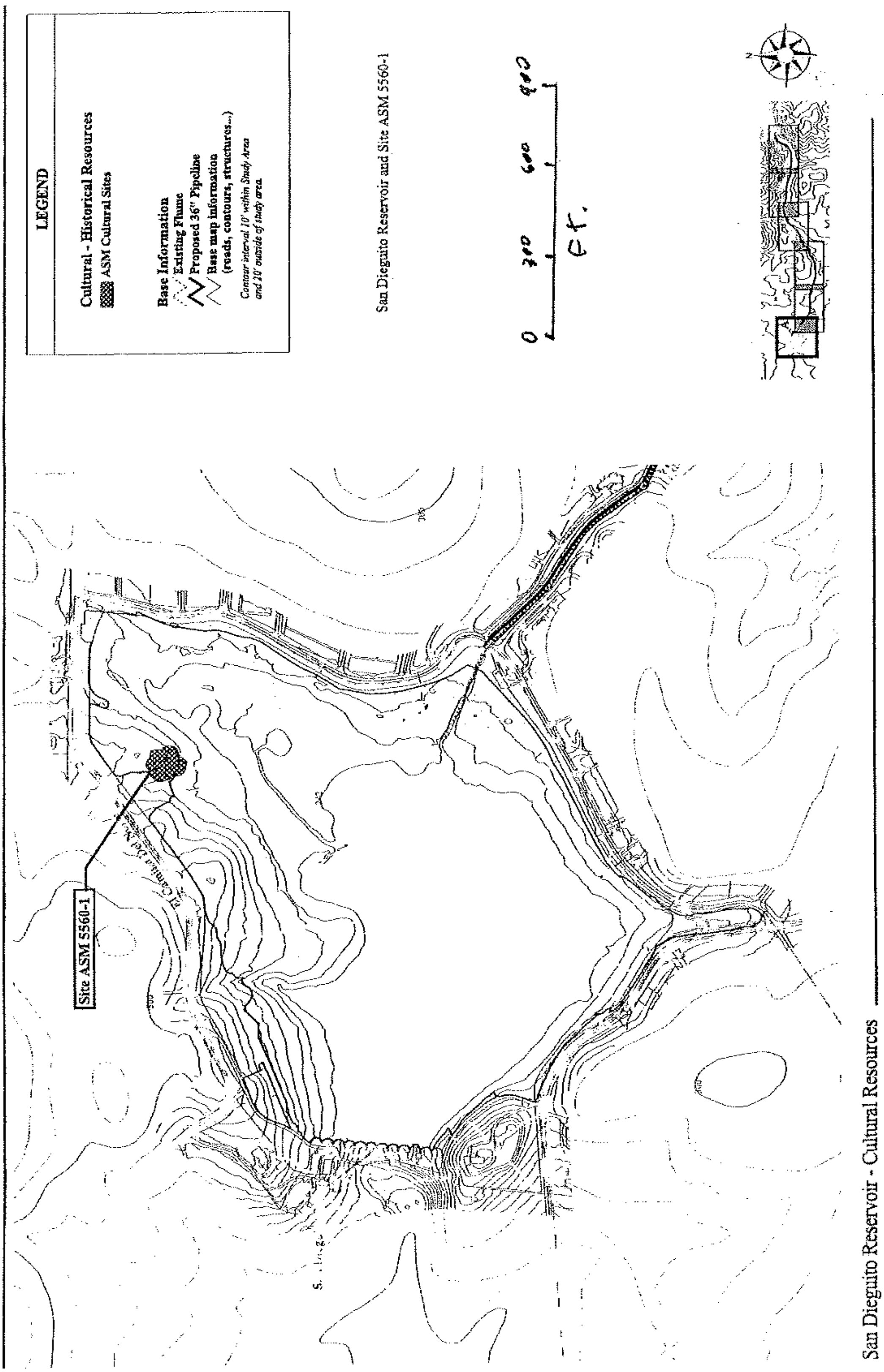
Primary #: 37-023709
HRS#:
Trinomial:

Resource Name or #: (Assigned by recorder): Lake Hodges Flume (ASM5560-4)

Recorded by: Jerry Schaefer and Ken Moslak

***Date:** Sept. 19, 2000

■ Continuation ☐Update



*Required information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

Primary # P-37-024354 UPDATE
HRI #
Trinomial
NRHP Status Code 3S

Other Listings
Review Code Reviewer Date

***Resource Name or #** **P-37-024354 - San Vicente Dam and Reservoir**
Recorded by: Shelby Gunderman and Michelle Dalope **Date:** 21 September 2009
☐ Continuation ■ Update

Description: The San Vicente Dam and Reservoir was originally recorded by A. Gustafson of EDAW in 2002 as a concrete gravity section dam constructed in 1943. The dam stood 220 feet tall and the reservoir had a 1,100 acre surface area and could hold 90,000 acre-feet of water. In 2002 EDAW found the dam eligible for the National Register of Historic Places under Criterion A for the key role it played in supplying water to the City of San Diego.

During the current survey the dam was found to be under construction, as part of the Emergency Storage Project, and will be raised by 117 feet. Construction on the dam and reservoir will be completed between 2014 and 2017. The current construction will impact the integrity of the dam and will likely render it ineligible for listing in the NRHP and CRHR. No historical resource study regarding the current construction project could be identified.

Recorded by:
Michelle Dalope and Shelby Gunderman
ASM Affiliates, Inc.
2034 Corte del Nogal
Carlsbad, CA 92011

Date Recorded: September 21, 2009

Survey Type: Historic Building Survey-Intensive

Report Citation: Sinéad Ní Ghabhláin, Michael P. Pumphrey, Sarah Stringer-Bowsher, and Shelby Gunderman (2010), *Assessment of Indirect Visual Impacts on the Historic Built Environment Properties within the Area of Potential Effect of the Approved San Diego Gas & Electric Sunrise Powerlink Final Environmentally Superior Southern Route, San Diego and Imperial Counties, California.* ASM Affiliates, Inc. Submitted to San Diego Gas and Electric and the Bureau of Land Management.

State of California — The Resources Agency DEPARTMENT OF PARKS AND RECREATION **PRIMARY RECORD**	**Primary #** 37024354 UPDATE (no P# on file) **HRI #** **Trinomial** **NRHP Status Code** **Other Listings** **Review Code** **Reviewer** **Date**

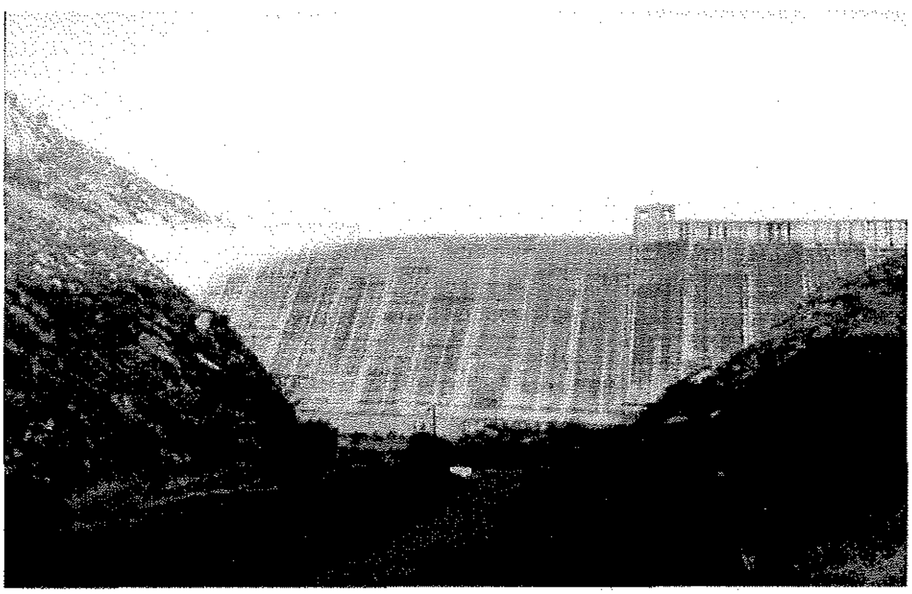
***Resource Name or #:** (Assigned by recorder) San Vicente Dam

P1. Other Identifier: SV-S-11H

***P2. Location:** □ **Not for Publication** □ **Unrestricted** ***a. County** San Diego
and P2c, P2e, and P2b or P2d. (Attach Location Map as necessary.)
***b. USGS 7.5′ Quad** San Vicente Reservoir Date 1971 T 14S; R 1W: SW ¼ of NW ¼ of Sec 31; SB B.M.
c. Address **City** **Zip**
d. UTM: (Give more than one for large and/or linear resources) **Zone:** 11 ; 507110 mE/ 3641350 mN
***e. Other Locational Data:** (E.g., parcel #, directions to resource, elevation, etc., as appropriate.) From Lakeside, drive north on Highway 67 for about 3.6 miles. Turn right (east) on Vigilante Road and drive for about 0.75 mile to a "Y" intersection with Moreno Avenue. Make a sharp left (north) turn on Moreno Avenue and drive for about 0.65 miles to a fork in the road. The left fork leads to the base of the dam (0.25 mile), and the right fork winds upslope to the crest of the dam.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries.) San Vicente Dam is a concrete gravity section dam with a straight axis. The dam took two years to build and was completed in 1943. The dam reaches 199 feet above the streambed, with foundations that start 37 feet below ground, and is 154 feet thick at the base. The crest of the dam is 980 feet long and 14 feet wide. The dam is grouted to 50 percent of its height. A spillway for uncontrolled overflow, located in the center of the dam, is able to contain 31,000 cubic feet of water per second. The spillway measures 275 feet long by 10 feet deep. While most of the dam was constructed of concrete, the central section of the foundation and the left abutment are composed of metamorphosed schist. The right abutment is composed of granite.

***P3b. Resource Attributes:** (See attributes and codes) HP21. Dam
***P4. Resources Present:** □ Building ☒ Structure □ Object □ Site □ District □ Element of District □ Other (Isolates, etc.)



P5b. Description of Photo: (View, date, accession #) View to the north, 01/03/02, 0K010.06-CO01-16

***P6. Date Constructed / Age and Sources:** ☒ Historic □ Prehistoric □ Both
1941-1943, Fowler 1953:76

***P7. Owner and Address:**
The City of San Diego
600 B Street, Suite 800
San Diego, California 92101

***P8. Recorded by:** (Name, affiliation, and address) A. Gustafson, EDAW, Inc.
1420 Kettner Blvd. Ste. 620
San Diego, CA 92101

***P9. Date Recorded:** 01/03/02
***P10. Survey Type:** (Describe) Evaluation

***P11. Report Citation:** (Cite Survey report and other sources, or enter "none.") Underwood, Jackson, Christy V. Dolan, and Lorraine M. Willey. 2002. Archaeological Evaluation of Sites Surrounding San Vicente Reservoir San Diego County Water Authority Emergency Storage Project.

*Attachments: □ None ☒ Location Map □ Sketch Map □ Continuation Sheet ☒ Building, Structure, and Object Record □ Linear Resource Record □ Archaeological Record □ District Record □ Milling Station Record □ Rock Art Record □ Artifact Record □ Photograph Record □ Other (List)

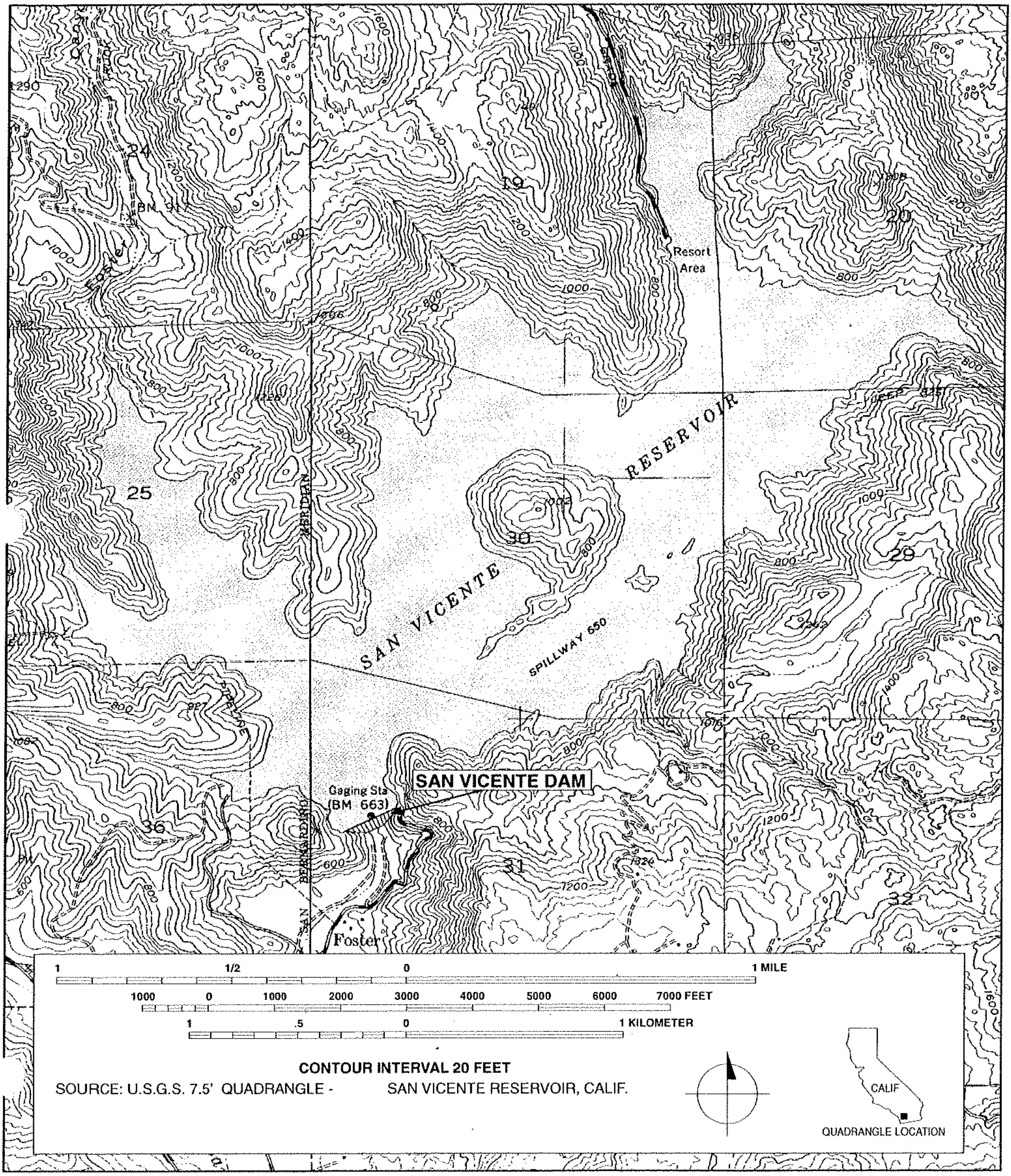
37024354

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # 37024354
HRI#
Trinomial

*Resource Name or # (Assigned by recorder) San Vicente Dam

Map Name: San Vicente Reservoir, Calif. 7.5' Quadrangle *Scale: 1:24,000 *Date of Map: 1971



State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
Primary # 37024354
HRI #

BUILDING, STRUCTURE, AND OBJECT RECORD

***NRPH Status Code** 3S
***Resource Name or #** (Assigned by recorder) San Vicente Dam

B1. Historic Name: San Vicente Dam

B2. Common Name: San Vicente Dam

B3. Original Use: Gravity dam **B4. Present Use:** Gravity dam

***B5. Architectural Style:**

***B6. Construction History:** (Construction date, alterations, and date of alternations.) In 1940, plans for the construction of the San Vicente dam were submitted as a Works Progress Administration (WPA) project. The dam was constructed between November, 1941 and March, 1943, and cost a total of $2,767,021 to build. The City of San Diego originally proposed to construct the San Vicente Dam to a height of 315 feet, but the constructed version was 190 feet tall. During construction, a tunnel 22 feet wide and 19.5 feet high was built through the center of the dam at the base to allow travel along the old Ramona highway until a new roadway was completed. The contractors designed a concrete plug to fill the tunnel before the reservoir was filled with water. No visible alterations have been made since that time.

***B7. Moved?** ☒**No** ☐**Yes** ☐**Unknown** **Date:** **Original Location:** Same
***B8. Related Features:**

B9a. Architect: Unknown **B9b. Builder:** Arundel Corporation of Baltimore, Maryland and L.E. Dixon Company of San Gabriel, California

***B10. Significance: Theme** Water resources **Area** San Diego County
Period of Significance 1887-1945 **Property Type** Dam **Applicable Criteria** 3S
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

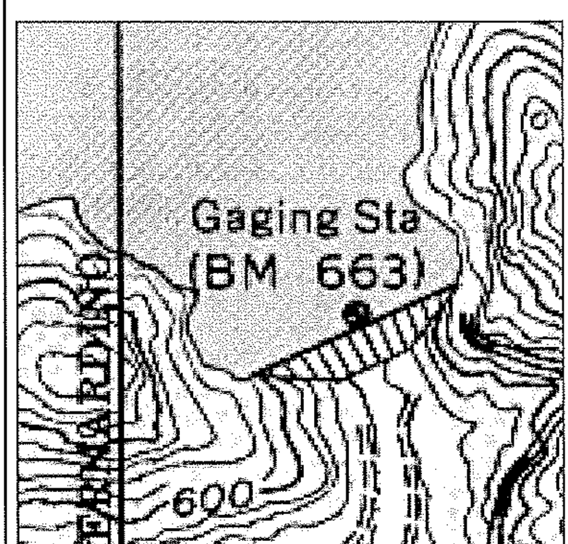
San Vicente Dam has played a role in the San Diego water system for the last 60 years. Although it was not the first dam in San Diego County, it supports a system of dams and reservoirs and plays a crucial role in bringing water to San Diego from the Colorado River. It also was constructed using WPA labor, which played a significant role in our history. In addition, although the San Vicente Dam was not built specifically to support the efforts during World War II, the advent of the war prompted an increased demand for water. San Vicente Dam was integral in satisfying that need. Based on all of these historical associations, San Vicente Dam is considered eligible for the National Register of Historic Places under criterion a.

B11. Additional Resource Attributes: (List attributes and codes):

***B12. References:** Fowler, Lloyd Charles. 1953. A History of Dams and Water Supply for Western San Diego County. Berkeley: University of California.

B13. Remarks: A previous form (SV-S-11H) was prepared in 1993 by Kathleen Crawford of Ogden Environmental. The dam appears in the records search data, but no Primary Number was assigned.

***B14. Evaluator:** C. V. Dolan



(This space reserved for official comments.)

***Required Information**

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary# 025928
HRI#
Trinomial 17241
NRHP Status Code

Other Listings
Review Code ____ Reviewer ____ Date

***Resource Name or #:** (Assigned by recorder) : BL-1

P1. Other Identifier:

***P2. Location:** ☒ **Not for Publication** ☐ **Unrestricted** ***a. County** San Diego
and (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** Barrett Lake **Date** 1960 (1988) **T** 17S ; **R** 3E ; **Sections** 15-16 ; SBr **B.M.**

c. Address ____ City ____ Zip ____

d. UTM: (Give more than one for large and/or linear resources) Zone 11, 530600 mE/; 3616150 mN (site center)
Trash Scatter 1: 530547 mE/; 3616139 mN. Trash Scatter 2: 530518 mE/; 3616135 mN.
Trash Scatter 3: 530550 mE/; 3616120 mN. Trash Scatter 4: 530539 mE/; 3616197 mN.
Trash Scatter 5: 530510 mE/; 3616200 mN.

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)

***P3a. Description: (Describe resource and its major elements.** Include design, materials, **condition**, alterations, **size**, **setting** (vegetation), and boundaries)

Five historic trash scatters associated with the former location of at least five married employees' cottages within the Barrett Dam construction camp. The dam was built between Oct. 1919 and July 1922. The artifacts

date between 1918-1929; they are primarily rusted cans, including hold-in-cap cans, beverage bottles, drinking glasses, and a few sherds of largely undecorated whiteware. The deposits have been disturbed by high lake levels and repeated removal by bottle collectors over many decades.

***P3b. Resource Attributes:** (List attributes and codes): AH4 – historic trash scatters

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)

***P4. Resources Present:** ☐ Building ☐ Structure ☐ Object ☒ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #) :

***P6. Date Constructed/Age and Source:** ☒ Historic ☐ Prehistoric ☐ Both

***P7. Owner and Address:**
City of San Diego
Barrett Lake and Dam Site
2417 Barrett Lake Road
Dulzura, CA 91917

***P8. Recorded by:** (Name, affiliation, and address) Philip de Barros, Chambers Group, 17671 Cowan Ave., Suite 100, Irvine, CA 92614

***P9. Date Recorded:** 12/19/2004

***P10. Survey Type:** (Describe) Reconnaissance

P11. Report Citation: (Cite survey report and other sources, or enter "none.")
Cultural Resources Inventory of an 8-Acre Parcel for a New Boat Ramp Project On Barrett Lake, City of San Diego Water Authority, San Diego, California, by Philip de Barros. Chambers Group, Inc., 2004.

***Attachments:** ☐ NONE ☒ Location Map ☒ Sketch Map ☒ Continuation Sheet ☐ Building, Structure, and Object Record ☒ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record ☐ Artifact Record ☐ Photograph Record ☐ Other (List):

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
ARCHAEOLOGICAL SITE RECORD

Primary # 025926
Trinomial 17241

 *Resource Name or # (Assigned by Recorder) BL-1

A1. Dimensions: a. Length 200 m (EW) b. Width 100 m (NS)
Method of Measurement: ☐ Paced ☐ Taped ☐ Visual estimate ☒ Other: GPS data & topo map
Method of Determination (Check any that apply.): ☒ Artifacts ☒ Features ☐ Soil ☐ Vegetation ☒ Topography ☐ Cut bank ☐ Animal burrow ☐ Excavation ☐ Property boundary ☐ Other (Explain):
Reliability of Determination: ☒ High ☐ Fair ☐ Low Explain:
Limitations (Check any that apply): ☐ Restricted access ☐ Paved/built over ☒ Site limits incompletely defined – the construction camp for Barrett Lake was an entire community that extended well to the south and somewhat to the north of the study area. This site reflects only features and artifacts from within the boundaries of the study area.
☒ Disturbances – part of the site was bladed a long time ago, removing all vestiges of structures that were once on the property; the 1998 lake levels drowned much of the site and wave action worked on some of the trash deposits ☐ Vegetation ☐ Other (Explain):

A2. Depth: ☒ None ☐ Unknown Method of Determination: bedrock and steep, wave-eroded slopes

***A3. Human Remains:** ☐ Present ☒ Absent ☐ Possible ☐ Unknown (Explain):

***A4. Features:** (Number, briefly describe, indicate size, list associated cultural constituents, and show location of each feature on sketch map.)
Five trash historic trash scatters containing historic metal, glass, and ceramic artifacts; these artifacts consist primarily of historic cans, including hole-in-cap cans, beverage bottles, and some largely undecorated whiteware sherds. These artifacts date primarily between 1918-1929.

***A5. Cultural Constituents:** (Describe and quantify artifacts, ecofacts, cultural residues, etc., not associated with features.)
An isolated gilt-edged plate with the incomplete maker's mark K.T.&K.. then ____________V below that, then _________ below that, then ...A. below that. It dates between 1915-1926.

***A6. Were Specimens Collected?** ☐ No ☒ Yes (If yes, attach Artifact Record or catalog and identify where specimens are curated.)

***A7. Site Condition:** ☐ Good ☐ Fair ☒ Poor (Describe disturbances.): Trash scatters have been heavily looted and four of them have been eroded by wave action from 1998 high-water lake levels.

***A8. Nearest Water: (Type, distance, and direction.)** Barrett Lake – directly adjacent to the north, east, and south.

***A9. Elevation:** 1620-1680 feet

A10. Environmental Setting: (Describe culturally relevant variables such as **vegetation**, **fauna**, soils, **geology (granodiorite or Julian schist)**, **landform**, **slope**, aspect, exposure)
Granite bedrock, granitic soils; inland sage scrub; small peninsula landform created by Barrett Lake level

A11. Historical Information: The site was part of the construction camp for building Barrett Dam from October 1919 to July 1922. H.N. Savage was the hydraulic engineer in charge. The portion of the site recorded here was an area of at least five married employee's cottages and some hog pens to the east.

***A12. Age:** ☐ Prehistoric ☐ Protohistoric ☐ 1542-1769 ☐ 1769-1848 ☐ 1848-1880 ☐ 1880-1914 ☒ 1914-1945 ☐ Post 1945 ☐ Undetermined **Describe position in regional prehistoric chronology or factual historic dates if known:**

A13. Interpretations: (Discuss data potential, function[s], ethnic affiliation, and other interpretations) The trash scatters have little data potential because they have been looted and cannot be associated with specific individuals or families.

A14. Remarks: The bulk of the construction camp for Barrett Damp was to the south near the dam; there were also other married employees' cottages to the west and north as well as a small school of the Corte Madera School District. There are no construction camp structures within visual range of the site.

A15. References: (Documents, informants, maps, and other references) *Barrett Dam Construction Feature History*, 3 Vols., by H.N. Savage. Located in the California Room of the San Diego Public Library, Main Branch.

A16. Photographs (List subjects, direction of view, and accession numbers or attach a Photograph Record.):
Original Media/Negatives Kept at:

***A17. Form Prepared by:** Philip de Barros, Ph.D., SOPA, RPA **Date:** 12/17/2004
Affiliation and Address: Chambers Group, Inc., 17671 Cowan Ave., Suite 100, Irvine, CA 92614

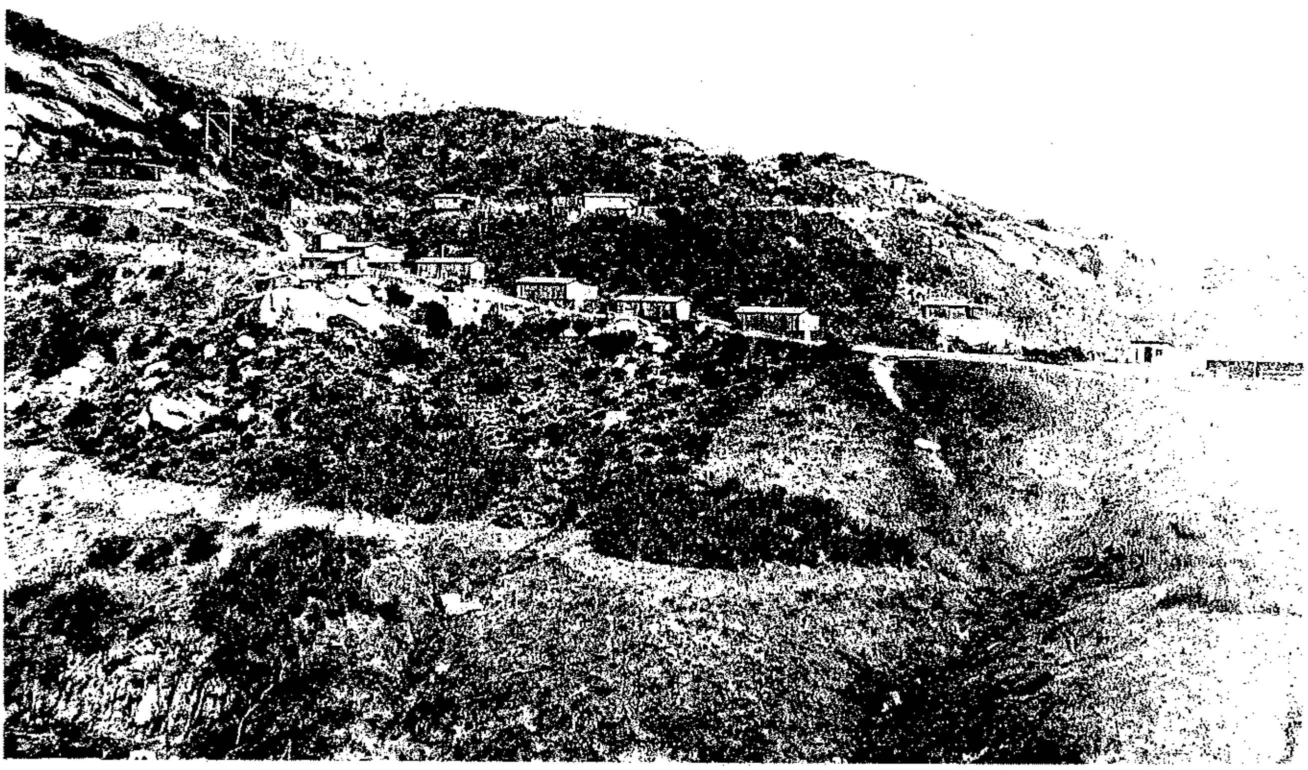
State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

Primary # 025926
HRI #
Trinomial 17241

Page 3 of 5 | *Resource Name or # (Assigned by recorder) BL-1

*Recorded by: Philip de Barros | *Date 12/19/04 | ☒ Continuation ☐ Update

SOME OF THE MARRIED EMPLOYEES' COTTAGES, BARRETT DAM CONSTRUCTION CAMP, 3/15/1921, FACING NORTH STRUCTURES SHOWN ALONG DIRT ROAD IN FOREGROUND ARE WITHIN THE SITE AREA (Source: H.N. Savage's *Barrett Dam Construction Feature History*, 1922)



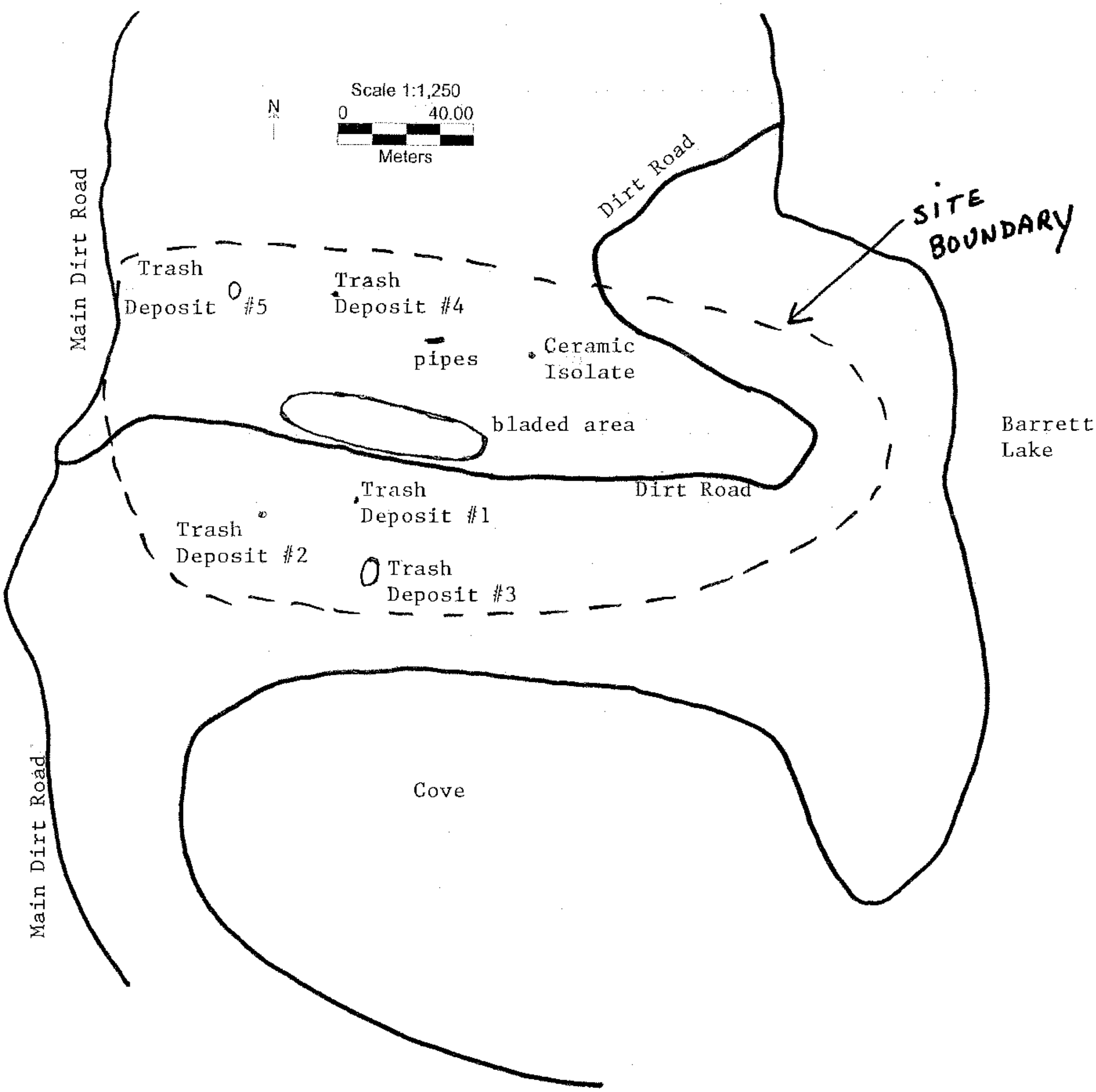
State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary # 625926
HRI#
Trinomial 17241

Page 4 of 5 *Resource Name or # (Assigned by recorder) BL-1

*Drawn by: Philip de Barros *Date of map: 12/19/04

BARRETT DAM CONSTRUCTION CAMP – PART OF MARRIED EMPLOYEES' COTTAGES & HOG PENS



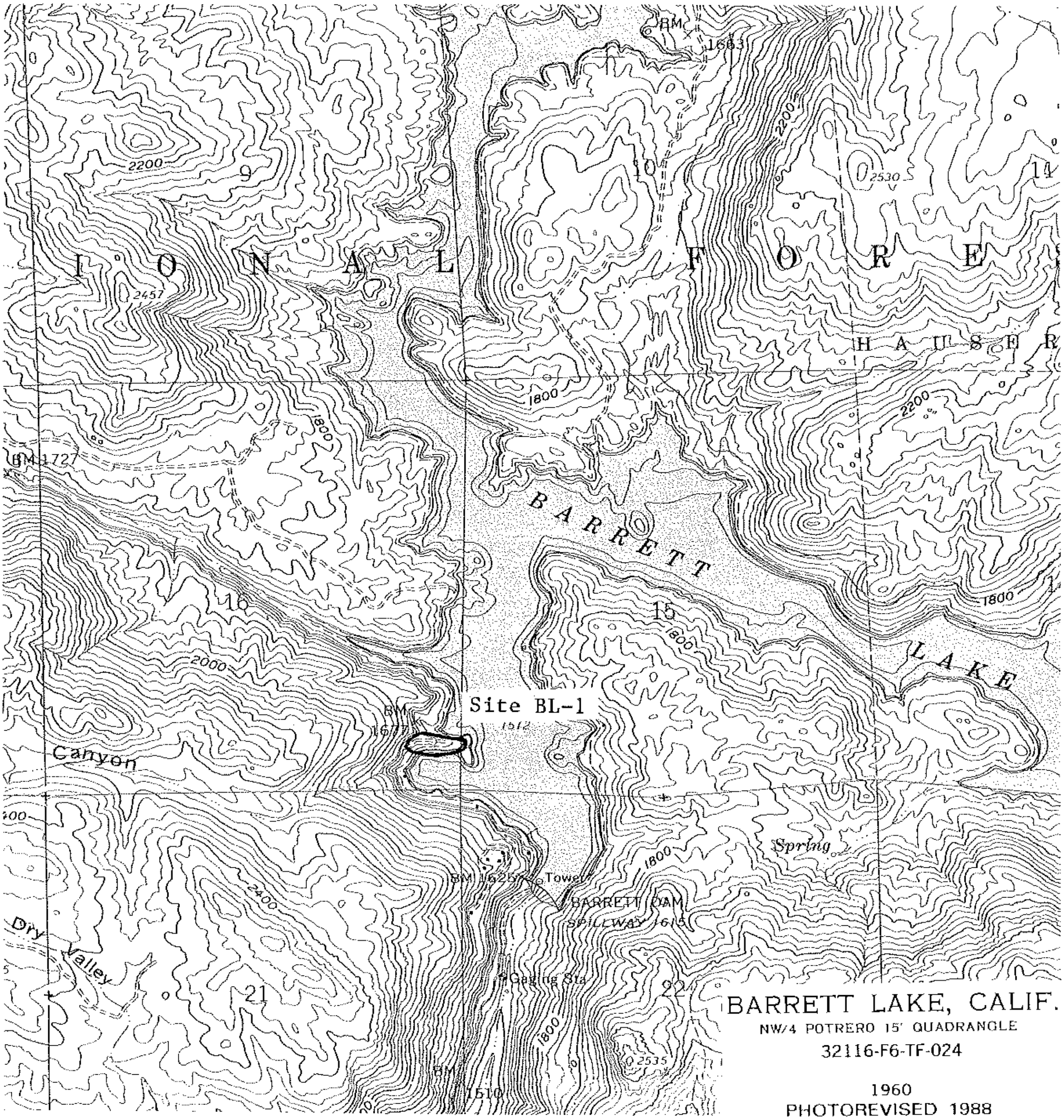
NOTE: Include bar scale and north arrow.

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

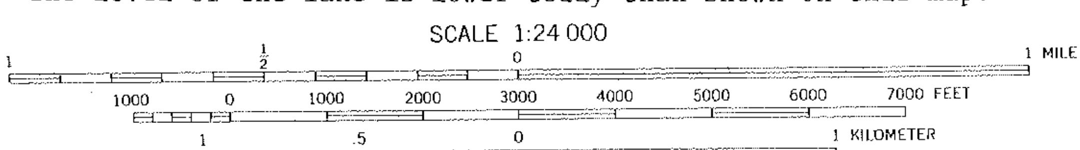
Primary # 025926
HRI#
Trinomial 017241

 ***Resource Name or #** (Assigned by recorder) BL-1

***Map Name:** Barrett Lake ***Scale:** 1:24,000 ***Date of map:** 1960 (1988 photorevision)



NOTE: The level of the lake is lower today than shown on this map.



CONTOUR INTERVAL 40 FEET

***Resource Name or #** **SDI-17656 – Old Julian Highway**
Recorded by: Brian Williams
Date: 03 August 2009
☐ Continuation ■ Update

P1. Other Identifier: Old Julian Highway
***P2. Location:** ☐ **Not for Publication** ☒ **Unrestricted**

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
Stephen Van Wormer of Walter Enterprises originally recorded this site in 2005 as a segment of an old concrete highway, the Old Julian Highway, (ca. 1914 to 1945) that ran through Foster prior to the construction of San Vicente Dam. During the current survey, ASM identified the portion of the highway intersecting the APE in a worsened condition as the original record, with increased wear caused by the result of heavy machinery driving across the area, probably for access related to dam improvements.

This short segment of concrete road is a remnant of the original Old Julian Highway. It was impacted by the construction of San Vicente Dam, which necessitated construction of an alternative road. This resource does not retain sufficient integrity to convey its significance and is therefore recommended not eligible for listing in the NRHP and CRHR.

***P8. Recorded by:** (Name, affiliation, and address)
Brian Williams
ASM Affiliates, Inc.
2034 Corte del Nogal
Carlsbad, CA 92011

***P10. Survey Type: (Describe):**
Historic Building Survey - Intensive

***P11. Report Citation:**
Sinéad Ní Ghabhláin, Michael P. Pumphrey, Sarah Stringer-Bowsher, and Shelby Gunderman (2010), *Assessment of Indirect Visual Impacts on the Historic Built Environment Properties within the Area of Potential Effect of the Approved San Diego Gas & Electric Sunrise Powerlink Final Environmentally Superior Southern Route, San Diego and Imperial Counties, California.* ASM Affiliates, Inc. Submitted to San Diego Gas and Electric and the Bureau of Land Management.

***Attachments:** ☐ NONE ☐ Location Map ☐ Sketch Map ☐ Continuation Sheet ☒ Building, Structure, and Object Record ☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record ☐ Artifact Record ☐ Photograph Record ☐ Other (List):

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #
HRI #
Trinomial CA-SDI-17656_UPDATE

Page 2 **of** 2
Drawn by: Alice Brewster-Linlor

***Resource Name or #** SDI-17656 – Old Julian Highway
Date: 03 August 2009

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

Primary # ______
HRI # ______
Trinomial CA-SDI-17656

***Resource Name or #** SDI-17656

Recorded by: Brian Williams
Date: 03 August 2009

☐ Continuation ■ Update

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
Walter Enterprises originally recorded this historic highway in 2005. During the current survey, ASM relocated the portion of the highway intersecting the project area. The site condition has worsened since its original recordation due to increased traffic of heavy machinery for dam improvements.

***P8. Recorded by:** (Name, affiliation, and address)
Brian Williams
ASM Affiliates, Inc.
2034 Corte del Nogal
Carlsbad, CA 92011

***P10. Survey Type: (Describe):**
Intensive Pedestrian

***P11. Report Citation:**
Arleen Garcia-Herbst, David Iversen, Brian Williams and Don Laylander
2009 *Class III Inventory of the Cultural Resources along the Approved San Diego Gas & Electric Sunrise Powerlink Final Environmentally Superior Southern Route, San Diego and Imperial Counties, California*. ASM Affiliates, Inc. Submitted to SDG&E.

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # 37026974
HRI #
Trinomial 17656
NRHP Status Code

Other Listings
Review Code Reviewer Date

*Resource Name or #: Old Foster-Julian Highway # 1

P1. Other Identifier: Old Julian Highway

***P2. Location:** ☒ Not for Publication ☐ Unrestricted ***a. County: San Diego**
and (P2b and P2c or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad:** San Vicente Reservoir **Date:** 1971 **T** 14 South; **R** 1 East; W. 1/2**of** S.W. ¼ and S.W. ¼ of the N.W. ¼ **of Sec** 31; San Bernardino M.D. **B.M.**

c. Address: N/A City: N/A Zip: N/A

d. UTM: Zone. Point A: 11s; 507095 mE/ 3641491mN (G.P.S.). Point B: 11s; 506787 mE/ 3640852 mN (G.P.S.)

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate) Elevation

Running down Foster Canyon south of San Vicente Dam and through the former Foster town site, for approximately ½ mile.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

This site consists of a segment of the old concrete highway that ran from San Diego to Julian prior to the construction of San Vicente Dam. This segment runs through the former Foster town site.

***P3b. Resource Attributes:** (List attributes and codes) HP 37: Highway.

***P4. Resources Present:** ☐Building ☐Structure☐Object ☒Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5a. Photo or Drawing (Photo required for buildings, structures, and objects.)

See continuation sheets

P5b. Description of Photo: (View, date, accession #)

See continuation sheet.

***P6. Date Constructed/Age and Sources:** ☒Historic ☐Prehistoric ☐Both

Early 20th century

***P7. Owner and Address:**
San Diego County Water Authority. 4677 Overland Avenue, San Diego 92123

***P8. Recorded by:** (Name, affiliation, and address)

Stephen Van Wormer
Walter Enterprises
238 Second Avenue
Chula Vista, CA 91910

*P9. Date Recorded: July 2005

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # ____
HRI # ____
Trinomial 17656

Resource Name or #: (Assigned by recorder) **#:** Old Foster-Julian Highway #1

***P10. Survey Type:** (Describe)
Reconnaissance survey.

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")
Supplemental Inventory Report on the Cultural Resources Survey of the San Vicente Emergency Storage Project Revised Maximum Inundation, by Susan M. Hector. ASM Affiliates. 2005.

***Attachments:** ☐NONE ☒Location Map ☐Sketch Map ☒Continuation Sheet ☐Building, Structure, and Object Record ☒Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

DPR 523A (1/95) ***Required Information**

*A1. Dimensions: a. Length: 0.5 miles

Method of Measurement: ☐ **Paced** ☐ **Taped** ☐ **Visual estimate** ☒ **Other:** Measured off map

Method of Determination (**Check any that apply.**): ☐ **Artifacts** ☐ **Features** ☐ **Soil** ☐ **Vegetation** ☐ **Topography** ☐ **Cut bank** ☐ **Animal burrow** ☐ **Excavation** ☐ **Property boundary** ☒ **Other (Explain)**:
Old Concrete Highway approximately 0.5 miles in length.

Reliability of Determination: ☒ **High** ☐**Medium** ☐ **Low** **Explain:** Measured off map.

Limitations (**Check any that apply**): ☒ **Restricted access** ☐ **Paved/built over** ☐ **Site limits incompletely defined** ☐**Disturbances** ☐ **Vegetation** ☐ **Other (Explain):**

A2. Depth: ☒ **None** ☐ **Unknown** **Method of Determination:**
*A3. Human Remains: ☐ **Present** ☑ **Absent** ☐ **Possible** ☐ **Unknown (Explain):**

*A4. Features (**Number, briefly describe, indicate size, list associated cultural constituents, and show location of each feature on sketch map.**):

N/A

*A5. Cultural Constituents (**Describe and quantify artifacts, ecofacts, cultural residues, etc., not associated with features.**):

N/A

*A6. Were Specimens Collected? ☑ **No** ☐ **Yes** (**If yes, attach Artifact Record or catalog and identify where specimens are curated.**)
*A7. Site Condition: ☐ **Good** ☒ **Fair** ☐**Poor** (**Describe disturbances.**): Not maintained

*A8. Nearest Water (**Type, distance, and direction.**): The creek bed. San Vicente Creek flowed regularly before the dam was built in the 20th century.

*A9. Elevation: 453 feet to 532 feet AMSL.

A10. Environmental Setting (**Describe culturally relevant variables such as vegetation, fauna, soils, geology, landform, slope, aspect, exposure, etc.**): Oak Riparian

A11. Historical Information:

This site is associated with the former community of Foster, which was located in this valley during the early 20th century.

*A12. Age: ☐ **Prehistoric** ☐ **Protohistoric** ☐ **1542-1769** ☐ **1769-1848** ☐ **1848-1880** ☐**1880-1914** ☒ **1914-1945** ☐ **Post 1945** ☐ **Undetermined** Describe position in regional prehistoric chronology or factual historic dates if known:

A13. Interpretations (**Discuss data potential, function[s], ethnic affiliation, and other interpretations**):

N/A

 *Resource Name or #: #: Old Foster-Julian Highway # 1

A14. Remarks:

N/A

A15. References (Documents, informants, maps, and other references):

N/A

A16. Photographs (List subjects, direction of view, and accession numbers or attach a Photograph Record.):

See continuation sheet.

Original Media/Negatives Kept at: Walter Enterprises

*A17. Form Prepared by: Stephen R. Van Wormer

Date: 8/22/05

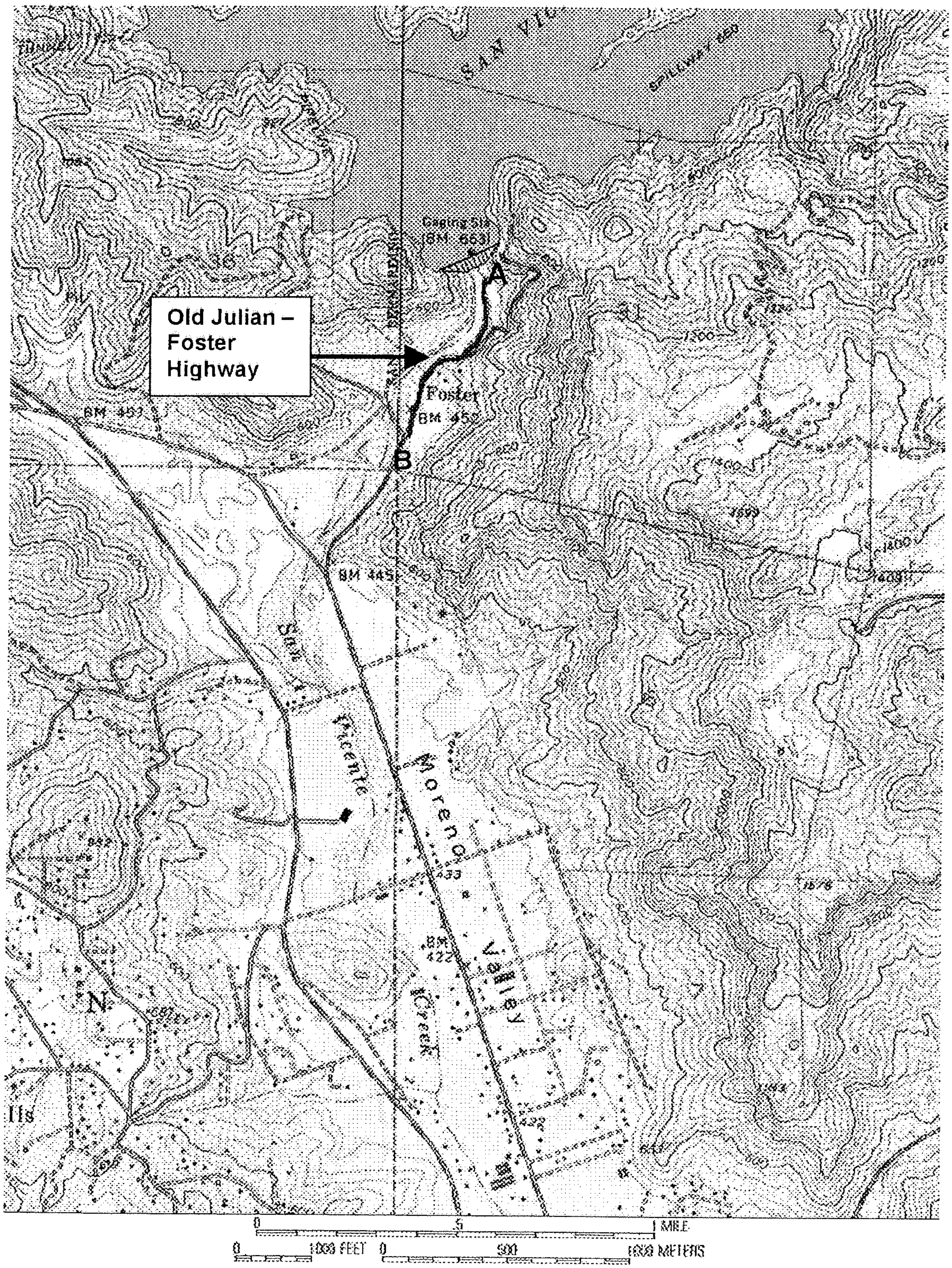
Affiliation and Address: Walter Enterprises
238 Second Avenue
Chula Vista, CA 91910

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary # 37026974
HRI#
Trinomial 17656

Page 5 of 6 *Resource Name or Number: #: Old Foster-Julian Highway # 1



Printed from TOPO! ©2001 National Geographic Holdings (www.topo.com)

State of California — The Resources Agency DEPARTMENT OF PARKS AND RECREATION **CONTINUATION SHEET**	Primary # 37026974 HRI# Trinomial 17656

Page 6 of 6 *Resource Name or # (Assigned by recorder): #: Old Foster-Julian Highway #1

Recorded by: Stephen Van Wormer *Date: July 2005 ☒ **Continuation** ☐ **Update**

State of California — The Resources Agency DEPARTMENT OF PARKS AND RECREATION **PRIMARY RECORD**	**Primary #** P-37-031888 **HRI #** **Trinomial** **NRHP Status Code** 3S
Other Listings ____ Review Code ____	Reviewer ____ Date ____

 ***Resource Name or #:** El Capitan Dam and Reservoir

P1. Other Identifier: : El Capitan Dam and Reservoir

***P2. Location:** ☐ **Not for Publication** ☒ **Unrestricted**

*a. **County:** San Diego

*b. **USGS 7.5' Quads** El Cajon Mountain **Date** 1955; **T**15S; **R** 2E; E ½ **of** NE¼ **of Sec** 7; S.B. **B.M.**

c. **Address:** **City:** Lakeside **Zip:** 92040

d. **UTM: Zone** 11, 517828 **mE/** 3638436 **mN**

e. **Other Location Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate):** The El Capitan Dam is within APNs: 402-070-03 and 402-070-05 and the El Capitan Reservoir is within APNs: 402-070-03, 402-070-05, 402-080-01, 402-080-04, 402-080-05, 402-090-01, 402-150-02, and 402-020-07.

***P3a. Description:** The El Capitan Dam, which dams the San Diego River, is constructed of hydraulic earthen and rock fill and was originally completed in 1934. The dam is owned by the city of San Diego and its primary purpose is to supply drinking water to residents of the city. The dam is approximately 1170 ft. long, 237 ft. high and 26 ft. thick. When full, the reservoir has 1,562 surface acres, a maximum water depth of 197 feet, and 22 miles of shoreline. With a capacity of 112,800 acre ft, El Capitan Reservoir is the largest of all the reservoirs in the city of San Diego reservoir system. The reservoir collects runoff from a drainage area of 190 square miles. However in years of drought water is transferred into the El Capitan Reservoir from the San Vicente Reservoir or the First San Diego Aqueduct. Water passes from the reservoir through the El Capitan Dam into the El Capitan pipeline, which leads to a filtration system. A poured concrete spillway is located to the north of the main dam. The spillway and the dam are cut into the side of the hillside. The dam and reservoir retain good integrity.

***P3b. Resource Attributes:** HP 21 Dam and HP 22 Reservoir

***P4. Resources Present:** ☐ Building ☒ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐

P5a. Photograph or Drawing (See continuation page)

P5b. Description of Photo:
020.jpg, 9/21/2009, Overview of 402-080-01 El Capitan Dam and Reservoir, facing west.

***P6. Date Constructed/Age and Sources:**
☒ Historic ☐ Prehistoric ☐ Both
Constructed in 1934.
San Diego County Assessor Office

***P7. Owner and Address:**
City of San Diego, Property Department
202 C Street
San Diego, CA 92101

***P8. Recorded by:**
Michelle Dalope and Shelby Gunderman
ASM Affiliates, Inc.
2034 Corte del Nogal
Carlsbad, CA 92011

***P9. Date Recorded:** September 21, 2009

***P10. Survey Type:** Intensive-level survey

***P11. Report Citation:** Sinéad Ní Ghabhláin, Michael P. Pumphrey, Sarah Stringer-Bowsher, and Shelby Gunderman (2010), *Assessment of Indirect Visual Impacts on the Historic Built Environment Properties within the Area of Potential Effect of the Approved San Diego Gas & Electric Sunrise Powerlink Final Environmentally Superior Southern Route, San Diego and Imperial Counties, California.* ASM Affiliates, Inc. Submitted to San Diego Gas and Electric and the Bureau of Land Management.

***Attachments:** ☐ NONE ☐ Location Map ☒ Sketch Map ☒ Continuation Sheet ☒ Building, Structure, and Object Record ☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record ☐ Artifact Record ☐ Photograph Record ☐ Other (List):

***NRHP Status Code** 3S

***Resource Name or #** El Capitan Dam and Reservoir

B1. Historic Name: El Capitan Dam and Reservoir
B2. Common Name: Same
B3. Original Use: Dam and Reservoir B4. Present Use: same
***B5. Architectural Style:** Hydraulic fill dam
***B6. Construction History:** The dam and reservoir were constructed in 1934.
***B7. Moved?** ☒No ☐Yes ☐Unknown **Date:** **Original Location:**
***B8. Related Features:** Dam, reservoir, and pipeline of the El Capitan Dam and Reservoir. There is also a utilitarian ancillary building located approximately 800 ft northeast of the dam (See DPR Form for APN 402-070-05).
B9a. Architect: Hiram Newton Savage (Engineer) b. Builder: unknown
***B10. Significance: Theme:** Community Development **Area:** San Diego County
Period of Significance: 1934 **Property Type** Hydraulic earthen and rock fill dam **Applicable Criteria:** A/1
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Since 1934, El Capitan Reservoir has been a key component in the City of San Diego's water storage system. This water storage system made possible the rapid development of the City of San Diego during the 1940s and later. The dam and reservoir retain good integrity. El Capitan Dam and Reservoir is recommended eligible for the NRHP and CRHR under Criterion A/1 for the key role it played in providing drinking water to the City of San Diego. The period of significance is 1934.
El Capitan was a hybrid dam type, constructed with a hydraulic earthen and rock fill. The dam also featured a steel core for additional strength. At a height of 240 ft., El Capitan dam was one of the highest dams of its type in the world. The reservoir had a maximum capacity of 112,000 acre-feet (38 billion gallons) and was capable of adding 10 million gallons of water daily to the city's water supply, sufficient for an additional 100,000 people. Construction was completed at a total cost of $5,790,000. By the time El Capitan reservoir was built, the city of San Diego owned or controlled five major reservoirs: Morena and Barrett in the Tijuana drainage basin; Upper and Lower Otay in the Otay River basin; and Lake Hodges in the San Dieguito River Basin. These reservoirs had a combined storage capacity of 67 billion gallons, sufficient to supply San Diego with water for five years. The construction of El Capitan reservoir in the San Diego River drainage basin added 39 billion gallons of water storage, providing a total capacity of 106 billion gallons. Once completed El Capitan, was the largest and most important of the reservoirs and the capstone in the city's water conservation program.

B11. Additional Resource Attributes: (List attributes and codes)
***B12. References:**

California Department of Water Resources
2009 Dams within the jurisdiction of the State of California. http://www.water.ca.gov/damsafety/docs/Juris(A-G)1.pdf

City of San Diego
n.d. Reservoirs: El Capitan Reservoir. Water Department. http://www.sandiego.gov/water/recreation/elcap.shtml
2004 Surface Water Supply, Baseline Assessment, San Diego River Watershed Management Plan. http://www.projectcleanwater.org/pdf/sdr/baseline/section5.pdf

Kuhn, Joseph E
1935 El Capitan, Newest Reservoir Will Add Millions of Gallons to Safe Yield for Daily Use. *San Diego Union*. 4/28/1935.

USGS
2009 Feature Detail Report for: El Capitan Lake. U.S. Department of the Interior. http://geonames.usgs.gov/pls/gnispublic/f?p=gnispq:3:3170401069015086::NO::P3_FID:271028

***B14. Evaluator:** Michael Pumphrey, M.Arch, M.P.S.
ASM Affiliates, Inc.
***Date of Evaluation:** November 23, 2009

(This space reserved for official comments.)

(Sketch Map with north arrow required.)

See attached

State of California — The Resources Agency DEPARTMENT OF PARKS AND RECREATION **CONTINUATION SHEET**	**Primary #** P-37-031888 **HRI #** **Trinomial**

Page 3 **of** 5 **Resource Name or #** **El Capitan Dam and Reservoir**
***Recorded by:** Michelle Dalope and Shelby Gunderman ***Date** 9/21/09 ☒ Continuation ☐ Update

P5a. Photograph or Drawing

P5b. Description of Photo: 025.jpg, 9/21/2009, Overview of El Capitan Dam and Reservoir, facing west.

P5a. Photograph or Drawing

P5b. Description of Photo: 027.jpg, 9/21/2009, Overview of El Capitan Dam, facing north.

P5a. Photograph or Drawing

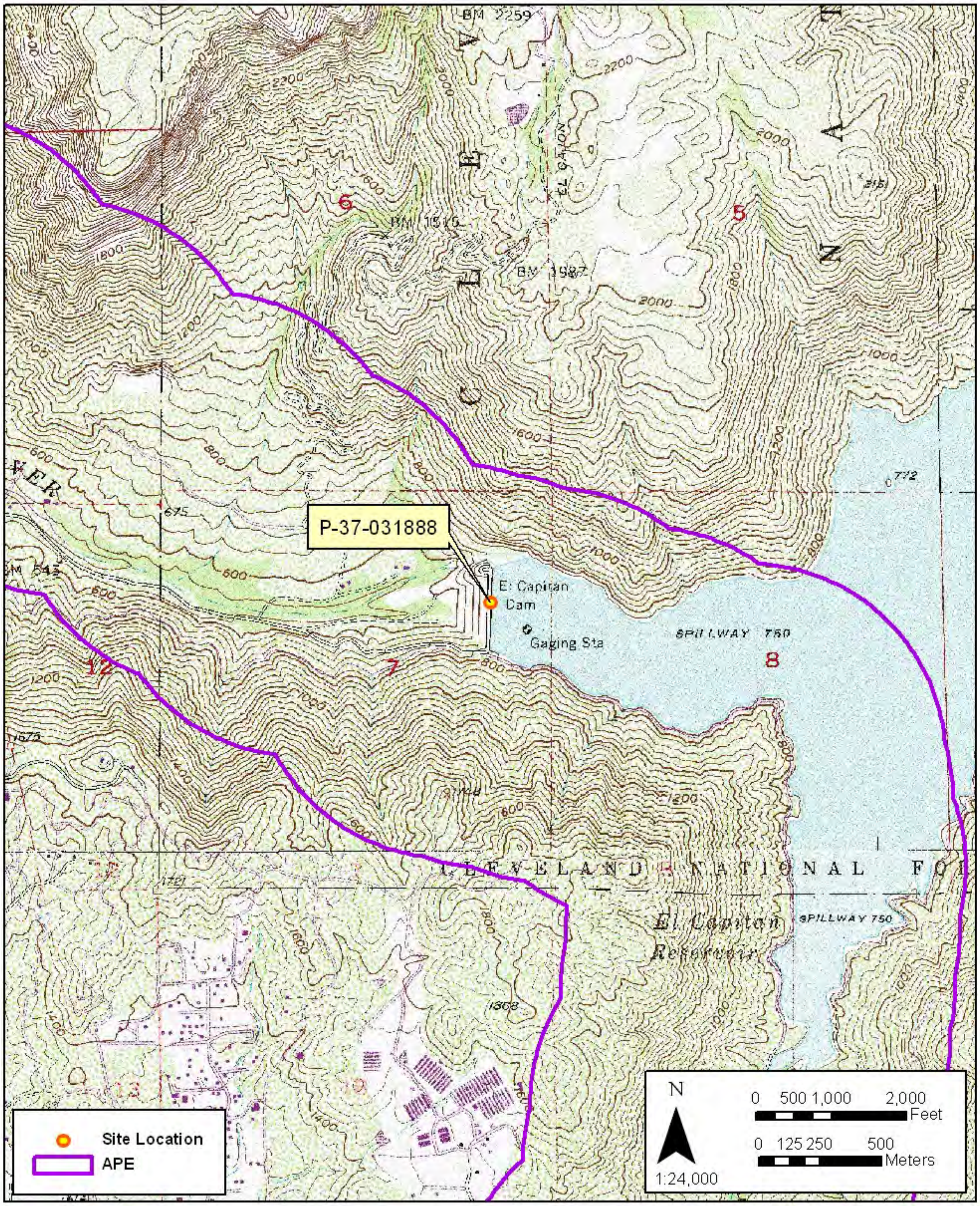
P5b. Description of Photo: 001.jpg, 11/12/2009, Close up of the spillway adjacent to the northern end of El Capitan Dam, facing north east.

LOCATION MAP

Primary # P-37-031888
HRI #
Trinomial

Resource Name or # El Capitan Dam and Reservoir

Map Name: USGS El Cajon Mountain **Scale:** 1:24000 **Date of Map:** 1997



 *Required information

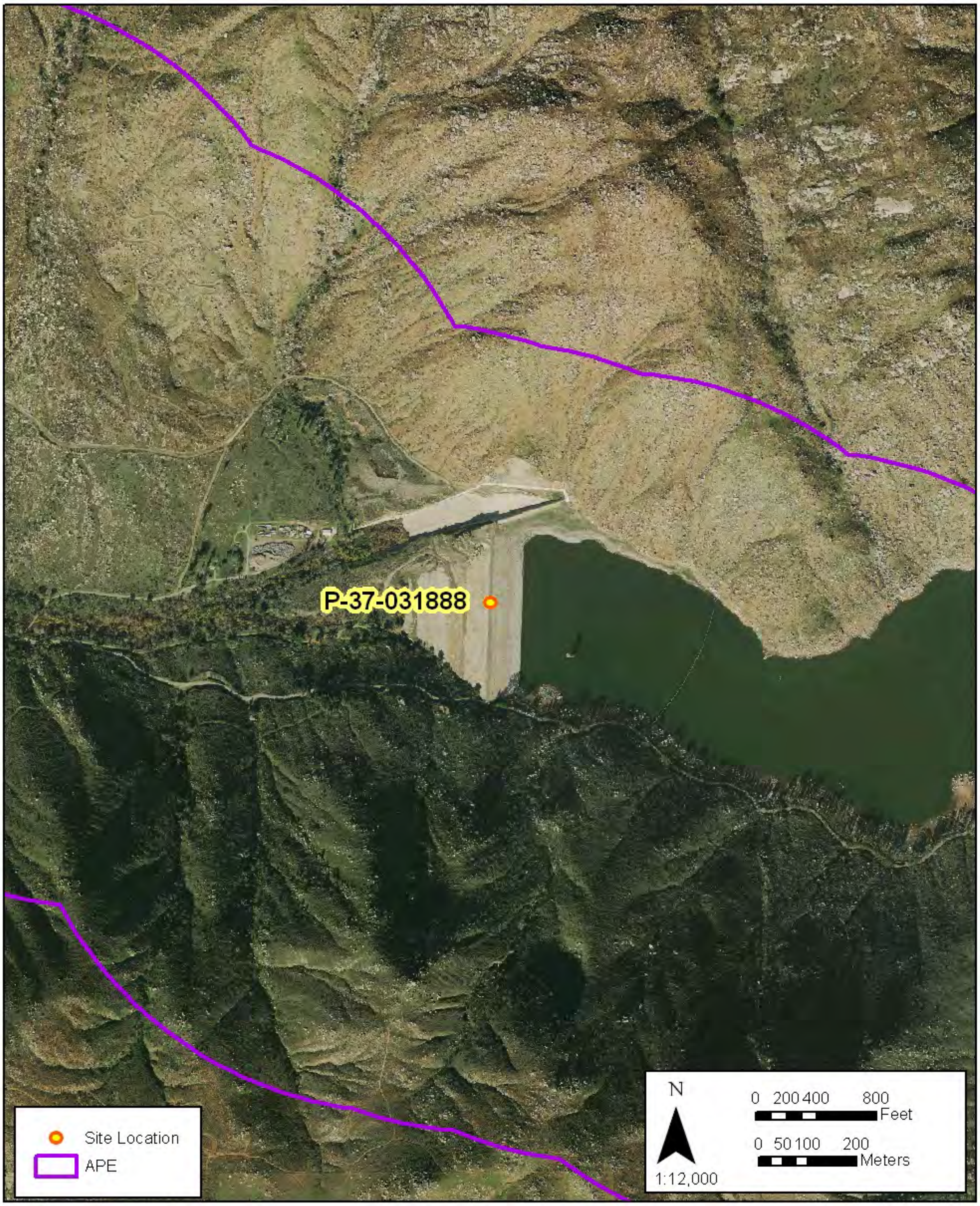
State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary # P-37-031888
HRI #
Trinomial

***Resource Name or #:** El Capitan Dam and Reservoir

Drawn by: Nick Doose

Date: 2011



*Required information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # P-37-031889
HRI #
Trinomial
NRHP Status Code 6Z

Other Listings
Review Code Reviewer Date

 ***Resource Name or #: 402-070-05**

P1. Other Identifier:
***P2. Location:** ☐ **Not for Publication** ☒ **Unrestricted**
*a. **County:** San Diego
*b. **USGS 7.5' Quad** El Cajon Mountain **Date** 1997; **T**15S; **R** 2E; NW¼ **of** NE¼ **of Sec** 7; S.B. **B.M.**
c. **Address:** El Monte Road **City:** Lakeside **Zip:** 92040
d. **UTM: Zone** ____, ______________ **mE/** _____________ **mN**
e. **Other Location Data:** APN: 402-070-05.

***P3a. Description:** This utilitarian building is wood framed with a rectangular ground plan, wooden cladding and a corrugated metal side gabled roof. A shed roofed entrance way extends out of the primary façade. No windows are present. The building is located adjacent to the El Capitan dam, which is immediately to the east.

***P3b. Resource Attributes:** HP 4 Ancillary building

***P4. Resources Present:** ☒ Building ☐ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5a. Photograph or Drawing

P5b. Description of Photo:
028.jpg, 9/21/2009, Overview of 402-070-04, facing west.

***P6. Date Constructed/Age and Sources:**
☒ Historic ☐ Prehistoric ☐ Both
Pre-1953
United States Department of Agriculture – 1953 Historic Aerial

***P7. Owner and Address:**
United States of American

***P8. Recorded by:**
Michelle Dalope and Shelby Gunderman
ASM Affiliates, Inc.
2034 Corte del Nogal
Carlsbad, CA 92011

***P9. Date Recorded:** September 21, 2009

***P10. Survey Type:** Historic Building Survey – Intensive

***P11. Report Citation:** Sinéad Ní Ghabhláin, Michael P. Pumphrey, Sarah Stringer-Bowsher, and Shelby Gunderman (2010), *Assessment of Indirect Visual Impacts on the Historic Built Environment Properties within the Area of Potential Effect of the Approved San Diego Gas & Electric Sunrise Powerlink Final Environmentally Superior Southern Route, San Diego and Imperial Counties, California.* ASM Affiliates, Inc. Submitted to San Diego Gas and Electric and the Bureau of Land Management.

***Attachments:** ☐ NONE ☐ Location Map ☐ Sketch Map ☐ Continuation Sheet ☒ Building, Structure, and Object Record ☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record ☐ Artifact Record ☐ Photograph Record ☐ Other (List):

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
BUILDING, STRUCTURE, AND OBJECT RECORD

Primary # P-37-031889
HRI #

***NRHP Status Code** 6Z

***Resource Name or # 402-070-05**

B1. Historic Name: None
B2. Common Name: None
B3. Original Use: Utilitarian building
B4. Present Use: Same
***B5. Architectural Style:** Utilitarian
***B6. Construction History:** Unknown construction date.

***B7. Moved?** ☒**No** ☐**Yes** ☐**Unknown** **Date:** **Original Location:**
***B8. Related Features:** none

B9a. Architect: Unknown
b. Builder: Unknown
***B10. Significance:** **Theme:** None **Area:** San Diego County
Period of Significance: **Property Type:** Utilitarian Building **Applicable Criteria:**
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

This building is recommended not eligible to the NRHP and the CRHR as it is neither historically nor architecturally significant. It is not associated with any important events or individuals in terms of local, state or national history. Moreover, it does not embody the distinctive characteristics of a type, period or method of construction, nor does it represent the work of a master architect or craftsman.

B11. Additional Resource Attributes:

***B12. References:**

McAlester, Virginia and Lee McAlester
2000 A Field Guide to American Houses. Alfred A. Knopf: New York.

***B14. Evaluator:** Michael Pumphrey, M.Arch, M.P.S.
ASM Affiliates, Inc.

***Date of Evaluation:** October 16, 2009

(Sketch Map with north arrow required.)

(This space reserved for official comments.)

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # P-37-037080
HRI #
Trinomial
NRHP Status Code 3S/3CS/5S3

Other Listings
Review Code **Reviewer** **Date**

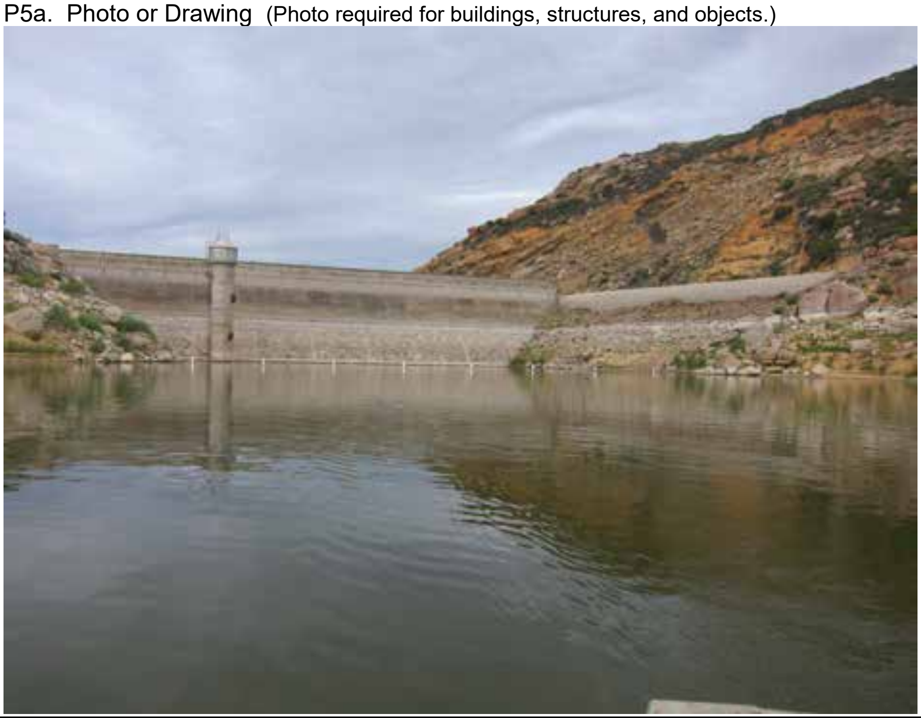
 ***Resource Name or #:** Morena Dam and Outlet Tower

P1. Other Identifier:
***P2. Location:** ☐ **Not for Publication** ■ **Unrestricted** ***a. County:** San Diego
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad:** *Morena Reservoir* **Date:** 1960 P.R. 1982 **T** 17 S; **R** 4 E; NW **¼ of** NE **¼ of Sec** 23**;** S.B. **B.M.**
c. Address: City: Zip:
d. UTM: NAD 83 Zone: 11S ; 542431.45 mE/ 3616525.37 mN (G.P.S.) Google Earth
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate) Elevation: 3001-3053 feet above mean sea level. APN: 6030800600. The subject property is located in the Morena Reservoir in unincorporated San Diego County in the Morena Village community of Campo, just north of Morena Butte and Houser Canyon.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
The Morena Dam is located in a canyon 80 feet wide, with side slopes in the solid granite rising at a 45-degree angle. The dam is a loose rockfill structure with a concrete masonry water face. The crest measures 550 feet wide with a 20-foot-thickness at the coping. The dam sits 171 feet above the streambed (to the top of the parapet wall). The existing parapet wall is approximately 4 feet high (above the crest) and contains a series of evenly spaced wide concrete block columns that span the top of the wall. The parapet wall (constructed in 1930) is reinforced with metal spacer bars and wall anchors. The upstream face of the dam is composed of 6- to 10-ton blocks of rubble granite set in concrete mortar, and is constructed on a slope of 9 horizontal to 10 vertical. Reinforced concrete slabs (approximately 1.5 feet thick) are attached to the solid masonry with iron rods and make up the upper water face of the dam. The rock fill portion of the dam (the lower 120 feet) consists of hand-placed derrick and crevices chinked with small stones. A concrete cut-off wall extends 112.5 feet below the streambed, making the total height of the dam (including the portion below the streambed) 283.5 feet. Documented alterations to the dam face include raising the crest 5 feet in 1917, raising the crest an additional 10 feet in 1923 by placing a 15-foot-thick layer of loose rock on the downstream face from the berm to the crest, and raising the dam another 4 feet in 1930 by adding a 6-foot thickness to the downstream face from the berm to the crest and raising the parapet wall vertically (see Continuation Sheet page 4).

***P3b. Resource Attributes:** (List attributes and codes) HP11. Engineering Structure; HP21. Dam; HP22. Reservoir
***P4. Resources Present:** ☐Building ■Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5a. Photo or Drawing (Photo required for buildings, structures, and objects.)



P5b. Description of Photo: (View, date, accession #)
Overview of Morena Dam, Outlet Tower and spillway; view to west; 6/29/15; IMG_4919.

***P6. Date Constructed/Age and Sources:** ■Historic ☐Prehistoric ☐Both
1912 (San Diego Public Utilities Department)

***P7. Owner and Address:**
City of San Diego
535 B Street, Suite 750, MS 908A
San Diego, CA 92101

***P8. Recorded by:** (Name, affiliation, and address)
Samantha Murray and Salli Hosseini
Dudek
605 Third Street
Encinitas, CA 92024

***P9. Date Recorded:** 6/29/2015

***P10. Survey Type:** (Describe) Intensive

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") *Cultural/Historical Resource Technical Report: Morena Reservoir Outlet Tower Replacement Project, Lake Morena Village, San Diego County, California, Services R-308078 Task Order No. 30.* Prepared by Dudek 2015.

***Attachments:** ☐NONE ■Location Map ☐Sketch Map ■Continuation Sheet ■Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

Primary #
HRI# P-37-037080
Trinomial

LOCATION MAP

***Resource Name or #:** Morena Dam and Outlet Tower

***Map Name:** *Morena Reservoir*, CA ***Scale:** 1:24,000 ***Date of Map:** 1960, P.R. 1982

BUILDING, STRUCTURE, AND OBJECT RECORD

 ***NRHP Status Code** 3S/3CS/5S3

***Resource Name or #** (Assigned by recorder) Morena Dam and Outlet Tower

B1. Historic Name: Morena Dam and Outlet Tower
B2. Common Name: Morena Dam and Outlet Tower
B3. Original Use: dam and outlet tower B4. Present Use: dam and outlet tower
***B5. Architectural Style:** n/a (loose rockfill construction)
***B6. Construction History:** (Construction date, alterations, and date of alterations) Construction of the Morena Dam occurred in two phases (1896-1898 and 1909-1912) with construction of both the dam and outlet tower reaching completion in 1912. Documented alterations to the dam face include raising the crest 5 feet in 1917, raising the crest an additional 10 feet in 1923 by placing a 15-foot-thick layer of loose rock on the downstream face from the berm to the crest, and raising the dam another 4 feet in 1930 by adding a 6-foot thickness to the downstream face from the berm to the crest and raising the parapet wall vertically. Documented alterations to the dam spillway include removing the original gate structures and trash racks in 1917; raising the spillway crest and increasing its length in 1923; installing 22 automatic gates and lengthening the channel to 312 feet in 1930; and enlarging the spillway, raising the crest an additional 2 feet, and removing the gate structures in 1946. Documented alterations to the exterior of the outlet tower include removal of the original steel pedestrian footbridge that accessed the outlet tower from the south side of the reservoir (exact date unknown, but post-1948), and addition of the cupola, including an exterior staircase with pipe railings (1930). It is also known that various internal alterations have occurred, likely associated with routine maintenance of the tower and its equipment (specifics unknown).
***B7. Moved?** ■No ☐Yes ☐Unknown **Date:** **Original Location:**
***B8. Related Features:** Morena Reservoir
B9a. Engineer: Michael Maurice O'Shaughnessy b. Builder:
***B10. Significance: Theme:** Regional Water Development **Area:** San Diego
Period of Significance: 1896-1946 **Property Type:** Dam/Engineering Structure **Applicable Criteria:** A/1, B/2, C/3
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

After struggling with the question of water for many months, the City of San Diego reached a unanimous decision on March 16, 1896, to adopt a resolution that would approve the SCMWC's proposition to construct the Morena Dam and its associated system. The agreement included construction of the dam, a conduit to the City, and a distribution system for a cost of $1.5 million. However, the measure had to meet the approval of San Diego voters (San Francisco Call 1896a). Three months later, more than two-thirds of voters approved building the new water system, which would bring in 1,000 inches (13 million gallons) of water from the mountains daily.

SCMWC president E.S. Babcock and partners John D. Spreckels and Adolph B. Spreckels (the Spreckels Brothers) received celebratory cheers from a "howling mob" when the election results were announced on June 27, 1896. At the Hotel del Coronado, which Babcock and J.D. Spreckels helped build, employees carried Babcock on their shoulders while fireworks, bonfires, and brass bands on the plaza led a large crowd to the beach to join in the celebration. After a 4-year battle with the San Diego Flume Company (the owner of the City's water system at the time), including numerous allegations of corruption, the City finally found itself free from a monopoly and gained sole ownership of a new water system. "The citizens generally regard this as the turning point in San Diego's career and are simply beside themselves" (San Francisco Call 1896b). **See Continuation Sheet page 4**.

B11. Additional Resource Attributes: (List attributes and codes)

***B12. References:** See Continuation Sheet page 13

B13. Remarks:

***B14. Evaluator:** Samantha Murray and Salli Hosseini

***Date of Evaluation:** 6/29/2015

(This space reserved for official comments.)

Source: Google Earth 2015

P3a. Description (Continued): The dam's concrete spillway is an ungated ogee crest type located on the north side of the dam. The spillway has a capacity of 25,000 cubic feet per second at the dam crest. The crest of the concrete spillway is 155 feet above the streambed, extends 312 feet upstream from the north section of the dam, and discharges through a channel. The length of the spillway channel is 317 feet. Documented alterations to the spillway include removing the original gate structures and trash racks in 1917; raising the spillway crest and increasing its length in 1923; installing 22 automatic gates and lengthening the channel to 312 feet in 1930; and enlarging the spillway, raising the crest an additional 2 feet, and removing the gate structures in 1946.

The cylindrical Morena Outlet Tower measures 15.5 feet in external diameter with walls varying in thickness from 20 to 36 inches and a maximum height of 172 feet. The top of the concrete tower features a reinforced concrete operating deck that regulates the outer gates, and a steel-reinforced cupola with an exterior staircase with pipe railing at the very top. The gates were manufactured by the Coffin Valve Company and were of sluice type with vertical stems controlled by guides. Each gate contains a screen cover to keep trash and other debris from entering into the 24-inch-diameter circular cast-iron pipes. The pipes run through the walls of the tower and connect with a 30-inch-diameter vertical down-pipe that discharges into the tunnel. The tunnel, measuring 387 feet long, 8 feet wide, and 7.5 feet high, was built through the solid bedrock on the south side of the dam at a 30-foot contour. It is lined with concrete and connects to the base of the outlet tower. The tunnel draws water from the reservoir by means of the reinforced concrete outlet tower structure (O'Shaughnessy 1913). Documented alterations to the exterior of the outlet tower include removal of the original steel pedestrian footbridge that accessed the outlet tower from the south side of the reservoir (exact date unknown, but post-1948), and addition of the cupola, including an exterior staircase with pipe railings (1930). It is also known that various internal alterations have occurred, likely associated with routine maintenance of the tower and its equipment (specifics unknown).

***B10. Significance (Continued):**

Phase I Dam Construction (1896–1898)

Preparation for the Morena Dam project began on June 29, 1896. Babcock consulted with his engineers at the Hotel del Coronado and issued orders for two corps of engineers to head into the field that week. Bids were called to freight the tons of cement, lumber, machinery, and other materials required for construction to the dam site, and the SCMWC asked for use of 400 horses and 100 wagons. With high expectations that voters would approve the bonds for the new water system, Babcock had already ordered a complete Ledgerwood cable and trolley system to haul large quantities of rock (San Francisco Call 1896c). Roads had to be cut through the Laguna Mountains to reach the Morena Dam site.

Construction was also underway on both the Lower Otay and Barrett Dams, two other projects overseen by Babcock (San Francisco Call 1896d). The system's total drainage area consisted of 375 square miles, including 119 miles for Lower Otay, 121 miles for Barrett, and 135 miles for Morena. The Lower Otay Reservoir would impound 13,766,328,500 gallons, Barrett 15,630,000,000 gallons, and Morena Dam 15,227,000,000 gallons. All three dams were to be constructed by a rock-fill pattern. This was found to be preferable to solid masonry structures in consideration of earthquakes. Rockfill dams were more likely to settle than collapse in response to an earthquake.

Water for the Morena Reservoir would be supplied by Cottonwood Creek, fed by the Metaguaguat Creek, Laguna Creek, and other creeks. Cottonwood Creek flowed past the dam site as an ice-cold stream supplied by snow melt from the high-range Laguna Mountains. The water quality was said to be "as pure as can be obtained from nature" (San Francisco Call 1896e).

The Morena Dam site was located in a narrow gorge between two 3,000-foot-high granite precipices. Camps of men worked to clear ground and build roads amidst a mass of huge granite boulders. Babcock and then Chief Engineer Lew B. Harris explored the narrow 60-foot-deep cave at the dam site, which was surrounded by immovable, exposed bedrock boulders. This natural formation of solid bedrock at the site of where the dam was to be constructed was seen as a great advantage to the engineer. The plan was to use dynamite to blow up the mass of boulders, allow the broken pieces of bedrock to settle into the dam site, and fill in the spaces between the rocks with concrete (San Francisco Call 1896e). On December 26, 1896, 100,000 pounds of black and giant powder were used all at once to successfully blast 150,000 tons of rock into the gorge below the heel of the dam (San Francisco Call 1896f). More blasts were completed in March and August 1897 to complete the job of displacing the enormous granite boulders.

A masonry wall extending 30 feet above the stream bed was the only portion of the dam constructed during the first phase, which began in 1896. Upon suspension of the project, out of a total of 306,000 cubic yards required to complete the dam to the prescribed plan, only approximately 120,000 cubic yards of rock fill had been placed (Engineering News 1913). Original handwritten project notes on file with the City of San Diego Public Utilities Department indicate that the dam's masonry toe wall was constructed in just 18 days using amateur builders and without the services of an engineer.

A report written by City Engineer Edwin M. Capps (December 3, 1896) following an inspection of the toe wall in November reported the following: "The upper thirty-five (35) feet of this wall is, in my opinion, very defective. This portion of the wall was constructed without the supervision of a civil engineer or a competent person, and was determined to be defective" (Capps 1896). The report goes on to state that the toe wall was found to have a number of serious leaks and numerous seams consisting of decomposed granite with patches of earth and rotting vegetation. Patches of gunny sack had been found rammed into the seams either to prevent water from coming through or to conceal the bad seams. Capps also reported that when the wall was tested with 1 to 30 feet of water pressure, it resulted in gushing leaks (the final wall would need to be able to withstand 150 to 185 feet of pressure). Capps concluded his report stating, "I attribute this faulty work, not to a desire of Mr. Babcock to do poor work or to curtail in cement, but solely to a zealous desire to complete the work before the winter rains, and from an over confidence in his own ability and that of his foreman" (Capps 1896).

Interestingly, a newspaper article published just 1 month later titled "Capps is Satisfied" quoted Capps as saying "when I left Morena, yesterday morning, the condition of the dam and the work being done there was entirely satisfactory, so far as I am concerned. If the work continues according to specifications, I have nothing further to say" (San Diego Union 1897).

A second inspection conducted in 1897 revealed that Capps did indeed have more to say. Specifically, that he was not at all satisfied with the work being conducted on the Morena Dam. In a follow-up report (dated September 30, 1897), Capps stated that nothing had been done to address the leaks in the toe wall, although Babcock had corrected some of the more serious defects in the seams at great expense. Excavations along the end of the masonry toe wall revealed that it was not resting on solid bedrock in some portions. The report goes on to discuss numerous deviations from the original plan specifications. It also stated that the SCMWC should provide a complete set of plans and specifications that reflect all of the proposed changes and deviations from the original plans. Capps also cited a major safety issue relating to the placing of loose stones that back the wall and are meant to be completely rigid to prevent the wall from moving. Capps expressed concern that if not placed properly, these stones could create instability in the entire dam and result in a wash-out or other disaster. Capps concluded his report by advising the City Council not to accept any portion of the work until after the dam is complete and passes a test under a full reservoir head of water (Capps 1897).

On October 9, 1897, the City Council voted unanimously to stop all work on the Morena Dam after reviewing Capps report (Los Angeles Times 1897). Original project notes on file with the City of San Diego Public Utilities Department indicate that because of Babcock's deviation from the plans and specifications agreed upon in the contract, and a lack of written agreement to remedy the issues, construction of Morena Dam was officially ordered to be stopped in 1898.

Phase II Dam Construction (1909–1916)

Construction of the Morena Dam resumed in May 1909, under the supervision of civil engineer Michael Maurice O'Shaughnessy. O'Shaughnessy was noted to be "one of the foremost engineers in the west" had been hired as chief engineer on the Morena Dam by the SCMWC (Los Angeles Herald 1910). J.S. Maloney served as the resident engineer and superintendent, assisted by R. Wueste and R.P. McIntosh (Fowler 1953; O'Shaughnessy 1913). Approximately 95 men were employed during the second phase of construction, and the work was noted to be "peculiarly" free from accidents due to the much-improved level of supervision on site (O'Shaughnessy 1913:111). The first phase of dam construction had several accidents, some of which resulted in serious injury and even death.

The second phase of construction involved the use of two Ledgerwood (sometimes called Lidgerwood) cableways, which were operated from towers hovering 300 feet above the streambed. The lower slope of the dam was serviced by a 1,350-foot-long fixed cable, and the water slope of the dam was serviced by a second cable measuring 1,100 feet long and mounted to moveable trucks. Each cable was capable of handling loads of up to 12 tons. The track trolley cable could be moved into a new position in a couple hours, allowing for a solution for moving stone from the quarries directly to the dam site where it was re-handled by derricks for completion of face-masonry and back-filling.

Under O'Shaughnessy's direction, design of the Morena Dam took a new direction. On August 30, 1909, another powder blast was exploded electrically to displace approximately 180,000 tons of granite rock to make way for the new dam work. O'Shaughnessy decided to change the dam's upper slope, from the top of the completed toe wall up to the 120-foot contour, to nine horizontal to 10 vertical, and make it, from the 120-foot contour to the top of the dam (150 feet) 1.2 horizontal to 1 vertical. Additionally, the character of the work done during the initial phase was altered by placing large masonry blocks of roughly dressed granite, from 5 to 10 tons selected from the rock piles, on the upstream face of the dam. These rocks were set in a mortar composed of cement and sand. To provide consistent support for the roughly 7-foot masonry skin, smaller stones were placed by hand and derrick for approximately 50 feet back from the face. Numerous men were employed to complete this work on the face of the dam, instructed to remove the sharp edges of the flat stones and chink in the cavities with broken rock.

The top of the dam was 16 feet wide and was capped with a 3-foot thick concrete coping to provide for wave wash. To provide for future extensions in raising the dam, the back slope was changed to 1.5 horizontal to 1 vertical with a berm of 21 feet at the 100-foot contour. This berm was created by altering the face slopes, which was originally designed to have a flatter water slope. Furthermore, a large part of the old fill located behind the toe wall was torn out, and all objectionable materials placed during the initial construction period were removed and replaced with clean, well-placed rock fill. A small slot measuring 1 foot wide by 5 feet deep was left in the original toe wall to support new reinforced concrete facing. The new dam materials provided a water-tight skin for the face of the dam, which kept the rock-fill clear of any soil or silt that could cause leaks (O'Shaughnessy 1913).

The Morena Dam spillway was cut out of the north side of the granite canyon wall and constructed with a 60-foot-wide channel measuring 5 feet deep with a 120-foot-wide entrance. Excavation for the Morena Dam was planned so that materials from the spillway excavation could be incorporated into the dam structure. The entrance to the spillway was controlled by 12 radial gates measuring 8.5 feet wide by 6 feet high. These gates were later removed from the spillway following the 1916 floods.

The Morena Outlet Tower was completed during the second construction phase in 1912 over the upstream portal of the outlet tunnel (Fowler 1953). The tower measures 15.5 feet in external diameter with walls varying in thickness from 20 to 36 inches and a height of 155.5 feet. The top of the concrete tower features a reinforced concrete operating deck that regulates the outer gates. Including the concrete rim at the top, the tower measured 160.5 feet when first built. A steel cupola was added at a later date. The gates were manufactured by the Coffin Valve Company and were of sluice type with vertical stems controlled by guides. The base of the tower connects to a tunnel that was built through the solid bedrock on the south side of the dam at a 30-foot contour (O'Shaughnessy 1913).

A historical reference concerning the design and construction of dams (Wegmann 1908) reveals that in typical dam construction, the outlet from the reservoir is controlled by sluice gates, valves, or stop-planks placed in a gate house, valve tower, or, in the case of Morena Dam, a circular outlet tower. Dams with a masonry toe-wall, like Morena, typically construct the outlet tower at the up-stream face of the wall. If the dam is constructed of earthen rocks, the outlet tower is placed near the toe of the inner slope and access to it is obtained by means of a foot bridge. For reservoirs with considerable water depth, the outlet tower is constructed of masonry. In cases such as the Morena Outlet Tower, the inlet openings consist of pipes embedded in the masonry and controlled by stop-cocks, sluice gates, flap valves, or poppet valves operated from the top of the tower.

Historic photographs of the outlet tower indicate that it also had a pedestrian footbridge leading from the southern side of the canyon to a ladder on the south side of the tower. This bridge is known to have been in place from 1912 to at least 1948. It is not known when the bridge was removed. The concrete footings of the bridge are still in place on the southern side of the canyon. There was also a boat dock located in the reservoir near the face of the dam just north of the outlet tower. No additional information was uncovered concerning the boat dock.

Subsequent Alterations (1916–1946)

To meet the changing needs of water capacity, the Morena Dam and its associated infrastructure have been subject to various alterations over the years. Following the scare of the 1916 floods, the crest of the Morena Dam was raised 5 feet in 1917, and the gate structures and trash racks were removed from the spillway (Fowler 1953).

In 1923, the Morena Dam received additional alterations under supervision of the City's Hydraulic Engineer H.N. Savage. The dam was raised an additional 10 feet (to a maximum height of 166 feet) in 1923 by placing a 15-foot-thick layer of loose rock on the downstream face from the berm to the crest. The spillway crest was also raised and its length increased (Fowler 1953).

In 1930, the dam, spillway, and safe duty were upsized, with H.N. Savage once again functioning as the engineer in charge. The dam was raised an additional 4 feet by adding a 6-foot thickness to the downstream face from the berm to the crest and raising the parapet wall vertically (City of San Diego 2013; Fowler 1953). Also, 22 automatic gates were installed on the side channel spillway, lengthening the spillway to 312.5 feet (City of San Diego 1928; Fowler 1953). The outlet tower cupola was also added at this time. Originally, the maximum height of the tower was 160.5 feet. A steel cupola was added that included an exterior staircase and pipe railings at the very top, increasing the tower's total height to 172 feet.

In 1946, the spillway was enlarged under supervision of hydraulic engineer Fred D. Pyle. This included raising the spillway crest an additional 2 feet to 3,039.4 feet above sea level (City of San Diego 2013). Also in 1946, the gate structures were removed to allow the free passage of flood flows (Fowler 1953).

Recreation at Morena Reservoir (1970–Present)

In 1970, through a desire to increase the recreational opportunities for San Diego residents, the County and City of San Diego entered into an agreement in which the County of San Diego purchased the Lake Morena Reservoir site from the City. The City owned Morena Reservoir, composed of 3,250 acres of land and extensive water rights in the basin, draining into Morena Reservoir as impounding water to supply the City's need. As part of the contract, the County of San Diego agreed to construct, operate, and maintain a fishing area, park, and recreation area at Morena Reservoir (City of San Diego 1970, 1976). The City's goal was to transfer recording issues such as weather, water level, and flow; fire prevention; security; and maintenance of the roads to the dam to the County of San Diego (City of San Diego 1970). A newspaper article (source and date unknown) on file with the City's Public Utilities Department suggests that the 1970 agreement did not include the dam site.

Property Type: Dams

For thousands of years, people have stored water and altered their natural environment to their benefit. The oldest known dams date back to 6,000 years ago in present-day Jordan, where farmers constructed earthen mounds to capture rainfall. Dams are typically constructed to serve three main purposes; to hold back or store water, to produce energy and or to control flooding. And while technological advancements have improved capacity, safety and reduced failures, the design of dams has not deviated from several successful engineering methods (Billington et.al 2005).

With California's long history of locating and maintaining sufficient water sources, it is no coincidence that these efforts have resulted in California being the location of numerous advancements and significant failures in the construction and development of dams. California's earliest dams builders constructed some of the nation's engineering marvels with manual labor and without a strong understanding of the landscape, geologic conditions, or rainfall averages. Since the 1880s, more than 50 dams have been constructed in San Diego County alone.

<u>California Dam Types</u>

Dams are classified in terms of materials and form. In California, dams typically rely on gravity or structural (arch or buttress) resistance and can be part of one of several construction methodologies; rockfill, earthen, masonry and/or concrete. In California, the topography and geology of a region often drives the construction of a dam, resulting in a vernacular design which often does not adhere to one specific method (Corns et., al 1998).

Gravity dams are essentially dams which rely on the force of gravity pulling vertically down on the dam to retain a volume of water and provide resistance against horizontal (water) reservoir pressures. A gravity dam is designed to create as much material (typically concrete) as possible to resist water pressure, and ensure that the dam will not tip over, slide or rupture. Gravity dams are triangular in cross-section, a design that complements the distribution of water pressure. Deeper water puts more pressure on the horizontal plane. Thus, the maximum amount of pressure is located at the base of the dam, while at the surface of the reservoir, there is little pressure. This results in a sturdy structure which can survive weathering and deterioration (Billington et.al 2005).

Unlike gravity dams, which rely on bulk to hold pressure, structural dams use their design and shape rather than sheer bulk to resist pressure. The use of certain forms, such as arches or buttresses can result in a significant reduction in the bulk of the dam's profile and mass. And while there are key distinctions between gravity and structural methodologies, these can be blurred, resulting in a dam which may feature both the mass of a gravity dam and the curvature of a structural dam (Billington et.al 2005). The Sweetwater Dam was an early example of the gravity arch dam, which used the weight of the concrete to hold the structure in place and an arch to direct the water force into the rock abutment on each side of the dam (Hill 2002).

The gravity rockfill dam construction method, implemented either in the form of machine filled or hand-laid cobbles and masonry originated in California in the 1850s during the Gold Rush when miners would use drill and blast techniques to create an abundant supply of rock material for construction. Early rockfill dams (the first major milestone in rockfill dam construction) were small and composed of loosely dumped rockfill with an upstream timber face to slow water seepage. By the mid-1800s the rockfill method was implemented to construct numerous dams throughout California, including some of the tallest in the world. Upstream-facing materials improved with the use of steel and concrete, creating relatively low permeability (Breitenbach 2004).

Rockfill dams can vary significantly in material types; central earth core or sloping earth core and materials including basalt, andesite, sandstone, conglomerate, granite, limestone, and alluvial cobbles. Rockfill construction is an economical method and particularly suitable when there is no satisfactory earth available and when a plentiful supply of sound rock is at hand (Leps 1998). Examples of the rockfill dam within San Diego County include Morena, Barrett and Escondido Dams.

NRHP and CRHR Significance Evaluation

NRHP Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.

CRHR Criterion 1: Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

Morena Dam, the outlet tower, and reservoir are directly associated with events that have made a significant contribution to the history of water development in the San Diego region. As the second oldest dam in San Diego County (after Sweetwater, 1888) and oldest dam with the City system, the Morena Dam is significant under Criterion A/1, for its association with San Diego's water infrastructure, which was essential to the stability of the region. Water or the lack thereof played a critical role in the planning, growth and development of San Diego County, and the City. When construction began in the 1890s, the Morena Dam was heralded as the solution to the City's persistent water problems, as it would have the largest capacity of any local dam. Although its construction did not succeed in alleviating the City's entire water shortfall, its completion in 1912 was a critical milestone in advancing the City's infrastructure. The Morena Dam was part of the Otay-Cottonwood watershed, which would ultimately become the primary supplier of water to San Diego. In summary, the subject property is directly associated with important events related to water development in the San Diego region, namely with the City gaining source water independence and being a critical component to the water infrastructure that supported the City's growth and development until the end of World War II. **Therefore, the subject property appears eligible under NRHP/CRHR Criteria A/1.**

NRHP Criterion B: Associated with the lives of significant persons in our past.

CRHR Criterion 2: Associated with the lives of persons important in our past.

The subject property does have connections to noted individuals, including E.S. Babcock, the Spreckels brothers, and Charles Hatfield. Despite these associations, the subject property is not connected with any of these individuals in a way that demonstrates their contributions were demonstrably important within a local, State, or national historic context. **Therefore, the subject property does not appear eligible under NRHP/CRHR Criteria B/2.**

NRHP Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

CRHR Criterion 3: Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

The Morena Dam and Outlet Tower is the second oldest dam in San Diego County (after Sweetwater, 1888) and is the oldest dam owned and operated by the City of San Diego. At the time of its construction, the Morena Dam was said to be the largest rockfill dam in the world (SNAC 2015). It is important as a rare example of early rockfill-type construction. Its initial construction from 1886 until 1912 was also an important milestone in the development of municipal dams in California and is recognized for its considerable size, construction techniques and workmanship which were all significant for this period. Further, subsequent improvements to the dam, after its original construction (1912-1947), correlate to important milestones in the advancement of water infrastructure.

The Morena Dam embodies the distinctive characteristics of a rockfill dam, a type of construction that originated in California in the 1850s during the Gold Rush when miners would use drill and blast techniques to create an abundant supply of rock material for construction. Early rockfill dams (the first major milestone in rockfill dam construction) were small and composed of loosely dumped rockfill with an upstream timber face to slow water seepage. In the early 1900s, rockfill dams reached a new milestone, with heights exceeding 100 feet. Upstream-facing materials improved with the use of steel and concrete, creating relatively low permeability (Breitenbach 2004). The Morena Dam falls into this second milestone of rockfill dam construction techniques, which is evident in California between the 1910s and 1940s.

The Morena Dam also stands apart from other dams in the San Diego region (i.e., Sweetwater, Savage, Barrett), which are of concrete gravity-arch type. The original Lower Otay Dam was also a rockfill-type dam, but this dam was destroyed in the 1916 floods and replaced with a gravity-arch type. Cursory research reveals no other examples of rockfill dams in California from the same time period, although there were later examples of rockfill dams in Los Angeles County, including the Cogswell Dam (c. 1935) and Eaton Wash Dam (c. 1937). Therefore, examples of rockfill dams from the second milestone of rockfill dam construction techniques (1910s to the 1940s) are becoming increasingly rare in Southern California, and early examples like Morena Dam are non-existent.

***Recorded by:** Samantha Murray and Salli Hosseini ***Date:** 6/29/2015 ■ **Continuation** □ **Update**

All of the rockfill along the upper half of the dam face was positioned by derrick and hand placement techniques. The crevices of the rockfill were detailed by hand, hammering with a small stone to ensure that sharp edges were removed and to prevent serious settlement. The work required a small army of men to provide intricate handwork and stability to the dam face.

Subsequent improvements to the dam, including increases to the dam crest and spillways, have not altered the character-defining elements of this rockfill construction, which demonstrate the careful workmanship that went into its initial construction. Rather, these improvements correlate with important milestones in the advancement of water infrastructure that were occurring throughout the San Diego region, California, and the United States, and thus, contribute to the dam's significance by reflecting important safety-related building practices occurring in the San Diego region. Important improvements within the period of significance include:

1) Raising the crest of the dam an additional five feet in 1917 in direct response to the 1916 floods. These massive floods tore through the San Diego region, leaving scars on the mountains and hillsides, and destroying important water infrastructure throughout San Diego County, including complete destruction of the Lower Otay Dam. A massive water infrastructure building/improvement campaign took place throughout San Diego in its wake.

2) Raising the crest of the dam an additional four feet in 1930 in direct response to the 1926 St. Francis Dam disaster, which triggered new safety legislation for dams throughout California. In San Diego, the dam disaster led to significant public concerns about the safety of the largest dams in the region, including Barrett, Lower and Upper Otay.

3) Enlarging the dam spillway in 1946 to accommodate the increase in water supply from the Colorado Rivers. San Diego County Water Authority charts demonstrated that, "without Colorado River water, all City of San Diego reservoirs would have been bone dry in September 1949 (Cooper 1968:106)."

The rockfill dam, its associated concrete crest/parapet improvements, associated outlet tower, spillways and sluice gates are all contributing elements, which reflect the importance of the function and significance of the dam. Therefore, the period of significance for the dam and outlet tower's construction history is 1896-1946.

The Morena Dam and Outlet Tower also represent the work of master engineer M.M. O'Shaughnessy. O'Shaughnessy had an impressive resume of large-scale engineering structures and municipal projects during the early 20th century, including the Merced River Dam, Throttle Dam, the Twin Peaks Reservoir and Tunnel, the Stockton Street Tunnel, the Municipal Railway System, San Francisco's streetcar system, the Hetch Hetchy Reservoir and Power Project, the Lake Eleanor Dam, and the O'Shaughnessy Dam. O'Shaughnessy was hired for the Morena project in 1909 during the second phase of construction of the dam and its associated outlet tower. After what had turned out to be a disastrous first phase of construction, which included construction of a faulty toe wall and numerous deviations from the original plan specifications, O'Shaughnessy breathed new life into the project. He brought with him a high level of engineering expertise (which had been severely lacking from the project), redesigned the dam to new specifications (which included scrapping much of the original faulty construction), and provided a more professional and safe working environment with appropriate oversight. In 1913, as a regular contributor to the publications of the Society of Civil Engineers, O'Shaughnessy won the James Laurie Prize for his 1911 article, "Construction of the Morena Rockfill Dam" (SNAC 2015). This was also the first James Laurie Prize ever awarded. While O'Shaughnessy developed a long list of impressive engineering structures throughout his career, the Morena Dam represents a particularly noteworthy example of his work for the fact that the dam represents a unique construction technique. Further, at the time of its construction, Morena Dam was said to be the largest rockfill dam in the world (SNAC 2015). This fact alone makes the Morena Dam one of the most important structures ever designed by O'Shaughnessy.

In summary, the Morena Dam is the oldest dam in the City, and represents an engineering achievement that embodies the distinctive characteristics of a rockfill dam (an increasingly rare dam type in California from this time period), embodying improvements that correlate to important building periods in state and local water infrastructure development, and represents a notable work of master engineer M.M. O'Shaughnessy. **Therefore, the subject property appears eligible under NRHP/CRHR Criteria C/3.**

NRHP Criterion D: Have yielded, or may be likely to yield, information important in history or prehistory.

CRHR Criterion 4: Has yielded, or may be likely to yield, information important in prehistory or history.

There is no evidence to indicate that the subject property is likely to yield any additional information important in prehistory or history beyond what is already known. The subject property is also not associated with an archaeological site or a known subsurface cultural component. Therefore, the subject property does not appear eligible under NRHP/CRHR Criteria D/4.

City of San Diego Significance Evaluation

Criterion A: Exemplifies or reflects special elements of the City's, a community's, or a neighborhood's historical, archaeological, cultural, social, economic, political, aesthetic, engineering, landscaping, or architectural development.

The Morena Dam and Outlet Tower reflect special elements of San Diego's historical development. Construction of the dam made a significant contribution to the history of water development in the San Diego region and was a milestone in the City's quest to achieve source water independence.

The Morena Dam and Outlet Tower also reflect special elements of San Diego's engineering development. The Morena Dam embodies the distinctive characteristics of a rockfill dam, a type of construction that originated in California in the 1850s during the Gold Rush era when miners would use drill and blast techniques to create an abundant supply of rock material for construction. Early rockfill dams (the first major milestone in rockfill dam construction) were small and composed of loosely dumped rockfill with an upstream timber face to slow water seepage. In the early 1900s, rockfill dams reached a new milestone, with heights exceeding 100 feet. Upstream-facing materials improved with the use of steel and concrete, creating relatively low permeability (Breitenbach 2004). The Morena Dam falls into this second milestone of rockfill dam construction techniques, which is evident in California between the 1910s and 1940s.

The Morena Dam and Outlet Tower is the second oldest dam in San Diego County (after Sweetwater, 1888) and is the oldest dam owned and operated by the City of San Diego. It aslo stands apart from other dams in the San Diego region (i.e., Sweetwater, Savage, Barrett), which are of concrete gravity-arch type. The original Lower Otay Dam was also a rockfill type dam, but this dam was destroyed in the 1916 floods and replaced with a gravity-arch type. Cursory research reveals no other examples of rockfill dams in California from the same time period. Although there are slightly later examples of rockfill dams in Los Angeles County, including the Cogswell Dam (c. 1935) and Eaton Wash Dam (c. 1937), early examples like Morena Dam are non-existent. Examples of rockfill dams from the second milestone of rockfill dam construction techniques (1910s to the 1940s) are becoming increasingly rare in Southern California, and the Morena Dam represents a special element of the City's water infrastructure and engineering development. **Therefore, the subject property appears eligible under City Criterion A.**

Criterion B: Is identified with persons or events significant in local, state, or national history.

Persons: Although the subject property does have connections to noted individuals, including E.S. Babcock, the Spreckels brothers, and Charles Hatfield who hold importance within the history of San Diego, the subject property is not connected with any of these individuals in a way that directly represents their contributions within the local historic context.

Events: As described in the evaluation of NRHP/CRHR A/1 (see full discussion above), the subject property is associated with events significant in local, state, and national history. Construction of the Morena water project was a major undertaking in a remote part of San Diego that required significant planning and coordination. It was a major undertaking in a remote part of San Diego which required significant planning and coordination and was an important event at the time construction began. The Morena Dam was part of the Otay-Cottonwood watershed, which would ultimately become the primary supplier of water to San Diego. The subject property is directly associated with important events related to water development in the San Diego region, namely with the City gaining source water independence and being a critical component to the water infrastructure that supported the City's growth and development until the end of World War II. **Therefore, the subject property appears eligible under City Criterion B.**

Criterion C: Embodies distinctive characteristics of a style, type, period, or method of construction, or is a valuable example of the use of indigenous materials or craftsmanship.

As described under NRHP/CRHR Criteria C/3 (see full discussion above), the Morena Dam and Outlet Tower is the second oldest dam in San Diego County (after Sweetwater, 1888) and is the oldest dam owned and operated by the City of San Diego. At the time of its construction, the Morena Dam was considered the tallest rockfill dam in the United States. It is important as a rare example of early rockfill-type construction. Further, its initial construction from 1886 until 1912 was an important milestone in the development of municipal dams in California and is recognized for its considerable size, construction techniques and workmanship that were all significant for this period. In addition, subsequent improvements to the dam (post-1912 through 1946), including increases to the dam crest and spillways, have not altered the character-defining elements of this rockfill construction, which demonstrate the careful workmanship that went into its initial construction. Rather, these improvements correlate with important milestones in the advancement of water infrastructure that were occurring throughout the San Diego region, California, and the United States, and thus, contribute to the dam's significance by reflecting important safety-related building practices occurring in the San Diego region. The rockfill dam, its associated concrete crest/parapet improvements, associated outlet tower, spillways and sluice gates are all contributing elements, which reflect the importance of the function and significance of the dam. **Therefore, the subject property appears eligible under City Criterion C.**

Criterion D: Is representative of the notable work or a master builder, designer, architect, engineer, landscape architect, interior designer, artist, or craftsman.

As described under NRHP/CRHR Criteria C/3 (see full discussion above), the Morena Dam and Outlet Tower represent a notable work of master engineer M.M. O'Shaughnessy. O'Shaughnessy was hired for the Morena project in 1909 during the second phase of construction of the dam and its associated outlet tower. While O'Shaughnessy developed a long list of impressive engineering structures throughout his career, the Morena Dam represents a particularly noteworthy example of his work for the fact that the dam represents a unique construction technique. Further, at the time of its construction, Morena Dam was said to be the largest rockfill dam in the world (SNAC 2015). This fact alone makes the Morena Dam one of the most important structures ever designed by O'Shaughnessy. **Therefore, the subject property appears eligible under City Criterion D.**

Criterion E: Is listed or has been determined eligible by the National Park Service for listing on the National Register of Historic Places or is listed or has been determined eligible by the State Historical Preservation Office for listing on the State Register of Historical Resources.

The subject property is not known to be on any local, state, or national list of significant properties, nor is it known to have been determined eligible for listing on any register. Concurrence of eligibility by the State Historic Preservation Office is pending. **Therefore, the subject property does not appear eligible under City Criterion E.**

Criterion F: Is a finite group of resources related to one another in a clearly distinguishable way or is a geographically definable area or neighborhood containing improvements which have a special character, historical interest, or aesthetic value, or which represent one or more architectural periods or styles in the history and development of the City.

The subject property is not eligible as a contributor to a larger historic district, as it does not contribute to a unified entity or related group of resources. **Therefore, the subject property does not appear eligible under City Criterion F.**

***B12. References (Continued):**

Breitenback, A.J. 2004. "Part 2 – History of Rockfill Dam Construction." Geoengineer Newsletter, Berkeley, California. March 2005.

Capps, Edwin M. 1896. "Engineer Capps' Report." San Diego, California. On file with the City of San Diego Public Utilities Department.

Capps, Edwin M. 1897. "Engineer Capps' Report." San Diego, California. On file with the City of San Diego Public Utilities Department.

City of San Diego. 1928. Morena Reservoir Dam and Spillway and Safe Duty Enlargement. City of San Diego, California. On file with the City of San Diego Public Utilities Department.

City of San Diego. 1970. "Morena Reservoir-Original Agreement". On file with the City of San Diego Public Utilities Department.

City of San Diego. 1976. "Continued Operation of Lake Morena Regional Park by the County of San Diego." Public Facilities and Recreation, City of San Diego, California. On file with the City of San Diego Public Utilities Department.

City of San Diego. 2013. Public Utilities Department. "Morena Reservoir". Accessed June 29, 2015. http://s3.documentcloud.org/documents/1006251/morena-reservoir-7-13.pdf.

Engineering News. 1913. A Journal of Civil, Mechanical, Mining, and Electrical Engineering. Vol 69.January–June 1913. Hill Publishing Company, New York. Google books. Accessed July 17, 2015.

Fowler, L. 1953. "A History of the Dams and Water Supply of Western San Diego County." Thesis. University of California. On file with the City of San Diego Water Utilities Department.

Los Angeles Herald. 1910. "Southern California Mountain Water Company Expends Millions for Dams." Los Angeles Herald: Sunday Morning, August 14, 1910. Pg.4.

Los Angeles Times. 1897. "Work Stopped on the Dam: San Diego Brevities." Los Angeles Times (1886–1922); Oct 10, 1897; ProQuest Historical Newspaper; Los Angeles Times. Pg. 33.

San Diego Union. 1897. "Caps is Satisfied: He Now Says Morena Dam is All Right." January 3, 1897. From: Scrap Book "B" page 143. On file with the San Diego Public Utilities Department.

San Francisco Call. 1896a. "Water for San Diego; Voters of the Southern Town to Ballot Upon the Proposed Purchase of a Complete System." Thursday, March 17, 1896. Pg 4.

San Francisco Call. 1896b. "San Diego Gains a Water System." Sunday, June 28, 1896. Pg 6.

***Recorded by:** Samantha Murray and Salli Hosseini ***Date:** 6/29/2015 ■ **Continuation** ☐ **Update**

San Francisco Call. 1896c. "Water for San Diego; The Construction of the New System Will Be Commenced at Once." Monday, June 29, 1896. Pg 3.

San Francisco Call. 1896d. "San Diego Ballots Counted; City Fathers Announce a Majority for the Bond Issue-Work on the Water System." Tuesday, June 30, 1896. Pg 4.

San Francisco Call. 1896e. "Morena Dam, as Solid as the Hills." Sunday, July 19, 1896. Pg 24.

San Francisco Call. 1896f. "Hurls a Hill Into a Canyon; Work on the Morena Dam, Near San Diego, Expedited by a Monster Blast." Sunday, December 27, 1896.

San Francisco Call. 1912. "Engineers Told of Water Project; M.M. O'Shaughnessy Lectures on Source of Supply for San Diego." The San Francisco Call. Volume 111, Number 142, 20 April 1912. Accessed July 1, 2015. http://cdnc.ucr.edu/cgi-bin/cdnc?a=d&d=SFC19120420.2.29#.

O'Shaughnessy, M.M. 1913. Original Letter to Resident Engineer J.S. Molony, Morena Dam. On file with the City of San Diego Public Utilities Department.

Patterson, Thomas W. 1970. "Hatfield The Rainmaker." The Journal of San Diego History. San Diego Historical Society Quarterly. Winter 1970, Volume 16, Number 4. Accessed July 27, 2015. https://www.sandiegohistory.org/journal/70winter/hatfield.htm.

Pourade, Richard F. 1965. "Chapter Eleven: The Rainmaker-And Who Caused the Big Flood?" San Diego History Center. Accessed July 27, 2015. https://www.sandiegohistory.org/books/pourade/gold/goldchapter11.htm.

Wegmann, Edward. 1908. "The Design and Construction of Dams." New York. John Wiley & Sons. Accessed August 5,2015. https://npdp.stanford.edu/sites/default/files/other_materials/the_design_and_construction_of_dams.pdf.

State of California — The Resources Agency DEPARTMENT OF PARKS AND RECREATION **PRIMARY RECORD**	Primary # HRI # Trinomial **NRHP Status Code**	P-37-038717
Other Listings **Review Code**	**Reviewer**	**Date**

 ***Resource Name or #:** (Assigned by recorder) 9085-HJP-2

P1. Other Identifier:
***P2. Location:** ☑ **Not for Publication** ☐ **Unrestricted**
***a. County** San Diego **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary
***b. USGS 7.5' Quad** Barrett Lake **Date** 1988 **T** 17S ; **R** 3E ; SW ¼ **of** NW ¼ **of Sec** 22 **B.M.**
c. Address City Zip
d. UTM: (Give more than one for large and/or linear resources) Zone 11 , 3615519 mE/ 530730 mN in NAD 83
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate) Elevation – 1480' AMSL

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
9085–HJP-2 is the lower Barrett Dam used for storage. It is located approximately 1,000 feet downstream from the current Barrett Dam. Vegetation in the riparian/marsh included blue elderberry, red willow, Fremont cottonwood, cattails, and annual beard grass. Adjacent upland vegetation included California buckwheat, laurel sumac, and chaparral whitethorn.

Archival research indicated that the masonry foundation for the storage dam was built in 1898 on bedrock by the Southern California Mountain Water Company. It was built a year after the original Barrett Dam located upslope where the current dam is. The foundation extended 35 feet above the streambed. The base was 30 feet, the top was 13 feet, and the top length was 115 feet. An outlet tunnel 8 by 8 feet and 600 feet long was excavated in solid rock on the west bank at a height of 80 feet above the streambed. This was the beginning of the Dulzura Conduit. Ultimately, the dam would be rock-filled and would conserve the flow of Pine Creek and receive overflow from Morena Dam upstream. As of 1908 the rock-filled portion of the storage dam had not yet begun (Wingat 1908). Research did not verify that the rock-filled portion of the dam was completed.

At the time of the current survey, the dam consisted of two terraces. The top terrace measured 13 feet thick and extended 10 feet down to the lower terrace top. The lower terrace extends 32 feet down to the lower stack of rock, which is 13 feet 4 inches. Both the upper and lower terraces tops have 12 percent slopes.

***P3b. Resource Attributes:** (List attributes and codes) HP21: Dam
***P4. Resources Present:** ☐ Building ☐ Structure ☒ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #) Overview of Lower Barrett Dam; looking northwest; 6/26/2018; P1100963.jpg
***P6. Date Constructed/Age and Source:**
☒ Historic ☐ Prehistoric ☐ Both
***P7. Owner and Address:**
City of San Diego
***P8. Recorded by:** (Name, affiliation, and address)
N. Yerka and R. Shultz
RECON
1927 Fifth Avenue
San Diego, CA 92101
***P9. Date Recorded:** 6/26/2018
***P10. Survey Type:** (Describe)
Pedestrian survey

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")
Zepeda-Herman (2018) Historical Resources Survey for the Barrett Dam Drainpipe Replacement Project, San Diego, California

***Attachments:** ☐NONE ☒Location Map ☐Sketch Map ☐Continuation Sheet ☒Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

BUILDING, STRUCTURE, AND OBJECT RECORD

 ***Resource Name or #:** (Assigned by recorder) ***NRHP Status Code**

B1. Historic Name:
B2. Common Name:
B3. Original Use: storage pond **B4. Present Use:** storage pond ***B5. Architectural Style:**
***B6. Construction History:** (Construction date, alterations, and date of alterations)

The masonry foundation for the storage dam was built in 1898 on bedrock by the Southern California Mountain Water Company.

***B7. Moved?** ☒ **No** ☐ **Yes** ☐ **Unknown** **Date: Original Location:**
***B8. Related Features:**

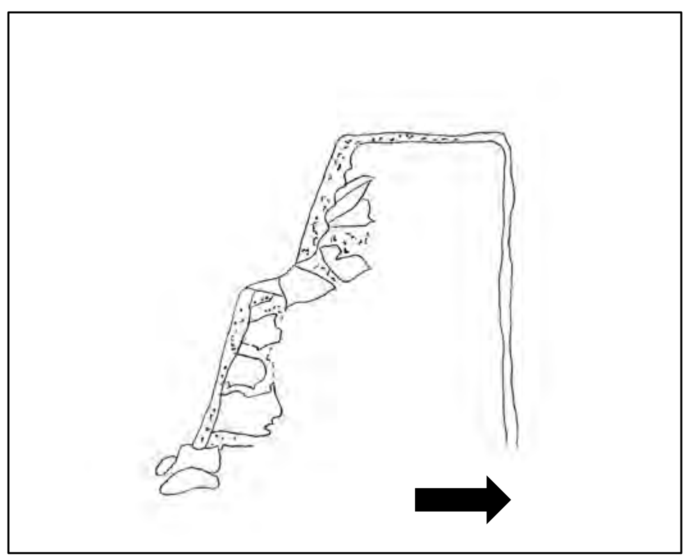
In 1897 prior to the construction of the storage dam (lower Barrett Dam), the Southern California Mountain Water Company erected a masonry dam 72 feet in height from its base, which is 22 feet below the streambed to its top 50 feet above. The dam rested on granite bedrock and was 14 feet thick at the bottom, 5 feet at the top, and 30 feet long at the crest (Schuyler 1901). This dam was replaced by the current Barrett Dam (Hill 2002). The purpose was to divert water from Moreno Reservoir into the first Dulzura Conduit, a wooden flume extending 12 miles along the mountainside to the Lower Otay Reservoir.

After the flood of 1916 and the breaking of the dam at Lower Otay, the need for additional storage capacity was realized. Construction of the newer and current Barrett Dam began in 1921 and was completed in 1923.

B9a. Architect: unknown **b. Builder:** unknown
***B10. Significance: Theme** early water infrastructure development for San Diego **Area**
Period of Significance 1898 through 1923 **Property Type** Water **Applicable Criteria** A/1
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

In early years southern California relied on private water and land companies, mutual water companies, and irrigation districts to develop water systems to provide local water. Private companies constructed six major dams on local rivers between 1887 and 1897. By 1923 every major drainage system in San Diego County had at least one reservoir (San Diego County Water Authority https://www.sdcwa.org/history). The lower Barrett Dam was one of them. It was built in 1898 and still retains excellent integrity. The dam qualifies as being part of the Otay-Cottonwood water storage system developed by the Southern California Mountain Water Company and its role in the development of San Diego water infrastructure.

B11. Additional Resource Attributes: (List attributes and codes)



***B12. References:**

Hill, Joseph
2002 Dry Rivers, Dammed Rivers, and Floods: An Early History of the Struggle Between Droughts and Floods in San Diego. *The Journal of San Diego History* 48(1).

Schuyler, James Dix
1901 *Reservoirs for Irrigation, Water-Power, and Domestic Water-Supply*. John Wiley & Sons: New York. Accessed on line June 18, 2018.

B13. Remarks:

***B14. Evaluator:** C. Zepeda-Herman/H. Price
***Date of Evaluation:** July 2018

State of California -- The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary Number:
HRI Number:
Trinomial:

P-37-038717

*Resource Name or Number (Assigned by recorder): 9085-HJP-2

*Map Name: Barrett Lake, California

Scale: 1:24,000

Date: 1988

0 260 520 780 1040 1300 1560 1820 2080 2340 2600 Meters

0 925 1850 2775 3700 4625 5550 6475 7400 8325 9250 Feet

Map Prepared by C. Zepeda-Herman
M:jobs5\9085\arc\gis\9085_HJP_2_loc.mxd

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

P-37-038881

Other Listings
Review Code **Reviewer** **Date**

Page 1 **of** 3 ***Resource Name or #:** (Assigned by recorder) 8863-BAO-4

P1. Other Identifier:
***P2. Location:** ☑ **Not for Publication** ☐ **Unrestricted** ***a. County** San Diego
and (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary
***b. USGS 7.5' Quad** El Cajon Mountain **Date** 1988 **T** 15 South; **R** 2 East; NE ¼ **of** NW ¼ **of** **Sec** 7 **B.M.**
c. Address N/A City Zip
d. UTM: Zone 11 , 517289 mE/ 3638519 mN in NAD 83
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate) **Elevation:** 570 feet AMSL
The resource is situated along an east/west trending asphalt road that splits north from El Monte Road. The road is on the north side of the San Diego River.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
8863-BAO-4 is a historic fieldstone lined ditch on the north side of an east-west asphalt road. The ditch walls are dry laid. Rocks are angular and appears to be a combination unshaped and roughly shaped. The ground surface rock is mostly light-grey while the subsurface rocks are stained orange by surrounding soil. The ditch is trapezoidal in cross section, being narrower at its top. It is partially filled with dirt to varying depths, the maximum depth of the ditch currently is 22 inches. The outside width is approximately 46 inches, the inside width is approximately 24-30 inches. The ditch is approximately 53 feet long and is possibly only a section of a longer ditch, the remainder of which has been covered by dirt. The ditch is possibly associated with foundations northwest off the dirt road and/or two fieldstone walls (one northwest and one south). No artifacts were noted.
***P3b. Resource Attributes:** (List attributes and codes) HP20: canal/aqueduct
***P4. Resources Present:** ☐ Building ☒ Structure ☐ Object ☒ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #) BAO-4, Close-up; 1/4/2018; #2999

***P6. Date Constructed/Age and Source:**
☒ Historic ☐ Prehistoric ☐ Both

***P7. Owner and Address:**
City of San Diego

***P8. Recorded by:** (Name, affiliation, and address)
H. Price, C. Zepeda, and J. Linton, RECON, 1927 Fifth Avenue, San Diego, CA 92101

***P9. Date Recorded:** 1/4/2018

***P10. Survey Type:** (Describe)
Intensive pedestrian survey

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")

RECON (2018) Historical Resources Survey for the El Capitan Dam Spillway Vegetation Removal Project, San Diego, CA

***Attachments:** ☐NONE ☒Location Map ☐Continuation Sheet ☐ Building, Structure, and Object Record
☐Archaeological Record ☐District Record ☐Linear Feature Record ☐ Milling Station Record ☐Rock Art Record
☐Artifact Record ☐Photograph Record ☐ Other (List):

BAO-4, Overview, looking northwest; 1/4/2018; #3001

State of California -- The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

SKETCH MAP

Primary Number:
HRI Number:
Trinomial:

P-37-038881

Page 2 of 3

*Resource Name or Number (Assigned by recorder): 8863-BAO-4

Drawn by: C. Zepeda-Herman/GPS

Date: 1/2018

State of California -- The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary Number:
HRI Number:
Trinomial:

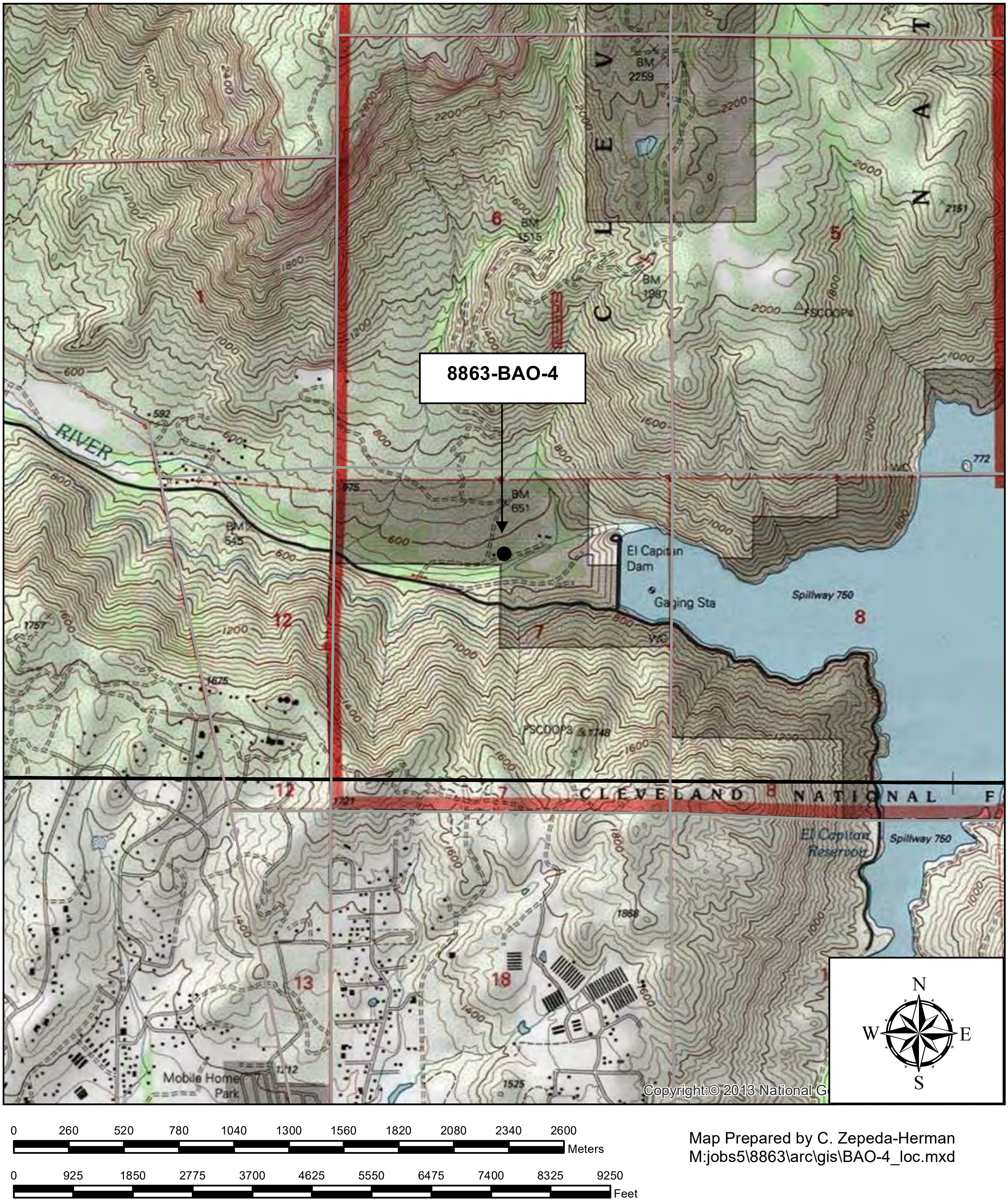
P-37-038881

*Resource Name or Number (Assigned by recorder): 8863-BAO-4

*Map Name: El Cajon Mountain, California

Scale: 1:24,000

Date: 1975



Map Prepared by C. Zepeda-Herman
M:jobs5\8863\arc\gis\BAO-4_loc.mxd

State of California — The Resources Agency DEPARTMENT OF PARKS AND RECREATION **PRIMARY RECORD**	Primary # HRI # Trinomial **NRHP Status Code**	P-37-038884 CA-SDI-22883
Other Listings **Review Code**	**Reviewer**	**Date**

 ***Resource Name or #:** (Assigned by recorder) 8863-HJP-1

P1. Other Identifier:

***P2. Location:** ☑ **Not for Publication** ☐ **Unrestricted** ***a. County** San Diego

and (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary

***b. USGS 7.5' Quad** El Cajon Mountain **Date** 1988 **T** 15 South; **R** 2 East; NW ¼ **of** NE ¼ **of** **Sec** 7 **B.M.**

c. Address N/A City Zip

d. UTM: Zone 11 , 517338 mE/ 3638669 mN in NAD 83

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate) **Elevation:** 605 feet AMSL

The resource is situated in a field, 320 feet east of a SW/NE trending dirt road that splits north from El Monte Road—an east-west dirt road on the north side of the San Diego River.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries) 8863-HJP-1 is a historic site consisting of a concrete slab, a small concrete block building, a cistern or other subsurface structure, two small fenced areas, and a larger fence enclosing all the other features. It is in a large flat field north of the San Diego River. The larger fenced area measures approximately 120 feet north-south by 120 feet east-west. The slab, small building, subsurface feature, and two small fenced areas occupy the western one third of the large fenced area. At the northwest corner of the large fenced area is one small fenced area measuring approximately 37 feet east-west by 19 feet north-south, possibly a garden area. Immediately south of this is pad 1, a poured concrete slab measuring 37.5 feet east-west by 20 feet north-south. (see continuation sheet).

***P3b. Resource Attributes:** (List attributes and codes) AH2 Foundations/structure pads, AH11 Walls/fences

***P4. Resources Present:** ☐ Building ☒ Structure ☐ Object ☒ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #) HJP-1, Overview, looking east; 11/16/2017; 228-2867.1

***P6. Date Constructed/Age and Source:** ☒ Historic ☐ Prehistoric ☐ Both

***P7. Owner and Address:** City of San Diego

***P8. Recorded by:** (Name, affiliation, and address) H. Price, N. Yerka, G. Kitchen, T. Sowles, and A. Soto, RECON, 1927 Fifth Avenue, San Diego, CA 92101

***P9. Date Recorded:** 11/16/2017

***P10. Survey Type:** (Describe) Intensive pedestrian survey

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") RECON (2018) Historical Resources Survey for the El Capitan Dam Spillway Vegetation Removal Project, San Diego, CA

***Attachments:** ☐NONE ☒Location Map ☐Continuation Sheet ☐Building, Structure, and Object Record ☒Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

***Resource Name or #:** 8863-HJP-1

***A1. Dimensions: a. Length:** 82 feet (N/S) × **b. Width:** 70 feet (E/W)
Method of Measurement: ☐ Paced ☐ Taped ☐ Visual estimate ☒ Other: GPS
Method of Determination (Check any that apply.): ☐ Artifacts ☒ Features ☐ Soil ☐ Vegetation ☐ Topography ☐ Cut bank ☐ Animal burrow ☐ Excavation ☐ Property boundary ☒ Other (Explain): Concrete block building, slab, cistern, fencing, and other features.

Reliability of Determination: ☒ High ☐ Medium ☐ Low Explain: Excellent structure, feature… etc. visibility

Limitations (Check any that apply): ☐ Restricted access ☐ Paved/built over ☐ Site limits incompletely defined ☐ Disturbances ☐ Vegetation ☐ Other (Explain):

A2. Depth: ☐ None ☒ Unknown Method of Determination:

***A3. Human Remains:** ☐ Present ☐ Absent ☐ Possible ☒ Unknown (Explain):
***A4. Features** (Number, briefly describe, indicate size, list associated cultural constituents, and show location of each feature on sketch map.): 8863-HJP-1 is a historic site consisting of a concrete slab, a small concrete block building, a cistern or other subsurface structure, two small fenced areas, and a larger fence enclosing all the other features.

***A5. Cultural Constituents** (Describe and quantify artifacts, ecofacts, cultural residues, etc., not associated with features.): No artifacts observed

***A6. Were Specimens Collected?** ☒ No ☐ Yes (If yes, attach Artifact Record or catalog and identify where specimens are curated.)

***A7. Site Condition:** ☐Good ☐Fair ☒ Poor (Describe disturbances.): The structures, buildings, and the like have suffered a high level of disturbance due to dismantling.

***A8. Nearest Water (Type, distance, and direction.)**: HJP-1 is located on the north side of the San Diego River; spillway channel occurs approximately 575 feet to the south.
***A9. Elevation:** 605 feet AMSL

A10. Environmental Setting (Describe culturally relevant variables such as vegetation, fauna, soils, geology, landform, slope, aspect, exposure, etc.): The site is on the north side of the San Diego River, in a south-facing gently sloping field of approximately 11 percent grade. The area has been brushed/scraped in the past, but dense ground cover obscures any indication. Vegetation consists of dense non-native grasses with a few scattered buckwheat and laurel sumac. Soils consist of coarse sandy loams.

A11. Historical Information:

***A12. Age:** ☐ Prehistoric ☐ Protohistoric ☐ 1542-1769 ☐ 1769-1848 ☐ 1848-1880 ☐ 1880-1914 ☒1914-1945 ☒ Post 1945 ☐ Undetermined **Describe position in regional prehistoric chronology or factual historic dates if known:**

A13. Interpretations (Discuss data potential, function[s], ethnic affiliation, and other interpretations):

A14. Remarks:

A15. References (Documents, informants, maps, and other references):

A16. Photographs (List subjects, direction of view, and accession numbers or attach a Photograph Record.):
Original Media/Digitals Kept at: RECON Environmental 1927 Fifth Avenue, San Diego, CA 92101

***A17. Form Prepared by:** N. Yerka **Date:** 12/2017

Affiliation and Address: RECON Environmental 1927 Fifth Avenue, San Diego, CA 92101

***P3a. Description: continued**

In the southeast corner of this pad is the small building. The pad has been poured in several sections, and there is a short section of concrete block wall two courses high on the northwest corner of the slab. The building is constructed of concrete block and is nine courses high, with a poured concrete floor. It measures 12 feet 3 inches east-west by 8 feet 4 inches north-south. There is no cement between the blocks, but the holes have been filled with concrete to bind the building together. Two-by-six boards were originally bolted to the top of the building, probably to attach a roof. There is an entrance opening on the east end of the north wall 4 feet wide, and a short stub wall extending south from the west side of the opening. There is a large diameter pipe in the floor, and this may have been a bathroom or shower room.

Approximately 10 feet south of the slab/building is a second concrete structure, measuring 16 feet east-west by 8 feet north-south, that extends above ground level 22 inches. This appears to be mostly subsurface, and could be a cistern or septic tank. The visible portion of the structure is poured concrete, and has two small rectangular holes in the top that measure 21 inches square and are plugged by concrete lids with rebar handles.

About 16 feet south of this structure is a second fenced area that occupies the southwestern corner of the site. This measures approximately 40 feet square, and is divided east west into two 20 feet by 40 feet halves.

Large historic material such as pipes, wire, metal fence posts, and other metal items were observed around the features, but ground cover in the form of non-native weeds severely restricted ground visibility. No glass, ceramics, or other smaller historic artifacts were observed. Vegetation consists primarily of non-native grasses, with some scattered laurel sumac, eucalyptus trees, and buckwheat bushes to the north.

The standing concrete building was constructed between 1953 and 1964 based on the aerial photographs accessed on-line at https://www.historicaerials.com/viewer.

State of California -- The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

SKETCH MAP

Page 4 of 5

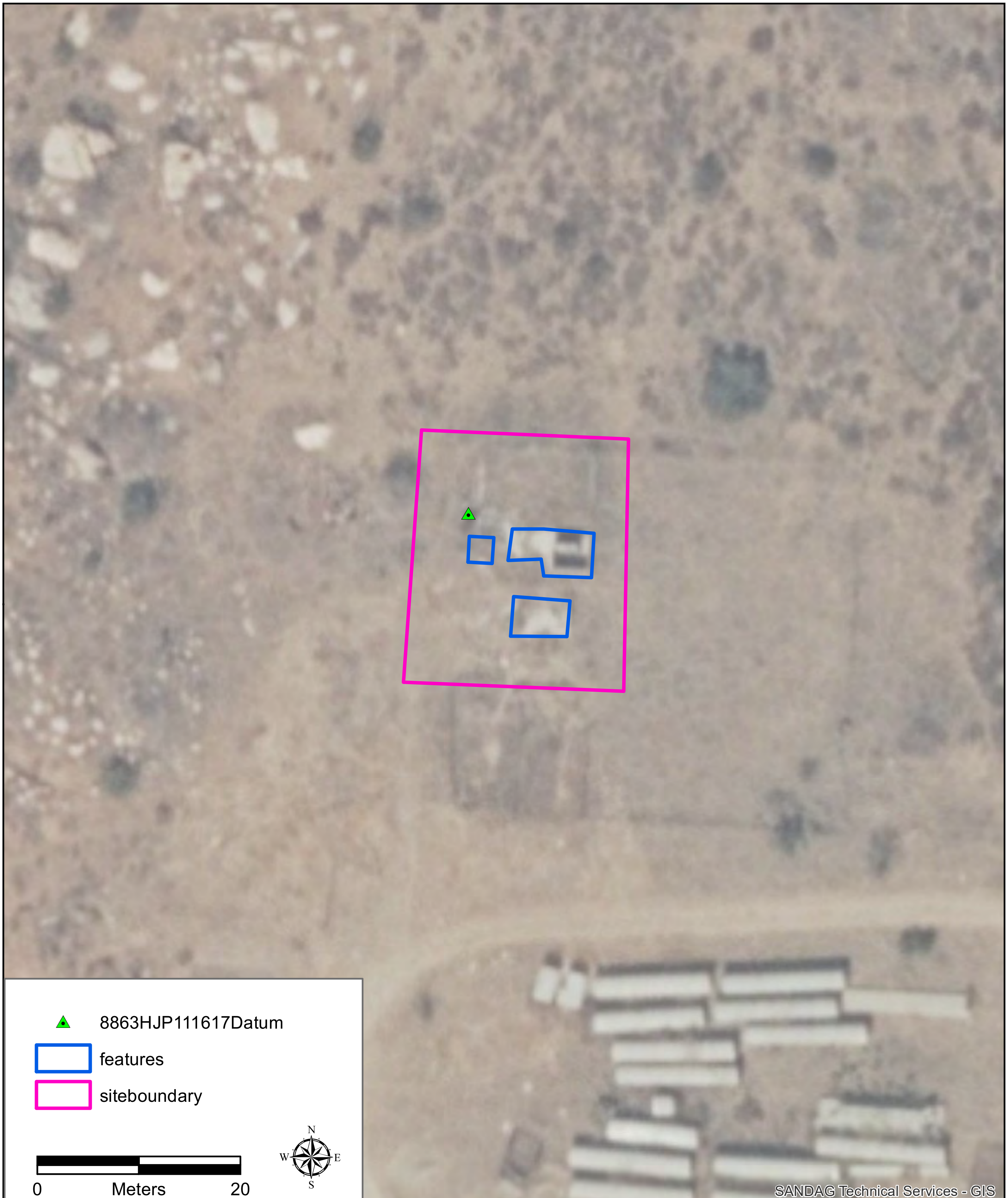
Drawn by: C. Zepeda-Herman/GPS

Primary Number:
HRI Number:
Trinomial:

P-37-038884
CA-SDI-22883

*Resource Name or Number (Assigned by recorder): 8863-HJP-1

Date: 12/2017



State of California -- The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary Number:
HRI Number:
Trinomial:

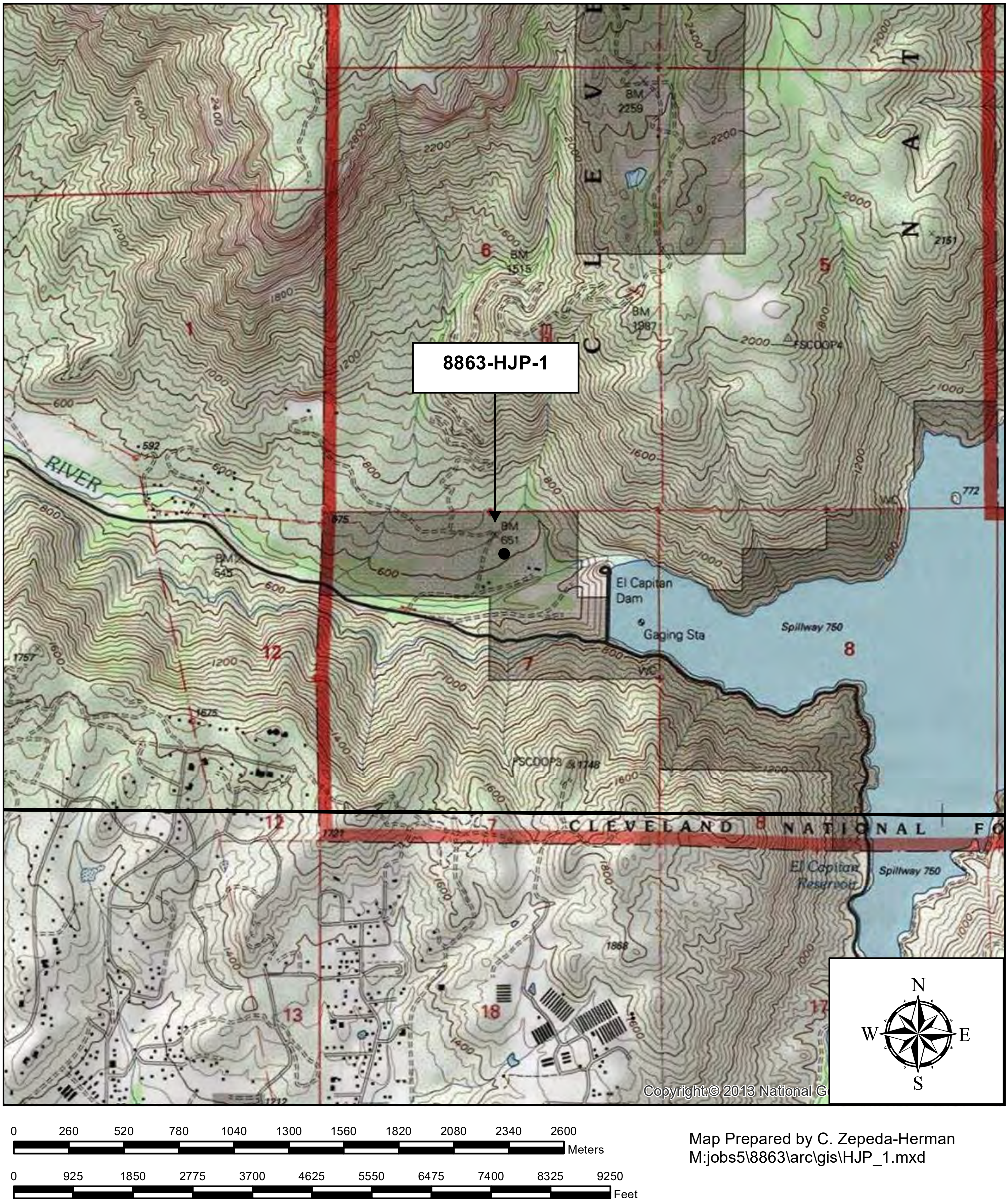
P-37-038884
CA-SDI-22883

*Resource Name or Number (Assigned by recorder): 8863-HJP-1

*Map Name: El Cajon Mountain, California

Scale: 1:24,000

Date: 1975



Map Prepared by C. Zepeda-Herman
M:jobs5\8863\arc\gis\HJP_1.mxd

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # P-37-038885
HRI #
Trinomial CA-SDI-22884
NRHP Status Code

Other Listings
Review Code **Reviewer** **Date**

 ***Resource Name or #:** (Assigned by recorder) 8863-HJP-2

P1. Other Identifier:
***P2. Location:** ☑ **Not for Publication** ☐ **Unrestricted** ***a. County** San Diego
and (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary
***b. USGS 7.5' Quad** El Cajon Mountain **Date** 1988 **T** 15 South; **R** 2 East; NE ¼ **of** NW ¼ **of** **Sec** 7 **B.M.**
c. Address N/A City Zip
d. UTM: Zone 11 , 517234 mE/ 3638524 mN in NAD 83
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate) **Elevation:** 605 feet AMSL
The resource is situated on the north side of and immediately adjacent to an east-west dirt road—El Monte Road—on the north side of the San Diego River.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
8863-HJP-2 consists of the foundations of two houses and accompanying structures. The site is on the north side of the San Diego River, approximately 160 feet north of the channel for the dam spillway. There is an east-west dirt road 45 feet to the south and a second, northeast-southwest trending dirt road 100 feet to the west. Foundation 1 measures 23 feet by 30 feet, and consists of a poured concrete perimeter wall foundation with interior concrete piers for floor support. The perimeter wall is 6 inches in width. The front wall is oriented to the southeast, and a poured concrete porch 4 feet wide and 7 feet 10 inches long is set in the center of that wall. The porch has a metal railing. A concrete slab extends off the northeast side of the foundation, which measures 21 feet 6 inches wide. A concrete block chimney is set to the left of center in the northeast wall. It has a metal firebox and red tile flume (see continuation sheet).

***P3b. Resource Attributes:** (List attributes and codes) HP2 Single Family Property, AH2 Foundations/structure pads, AH11 Walls/fences

***P4. Resources Present:** ☐ Building ☒ Structure ☐ Object ☒ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #) HJP-2, House 1, Overview, looking east; 11/16/2017; 228-2891

***P6. Date Constructed/Age and Source:** ☒ Historic ☐ Prehistoric ☐ Both
***P7. Owner and Address:** City of San Diego

***P8. Recorded by:** (Name, affiliation, and address) H. Price, N. Yerka, G. Kitchen, T. Sowles, and A. Soto, RECON, 1927 Fifth Avenue, San Diego, CA 92101

***P9. Date Recorded:** 11/16/2017

***P10. Survey Type:** (Describe)
Intensive pedestrian survey

***P11. Report Citation**: (Cite survey report and other sources, or enter "none.")
RECON (2018) Historical Resources Survey for the El Capitan Dam Spillway Vegetation Removal Project, San Diego, CA

***Attachments:** ☐NONE ☒Location Map ☐Continuation Sheet ☐Building, Structure, and Object Record ☒Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
ARCHAEOLOGICAL SITE RECORD

Primary # P-37-038885
Trinomial CA-SDI-22884

 *Resource Name or #: 8863-HJP-2

***A1. Dimensions: a. Length:** 212 feet (SW/NE) × **b. Width:** 145 feet (NW/SE)
Method of Measurement: ☐ Paced ☐ Taped ☐ Visual estimate ☒ Other: GPS
Method of Determination (Check any that apply.): ☐ Artifacts ☒ Features ☐ Soil ☐ Vegetation ☐ Topography
☐ Cut bank ☐ Animal burrow ☐ Excavation ☐ Property boundary ☒ Other (Explain): Concrete block building, slab, cistern, fencing, and other features.

Reliability of Determination: ☒ High ☐ Medium ☐ Low Explain: Excellent structure, feature… etc. visibility

Limitations (Check any that apply): ☐ Restricted access ☐ Paved/built over ☐ Site limits incompletely defined
☐ Disturbances ☐ Vegetation ☐ Other (Explain):

A2. Depth: ☐ None ☒ Unknown Method of Determination:

***A3. Human Remains:** ☐ Present ☐ Absent ☐ Possible ☒ Unknown (Explain):
***A4. Features** (Number, briefly describe, indicate size, list associated cultural constituents, and show location of each feature on sketch map.):
8863-HJP-2 consists of the foundations of two houses and accompanying structures.

***A5. Cultural Constituents** (Describe and quantify artifacts, ecofacts, cultural residues, etc., not associated with features.): No artifacts observed

***A6. Were Specimens Collected?** ☒ No ☐ Yes (If yes, attach Artifact Record or catalog and identify where specimens are curated.)

***A7. Site Condition:** ☐Good ☐Fair ☒ Poor (Describe disturbances.): The structures, buildings, and the like have suffered a high level of disturbance due to dismantling.

***A8. Nearest Water (Type, distance, and direction.)**: HJP-2 is located on the north side of the San Diego River; spillway channel occurs approximately 200 feet to the south.
***A9. Elevation:** 582 feet AMSL

A10. Environmental Setting (Describe culturally relevant variables such as vegetation, fauna, soils, geology, landform, slope, aspect, exposure, etc.): The site is on the north side of the San Diego River, on a south facing alluvial slope of approximately 11 percent grade. It is 160 feet north of the channel for the dam spillway. The area was probably brushed/scraped prior to construction of the houses, although dense grasses obscure any indication. Vegetation consists primarily of non-native grasslands and exotic trees including eucalyptus and pepper, surrounded by disturbed and non-disturbed Diegan coastal sage scrub. The area burned in the early 2000s which resulted in the destruction of the houses

***A12. Age:** ☐ Prehistoric ☐ Protohistoric ☐ 1542-1769 ☐ 1769-1848 ☐ 1848-1880 ☐ 1880-1914 ☐1914-1945
☒ Post 1945 ☐ Undetermined **Describe position in regional prehistoric chronology or factual historic dates if known:**

A13. Interpretations (Discuss data potential, function[s], ethnic affiliation, and other interpretations):

A14. Remarks: The two houses and accompanying features were constructed between 1953 and 1964, based on air photographs accessed on-line at https://www.historicaerials.com/viewer. The houses appear intact in a 2003 aerial photograph, but are destroyed in a 2004 photograph apparently due to a fire.

A15. References (Documents, informants, maps, and other references):

A16. Photographs (List subjects, direction of view, and accession numbers or attach a Photograph Record.):
Original Media/Digitals Kept at: RECON Environmental 1927 Fifth Avenue, San Diego, CA 92101

***A17. Form Prepared by:** N. Yerka **Date:** 12/2017

Affiliation and Address: RECON Environmental 1927 Fifth Avenue, San Diego, CA 92101

***P3a. Description: (continued)**

Foundation 2 is approximately 50 feet to the east-northeast of Foundation 1. Foundation 2 is a mirror image of Foundation 1, with the front porch also on the southeast wall. Asphalt driveways run from the dirt road south of the foundations to the slabs, which were most likely car ports.

A cast concrete bird bath is located about 50 feet north the northwest corner of Foundation 2. The birdbath is surrounded by a circular wall of single course granite rocks about 20 feet in diameter. There is a small rectangular fenced in area north of the bird bath that may have been a garden plot. A concrete and red brick BBQ sits about 15 feet northeast of Foundation 2. Vegetation surrounding the foundations consists of numerous eucalyptus trees and a single large palm tree to the south of Foundation 1. The ground surface is obscured by non-native weeds.

The two houses and accompanying features were constructed between 1953 and 1964, based on aerial photographs accessed on-line at https://www.historicaerials.com/viewer. The houses appear intact in a 2003 aerial photograph, but are destroyed in a 2004 photograph apparently due to a fire. The 1942, 1947, 1955, and 1964 topographic maps identify a prison camp in the area of 8863-HJP-2, with buildings in the approximate locations of the two foundations. However, since there are definitely no buildings in the locations of the two foundations in the 1953 air photograph, they do not appear to be associated with the prison shown on the USGS maps from the 1940s-1950s.

State of California -- The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

SKETCH MAP

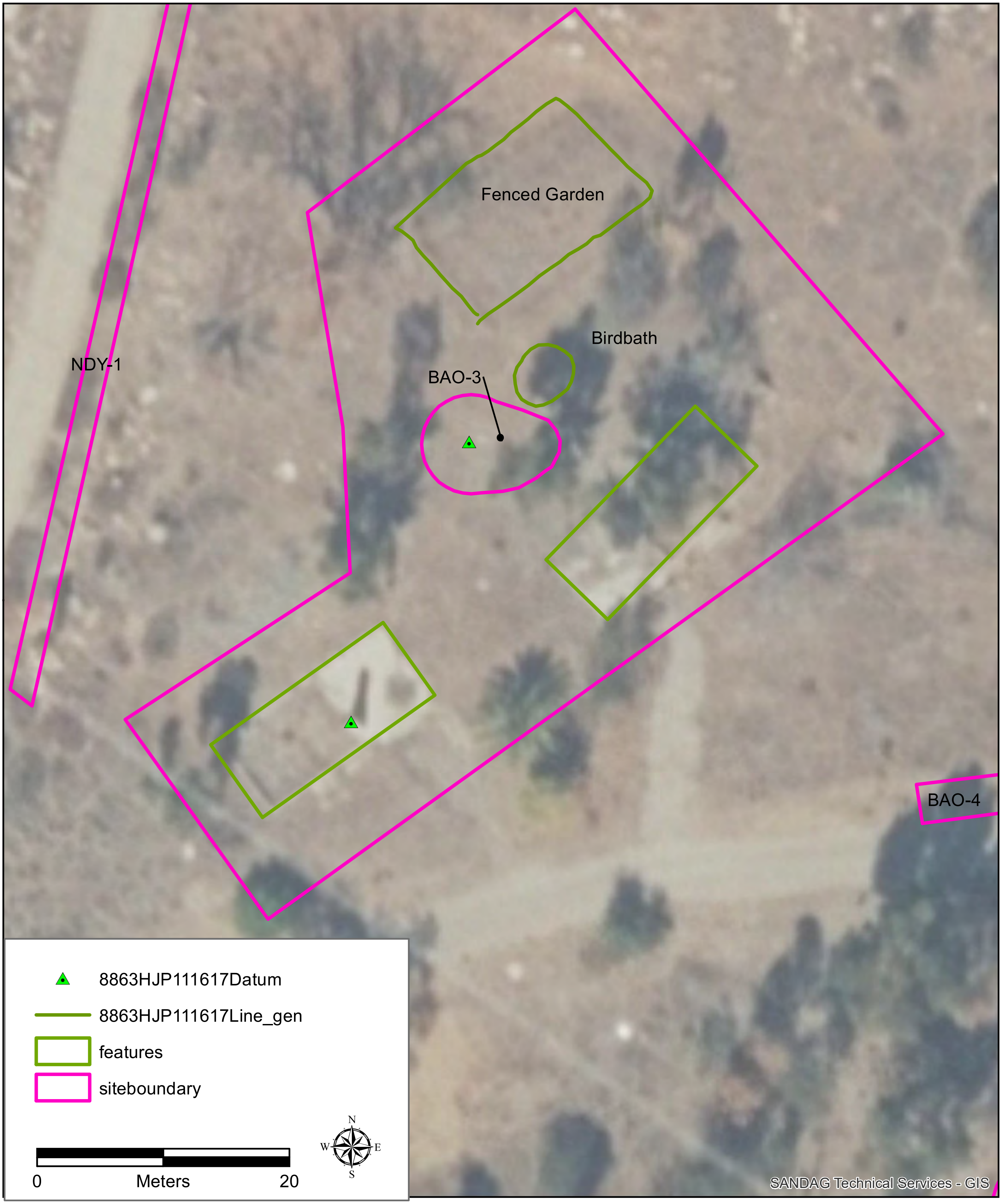
Primary Number:
HRI Number:
Trinomial:

P-37-038885
CA-SDI-22884

*Resource Name or Number (Assigned by recorder): 8863-HJP-2

Drawn by: C. Zepeda-Herman/GPS

Date: 12/2017



State of California -- The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary Number:
HRI Number:
Trinomial:

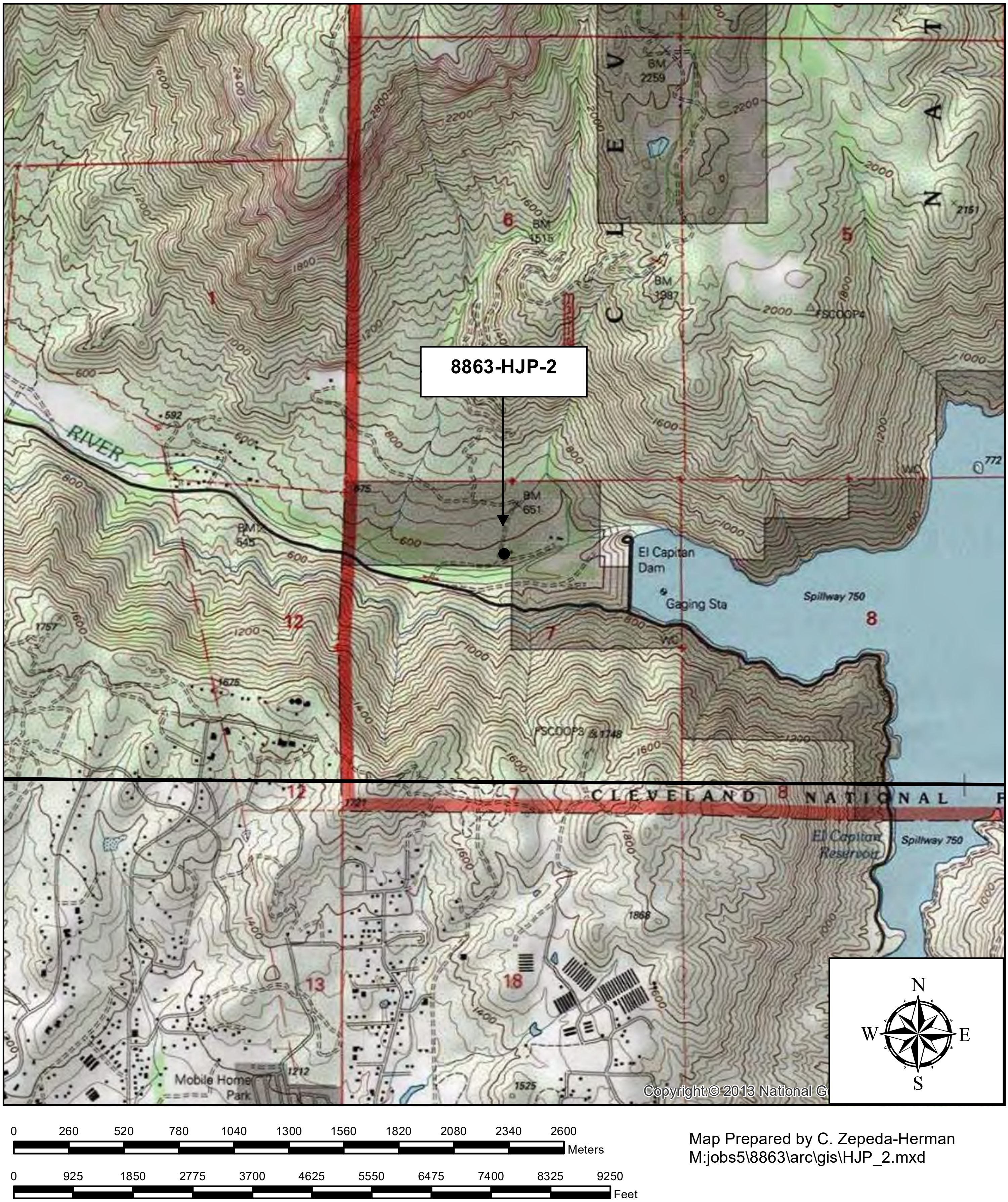
P-37-038885
CA-SDI-22884

*Resource Name or Number (Assigned by recorder): 8863-HJP-2

*Map Name: El Cajon Mountain, California

Scale: 1:24,000

Date: 1975



Map Prepared by C. Zepeda-Herman
M:jobs5\8863\arc\gis\HJP_2.mxd

State of California — The Resources Agency DEPARTMENT OF PARKS AND RECREATION **PRIMARY RECORD**	Primary # HRI # Trinomial **NRHP Status Code**	P-37-038887
Other Listings **Review Code**	**Reviewer**	**Date**

Page 1 **of** 3 ***Resource Name or #:** (Assigned by recorder) 8863-NDY-1

P1. Other Identifier:
***P2. Location:** ☑ **Not for Publication** ☐ **Unrestricted** ***a. County** San Diego
and (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary
***b. USGS 7.5' Quad** El Cajon Mountain **Date** 1988 **T** 15 South; **R** 2 East; NE ¼ **of** NW ¼ **of** **Sec** 7 **B.M.**
c. Address N/A City Zip
d. UTM: Zone 11 , 517226 mE/ 3638609 mN in NAD83
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate) **Elevation:** 586-610 feet AMSL
The resource is situated east of and immediately adjacent to a SW/NE trending dirt road that splits north from El Monte Road—an east-west dirt road on the north side of the San Diego River.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries) 8863-NDY-1 is a northeast-southwest oriented fieldstone wall immediately east of a dirt road, on the north side of the San Diego River. The wall is constructed of dry laid angular granitic rock obtained from the immediate area. The wall measures between 2.5 feet and 3 feet in width, and is slightly battered. The wall is constructed of larger facing stones on each side, with smaller rubble fill between. Height varies, with the tallest sections being about 3 feet high. Many portions are in disrepair and shorter in height. NDY-1 is approximately 342 feet in total length, with a tumbled section at approximately 320 feet from the south end. The wall continues northeast off the current survey area for an additional 440 feet. Then the wall (not recorded) turns east-northeast for approximately 600 feet, ending and the southerly trending drainage. This segment of wall has four breaks. The wall appears on a 1953 aerial photograph. Numerous cobbles and boulders of similar granitic composition are scattered around and to the west of the wall segment in the survey area. Vegetation consists of a mix of disturbed Diegan Coastal Sage Scrub and non-native grasses.
***P3b. Resource Attributes:** (List attributes and codes) HP46 Walls/gates/fences

***P4. Resources Present:** ☐ Building ☒ Structure ☐ Object ☒ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #) NDY-1, Overview, looking south; 11/16/2017; 228-2880

***P6. Date Constructed/Age and Source:** ☒ Historic ☐ Prehistoric ☐ Both

***P7. Owner and Address:**
City of San Diego

***P8. Recorded by:** (Name, affiliation, and address)
H. Price, N. Yerka, G. Kitchen,
T. Sowles, and A. Soto, RECON,
1927 Fifth Avenue, San Diego, CA 92101

***P9. Date Recorded:** 11/16/2017

***P10. Survey Type:** (Describe)
Intensive pedestrian survey

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")
RECON (2018) Historical Resources Survey for the El Capitan Dam Spillway Vegetation Removal Project, San Diego, CA

***Attachments:** ☐NONE ☒Location Map ☐Continuation Sheet ☐Building, Structure, and Object Record ☒Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California -- The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

SKETCH MAP

Primary Number:
HRI Number: P-37-038887
Trinomial:
*Resource Name or Number (Assigned by recorder): 8863-NDY-1

Drawn by: C. Zepeda-Herman/GPS

Date: 12/2017

State of California -- The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary Number:
HRI Number:
Trinomial:

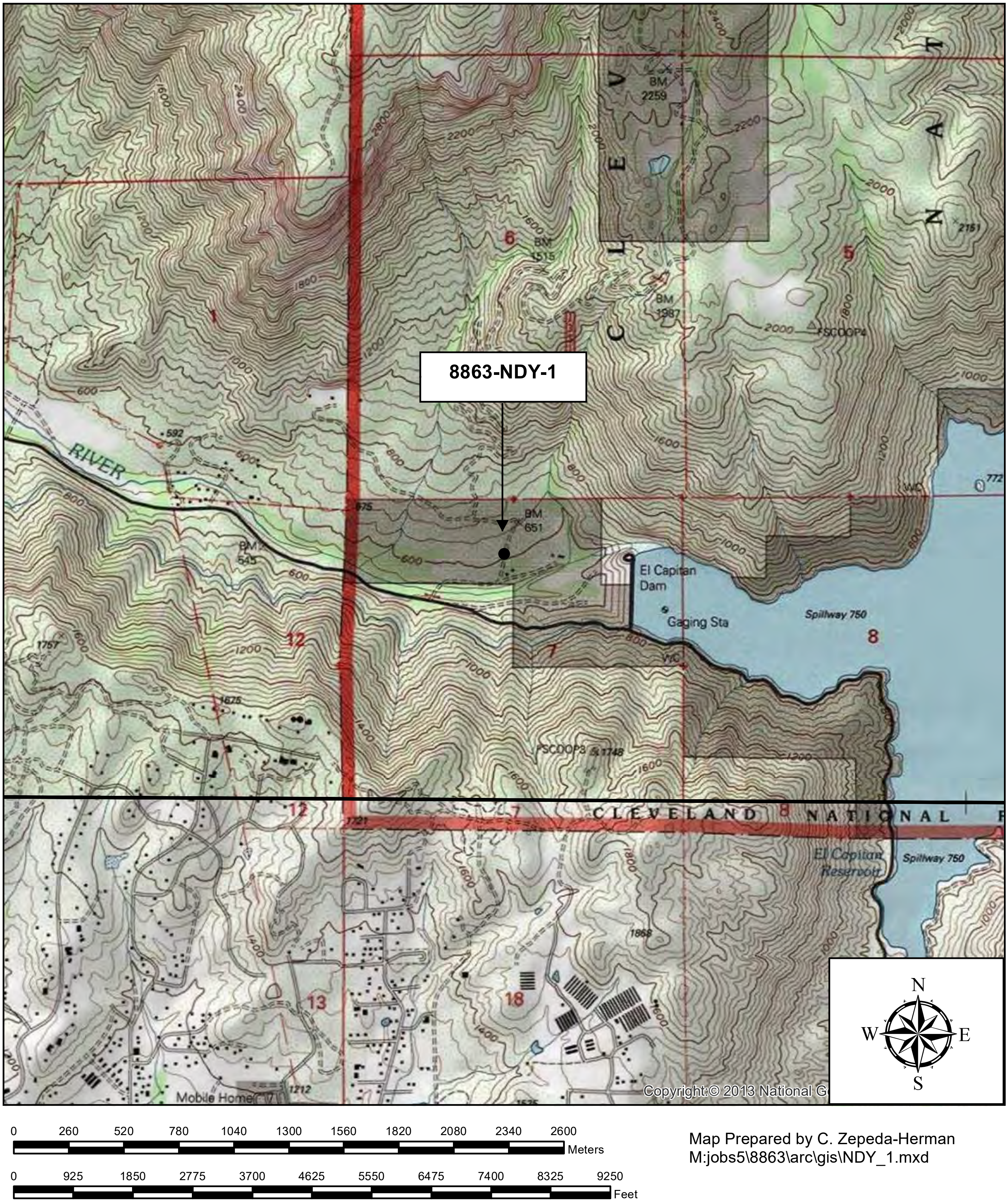
P-37-038887

*Resource Name or Number (Assigned by recorder): 8863-NDY-1

*Map Name: El Cajon Mountain, California

Scale: 1:24,000

Date: 1975



Map Prepared by C. Zepeda-Herman
M:jobs5\8863\arc\gis\NDY_1.mxd

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # P-37-038888
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code **Reviewer** **Date**

 ***Resource Name or #:** (Assigned by recorder) 8863-NDY-2

P1. Other Identifier:
***P2. Location:** ☑ **Not for Publication** ☐ **Unrestricted** ***a. County** San Diego
and (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary
***b. USGS 7.5' Quad** El Cajon Mountain **Date** 1988 **T** 15 South; **R** 2 East; SE ¼ **of** NW ¼ **&** SW ¼ **of** NEW ¼ **of Sec** 7 **B.M.**
c. Address N/A City Zip
d. UTM: Zone 11 , 517353 mE/ 3638510 mN in NAD83
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate) **Elevation:** 560-575 feet AMSL
The resource is situated on the south side of—and runs within approximately 45 feet of—El Monte Road—an east-west dirt road on the north side of the San Diego River (spillway channel occurs approximately 15 feet to the south).

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
8863-NDY-2 is a historic fieldstone wall running along the upper edge of the San Diego River spillway channel adjacent to the east west running main dirt access road. The wall is constructed of dry laid angular granitic rock obtained from the immediate area. The wall measures between 3 and 4 feet in width at its base, and is slightly battered. Height varies, with tallest areas approximately 4 feet high. Many segments are in disrepair. The wall is constructed of larger facing stones on each side, with smaller rubble fill between. In some areas existing bedrock outcrops have been incorporated into the wall. The wall is directly on the edge of the river/spillway channel, with a drop off of up to 15 feet into the channel itself. The wall is approximately 985 feet in total length. Vegetation consists of elements of disturbed Diegan Coastal Sage scrub, eucalyptus woodland, and disturbed southern cottonwood willow riparian forest. There is a dense understory of non-native grasses with scattered desert wild grape.

***P3b. Resource Attributes:** (List attributes and codes) HP46 Walls/gates/fences

***P4. Resources Present:** ☐ Building ☒ Structure ☐ Object ☒ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #)
NDY-2, Overview, looking south; 11/16/2017; 228-2912

***P6. Date Constructed/Age and Source:** ☒ Historic ☐ Prehistoric ☐ Both

***P7. Owner and Address:**
City of San Diego

***P8. Recorded by:** (Name, affiliation, and address)
H. Price, N. Yerka, G. Kitchen, T. Sowles, and A. Soto, RECON, 1927 Fifth Avenue, San Diego, CA 92101

***P9. Date Recorded:** 11/16/2017

***P10. Survey Type:** (Describe)
Intensive pedestrian survey

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")
RECON (2018) Historical Resources Survey for the El Capitan Dam Spillway Vegetation Removal Project, San Diego, CA

***Attachments:** ☐NONE ☒Location Map ☐Continuation Sheet ☐Building, Structure, and Object Record ☒Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California -- The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

SKETCH MAP

Primary Number:
HRI Number:
Trinomial:

P-37-038888

*Resource Name or Number (Assigned by recorder): 8863-NDY-2

Drawn by: C. Zepeda-Herman/GPS

Date: 1/2018

State of California -- The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary Number:
HRI Number:
Trinomial:

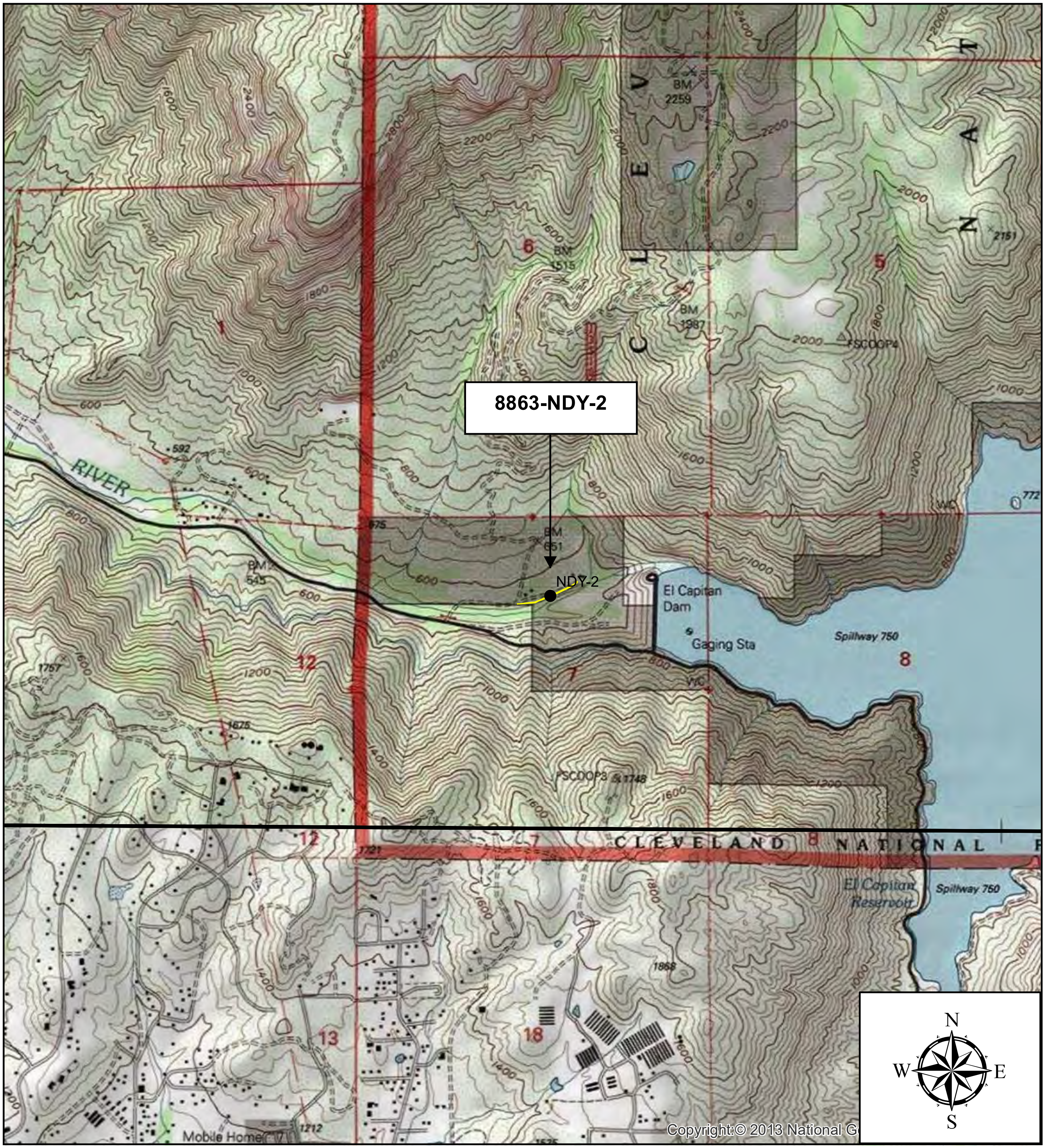
P-37-038888

*Resource Name or Number (Assigned by recorder): 8863-NDY-2

*Map Name: El Cajon Mountain, California

Scale: 1:24,000

Date: 1975



0 260 520 780 1040 1300 1560 1820 2080 2340 2600 Meters

0 925 1850 2775 3700 4625 5550 6475 7400 8325 9250 Feet

Map Prepared by C. Zepeda-Herman
M:jobs5\8863\arc\gis\NDY_2.mxd

Appendix E

DPR 523 Form Updates

The following section contains content that was obtained from a third party and may not achieve the same level of Americans with Disabilities Act (ADA) and Section 508 accessibility as other parts of this document.

***NRHP Status Code** 3B, 3CB, 5B

***Resource Name or # (Assigned by recorder):** Barrett Reservoir Complex Historic District
D1. Historic Name: Barrett Dam
D2. Common Name: Barrett Dam

***D3. Detailed Description**

This District Record provides an update to previous documentation of the Barrett Reservoir Complex and surrounding, eligible discontiguous thematic historic district, the City of San Diego Source Water System. Previous documentation was completed in 2018 by Dudek. This update builds on the earlier study by documenting and mapping each smaller historic district, and contributing elements, within the larger discontiguous system. This data was gathered through intensive-level survey and analysis conducted in July 2020 by HELIX Environmental Planning, Inc. for the City of San Diego Dam Maintenance Program (McCausland 2021).

The Barrett Reservoir Complex Historic District is located in the southwestern portion of Cleveland National Forest, south-east of the City of San Diego in San Diego County near the community of Jamul. The district includes the following 13 contributing resources: Barrett dam, outlet tower, spillway, two dam keeper's houses, two pump houses, remnants of a flume, a powder magazine, a picnic area featuring a concrete foundation and rubble masonry, Lower Barrett Dam (P-37-038717), and Barrett Lake Road (upper and lower). For a detailed description of Barrett dam, outlet tower, spillway, the two dam keeper's houses, two pump houses, flume remnants, powder magazine, and picnic area, see the 2018 Primary Record for the Barrett Reservoir Complex (Kaiser 2018).

Lower Barrett Dam (P-37-038717) is a masonry dam located downstream from Barrett Dam. The masonry dam, originally called the Bear Canyon Dam, was constructed in 1897 by the Southern California Mountain Water Company. For a detailed description, see the Primary Record for Lower Barrett Dam (Yerka and Shultz 2018). *(See Continuation Sheet)*

***D4. Boundary Description** The boundary includes each of the identified contributing resources as shown in the attached map on page 7. Upper Barrett Lake Road and Lower Barrett Lake Road are also included within the boundaries.

***D5. Boundary Justification:** The boundary includes all of the contributing resources within the complex identified to date. (Should additional contributing elements be identified in the future, the boundary may change accordingly).

D6. Significance: Theme Flood Recovery, Reinvestment, and City of San Diego Source Water System Development **Area** San Diego **Period of Significance** A/1: 1916-1928; C/3: 1922 **Applicable Criteria** A/1 and C/3; City A, B, C, D, and F

The Barrett Reservoir Complex Historic District is eligible for listing in the National Register of Historic Places, the California Register of Historical Resources, and the City of San Diego Historical Resources Register as a contributor to the discontiguous City of San Diego Source Water System Historic District and as a stand-alone, eligible historic district. (The complete evaluation of the complex is provided in Kaiser, 2018.)

***D7. References** (See Continuation Sheet)

***D8. Evaluator:** Annie McCausland, M.A. **Date:** August 2021

Affiliation and Address:
HELIX Environmental Planning 7578 El Cajon Blvd. La Mesa, CA 91942

***D3. Detailed Description (continued):**

Upper Barrett Lake Road

Upper Barrett Lake Road is a graded dirt road which connects Lyons Valley Road to the Barrett Reservoir Complex. It runs approximately 3.89 miles. The road curves along Wilson Creek and is surrounded by native oak trees. There are some remnants of gates and barb wire fences from an adjacent ranch which appears to be no longer active. The road features serval stone masonry culverts and a stone masonry and concrete water crossing. Remnants of a stonemasonry dam-like structure is located on the north side of the road. All of these features appear to be constructed of the same material of local river cobble and concrete mortar.

Stone masonry and concrete water crossing on Upper Barrett Lake Road (top left); masonry culvert (top right); culvert parapet (bottom left) Stonemasonry dam-like structure on Wilson Creek, north of Upper Barrett Lake Road (bottom right)

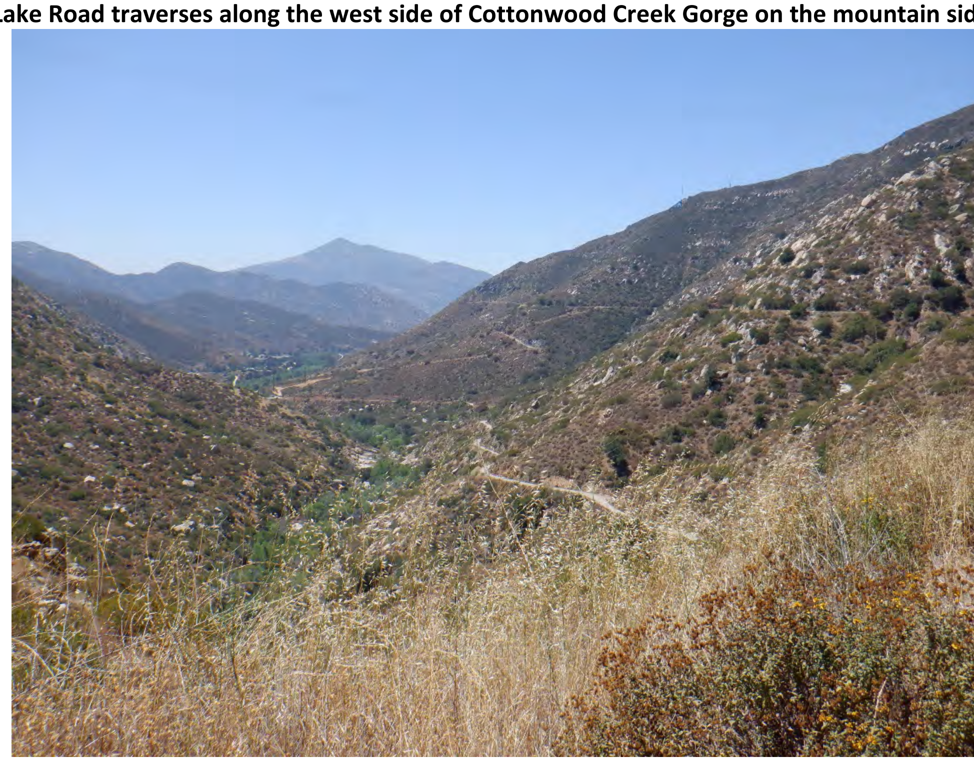
***D3. Detailed Description (continued):**

Upper Barrett Lake Road, looking west.

Lower Barrett Lake Road

Lower Barrett Lake Road, an approximately 6.3-mile two-lane road, runs from Campo Road in its southernmost end to the Barrett Dam to the north. Portions of the road are paved with asphalt, and others are graded dirt, and several gates are located along the alignment. The road was constructed in 1905 to provide access to the Dulzura Conduit and the Barrett Dam site in the early twentieth century and appears to be a contributor to the Barrett Reservoir Complex Historic District.

Lower Barrett Lake Road traverses along the west side of Cottonwood Creek Gorge on the mountain side, looking south.



D6. Historic Context for Barrett Lake Road

The Cottonwood Creek watershed, including one of its tributaries, Wilson Creek, was prone to flooding events in the nineteenth and early twentieth centuries. In fact, the devastating 1916 flood destroyed the original Barrett Dam, which was constructed in 1897, and prompted the need for a new larger dam.

Barrett Lake Road, originally a portion of Lyon's Valley Road, was, and continues to be, a main access road to the Barrett Reservoir Complex since the late nineteenth century.

The other segment of Barrett Lake Road runs north by south along the Cottonwood Creek gorge, connecting Imperial Highway (SR 94) (also known as Campo Road) to the Barrett Reservoir Complex. The north by south portion in the gorge was constructed in 1905 by Spreckels during the construction of the earlier Barrett Dam and was named Barrett Lake Road (The Evening Tribune 1919). At some point, the subject segment of Lyon's Valley Road was renamed Barrett Lake Road. Both segments were utilized during the construction of Barrett Dam between 1919 and 1922. The roads allowed for a loop route from the Jamul post office (The Evening Tribune 1919).

When Barrett Dam construction commenced in 1919, traffic increased on the road. Construction haulers, Barrett Dam camp residents, and sightseers alike utilized the route to access the dam construction site (The Evening Tribune 1919).

D6. Historic Context for Barrett Lake Road continued:

Dam engineer, H.S. Savage, assured the public in a newspaper article that the "road will be in excellent condition for sightseers as well as dam construction purposes" and he further urged "travel to the dam while it is being constructed" (The Evening Tribune 1919). Barrett Lake Road (Lyon's Valley Road) was improved by the County of San Diego in circa 1921 (The Evening Tribune 1921). In 1922, a newspaper article described Lyon's Valley Road from Barrett Dam to be a "dirt road in good condition but crossed by a number of small streams which do not offer difficulty if care is exercised in driving" (San Diego Union 1922). It is possible that the dam masonry workers who built the dam also built the various stone masonry culverts along the road, as well as the water crossing, since the road was an essential piece of infrastructure for access to the dam construction site and village. The culverts and water crossing made the road safer to travel during heavy rain events.

Once the road was improved it was promoted by automobile enthusiast publications. The road was considered scenic, and it was the recommended route for San Diegans visiting the dam construction camp (The Evening Tribune 1921).

***D7. References (continued):**

Kaiser, Kate
2018 DPR 523 Form for Barrett Reservoir Complex. Dudek. On file with the City of San Diego Public Utilities Department.

McCausland, Annie
2021 *City of San Diego Source Water System Historical Resources Assessment for the City of San Diego Dam Maintenance Program*. HELIX Environmental Planning, Inc. On file with the City of San Diego Public Utilities Department.

San Diego Union
1922 "Barrett Dam-Lyons Valley Road." *San Diego Union.* May 28, 1922. Electronic document available at Newspapers.com, accessed October 22, 2020.

The Evening Tribune
1919 "Magnificent Dam at Lower Otay is Great Asset for San Diego." *The Evening Tribune*. August 16, 1919. Electronic document available at Genealogy Bank.com, accessed October 22, 2020.

1921 "Trip to Barrett Dam is Boosted By Evening Tribune." *The Evening Tribune*. May 7, 1921. Electronic document available at Genealogy Bank.com, accessed October 22, 2020.

United States Geological Survey (USGS)
1903 Cuyamaca 1:62500 Topographic Quadrangle.

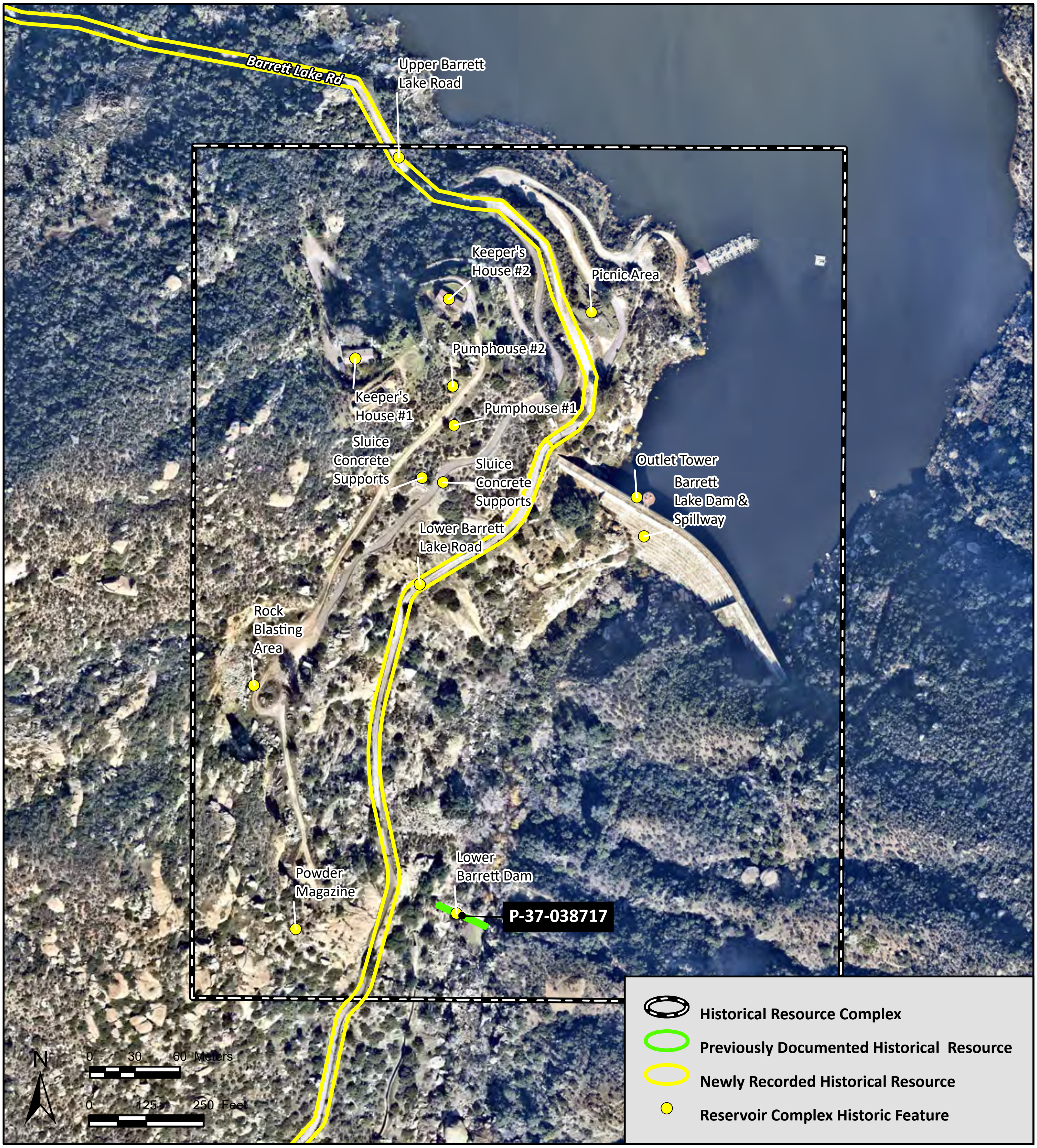
Yerka, N., and R. Shultz
2018 DPR 523 Form for "9085-HJP-2: Lower Barrett Dam" (P-37-038717). On file with the South Coastal Information Center.

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #:
HRI #
Trinomial:

Page 6 of 6 ***Resource Name or #:** Barrett Lake Reservoir Complex

***Drawn By:** SAB ***Date of Map:** Sept 2019



 ***Resource Name or #** P-37-025726

***Recorded by:** Julie Roy (HELIX) and Anthony LaChappa (Red Tail) ***Date:** July 2020 ☐ Continuation ■ Update

***P3a. Description:** The resource was recorded in 2004 by Chambers Group as five historic trash scatters associated with the former location of at least five married employees' cottages within the Barrett Dam construction camp. Artifacts within the scatters date between 1918 and 1929, and include cans, bottles, and ceramic sherds.

HELIX surveyed the area during a 2020 survey for the City of San Diego Dam Maintenance Program; although the site location was reidentified, the recorded features were not visible along the graded dirt roads within the project impact areas. Only a few fragments of ceramics were found in push piles left from grading. No other associated artifacts were identified during the survey.

P5b. Description of Photo: View to the west. Overview of site, north side of road. DSCN6851.

***P11. Report Citation:**
Wilson, Cooley, and Turner (2021) *Cultural Resources Inventory for the City of San Diego Dam Maintenance Program, County of San Diego, California.* Prepared for City of San Diego Public Utilities Department. HELIX Environmental Planning, Inc.

***Attachments:** ■NONE ☐Location Map ☐Sketch Map ☐Continuation Sheet ☐Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

***NRHP Status Code** 3B, 3CB, 5B

***Resource Name or # (Assigned by recorder): El Capitan Reservoir Complex Historic District**
D1. Historic Name: El Capitan Dam and Reservoir
D2. Common Name: El Capitan Dam

***D3. Detailed Description**

This District Record provides an update to previous documentation of the El Capitan Reservoir Complex and surrounding, eligible discontiguous thematic historic district, the City of San Diego Source Water System. Previous documentation was completed in 2018 by Dudek. This update builds on the earlier study by documenting and mapping each smaller historic district, and contributing elements, within the larger discontiguous system. This data was gathered through intensive-level survey and analysis conducted in July 2020 by HELIX Environmental Planning, Inc. for the City of San Diego Dam Maintenance Program (McCausland 2021).

The El Capitan Reservoir Complex Historic District is located in a rural area, east of the community of Lakeside and northeast of the City of San Diego in central San Diego County, California. The district is within the Cleveland National Forest, east of the Capitan Grande Indian Reservation border. The district includes the following 12 contributing resources: El Capitan dam, outlet tower, spillway, flume remnants, storage structure, Keeper's house foundations and remnants, bronze commemorative plaque, 8863-NDY-1 (fieldstone wall), 8863-NDY-2 (fieldstone wall), 8863-HJP-1 (Concrete slab, a small concrete block building, a cistern, two small fenced areas, and a larger fence enclosing the other features), 8863-HJP-2 (Two house foundations and accompanying structures), 8663-BAO-4 (fieldstone-lined ditch).

For a detailed description of El Capitan dam, spillway, flume remnants, outlet tower, and storage structure, Keeper's house foundations and remnants, bronze commemorative plaque, see the 2018 Primary Record for the El Capitan Reservoir Complex (Kaiser 2018).

***D4. Boundary Description** The boundary includes each of the identified contributing resources as shown in the attached map on page 3.

***D5. Boundary Justification:** The boundary includes all contributing resources of the complex identified to date. (Should additional contributing elements be identified in the future, the boundary may change accordingly).

D6. Significance: Theme Post St. Francis Dam Disaster Development, and City of San Diego Source Water System Development **Area** San Diego **Period of Significance** A/1: 1928-1947; C/3: 1935 **Applicable Criteria** A/1 and C/3; City A, B, C, D, and F

The El Capitan Reservoir Complex Historic District is eligible for listing in the National Register of Historic Places, the California Register of Historical Resources, and the City of San Diego Historical Resources Register as a contributor to the discontiguous City of San Diego Source Water System Historic District and as a stand-alone, eligible historic district. (The complete evaluation of the complex is provided in Kaiser, 2018.)

***D7. References** (See Continuation Sheet)

***D8. Evaluator:** Annie McCausland, M.A. **Date:** August 2021

Affiliation and Address:
HELIX Environmental Planning 7578 El Cajon Blvd. La Mesa, CA 91942

***D7. References (continued):**

Dalope, Michelle and Shelby Gunderman

2009a DPR 523 Form for "402-070-05" (P-37-031889). On file with the South Coastal Information Center, San Diego State University.

2009b DPR 523 Form for El Capitan Dam and Reservoir (P-37-031888). On file with the South Coastal Information Center, San Diego State University.

Kaiser, Kate

2018 DPR 523 Form for El Capitan Reservoir Complex. Dudek. On file with the City of San Diego Public Utilities Department.

McCausland, Annie

2021 *City of San Diego Source Water System Historical Resources Assessment for the City of San Diego Dam Maintenance Program*. HELIX Environmental Planning, Inc. On file with the City of San Diego Public Utilities Department.

Price, H., N. Yerka, and G. Kitchen

2017a DPR 523 Form for "8863-NDY-1" (P-37-038887). On file with the South Coastal Information Center, San Diego State University.

2017b DPR 523 Form for "8863-NDY-2" (P-37-038888). On file with the South Coastal Information Center, San Diego State University.

2017c DPR 523 Form for "8863-HJP-1" (P-37-038884). On file with the South Coastal Information Center, San Diego State University.

2017d DPR 523 Form for "8863-HJP-2" (P-37-038885). On file with the South Coastal Information Center, San Diego State University.

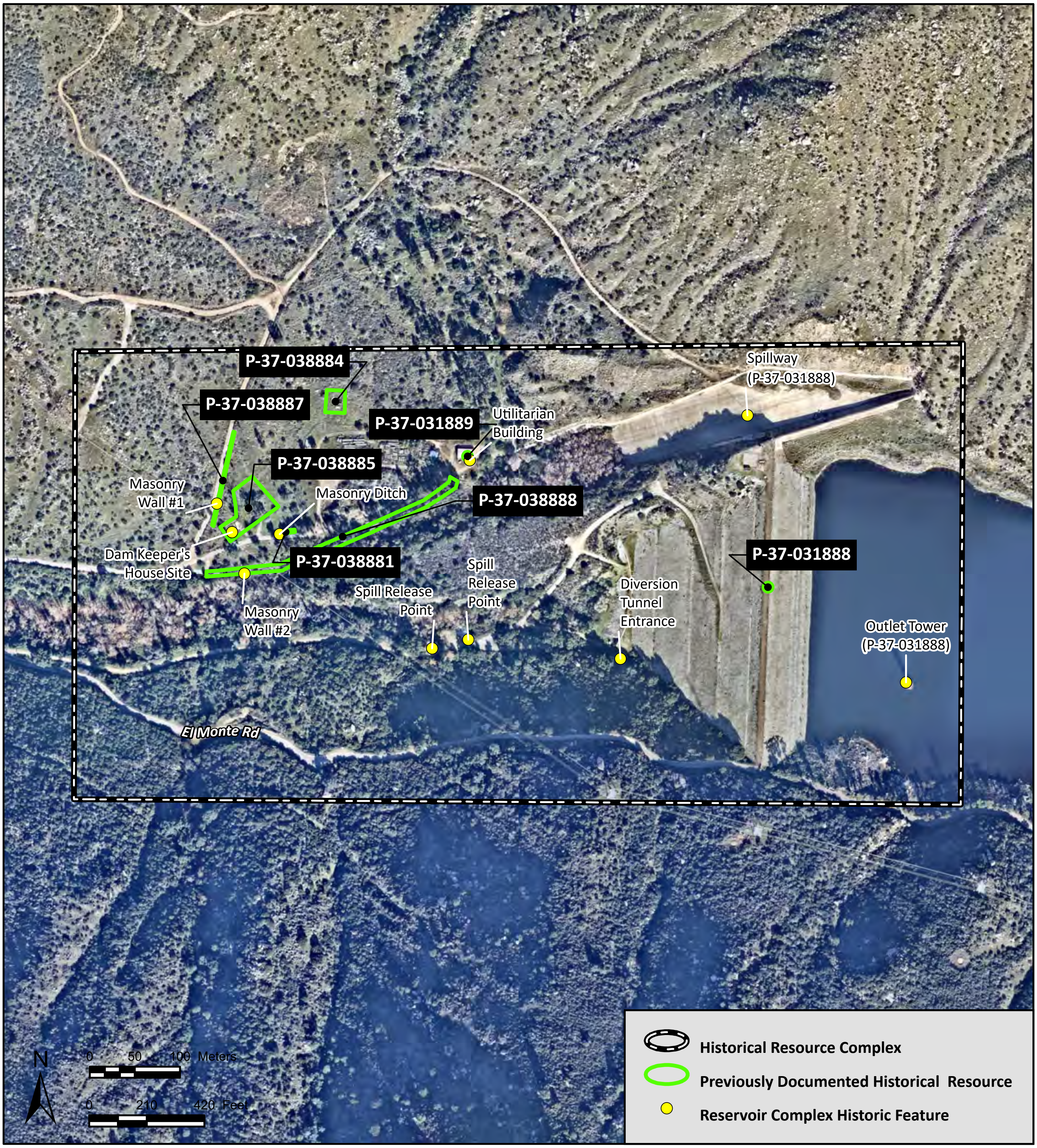
2018 DPR 523 Form for "8863-BAO-4" (P-37-038881). On file with the South Coastal Information Center, San Diego State University.

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #:
HRI #
Trinomial:

Page 3 of 3 ***Resource Name or #:** El Capitan Reservoir Complex

***Drawn By:** SAB ***Date of Map:** Sept 2019



***NRHP Status Code** 3B, 3CB, 5B

***Resource Name or # (Assigned by recorder)** Lake Hodges Reservoir Complex Historic District
D1. Historic Name: Carroll Dam
D2. Common Name: Hodges Dam

***D3. Detailed Description**
This District Record provides an update to previous documentation of the Lake Hodges Reservoir Complex and surrounding, eligible discontiguous thematic historic district, the City of San Diego Source Water System. Previous documentation was completed in 2018 by Dudek. This update builds on the earlier study by documenting and mapping each smaller historic district, and contributing elements, within the larger discontiguous system. This data was gathered through intensive-level survey and analysis conducted in July 2020 by HELIX Environmental Planning, Inc. for the City of San Diego Dam Maintenance Program (McCausland 2021).

The Lake Hodges Reservoir Complex Historic District is located along the San Dieguito River in Del Dios Valley, outside the community of Rancho Santa Fe, southeast of the City of Escondido. The district includes the following 9 contributing resources: Hodges dam and integrated spillway, flume remnants, a utility shed, Quonset hut, shed, dam keeper's house site, public outreach display, and a culvert with associated foundation.

For a detailed description of Hodges dam and integrated spillway, flume remnants, a utility shed, Quonset hut, shed, public outreach display, and a culvert with associated foundation, please refer to the 2018 Primary Record for the Lake Hodges Reservoir Complex (Kaiser 2018).

The complex appears to be unchanged since the June 2018 survey completed by Dudek (Kaiser 2018). However, the Keeper's House and concrete and brick barbeque have been demolished and are no longer extant. The interior of the Quonset hut appears to house historic objects and files that have not been identified or inventoried *(See Continuation Sheet).*

The early twentieth century dam keeper's house site, previously documented as "LH-2" (P-37-015585) appears to be a contributor to the Lake Hodges Reservoir Historic District. Please refer to the Primary record for a complete description (York and Mullen 1996).

***D4. Boundary Description** The boundary includes each of the identified contributing resources as shown in the attached map on page 4.
***D5. Boundary Justification:** The boundary includes all of the contributing resources within the complex identified to date. (Should additional contributing elements be identified in the future, the boundary may change accordingly).
D6. Significance: Theme Flood Recovery, Reinvestment, and City of San Diego Source Water System Development **Area** San Diego **Period of Significance** A/1: 1916-1928; C/3: 1919 **Applicable Criteria** A/1 and C/3; City A, B, C, D, and F

The Lake Hodges Reservoir Complex Historic District is eligible for listing in the National Register of Historic Places, the California Register of Historical Resources, and the City of San Diego Historical Resources Register as a contributor to the discontiguous City of San Diego Source Water System Historic District and as a stand-alone, eligible historic district. (The complete evaluation of the complex is provided in Kaiser, 2018.)

***D7. References** (See Continuation Sheet)
***D8. Evaluator:** Annie McCausland, M.A. **Date:** August 2021
Affiliation and Address:
HELIX Environmental Planning 7578 El Cajon Blvd. La Mesa, CA 91942

***D3. Detailed Description (continued):**

Keeper's House (no longer extant)

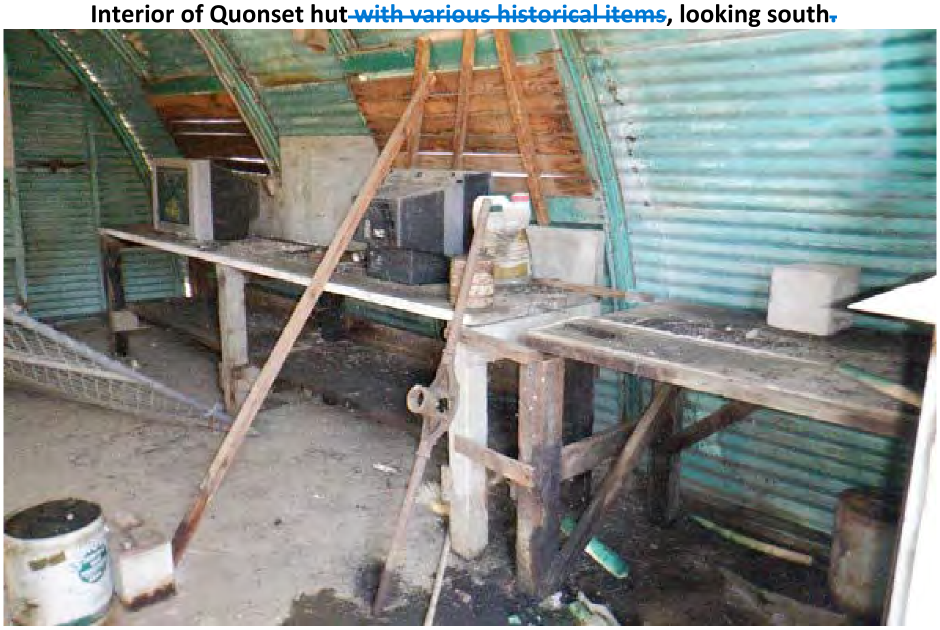
The 2018 Primary record for the lake Hodges Reservoir Complex includes the Dam Keeper's House and associated brick barbeque (Kaiser 2018). The house and barbecue are no longer extant and the site has been recently developed.

New facility where the Keeper's house was located, looking southwest~~.~~

Quonset Hut

The interior of the quonset hut appears to house historical objects and documents that have not been identified or inventoried.

Interior of Quonset hut~~ with various historical items~~, looking south~~.~~



Early Twentieth Century Dam Keeper's House Site "LH-2" (P-37-015585)

During the survey on August 4, 2020, the original dam keeper's residence site was identified (P-37-015585), which was previously documented in 1996 (York and Mullen 1996). This site appears to be a contributing resource within the Hodges Reservoir Complex Historic District. The current dam keeper, Conway Bowman, identified the site as the original dam keeper's house site.

Hodges dam keeper's house, 1936 (Courtesy of the City of San Diego Public Utilities Department Archives).

Lake Hodges Flume (P-37-023709)

Lake Hodges Flume, a 4.6-mile-long water conveyance structure, was found eligible for the CRHR and NRHP in 2000 (Schaefer and Moslak 2000). Historic American Engineering Record documentation was completed in 2002. Portions of the flume are still extant and are contributing to the Lake Hodges Reservoir Complex (Kaiser 2018).

***D7. References (continued):**

Kaiser, Kate
2018 DPR 523 Form for Lake Hodges Reservoir Complex. Dudek. On file with the City of San Diego Public Utilities Department.

McCausland, Annie
2021 *City of San Diego Source Water System Historical Resources Assessment for the City of San Diego Dam Maintenance Program*. HELIX Environmental Planning, Inc. On file with the City of San Diego Public Utilities Department.

Schaefer, Jerry and Ken Moslak
2000 DPR 523 Form for Lake Hodges Flume (P-37-023709). On file with the South Coastal Information Center.

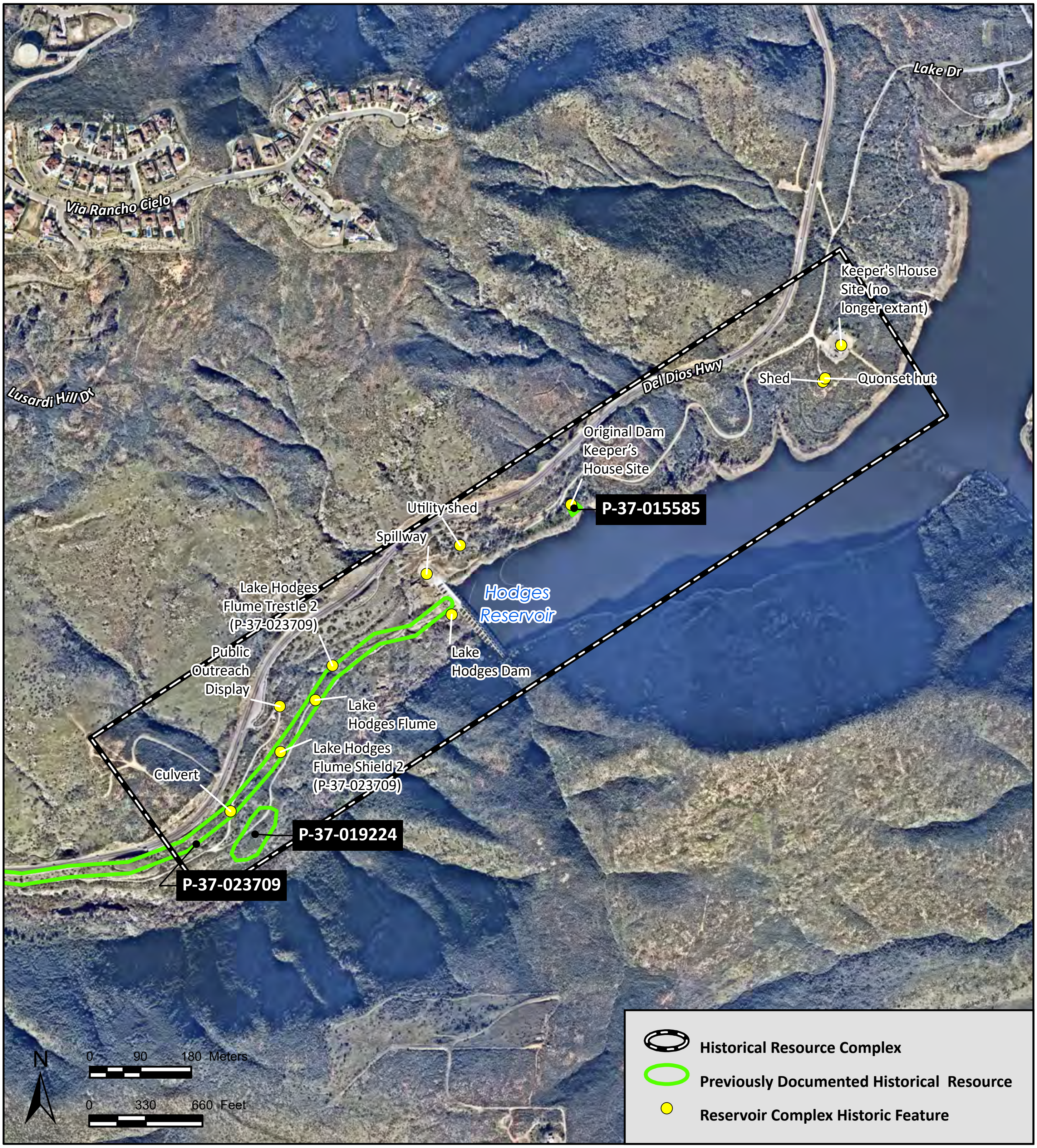
York, A., and J. Mullen
1996 DPR 523 Form for "LH-2" (P-37-015585). On file with the South Coastal Information Center.

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #:
HRI #
Trinomial:

Page 4 of 4 ***Resource Name or #:** Lake Hodges Reservoir Complex

***Drawn By:** SAB ***Date of Map:** Sept 2019



 ***Resource Name or #** 37-019224 Update

***Recorded by:** Annie McCausland ***Date:** July, 2020 ☐ Continuation ■ Update

Two masonry structures, and a concrete pad, were documented in 2000 (Moslak 2000). They were identified as structures possibly associated with the construction of Hodges Dam or Lake Hodges Flume. These structures were included in the 2018 documentation of the Hodges Reservoir Complex (Kaiser 2018). A portion of one of the masonry structures was identified during the survey for this project. The site was inaccessible due to heavy vegetation on the hillside, but a portion was visible from the road. It appears that only a small remnant of the structures remains; therefore, this study does not recommend this resource to be a contributor to the Hodges Reservoir Complex Historic District.

P5b. Description of Photo: Remnant of masonry structure, looking north.

***P11. Report Citation:** McCausland, Annie (2021) *City of San Diego Source Water System Historical Resources Assessment for the City of San Diego Dam Maintenance Program*. HELIX Environmental Planning, Inc. On file with the City of San Diego Public Utilities Department.

***Attachments:** ☐NONE ☐Location Map ☐Sketch Map ☐Continuation Sheet ☐Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

***NRHP Status Code** 3B, 3CB, 5B

***Resource Name or # (Assigned by recorder):** Morena Reservoir Complex Historic District
D1. Historic Name: Morena Reservoir Complex
D2. Common Name: Morena Dam

***D3. Detailed Description**

This District Record provides an update to previous documentation of the Morena Reservoir Complex and surrounding, eligible discontiguous thematic historic district, the City of San Diego Source Water System. Previous documentation was completed in 2015 by Dudek. This update builds on the earlier study by documenting and mapping each smaller historic district, and contributing elements, within the larger discontiguous system. This data was gathered through intensive-level survey and analysis conducted in July 2020 by HELIX Environmental Planning, Inc. for the City of San Diego Dam Maintenance Program (McCausland 2021).

The Morena Reservoir Complex Historic District is located in the Morena Village community of Campo in eastern San Diego County. The district includes the following 8 contributing resources: Morena dam, spillway, outlet tower, lower weir, upper weir, outlet tunnel, outlet gate; and various dam construction artifacts. For a detailed description of Morena dam, outlet tower, and spillway, see the 2015 Primary Record for the Morena Reservoir Complex (Murray 2015). *(See Continuation Sheet)*

***D4. Boundary Description** The boundary includes each of the identified contributing resources as shown in the attached map on page 5.

***D5. Boundary Justification:** The boundary includes all contributing resources of the complex identified to date. (Should additional contributing elements be identified in the future, the boundary may change accordingly).

D6. Significance: Theme Early Water System Development, and City of San Diego Source Water System Development **Area** San Diego **Period of Significance** A/1: 1887-1916; C/3: 1912 **Applicable Criteria** A/1 and C/3; City A, B, C, D, and F

The Morena Reservoir Complex Historic District is eligible for listing in the National Register of Historic Places, the California Register of Historical Resources, and the City of San Diego Historical Resources Register as a contributor to the discontiguous City of San Diego Source Water System Historic District and as a stand-alone, eligible historic district. (The complete evaluation of the complex is provided in Murray, 2015.)

***D7. References** (See Continuation Sheet)

***D8. Evaluator:** Annie McCausland, M.A. **Date:** August 2021

Affiliation and Address:
HELIX Environmental Planning 7578 El Cajon Blvd. La Mesa, CA 91942

***D3. Detailed Description (continued):**

Morena Dam Lower Weir

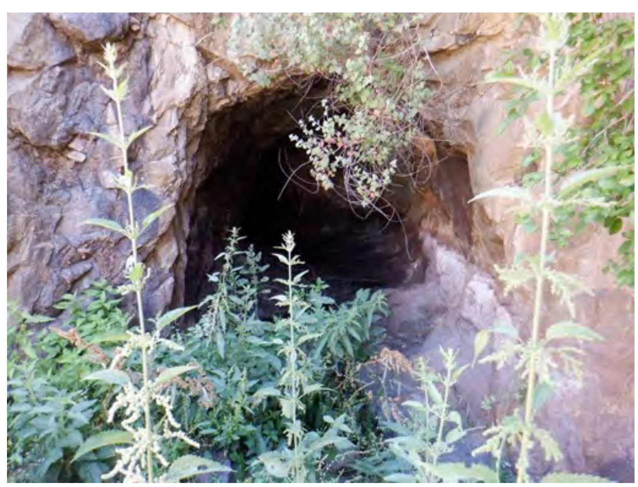
The Morena dam lower weir is located downstream from the dam at the bottom of the Cottonwood Creek canyon. The concrete weir was recently replaced with a new metal measuring device in 2020. The board-formed concrete approach channel walls appear to be constructed circa 1913. The lower weir appears to be a contributor to the Morena Reservoir Complex Historic District.

Morena Dam Upper Weir, Outlet Tunnel and Outlet Gate

The upper weir, outlet tunnel, and outlet iron gate are located on the downstream face of the dam and are accessible via a single-track dirt path. The iron gate is lying on the ground near the outlet tunnel and upper weir. The iron gate appears to be the appropriate size to fit and cover the tunnel entrance. The upper weir, outlet tunnel, and outlet gate appear to be contributors to the Morena Reservoir Complex Historic District.

Morena dam weir with modern metal measuring device, looking east (top left); upper weir and iron outlet gate, looking from above, facing west (top right); outlet tunnel iron gate (bottom left) outlet tunnel entrance, looking southeast (bottom right)



***D3. Detailed Description (continued):**

Morena Dam Construction Artifacts

Various artifacts were identified on the downstream face of the dam that appear to be associated with the construction of the dam. These artifacts include iron buckets and other iron objects and tools. A sand dredger machine is also located in the reservoir near the upstream face of the dam. According to the dam keeper, sometimes the dredger is not visible due to fluctuating water levels. These historic objects appear to be contributing features of the Morena Reservoir Complex Historic District.

Only the sand dredger is highlighted on the attached map.

Iron remnants on the downstream face of the dam, looking northwest (top left); Iron buckets on the downstream face of the dam, looking southeast (top right); sand dredging machine, looking east (bottom center)

***D7. References (continued):**

McCausland, Annie
2021 *City of San Diego Source Water System Historical Resources Assessment for the City of San Diego Dam Maintenance Program*. HELIX Environmental Planning, Inc. On file with the City of San Diego Public Utilities Department.

Murray, Samantha
2015 DPR 523 Form for the Morena Reservoir Complex. Dudek. On file with the City of San Diego Public Utilities Department.

Murray, Samantha, and Salli Hosseini
2015 DPR 523 Form for Morena Dam and Outlet Tower (P-37-037080). On file with the South Coastal Information Center.

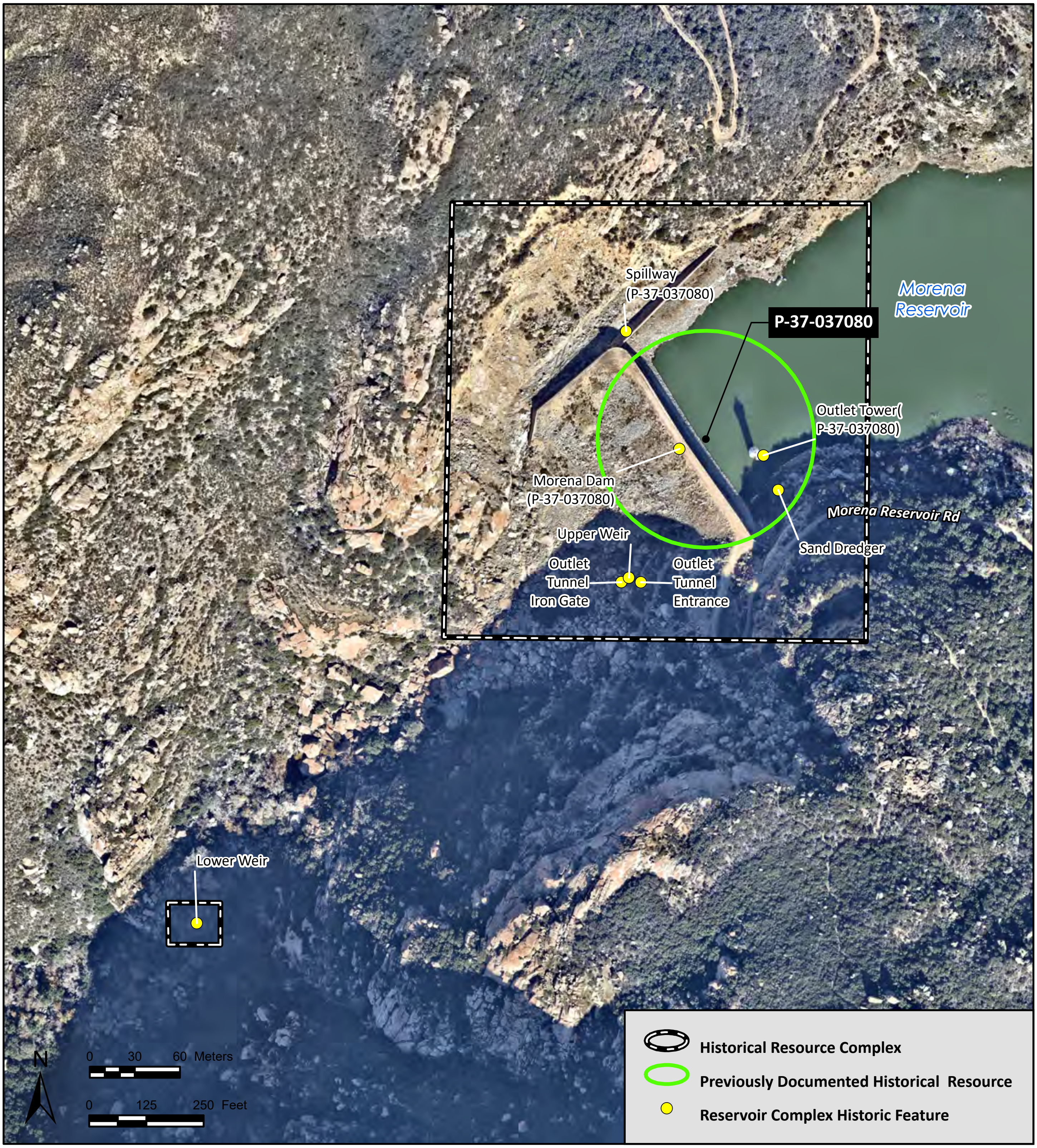
State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #:
HRI #
Trinomial:

*Resource Name or #: Morena Dam and Outlet Tower

*Drawn By: SAB

*Date of Map: Sept 2019



***Resource Name or #** P-37-016024 Update

***Recorded by:** Annie McCausland ***Date:** July, 2020 ☐ Continuation ■ Update

The Lake Murray Dam Keeper's House, constructed sometime before 1910, was recorded in 1998 by Stephen Van Wormer. The house was remodeled in 1985, and was relocated to the western shore of the reservoir when the Alvarado Water Filtration Plant was expanded in the early 1990s to 2000s. The house has since been demolished.

P5b. Description of Photo: Original location of the Murray Dam Keeper's house, view to the north.

***P11. Report Citation:** McCausland, Annie (2021) *City of San Diego Source Water System Historical Resources Assessment for the City of San Diego Dam Maintenance Program*. HELIX Environmental Planning, Inc. On file with the City of San Diego Public Utilities Department.

***Attachments:** ☐NONE ☐Location Map ☐Sketch Map ☐Continuation Sheet ☐Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

***NRHP Status Code** 3B, 3CB, 5B

***Resource Name or # (Assigned by recorder): Lower Otay Reservoir Complex Historic District**
D1. Historic Name: Lower Otay Dam
D2. Common Name: Savage Dam

***D3. Detailed Description**

This District Record provides an update to previous documentation of the Lower Otay Reservoir Complex and surrounding, eligible discontiguous thematic historic district, the City of San Diego Source Water System. Previous documentation was completed in 2018 by Dudek. This update builds on the earlier study by documenting and mapping each smaller historic district, and contributing elements, within the larger discontiguous system. This data was gathered through intensive-level survey and analysis conducted in July 2020 by HELIX Environmental Planning, Inc. for the City of San Diego Dam Maintenance Program (McCausland 2021).

The Lower Otay Reservoir Complex Historic District is located in the southcentral portion of San Diego County in a suburban area. It is flanked by Otay County Open Space Preserve in the San Ysidro Mountains on the east, and the city of Chula Vista on the west. The district includes the following 7 contributing resources: Lower Otay dam, outlet tower, spillway, original dam remnants, powder magazines #1 and #2, and highway bridge remnants. For a detailed description of the Lower Otay dam, outlet tower, spillway, original dam remnants, and powder magazine #2, see the 2018 Primary Record for the Lower Otay Reservoir Complex (Kaiser 2018).

Photographs of the original dam remnants and the powder magazine #2 were not included in the 2018 DPR 523 Forms. Photographs of these contributing resources within the Lower Otay (Savage) Reservoir Complex Historic District are included on the attached Continuation Sheets.

Another powder magazine (#1) and highway bridge remnants were identified during the survey. It appears that the powder magazine #1 remnants are also contributors to the Lower Otay (Savage) Reservoir Complex Historic District. *(See Continuation Sheet)*

***D4. Boundary Description** The boundary includes each of the identified contributing resources as shown in the attached map on page 6.

***D5. Boundary Justification:** The boundary includes all of the contributing resources within the complex identified to date. (Should additional contributing elements be identified in the future, the boundary may change accordingly).

D6. Significance: Theme Flood Recovery, Reinvestment, and City of San Diego Source Water System Development **Area** San Diego **Period of Significance** A/1: 1887-1928; C/3: 1895; 1919 **Applicable Criteria** A/1 and C/3; City A, B, C, D, and F

The Lower Otay Reservoir Complex Historic District is eligible for listing in the National Register of Historic Places, the California Register of Historical Resources, and the City of San Diego Historical Resources Register as a contributor to the discontiguous City of San Diego Source Water System Historic District and as a stand-alone, eligible historic district. (The complete evaluation of the complex is provided in Kaiser, 2018.)

***D7. References** (See Continuation Sheet)

***D8. Evaluator:** Annie McCausland, M.A. **Date:** August 2021

Affiliation and Address:
HELIX Environmental Planning 7578 El Cajon Blvd. La Mesa, CA 91942

***D3. Detailed Description (continued):**

Original Dam Concrete Remnants and Powder Magazine #2

These contributing resources are described in detail in the 2018 DPR 523 Forms, but photographs were not included (Kaiser 2018). Photographs of these contributing resources within the Lower Otay Reservoir Complex Historic District is provided below.

Original dam concrete infrastructure, looing southwest (top left); original dam concrete infrastructure remnant, looking south (top right); original dam concrete infrastructure remnant, looking southwest (bottom left); powder magazine #2, looking south (bottom right)

***D3. Detailed Description (continued):**

Powder Magazine #1

What appears to be another powder magazine structure was identified during the project survey. This structure appears to be a contributor to the Lower Otay Reservoir Complex Historic District.

Powder Magazine #1 entryway.

***D3. Detailed Description (continued):**

Highway Bridge Remnants

Highway bridge remnants across the Lower Otay spillway were identified during the project survey. Concrete bridge approach slabs are extant on the east and west sides of the spillway. Wooden posts, possibly remnants of a fence, are extant on the east side of the spillway, near the concrete approach way Concrete pier remnants are attached to the floor of the spillway in alignment with the concrete approach slabs. The bridge is illustrated in the 1916 plans by Hiram N. Savage. It appears that these bridge remnants are contributing resources within the Lower Otay Reservoir Complex.

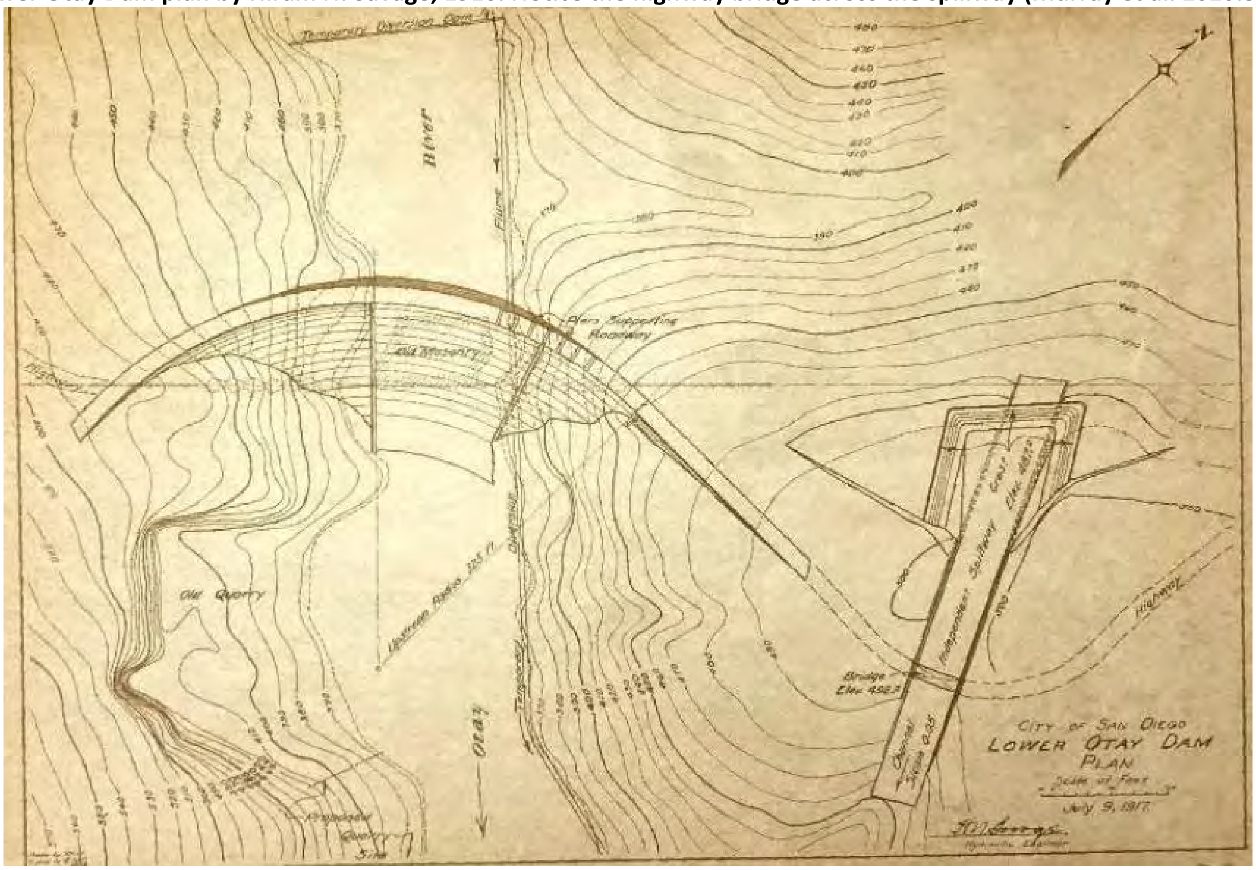
Concrete approach slab on the west side of the spillway, looking north (top left); close up of concrete approach slab with layer of rocks and a top layer of asphalt, looking southeast (top right); concrete approach slab and wooden posts and fence remnants on the east side of the spillway, looking northeast (bottom left); concrete bridge pier remnants extant on the concrete floor of the spillway, looking east (bottom right)




Resource Name or #: Lower Otay Reservoir Complex Historic District

***Recorded by:** HELIX Environmental Planning, Inc. ***Date:** 9 August 2021 ☑ Continuation □ Update

Lower Otay Dam plan by Hiram N. Savage, 1916. Notice the highway bridge across the spillway (Murray et al. 2020:39).



***D7. References (continued):**

Kaiser, Kate
2018 DPR 523 Form for Lower Otay (Savage) Reservoir Complex. Dudek. On file with the City of San Diego Public Utilities Department.

McCausland, Annie
2021 *City of San Diego Source Water System Historical Resources Assessment for the City of San Diego Dam Maintenance Program*. HELIX Environmental Planning, Inc. On file with the City of San Diego Public Utilities Department.

Murray, Samantha, Sarah Corder, Nicole Frank, Kate Kaiser, Kara Dotter, and Jessica Colston.
2020 City of San Diego Source Water System Historic Context Statement. Prepared for the City of San Diego Public Utilities Department. Dudek. Encinitas, California.

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #:
HRI #
Trinomial:

Page 6 of 6 ***Resource Name or #:** Lower Otay Reservoir Complex

***Drawn By:** SAB ***Date of Map:** Sept 2019

DPR 523K (1/95) ***Required Information**

***NRHP Status Code** 3B, 3CB, 5B

***Resource Name or #:** San Vicente Reservoir Complex Historic District
D1. Historic Name: San Vicente Dam
D2. Common Name: San Vicente Dam

***D3. Detailed Description**
This District Record provides an update to previous documentation of the San Vicente Reservoir Complex and surrounding, eligible discontiguous thematic historic district, the City of San Diego Source Water System. Previous documentation was completed in 2018 by Dudek. This update builds on the earlier study by documenting and mapping each smaller historic district, and contributing elements, within the larger discontiguous system. This data was gathered through intensive-level survey and analysis conducted in July 2020 by HELIX Environmental Planning, Inc. for the City of San Diego Dam Maintenance Program (McCausland 2021).

The San Vicente Reservoir Complex Historic District is located on San Vicente Creek near the community of Lakeside in northeastern San Diego County, California. The district includes the following 11 contributing resources: San Vicente dam, incorporated outlet tower, incorporated spillway, commemorative plaque, ice house, keeper's house, keeper's office, Quonset hut, concrete mixer and batching plant foundation, San Diego Aqueduct outlet structure, and the Mussey Grade Road (Old Julian Highway).

For a detailed description of San Vicente dam, incorporated outlet tower, incorporated spillway, commemorative plaque, ice house, Keeper's house, Keeper's office, concrete mixer and batching plant foundation, San Diego Aqueduct outlet structure, and the Mussey Grade Road (Old Julian Highway), please refer to the 2018 Primary Record for the San Vicente Reservoir Complex (Corder and Kaiser 2018). *(See Continuation Sheets).*

***D4. Boundary Description:** The boundary includes each of the identified contributing resources as shown in the attached map on page 4.

***D5. Boundary Justification:** The boundary includes all contributing resources of the complex identified to date. (Should additional contributing elements be identified in the future, the boundary may change accordingly).

D6. Significance: Theme Post St. Francis Dam Disaster Development, and City of San Diego Source Water System Development **Area** San Diego **Period of Significance** 1928-1947 **Applicable Criteria** A/1; City A, B, and F

The San Vicente Reservoir Complex Historic District is eligible for listing in the National Register of Historic Places, the California Register of Historical Resources, and the City of San Diego Historical Resources Register as a contributor to the discontiguous City of San Diego Source Water System Historic District and as a stand-alone, eligible historic district. (The complete evaluation of the complex is provided in Corder and Kaiser, 2018.)

***D7. References** (See Continuation Sheet)

***D8. Evaluator:** Annie McCausland, M.A. **Date:** August 2021

Affiliation and Address:
HELIX Environmental Planning 7578 El Cajon Blvd. La Mesa, CA 91942

***D3. Detailed Description (continued):**

Dam Keeper's Office and Auxiliary Structures

The 2018 site record does not include photographs or descriptions of the following contributing resources: the Keeper's office and auxiliary structure, which are located in the downstream valley of the dam. Here are photos of these contributing resources within the San Vicente Complex Historic District.

Another storage structure was identified during the 2020 survey. The structure is a Quonset hut currently used for storage and appears to be associated with the dam Keeper's office and storage structure constructed circa 1940. Due to its age and association with the adjacent dam keeper's office, the Quonset hut appears to be a contributing historical resource within the San Vicente Reservoir Complex Historic District.

Dam keeper's office, looking southeast (top left); Auxiliary structure, looking north (top right); Primary south façade of Quonset hut, looking north (bottom left) Interior view of Quonset hut, looking north (bottom right)




***D3. Detailed Description (continued):**

Mussey Grade Road (Old Julian Highway) (P-37-026974)

Old Julian Highway is included in the 2018 documentation of the San Vicente Reservoir Complex; however, it is referred to as Mussey Grade Road (Corder and Kaiser 2018). Old Julian Highway is a contributing historical resource within the San Vicente Reservoir Complex Historic District. Old Julian Highway was first documented in 2005 and later in 2009 (Van Wormer 2005; Williams 2009).

***D7. References (continued):**

Corder, Sarah and Kate Kaiser
2018 DPR 523 Form for San Vicente Reservoir Complex. Dudek. On file with the City of San Diego Public Utilities Department.

Dalope, Michelle and Shelby Gunderman
2009 DPR 523 Form Update for San Vicente Dam and Reservoir (P-37-024354). On file with the South Coastal Information Center, San Diego State University.

Gustafson, A.
2002 DPR 523 Form Update for San Vicente Dam (P-37-024354). On file with the South Coastal Information Center, San Diego State University.

McCausland, Annie
2021 *City of San Diego Source Water System Historical Resources Assessment for the City of San Diego Dam Maintenance Program*. HELIX Environmental Planning, Inc. On file with the City of San Diego Public Utilities Department.

Van Wormer, Stephen
2005 DPR Form for Old Foster-Julian Highway #1 (P-37-026974). On file with the South Coastal Information Center.

Williams, Brian
2009 DPR 523 Form Update for Old Julian Highway (P-37-026974). On file with the South Coastal Information Center.

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

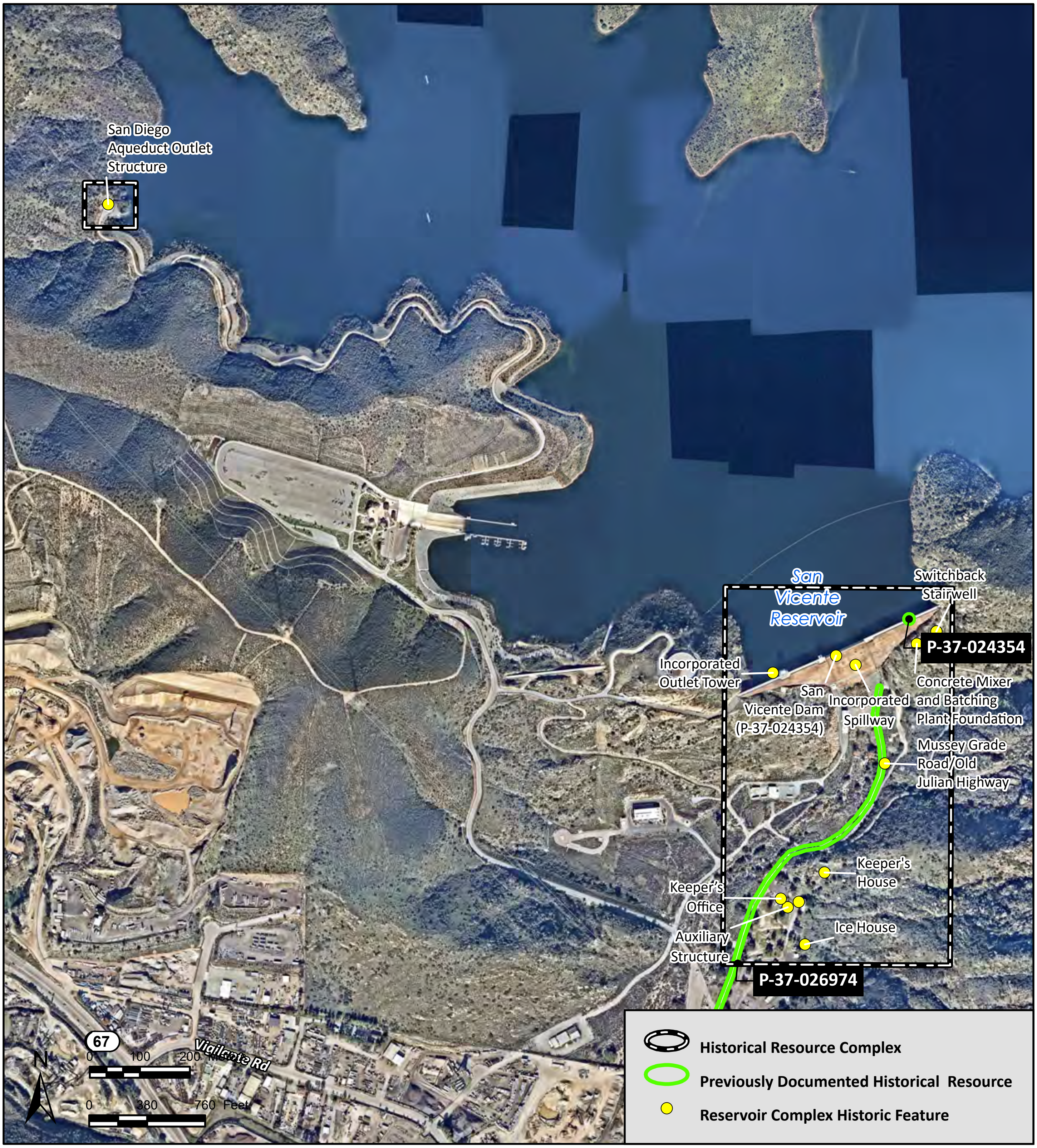
SKETCH MAP

Primary #:
HRI #
Trinomial:

*Resource Name or #: San Vicente Reservoir Complex

*Drawn By: SAB

*Date of Map: Sept 2019



*Required Information

***NRHP Status Code** 3B, 3CB, 5B

***Resource Name or # (Assigned by recorder): Upper Otay Reservoir Complex Historic District**
D1. Historic Name: Upper Otay Dam
D2. Common Name: Upper Otay Dam

***D3. Detailed Description**

This District Record provides an update to previous documentation of the Upper Otay Reservoir Complex and surrounding, eligible discontiguous thematic historic district, the City of San Diego Source Water System. Previous documentation was completed in 2018 by Dudek. This update builds on the earlier study by documenting and mapping each smaller historic district, and contributing elements, within the larger discontiguous system. This data was gathered through intensive-level survey and analysis conducted in July 2020 by HELIX Environmental Planning, Inc. for the City of San Diego Dam Maintenance Program (McCausland 2021).

The Upper Otay Reservoir Complex Historic District is located in the southcentral portion of San Diego County just north of Lower Otay Lake and 13 miles southeast of the City of San Diego. The district includes the following 3 contributing resources: Upper Otay dam, spillway, and the Otay Lakes Road underpass. For a detailed description of the contributing resources, see the 2018 DPR 523 Form for the Upper Otay Reservoir Complex (Corder 2018).

***D4. Boundary Description** The boundary includes each of the identified contributing resources as shown in the attached map on page 2.

***D5. Boundary Justification:** The boundary includes all the contributing resources within the complex identified to date. (Should additional contributing elements be identified in the future, the boundary may change accordingly).

D6. Significance: Theme City of San Diego Source Water System Development **Area** San Diego **Period of Significance** A/1: 1887-1916; B/2: 1896-1922; C/3: 1902 **Applicable Criteria** A/1, B/2, and C/3; City A, B, C, D, and F

The Upper Otay Reservoir Complex Historic District is eligible for listing in the National Register of Historic Places, the California Register of Historical Resources, and the City of San Diego Historical Resources Register as a contributor to the discontiguous City of San Diego Source Water System Historic District and as a stand-alone, eligible historic district. (The complete evaluation of the complex is provided in Corder, 2018.)

***D7. References**

Corder, Sarah
2018 DPR 523 Form for Upper Otay Reservoir Complex. Dudek. On file with the City of San Diego Public Utilities Department.

McCausland, Annie
2021 *City of San Diego Source Water System Historical Resources Assessment for the City of San Diego Dam Maintenance Program*. HELIX Environmental Planning, Inc. On file with the City of San Diego Public Utilities Department.

***D8. Evaluator:** Annie McCausland, M.A. **Date:** August 2021

Affiliation and Address:
HELIX Environmental Planning 7578 El Cajon Blvd. La Mesa, CA 91942

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

SKETCH MAP

Primary #:
HRI #
Trinomial:

Page 2 of 2

*Resource Name or #: Upper Otay Reservoir Complex

*Drawn By: SAB

*Date of Map: Sept 2019

State of California — The Resources Agency DEPARTMENT OF PARKS AND RECREATION **CONTINUATION SHEET**	**Primary #** P-37-011605 Update **HRI#** **Trinomial**

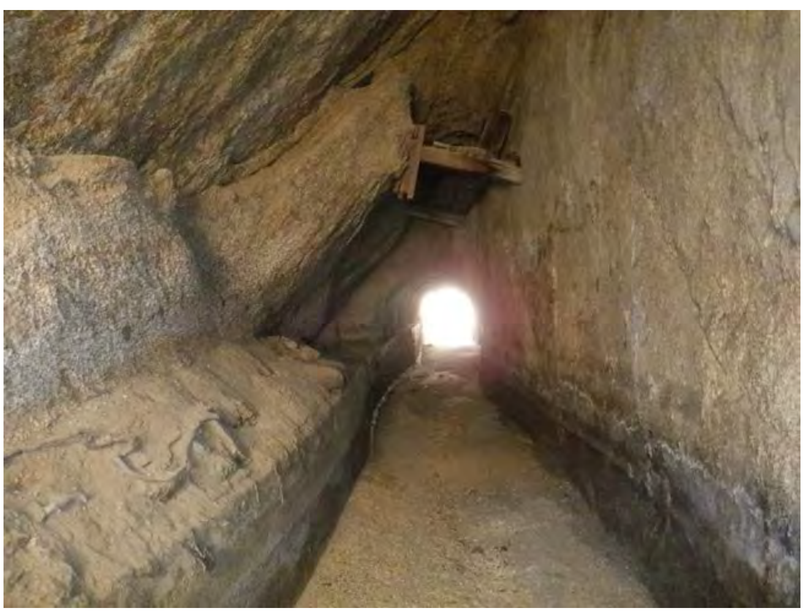
Page 1 **of** 1 ***Resource Name or #** Dulzura Conduit

***Recorded by:** Annie McCausland, HELIX Environmental Planning ***Date:** July, 2020 ☐ Continuation ■ Update

This record provides an update to previous documentation of the Dulzura Conduit and surrounding, eligible discontiguous thematic historic district, the City of San Diego Source Water System. Previous documentation was completed in 2018 by Dudek (Frank 2018). This data was gathered through intensive-level survey and analysis conducted in July 2020 by HELIX Environmental Planning, Inc. for the City of San Diego Dam Maintenance Program (McCausland 2021). During the project survey, a timber support structure was identified within Tunnel 2. This might be one of the last remaining portions of the Dulzura Conduit timber infrastructure remaining.

The Dulzura Conduit has been documented several times, beginning in 1989, when the remaining six timber flumes were documented in order to mitigate the effects of their removal (Van Wormer 1989). A DPR 523 Form update was prepared in 2002 when a remaining timber flume section (Flume 12) was destroyed during the Barrett Fire (Robbins-Wade 2002). In 2007, another update for the conduit was prepared for a State Route 94 improvement project, which included the documentation of a southern portion of the conduit (Tsunoda and DeGiovine 2007). Another segment, 1/8 mile west of Barrett Lake Road, was documented in 2010, which included the identification of a metal flow control gate and the replacement of once wooden Flume 5 with a modern metal flume resting on metal trestles (Gunderman 2010). In 2013, a portion of the conduit was located four miles north of the Campo Road/Barrett Lake Road junction, and 0.25 mile west up an access road from Barrett Lake Road. The segment includes contemporary cinder blocks stacked along the sides of the conduit as well as concrete covers over the conduit. A contemporary drainage opening was also documented northeast of Tunnel 6. The original concrete had also been removed and replaced with new concrete. The old concrete was left stacked nearby (Droessler 2013).

The Dulzura Conduit is regularly repaired, most recently in 2019. Shotcrete was used to repair 10 deteriorated sections of the conduit, adhering to the Secretary of the Interior Standards for Rehabilitation (Murray 2019). Portions of historic concrete are deteriorating and flaking off.



P5b. Description of Photo: Timber support structure within Tunnel 2, looking southwest.

***P11. Report Citation:** McCausland, Annie (2021) *City of San Diego Source Water System Historical Resources Assessment for the City of San Diego Dam Maintenance Program*. HELIX Environmental Planning, Inc. On file with the City of San Diego Public Utilities Department.

***Attachments:** ☐NONE ☐Location Map ☐Sketch Map ☐Continuation Sheet ☐Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):