CITY OF LAKE ELSINORE

MASTER DRAINAGE PLAN UPDATE

(CIP Project No. 120)

Prepared for:

Prepared by:

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SECTION 1 - EXECUTIVE SUMMARY

Strategically located off the I-15 freeway between the Inland Empire and San Diego, the City of Lake Elsinore is experiencing tremendous growth. With 70% remaining to build-out of its total 42 square miles, the City's growth and development is expected to continue for the next few decades. Recognizing the importance of having a well-planned infrastructure system to meet the demands of an expanding population, the City set the goal of updating its existing Master Drainage Plan (MDP) into a comprehensive document which will consolidate the existing 51 drainage districts, incorporate land areas annexed over the last 30 years, and update the existing Area Drainage Fee schedule. All future development in Lake Elsinore is subject to Area Drainage Fees under the auspices of Assembly Bill 1600, the Mitigation Fee Act.

■ Overview

Unique to the City is its namesake, Lake Elsinore, the Lake with the world famous thermal wind. It is the resource, amenity, and primary attraction of the City, providing a wide range of sport and recreational opportunities for residents and visitors alike. "**Dream Extreme"** the City's logo and branding slogan, attracts and promotes the sports of sky diving, parasailing, hang-gliding, water skiing, jet skiing, boat racing, fishing, off-road racing, and such.

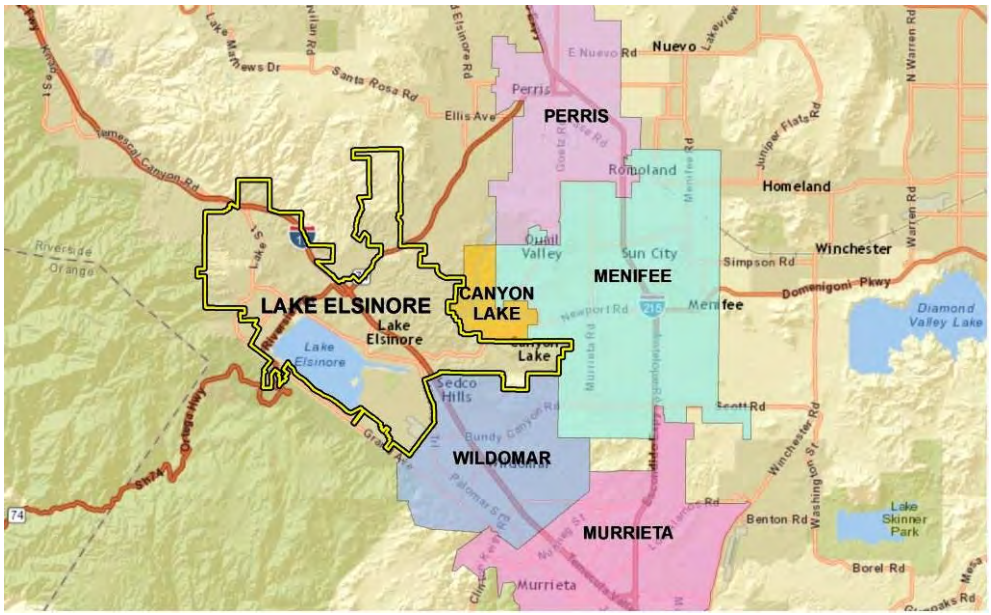
The Lake also posts challenges and restrictions to the rapid growth of the City due to excessive levels of nitrogen and phosphorus (nutrient loading), sediment toxicity, and low water levels resulting from periodic drought conditions.

Lake Elsinore is at the terminus of the San Jacinto River, within the Santa Ana River watershed. Lake Elsinore is the largest natural lake in Southern California. It has been in existence for thousands of years and has historically experienced significant variations in its water level. Today, the lake receives surface flows from local tributaries, water releases from Canyon Lake, and recycled water from Elsinore Valley Water District. During rare overflow events, at approximately 1,255 feet water surface elevation (Datum NGVD 1929, Lake Elsinore Outlet Channel designed by U.S. Army Engineer District Los Angeles, Corps of Engineers), Lake Elsinore overflows into Temescal Creek and ultimately to the Santa Ana River.

The City of Lake Elsinore is located approximately 60 miles southeast of Los Angeles and 70 miles north of San Diego, in western Riverside County. The City is bounded by Cities of Canyon Lake, Menifee and Wildomar to the east, unincorporated areas of Riverside County to the north, south and west as it lies nestled at the foot of the Cleveland National Forest. Figure 1-1 shows the general vicinity of the City.

The city terrain ranges in elevation from 1,250 feet at the Lake to a maximum of 2,400 feet above sea level at southwest corner of the City within the Santa Ana Mountain range.

Figure 1-1
City of Lake Elsinore General Vicinity Map



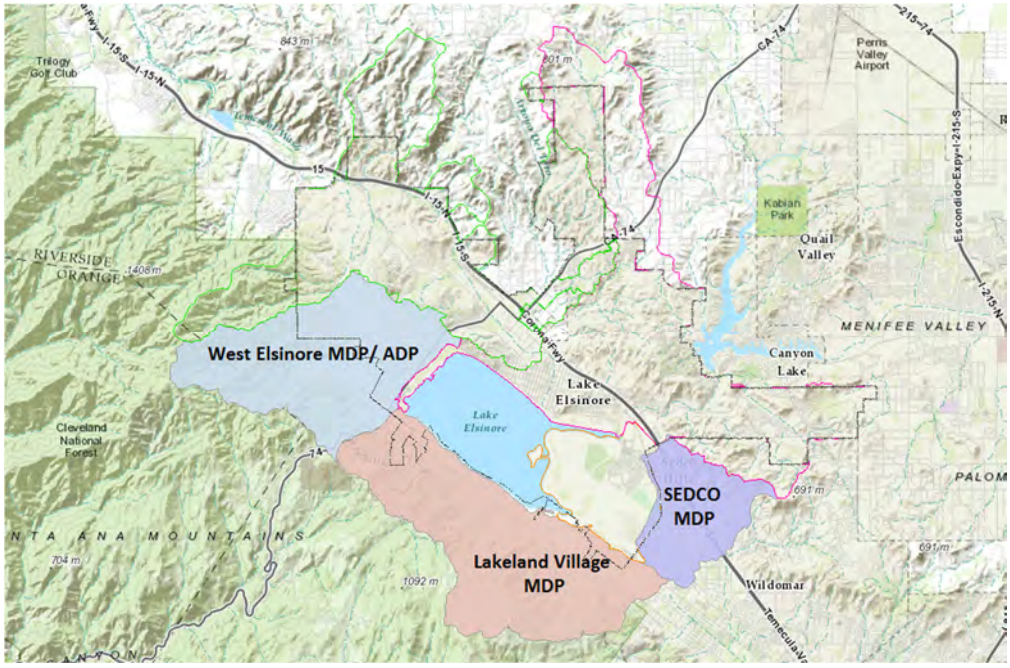
■ Existing MDPs and Drainage Infrastructure

The existing city wide Master Drainage Plan (MDP) and Area Drainage Fee (ADF) was approved and adopted by the City in 1990. This master drainage plan divided the City into 54 drainage districts with drainage fees assigned for 51 of the 54 districts. The fee schedule associated with the 1990 MDP was updated by Harris and Associates in 2004, the 2004 updated MDP used the same hydrology analysis to size the facilities in the 1990 MDP and incorporated much of the same information from the 1990 MDP.

Within the city boundary and its sphere of influence, there are three MDPs and one Area Drainage Plan (ADP) prepared and adopted by the Riverside County Flood Control and Water Conservation District (District). Figure 1-2 depicts the boundaries of these three MDPs.

1. "**West Elsinore Master Drainage Plan**" and "**West Elsinore Area Drainage Plan**" were prepared by Riverside County Flood Control and Water Conservation District (District), with the Area Drainage Fee approved in 1986 and updated in June 12, 1993. The drainage area covered by this MDP consists of approximately 10.5 square miles, where nearly 40% of the drainage area is within the City boundary. Currently, most of the MDP facilities are constructed, and areas are well developed, except the steep hillside area.

Figure 1-2
City of Lake Elsinore Existing MDP Exhibit



2. **"SEDCO Master Drainage Plan"** was prepared by the District in March, 1982. The drainage area covered by SEDCO MDP consists of approximately 4.5 square miles, mostly outside the City boundary. However, all SEDCO storm water runoffs discharge to the Lake through the East Lake area of the City. The SEDCO area and area to the east were incorporated in 2009 as the City of Wildomar. The City of Wildomar is also in the process of preparing a city-wide Master Drainage Plan.

3. **"Lakeland Village Master Drainage Plan"** was prepared by the District and adopted in March 2015. This MDP study area encompasses approximately 13 square miles, located south of the Lake, within unincorporated Riverside County. A limited area of the City is located within this MDP. Since this is one of the latest MDPs prepared by the District, it is also used as reference for this report.

The above listed three Master Drainage Plans depict three stand-alone watersheds, with runoff originating from these watersheds flowing into Lake Elsinore. The general areas within these MDP boundaries are excluded for this study.

■ Purpose

The primary purpose of updating the Master Drainage Plan (MDP) is to provide a comprehensive storm water strategy that provides flood protection for both existing and future developments within the City.

The MDP will also: identify the drainage facilities to address the major drainage problems within the City; establish the estimated costs of those facilities, and identify the funding sources for the city-wide flood control and drainage infrastructure, to facilitate safe, orderly and economically development of the area. In addition, this study will also explore the opportunity for implementing watershed-based BMPs, and water quality mitigation and treatment with the focus on nutrient

reduction, to enhance the beneficial use of, and minimize the negative impact to the Lake water quality from current and future development.

This MDP update study addresses the current and future drainage needs of the communities within the City. The boundary of each drainage zone follows regional watershed limits. The proposed facilities include channels, storm drains, debris and detention basins, and any other conveyance capable of economically relieving flooding problems within the City. The plan includes an estimate of facility capacity, sizes and costs.

In addition to providing a guide for the orderly development of the City, the MDP update also provides an estimate of costs to resolve flooding issues within each drainage zone or sub-zone. Those costs will be used to establish Area Drainage Fees exacted under AB 1600, which prevent existing taxpayers from having to shoulder the burden of land development costs.

The alignment and location of the facilities proposed in this MDP update are conceptual. Precise locations and size of the facility will be dictated by site specific conditions and other factors such as environmental, engineering and economic considerations.

■ Scope of Study

The updated MDP study consolidates the drainage districts, assesses and inventories the existing drainage infrastructures, incorporates updated city boundary, general plan land use, and rainfall data, and produces a comprehensive master drainage plan for the entire city. The drainage fee schedule will correspond to the consolidated drainage zones. West Elsinore ADP fees will be adjusted using the published construction cost price index value by Engineering News Record, widely known as ENR.

In conjunction with this study, GIS data layers have been developed for MDP facilities, drainage zone boundaries, and the area drainage fee schedule to integrate into the City GIS data base.

The overall scope of the MDP update included the following:

- Existing drainage facility data collection and field investigation of the flooded areas and conditions of inlets and outlets of major storm drains
- Establishing basic engineering design criteria and consolidating existing 51-Drainage Districts to 4-MDP Zones for drainage and flood control within the City
- Compiling existing available topography and land use plans for the project area
- Preparing hydrology analysis for the study area of the City and its tributary areas
- Identifying proposed drainage improvements for each MDP zone or sub-zone
- Investigation of alternatives for the proposed drainage facilities and cost estimates
- Finalizing MDP facility and Area Drainage Fee for each zone or subzone

■ Design Criteria

It is imperative to establish the criteria for the Hydrology and Hydraulics (H&H) study and MDP design guideline before proceeding with the detailed studies and design. Webb has reviewed the existing MDPs within or near the city boundary prepared by Riverside County Flood Control District (District) to ensure the City of Lake Elsinore MDP will be compatible and consistent with the surrounding areas. The following criteria were discussed with the Interim City Engineer, and were reviewed and approved by the City.

1. Hydrology

The hydrology for this MDP will be developed using two methods: the Rational Method and the Synthetic Unit Hydrograph Method. The Rational Method will be used to determine the peak discharges (cubic feet per second) generated from watersheds smaller than 300 to 500 acres in size. For watersheds larger than 300 to 500 acres, primarily the watersheds outside the city boundary and steep hilly areas, the Synthetic Unit Hydrograph Method will be used. Methodology and supportive data for both Rational and Synthetic hydrology, including estimation of loss rates/infiltration, may be found in the *Riverside County Flood Control and Water Conservation District Hydrology Manual*, dated April 1978 (District Hydrology Manual).

2. Land Use

In 2011, the City completed an update of its General Plan. For the watershed areas within the city boundary, land use designations from the updated General Plan will be used to develop the hydrology for this MDP.

For the watershed areas outside the city boundary, the 2003 Riverside County General Plan land use designations will be used.

In addition to the City and County General Plan land use, there are 17 Specific Plans within the city, and each has its own land use designations. Some of these Specific Plans are almost built-out, while others are still evolving and going through amendments.

Due to the dynamic and complex nature of the land use designations and their actual impacts to the hydrology studies, we propose to consolidate the land use into 7 categories with assigned impervious percentage recommended per the District Hydrology Manual. For Specific Plans, if there are 10 planning areas with varied density, an average total may be used for MDP level of the studies. This approach will simplify the process without compromising the integrity of the study.

City of Lake Elsinore MDP Land Use Summary

Land Use Group	Land Use per General Plan	RCFCD Hyd Manual Cover Type	Impervious Cover	Remarks
Open Space	OS-Open Space, F-Floodway, Conservation Bank, RMR-Rural Mountainous Residential, RR-Rural Residential	Natural (Fair) Chaparral Broadleaf	5%	Lakeland Village MDP used (Good) cover for the same land use group.
Park & Rec	Park, L-Lakeshore, R-Recreation, Golf Course	Urban Landscaping	15%	
VLDR	Very Low Density Residential, Estate Density Residential	1 Acre Lots	30%	
LDR	PI-Public Institutional, Schools, LDR-Low Density Residential	1/2 Acre Lots	40%	Use >40% based on actual impervious cover
MDR	R1-Single Family Residential, R2-Medium Density Residential, LMD-Low Medium Density Residential, MD-Medium Density Residential, MHD-Medium High Density Residential	1/4 Acre Lots	50%	
HDR	High Density Residential, RMU-Residential Mixed Use, MC-Mobile Home community, EC-Existing Condo, EMH-Existing Mobile Home Complex	Condo, Apartments, Mobile Home Park	75%	
Commer-cial	Varies Commercial C1, C2, CM, CO, CP, CR, NC, TC, GC, Manufacturing M1, M2, M3, BP-Business Professional, LI-Light Industrial	Commercial, Downtown Business or Industrial	90%	

3. Rainfall Values

To be consistent with the recently completed Lakeland Village MDP prepared by the District, the NOAA Atlas 14 rainfall data will be used in the hydrology calculations for this MDP. The rainfall frequencies examined are the 2-year (50% annual chance) and the 100-year (1% annual chance) recurrence intervals with 1, 3, 6 and 24 hour durations. The calculated slope of the intensity-duration curve is 0.6. The following NOAA Atlas 14 Version 4 average point rainfall values will be used to develop the hydrology:

NOAA Atlas 14 Point Rainfall Values

Storm Frequency and Duration	Average Point Rainfall (Inches)
2 Year – 1 Hour	0.48
2 Year – 3 Hour	0.86
2 Year – 6 Hour	1.24
2 Year – 24 Hour	2.34
100 Year – 1 Hour	1.34
100 Year – 3 Hour	2.17
100 Year – 6 Hour	3.06
100 Year – 24 Hour	6.29

4. MDP Facilities

Currently, the existing storm drain facilities within the city limits are maintained by various entities and agencies; including RCFCD, Caltrans, City of Lake Elsinore, City of Wildomar, County of Riverside Transportation Department, HOAs and others. To streamline the future design, maintenance, and funding, the City may consider establishing some guidelines and maintenance mechanisms (CFDs or Assessment Districts) and the discussion of those is included in the MDP documents. Each maintenance entity also dictates the design standards. For the purpose of MDP facility design and cost estimate, RCFCD standards and design guidelines will be used.

Underground Storm Drain System

All of the underground storm drain systems will be designed to convey the runoff from a 100-year storm, with RCP sized 36” and larger. Road culverts, laterals and collectors will not be identified as MDP facilities. The underground facilities proposed in this MDP will be located within existing or assumed future right-of-way, whenever possible. The typical MDP storm drain pipe or box design will have 3’ of cover with the slopes parallel to the existing ground.

Open Channels

Well defined natural channels, canyons and ravines are the most economical way to transport and convey the storm runoff, and pose the least impacts to potentially sensitive areas. The MDP study will focus on preserving and maximizing the utilization of natural water courses.

When natural water courses become less defined, flattened and spread out, they may cause flooding of the roadway and properties, as well as add constrains to future development. Open channels may be used to continue transporting storm runoff to a safe outlet. The open channels not only serve as flow conveyors, they also provide an outlet for underground facilities. This MDP study will utilize two types of open channels, lined and unlined. Lined channels will be used in high velocity flow situations and are typically rectangular or trapezoidal shaped with concrete paving on the sides and bottom. Unlined channels will be utilized in low velocity flow situations, are typically trapezoidal in shape and have no protection for the bottom or side slopes. The

unlined channels can also provide infiltration or filtration opportunities for water quality management.
The channel right-of-way required for both lined and unlined facilities must accommodate the full channel width along with adequate maintenance access. Channels with top widths less than 20 feet require one maintenance access road, and where the top width exceeds 20 feet, two maintenance access roads are necessary per RCFCD design standards. All of the open channels will be designed to convey the runoff from a 100-year storm.

Detention Basin

Detention basins maybe utilized for this MDP. The purpose of the detention basin is to lower the peak flow rate through the use of temporary detention storage, thus reducing the size and cost of the downstream MDP facilities. It should be noted that a detention basin, if proposed, will be sized for the 1% annual chance ("100-year" storm) event. Flows exceeding the design capacity of the basin would pass over the emergency spillway or overflow structure, discharge into the downstream storm drain pipe or open channel. A detention basin may also be used when existing downstream facilities have inadequate capacity.

Debris Basins

Debris basins may be used in watersheds that are equal to or greater than 64 acres and are generally located upstream of the proposed facilities to capture debris before it enters the downstream conveyance system. The proposed debris basins will be sized based on the *Los Angeles District Method for Prediction of Debris Yield* (Method) developed by the U.S. Army Corps of Engineers Los Angeles District, dated February 2000. The Method is intended to be used for the estimation of debris yield in watersheds of 64 to 128,000 acres in areas with steep, mountainous terrain. The MDP study will further evaluate the benefits of reducing sedimentation and debris, reducing facility size (without using bulked flowrate) and ease of maintenance versus the cost of land acquisition and cost of construction of the debris basins.

Recharge Basins

An evaluation for use of recharge basins was made as part of the MDP. Due to the highest and best use assigned to runoff to the Lake and the basin size required to be cost effective, locations were not selected at this time. Recharge Basins can and will be considered as construction of MDP facilities occurs.

SECTION 2 - EXISTING FACILITIES AND DRAINAGE ISSUES

Drainage issues include street and private property flooding, erosion, long-term ponding, drainage facility maintenance issues, and hillside runoff. The drainage facilities include City-owned storm drains and channels, Riverside County Flood Control District-owned and maintained storm drains and channels, homeowner association-owned basins, and the inlets and outlets associated with each. The field surveys and documentation provided in this report were collected from January to March 2015.

Most of the drainage issue locations and drainage facility locations were identified by City staff prior to the field surveys. The drainage issue locations were collected by City maintenance and engineering staff based on past resident complaints and prior knowledge and experience in the area. The type and location of various existing storm drain facilities are based on as-built plans in the City's possession. The locations were input into an electronic map using GIS software to keep collected information geo-referenced and easily accessible. During the field surveys, all notes and pictures were collected using the ArcGIS Collector mobile application. This application operates on any mobile phone or data-enabled tablet and uploads information to the GIS map in real-time.

All of the field surveys were conducted by at least one engineering staff member from Albert A. Webb Associates (Webb) along with at least one engineering staff member from the City.

■ Flooding and Drainage Issues

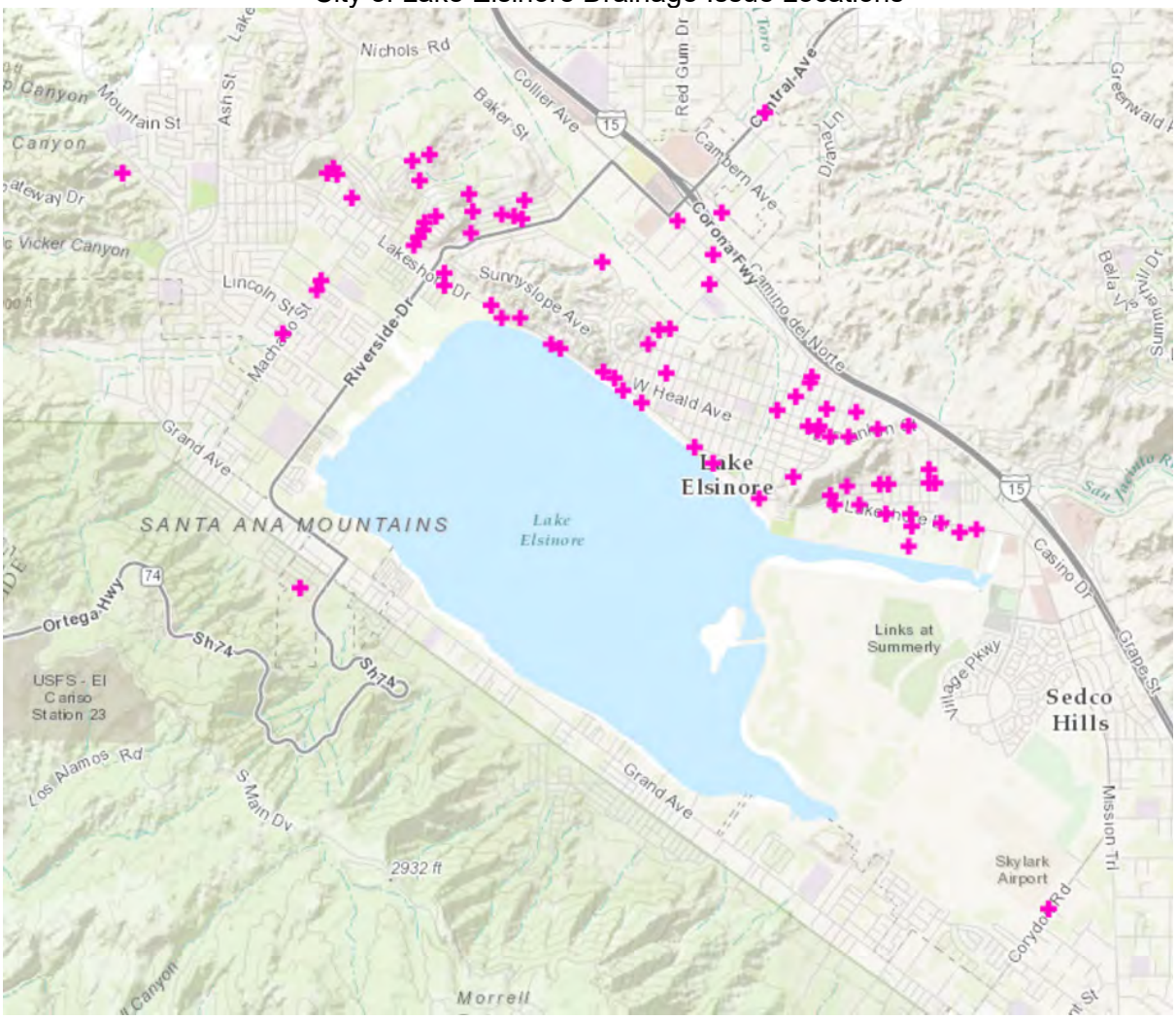
With the assistance of the City Maintenance and Operation staffs, Webb surveyed and documented approximately 79 drainage issue locations. These locations are characterized by any combination of street flooding, private property flooding, dirt or roadway erosion, long-term ponding, hillside runoff, and maintenance issues. Nearly all of the drainage issue locations are located between Interstate 15 and the northeast side of the lake. The northeast side of the City is largely an older area with few to no existing storm drain facilities. There are also several steep slopes in the area that seem to exacerbate the flooding and runoff problems.

Below are the top ten flooding locations in the City provided by the city staff:

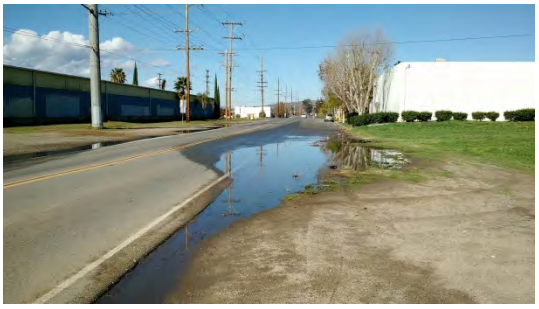
1. 1209 N. Sumner
2. 3rd Street / Pasadena
3. Avenue 6 / Lakeshore
4. Pepper / Dawes
5. Mission Trail south of Olive.
6. High St / Alley e/o Lakeshore
7. East side of Lakeshore from Morton to 100 feet past Lake Park Street
8. Lakeshore / Kansas on north side of Lakeshore
9. W/S Machado s/o Joy St by guard rail
10. Franklin by Cell Tower

Figure 2-1 shows the locations of observed drainage issues throughout the City.
A summary table with the locations of the City wide drainage issues and recommended mitigation measures are provided at the end of this section.

Figure 2-1
City of Lake Elsinore Drainage Issue Locations



- **Street Flooding.** Street flooding in the City is primarily caused by low points in or near the street without proper drainage facilities. Although the climate is relatively arid, water often remains in the street for days and even weeks after a rain event. This is especially true on gravel roads and on streets with low points in or near dirt shoulders.



Roadway flooding on Collier Ave. near Chaney Street

Roadway flooding on Lakeshore Drive at Matich Street

- **Private Property Flooding.** Private property flooding and water damage in the City mainly occurs near hills and in areas of low elevations. Water often flows down hills or streets and runs through or ponds in private property. This kind of flooding usually occurs when property is at lower elevations than the street or when the street is lacking curbs or berms to properly channelize the water. Often gravel bags were placed along the street edge of pavement or property line by the City M&O staff to reduce the flooding.

Street flow on Ellis Street drains down slope into property at Lower elevation

Sand bags at Country Club Dr. and Acacia Street

- **Erosion.** Street shoulder erosion is most commonly found on streets with no curb or berm to properly channelize water. Storm runoff flows in the dirt at the edge of the street creating ravines. The runoff can get underneath the street and cause pavement damage. Erosion is also found wherever an undeveloped hillside meets a street. Dirt and debris from the hill are carried by the water and are deposited on downstream streets and property.

Dirt shoulder erosion adjacent to pavement on Franklin Street

Hillside erosion

- **Maintenance Issues.** There are many locations that the City's maintenance staff handles on a regular basis. The staff places sandbags in runoff areas near hills, vacuums problematic ponding areas, and clears runoff debris from streets and blocked storm drains. Maintenance of drainage areas is constant. Storm drains are routinely blocked after a rain event with heavy deposits of dirt and debris.

Storm drain outlets blocked with dirt on Pierce and Collier Avenue

■ Drainage Issues - General Remedies

Most of the drainage issues occur from only a few causes. The most common causes of the surveyed drainage issues are low points on the street or property, lack of curbs and/or gutter facilities, unimproved hillside, and insufficient maintenance of existing facilities.

Street flooding is often caused by streets not having proper slopes and crowns, and lack of dewatering measures at low points. Some streets in the City were found to have low points within the traveled way. The slopes of the pavement can be improved by paving, but care should be taken to not simply put the water on the shoulder of the road. Water can often pond or erode dirt shoulders if not properly channelized.

The City uses a mix of asphalt concrete berm, curb, and curb/gutter combinations throughout the City to help channelize water that runs off of the street. However, many locations simply have dirt shoulders without any curb or gutter facility. This leads to ponding, dirt erosion, and dirt runoff. Constructing berms, curbs, and gutters can help channelize the water along the street and towards storm drain facilities.

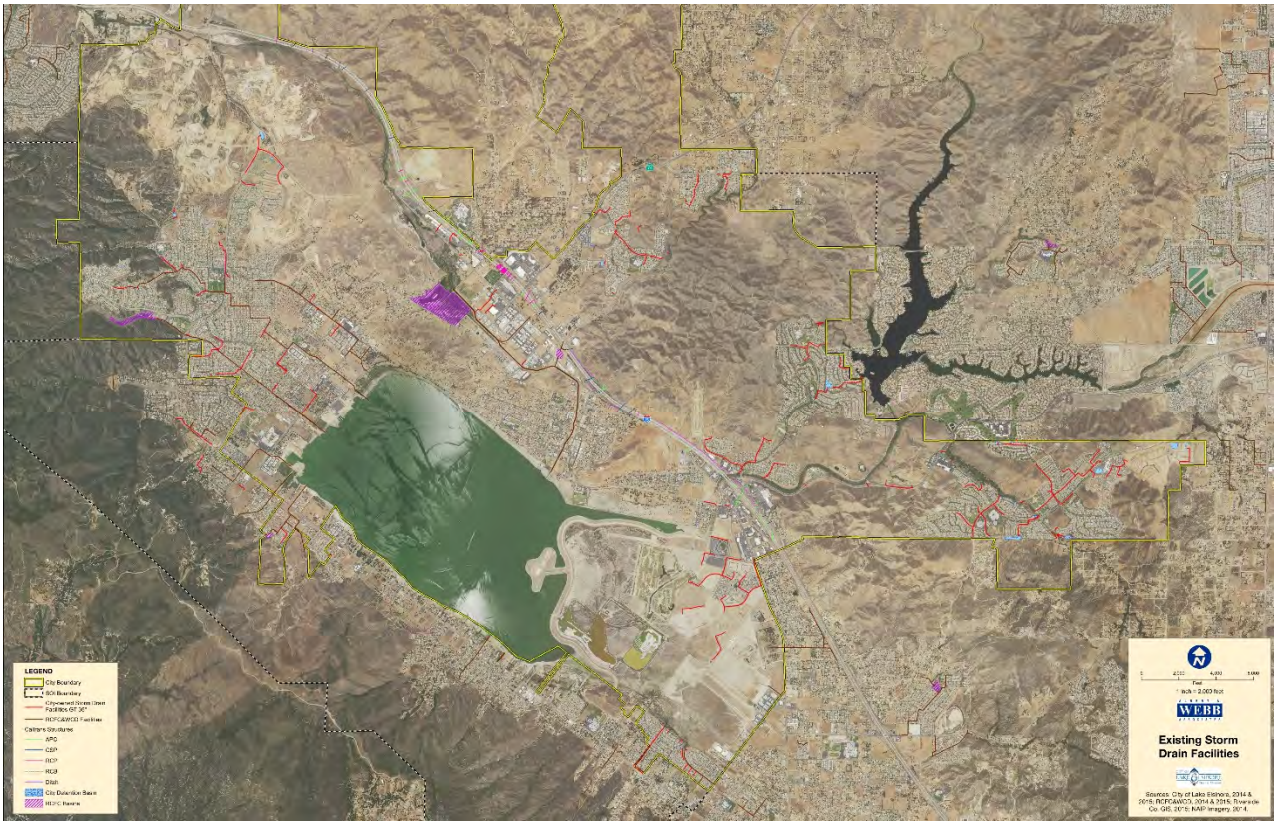
There are many vacant and unimproved lots and areas throughout the City imbedded in the older neighborhood, and often leave gaps in curbs, gutters and sidewalks. The storm runoff from these lots often brings dirt and debris to the street and causes erosion and blocks the street flow. The City has been placing sandbags to keep the storm runoff flowing within the street, as a temporary solution. More permanent solutions such as berms, curbs, and gutters can be added to the frontage of these lots to assist in drainage. Also, the addition and preservation of vegetation and other plants can reduce the amount of water runoff and dirt erosion from these areas. A special assessment fee or NPDES requirements for the vacant lots may be considered for funding of the maintenance.

It is clear that the majority locations with flooding and drainage issues are in older neighborhoods of the City, areas with very few to no existing storm drain facilities. A few areas with the erosion and flooding issues can be addressed by installing asphalt berm or concrete curb and gutter along the existing edge of pavement, a low cost solution. For the majority of the areas with flooding issues, the long term solution is to establish a system of drainage facilities to safely convey storm runoff to the Lake or other receiving water.

■ Inventory of Existing Drainage Facilities

The existing storm drain facilities within the City boundary and MDP study area can be separated to three major categories based on the maintenance responsibility:

Figure 2-2
City of Lake Elsinore Existing Drainage Facilities



1. **City and privately owned and maintained facilities** – the City completed a City-wide GIS mapping in July of 2013. The City facilities range from underground pipe systems and concrete lined channels, to culverts and basins. Some of the water quality basins and detention basins may be maintained by the HOAs or POAs. Some of the facilities shown on the City GIS map database may be duplications of the District's facilities (in the West Elsinore MDP area).

2. **The District (RCFCD) owned and maintained facilities** – The MDP study area is located in the District's Zone 3. There are 47 sets of "As Built" RCFCD storm drain plans collected and reviewed for this study. These "As Built" plans dated as early as 1954, the latest addition is Arroyo Del Toro Channel plans dated 2013. Among the District facilities, Outlet Channel is a unique facility designed by the Army Corp of Engineers. With its crest (high point) located at mid Wasson Canyon Channel inlet, it conveys half of the Wasson Canyon runoff to the Lake in normal storm events. It also discharges Lake's overflow to the Temescal Wash when 1255 water surface elevation is reached in the Lake. A summary of the District's facilities is provided hereon for reference.

Existing RCFCD Facilities					
No.	**Project No.**	**Dwg No.**	**Facility Name**	**Reach**	**Type**
1	3-0-00010	3-063	Lakeland Village Storm Drain	Lake to Grand Ave.	U Channel
2	3-0-00008	3-068	Churchill Street Ditch	Turnaround to Grand	Ditch
3	3-0-00100	3-070	Leach Canyon Debris Dam	Right of Way Map, Debris Dam	Dam
4	3-0-00030	3-078	Lime St. Channel Stage I & II	Hill Street	Trap Channel
5	3-0-00030	3-078	Lime St. Channel Stage I & II	Lake to Laguna Ave	Trap
6	3-0-00060	3-079	Stoneman St. Channel	Stoneman at Grand	Trap
7	3-0-00030	3-085	Lime St. Channel Stage III	Laguna to Grandview	Trap
8	3-0-00060	3-092	Stoneman St. Channel Stage II	Stoneman St	Channel
9	3-0-00090	3-093	South riverside Channel Stage I	Lake Elsinore to Laguna Ave.	Trap
10	3-0-00090	3-100	South riverside Channel Stage II	Washington to Dreycott on Laguna	RCP
11	3-0-00070	3-102	Ortega Channel Stage I	Lake to Grand Ave.	Trap
12	3-0-00100	3-106	Leach Canyon Channel Stage I	Lake 3+40 to 33+50	Conc. Trap
13	3-0-00100	3-109	Leach Canyon Channel Stage II	Machado to Riverside	Conc. Channel
14	3-0-00120	3-110	Four Corners Storm Drain Stage I	Lake to Riverside Dr.	RCP
15	3-0-00100	3-112	Leach Canyon Channel Stage I	Restoration	Conc Channel
16	3-0-00120	3-116	Four Corners Storm Drain Stage III	On Lakeshore Dr. to Gunnerson	RCP
17	3-0-00140	3-119	SEDCO Line D & D-1	Mission Trail to I-15	RCP
18	3-0-00175	3-126	Third Street Channel	Thrid St and Collier Ave	Trap, RCB
19	3-0-00180	3-127	Wasson Canyon Channel Stage I	Minthorn Street and Collier Ave	Basin, RCP, channel
20	3-0-00149	3-128	SEDCO Line F-2	Along Tract 23235 boundary	U Channel, 60" RCP
21	3-0-00070	3-129	Ortega Channel Stage II-A	Grand to Ortega Hwy	RCP
22	3-0-00070	3-130	Ortega Channel Stage III	Tr 19358	Channel & RCP
23	3-0-00040	3-131	SEDCO Line F-3	North of Strickland Av to South of Collier Ave	RCP or CIPP
24	3-0-00071	3-133	Ortega Channel Laterals A & A1	Tract 20139-1	RCP
25	3-0-00005	3-135	Lake Elsinore Outlet Channel	Sheets R1-R50 Mics, Waterline relocations	
26	3-0-00004	3-135R	Lake Elsinore Outlet Channel-Rt 74	Channel Bridge -Caltrans Riverside Dr	Bridge
27	3-0-00216	3-141	W Elsinore MDP Line A-1	Tr 28748 & 28748-1 / Stage 1 on Grand Ave	RCP
28	3-0-00148	3-142	SEDCO Line F-4	Tr 23295 - Gafford Road & Winding Way	RCP, Channel
29	3-0-00071	3-143	Ortega Channel Stage II	On Grandview and Lakeridge	RCP
30	3-0-00220	3-146	W Elsinore MDP Line C	Tr 30789 Stage 2, Sandpiper Drive	RCP
31	3-0-00100	3-147	Leach Canyon Channel	CFD 88-3, Line B, Stage 3 & Line B-1, Stage 1	Trap Channel
32	3-0-00100	3-149	Leach Canyon Channel	CFD 88-3, McVicker Channel Line B-1, Stage 2	Trap Channel
33	3-0-00100	3-158	Leach Canyon Channel	CFD 88-3, Line B-1, Stage 3	Channel, RCP
34	3-0-00226	3-159	W Elsinore MDP McVicker Debris Basin	CFD 88-3 Debris Basin, Line B-1 Stage 4	Basin, Channel
35	3-0-00004	3-162	Lake Elsinore Outlet Channel-USACE	Lake Elsinore to Temescal Creek	Trap Channel
36	3-0-00071	3-171	Ortega Channel Lat-A Debris Basin	Welford Place	Basin
37	3-0-00120	3-178	Four Corners Storm Drain	Stage 4, Lakeshore Drive	RCP
38	3-0-00220	3-179	W Elsinore MDP Line C & C1	Tract 30789, Line C Stage 2	RCP, Basin
39	3-0-00145	3-180	SEDCO Line E	Park Access to Mission Trail	RCP, Channel
40	3-0-00220	3-185	W Elsinore MDP Line C & C1	Tract 31917, Line C Stage 3	RCP, Basin
41	3-0-00045	3-186	Palomar and Corydon Channel	Channel Bridge -Caltrans Riverside Dr	Channel & RCB
42	3-0-00085	3-187	SEDCO Bryant St Storm Drain	Stage 1 From Collier Marsh to I-15	RCP
43	3-0-00085	3-190	SEDCO Bryant St Storm Drain	Tract 29513	RCP, Basin
44	3-0-00141	3-191	SEDCO Line F	Stage 2, from Elsinore HS to I-15	60" 72"-RCP
45	3-0-00040	3-194	Gunnerson Pond - USACE	Gunnerson Pond Restoration, landscape	Pond
46	3-0-00086	3-195	SEDCO Beech Dr. Storm Drain	Tract 31345	RCP, Basin
47	3-0-00170	3-196	Arroyo Del Toro Channel	Stage 1 From Collier Marsh to I-15	RCB & U-Channel

3. **Caltrans facilities –** Integrated with the construction of I-15 Freeway in 1980, many drainage culverts were constructed within the State R/W, to allow the storm runoff crossing under I-15 along the existing drainage courses as well as provide for de-watering of the highway. The "As Built" storm drain plans were obtained from Caltrans and examined. The drainage facilities shown on the "As Built" plans were compiled and depicted on the Existing Drainage Facilities shown on Figure 2-2 and Caltrans Culverts on Figure 2-3. These culverts are maintained by Caltrans. Typically, neither culvert design capacity nor hydraulics data are depicted on the "as built" plans. For any extension, connection or modifications of these culverts, a Caltrans encroachment permit will need to be obtained.

Figure 2-3
Existing Caltrans Culverts

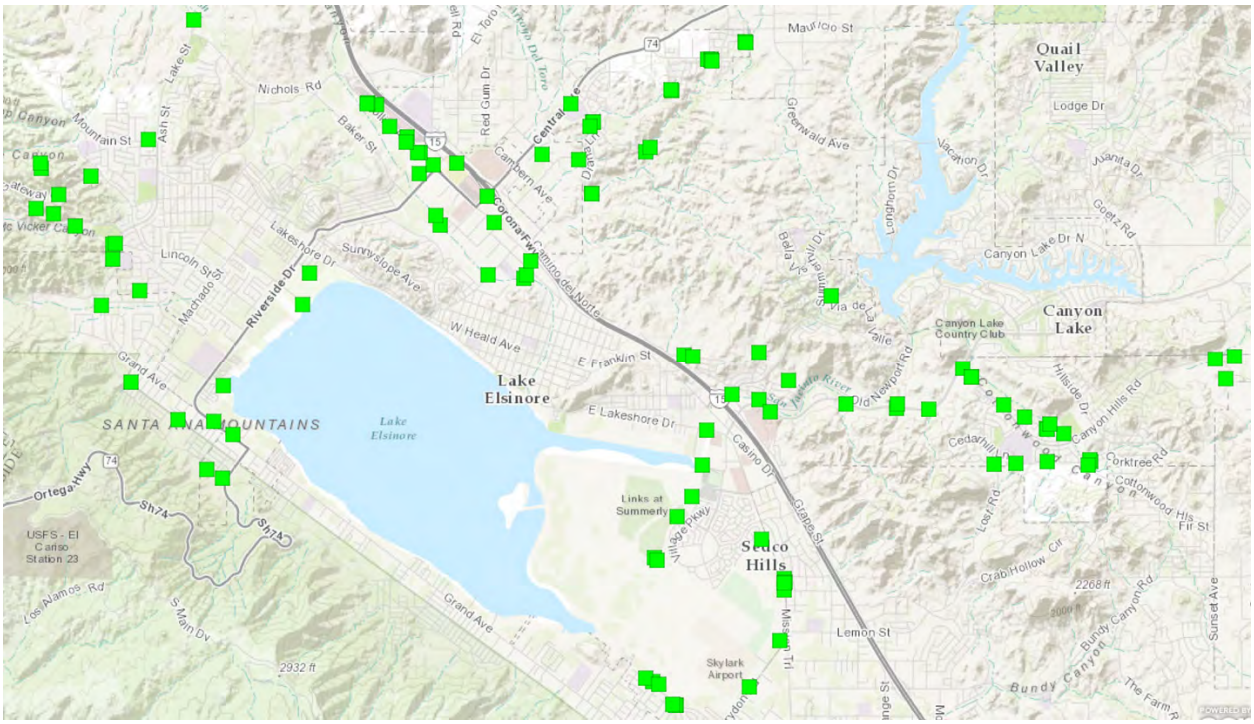
■ Field Investigation of Existing Drainage Inlet and Outlet

A survey of the documented existing storm drain inlets and outlets larger than 36" in diameter was conducted. Some of the inlets and outlets surveyed had various degrees of blockage due to sediment, debris, foliage, or a combination of the three. An effort should be made to clear all of the blocked inlets and outlets. In addition, regularly scheduled maintenance of the facilities is required in order to keep the facilities operating as intended.

With the assistance of the City O & M staff, Webb surveyed and documented approximately 109 inlet or outlet locations throughout the City to verify size, location, and condition of each. Included

in the survey are large culverts, weirs, inlets and outlets in basins, and storm drain channels. Regarding inlets and outlets, Webb only surveyed pipes 36” inches in diameter or larger to limit the field review to MDP mainlines and large pipes. The inlets and outlets were found throughout the developed areas of the City. Figure 2-4 shows the locations of surveyed inlets and outlets within the City.

Figure 2-4
City of Lake Elsinore Storm Drain Inlet and Outlet Locations



The existing drainage facilities include City-owned storm drains and channels; Riverside County Flood Control District-owned underground storm drains, open channels and debris basins; homeowner or property owner association-owned and maintained basins, and the inlets and outlets associated with each. An in depth, detailed Field Investigation Report is provided in Appendix A of this report.

Outlet Headwall in the Links at Summerly Golf Course

Box Culvert under Collier Avenue

Based on the field survey and observation, we recommend that the following measures be considered for drainage facility maintenance:

- Establish an annual major drainage facility clean up schedule, preferably completed before the starting of the rainy season, once a year minimum
- Allocate funding and manpower for major cleanup and debris removal
- Organize local communities, volunteer groups, and school districts to participate in the cleanup
- Combine the cleanup with public outreach and public education for “Keep Our Lake Clean”, “Only Rain in the Lake” and such
- Keep a record of sediment and debris removal load and frequency at the major inlets and outlets
- Identify the sources and evaluate any additional measures which can be implemented to reduce the sediment and debris load

■ Methodology

The hydrologic analysis for the study area was performed using methodology consistent with the guidelines in the Riverside County Flood Control and Water Conservation District Hydrology Manual. The Modified Rational Method and Synthetic Unit Hydrograph Method were used to establish the peak discharge rates. The methodology for the hydrologic analysis is also discussed in Design Criteria of SECTION 1 of this report, and approved by the Interim City Engineer prior to commencing the hydrology study.

■ MDP Zone Delineation

Based on the initial data collection, analysis, regional drainage boundaries from the prior master drainage plans prepared by the District and input from the City, the following parameters for the MDP update and zone delineation were established:

- East Lake area is a special development focus zone of the City, with the continuation of East Lake Specific Plan Amendments, and priority set by the City, this area shall have an independent study.

- Sedco area is outside the City boundary with an existing District MDP, its runoff drains into the Lake through the East Lake area. The City of Wildomar is currently preparing a city-wide MDP, which incorporates the Sedco area. The results of Wildomar's MDP study data is be utilized for the East Lake drainage design.

- West Elsinore area is guided by the District's West Elsinore MDP, and its drainage facilities are 80 to 90% constructed. No new study is required.

- The District completed and adopted Lakeland Village MDP in March, 2015. Lakeland Village area will be excluded from this study.

- The areas outside the City limit will not be studied unless the areas are in the watersheds directly draining into the City.

Webb also reviewed and examined the existing MDP Map and fee schedule. Fourteen (14) of the total 51 MDP districts are either completely or mostly outside the City boundary; the City has no jurisdiction to collect Area Drainage Fees from these unincorporated areas or within the City of Wildomar.

In addition to the above-listed considerations, we established three proposed MDP Zones under the direction of the City Engineer. The division of the new zones is primarily based on the receiving water. The storm runoffs from the East Lake and the Lake Zone are directly discharged into the Lake, as is the runoff from existing West Elsinore MDP and Lakeland Village MDP. Temescal Wash is the receiving water for the Temescal Wash Zone.

The overlay of the existing MDP Map and Proposed MDP Zones is shown on Figure 3-1 below. The proposed MDP Exhibit is shown on Figure 3-2.

Figure 3-1
Existing City MDP Map Overlay

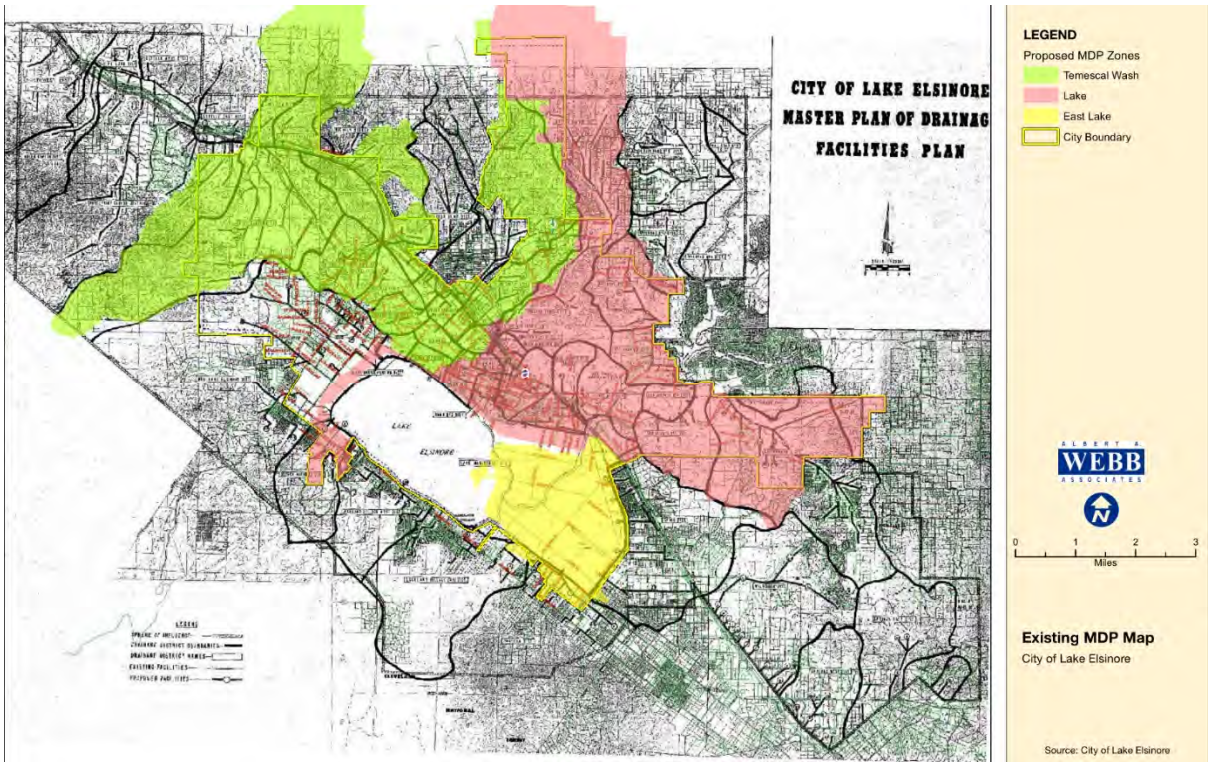
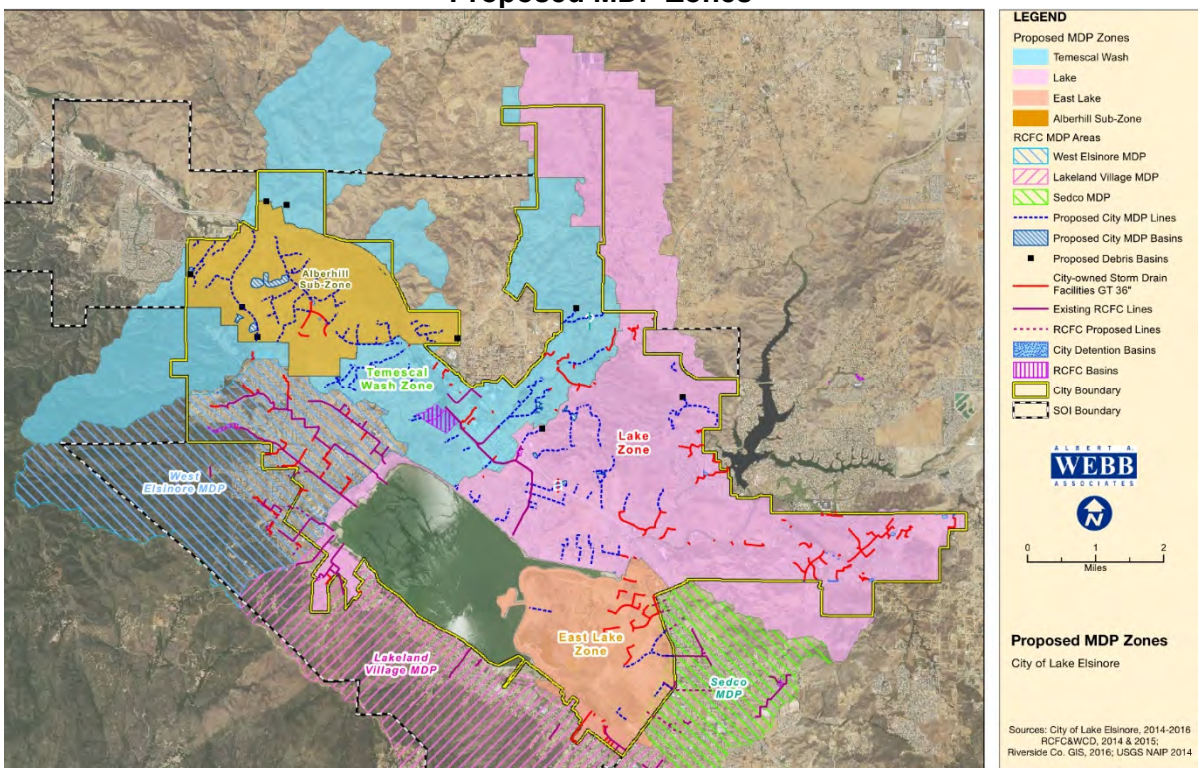


Figure 3-2
Proposed MDP Zones



■ Sub-Drainage Area Delineation

The delineation of the sub-drainage area is based on the natural flow patterns, ridge lines, developed conditions and available data for the proposed developments.

For the areas outside any filed Specific Plans and Tentative Maps, natural drainage patterns were used for hydrology study.

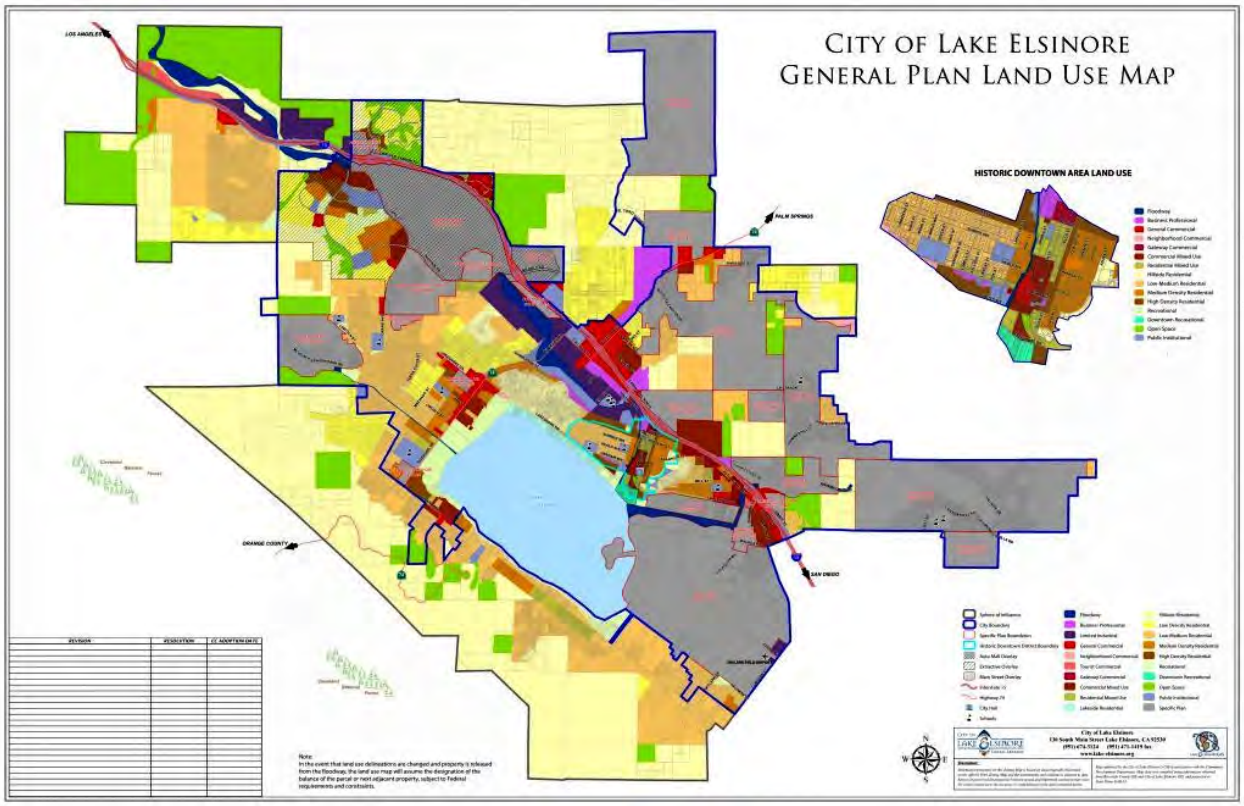
For the existing master planned communities, such as Canyon Hills, Tuscany Hills, Canyon Creek, La Laguna Estates, etc. no additional studies are performed since the drainage facilities in these communities are either fully or partially build out.

For the areas within the Tentative Tract Map or Specific Plan Studies, the proposed storm drain facilities are obtained from the design engineer when available, and incorporated in the MDP accordingly.

■ Land Use & Specific Plans Consistency

As established in Design Criteria of Section 1 of this report, the General Plan Land Use needs to be consolidated and reclassified based on the imperviousness for hydrology study.

Figure 3-3
2012 General Plan Land Use Map



Within the city boundary there are 17 adopted Specific Plans. Land uses for these Specific Plans were not depicted on the Land Use Map as shown in Figure 3-3. Some of the Approved Specific Plans have been amended many times. East Lake Specific Plan has been amended 10 times, and is in the process of additional modifications.

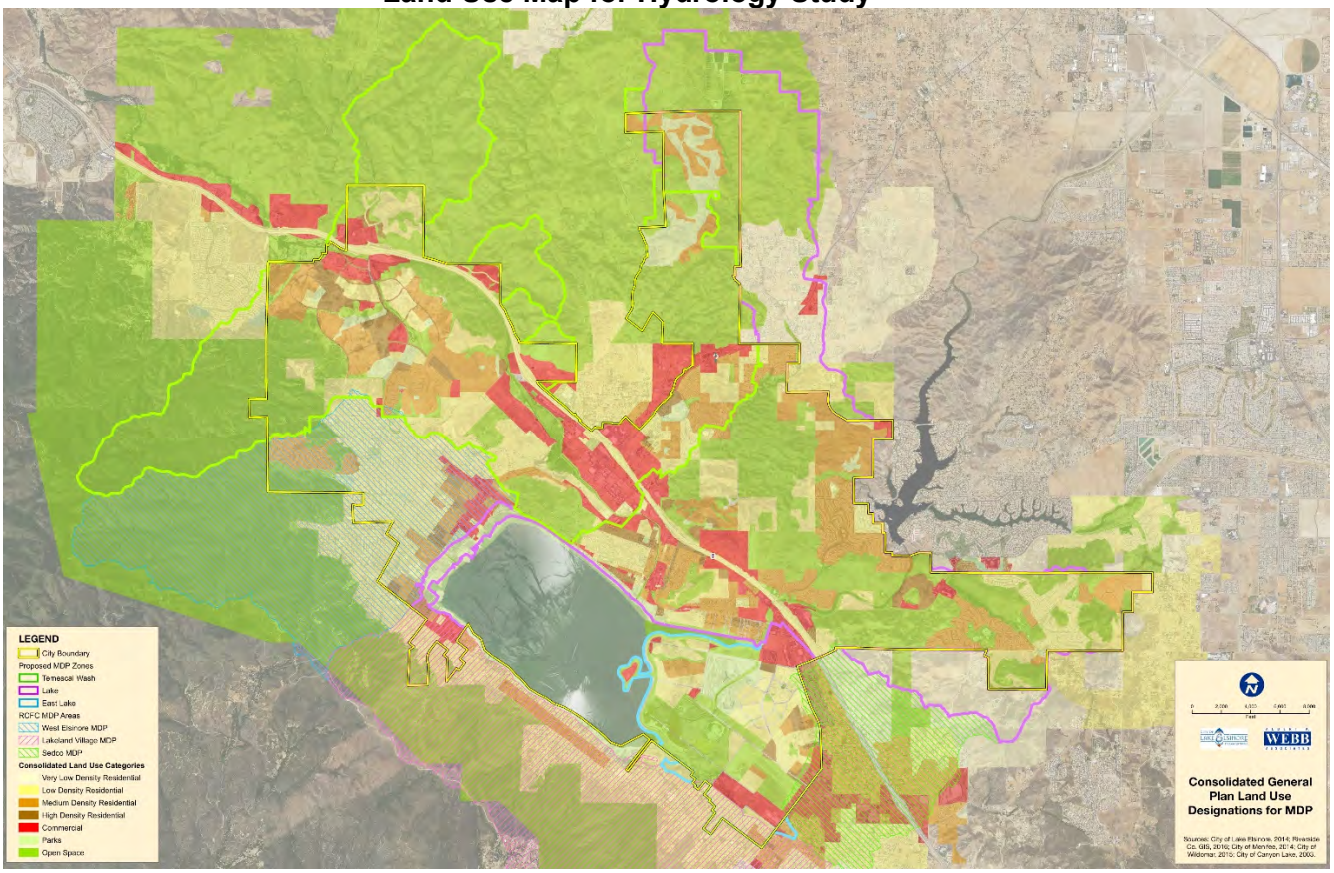
It is anticipated that the future development trend, market demand, and environmental regulations will result in many additional amendments. New Specific Plans will also bring changes in land use. It is understood that the city-wide land use map is a dynamic, ever changing document. For the hydrology study, the exactness of the land use is less prevalent than imperviousness derived from the land use.

Webb compiled a comprehensive land use map to cover the MDP study areas (see Figure 3-4). The land uses from following Specific Plans were reviewed and incorporated in this overall land use map.

City of Lake Elsinore Specific Plan Summary

Specific Plan Name	Amd No	Date	Location to Lake	MDP Receiving Water	Proposed MDP Zone	Stage
Alberhill Ranch	#3	1997	NW	Temescal Wash	Alberhill Sub-Zone	Undev
Murdock Alberhill Ranch	#2	2008	NW	Temescal Wash	Alberhill Sub-Zone	Phase 1 Dev
Canyon Creek (La Strada) N	#3	2005	NE	San Jacinto River	Lake	Undev
Canyon Creek (La Strada) S	#3	2005	NE	San Jacinto River	Lake	In Construction
Canyon Hills (cottonwood Hills)	#3	2009	East	San Jacinto River	Lake	Partial Dev
Canyon (Hills) Estates		2006	East	San Jacinto River	Lake	Undev
Cape of Good Hope		1993	NW	Lake / Temescal Wash	Temescal Wash	Undev
Cottage Lane		2005	West	Lake	West Elsinore MDP	Partial Dev
Diamond	#1	2010	East	Lake	East Lake	Partial Dev
East Lake	#10	2013	East	Lake	East Lake	Partial Dev
Elsinore City Center		2001	East	San Jacinto River	Lake	Complete
Lake Elsinore Outlet Center	#3	2000	North	Temescal Wash	Temescal Wash	Mostly Develop
Lakeshore Village		2003	West	Lake	West Elsinore MDP	Mostly Develop
La Laguna Estates	#1	2003	West	Lake	West Elsinore MDP	Complete
North Peak	#2	1999	North	Lake / Temescal Wash	Lake / Temescal Wash	Undev
Ramsgate	#6	2008	North	Lake / Temescal Wash	Lake / Temescal Wash	Partial Dev
Spyglass Ranch		2008	North	Lake	Lake	Undev
The Village at Lakeshore		2006	West	Lake	West Elsinore MDP	Undev
Tuscany Hills	#1	1990	NE	San Jacinto River/ Canyon Lake	Lake	South side Dev
Terracina		2014	NW	Lake / Temescal Wash	Lake / Temescal Wash	In Review
Alberhill Villages		2015	NW	Temescal Wash	Alberhill Sub-Zone	In Review

Figure 3-4
Land Use Map for Hydrology Study

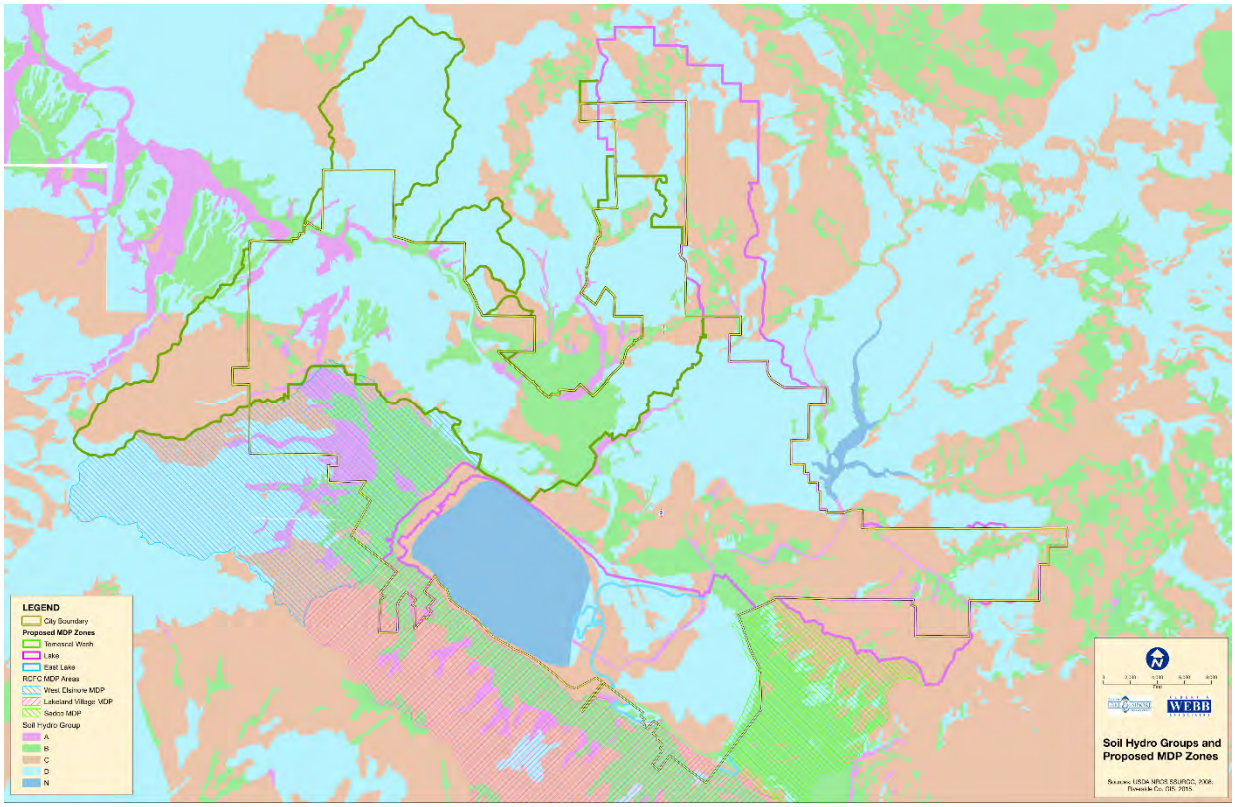


■ Hydrologic Soil Group Map

Another major factor affecting infiltration and peak storm runoff is the nature of the soil. Soil types for this study were taken from the hydrologic soils classification maps in the Hydrology Manual of the District. An overall hydrologic soil group map is compiled for the study areas as shown in Figure 3-5.

The four main hydrologic soils groups developed by the Soil Conservation Service of the U. S. Department of Agriculture were utilized by the District to classify soils types. Soils Group A has low runoff potential and high infiltration rates with mostly sandy soils. On the other end of the spectrum, Soils Group D has high runoff potential, very slow infiltration rates, consists of mostly clay soils and is nearly impervious. As shown in Figure 3-5, the majority of the study areas consist of Groups C and D soils. Generally speaking these types of soils are not suitable for infiltration and ground water recharging.

Figure 3-5
Hydrologic Soil Groups Map



■ Debris and Detention Basins

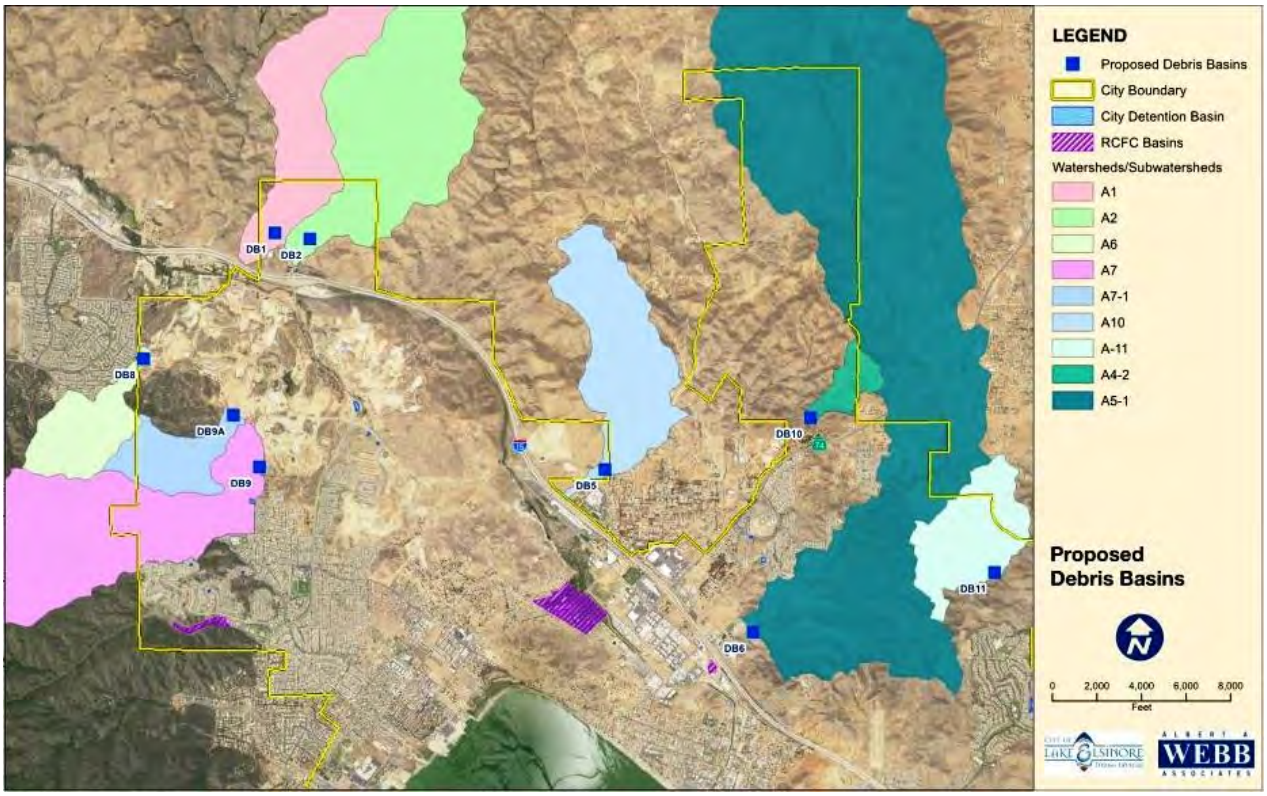
Debris Basins

The estimation of debris yield from an erosive upland watershed is an important factor in the design and maintenance of debris basin and flood control projects. Nine debris basins have been proposed to capture sediment and debris before it enters the proposed storm drain facilities (see Figure 3-6 Proposed Debris Basins). The 100-year single event debris yield estimates were determined at the canyon mouths of Subareas A1 and A2, A4-2, A6, A7-1, A10, A11, A4-2, and A5-1 using the LADCOE Debris Method. The delineation of these subareas is also shown on Figure 3-6.

Sediment production from a watershed is a function of several variables. The most evident variables are vegetative cover, rainfall intensity, slopes of the watershed, geology, soil type, and size of the drainage area. Fire greatly increases the amount of runoff and erosion from a mountain watershed caused by lack of vegetation and lowered infiltration rates. The inclusion of sediment in runoff results in a greater total discharge which is referred to as bulking. Sediment discharge from a major storm can be equal to the actual storm runoff, that is, runoff bulked 100 percent. If debris basins were not proposed for these areas, the downstream facilities would need to be sized

for the bulked flows and routinely maintained (cleanout) to ensure that the design capacity is conveyed at all times. Due to the enclosed nature of the underground storm drains and difficulty in removing the sediments, the sediment removal costs would be far more costly than debris basin cleanout costs.

Figure 3-6
Proposed Debris Basins



Flood history in Southern California clearly demonstrates the debris yield hazard as one associated with singular storm events, and has shown that over 80% of the annual volume of sediment comes from a single storm event. Therefore, the debris basins proposed in this MDP are designed for a single event as opposed to a long term (average annual) volume basin. Because the proposed structures are sized to only intercept debris from a single flood event (100-year frequency), the captured debris would need to be removed from the basins to ensure adequate storage capacity for subsequent storm events.

The proposed debris basins were sized based on the Los Angeles District Method for Prediction of Debris Yield by the U.S. Army Corps of Engineers Los Angeles District (LADCOE), dated February 2000. The Method provides a systematic approach for determining the debris yield from a single flood event to be used in the debris basin design sizing. Debris basins were sized for the 100-year event storm using the 100-year 1-hour rainfall data. Due to the lack of site specific data, the most conservative fire factor (FF) of 6.5 was used (corresponding to less than one year after 100% watershed burn). For areas outside (San Gabriel Mountains) of which the equations are based, application of the Adjustment-Transposition (A-T) Factor must be carefully determined. To preclude any subjectivity of this very sensitive parameter and to produce conservative results, an

A-T factor 1.0 was used. Typically a factor of safety is needed because of the uncertainty in the estimation of certain parameters (A-T and FF factors), but the most conservative values were used, therefore no factor of safety was applied to produce the storage volume needed for the sizing of the basins. Results of the analysis are presented in table below.

100–Year Single Event Debris Yield Summary

Debris Basin	Drainage Area (ac)	Drainage Area (mi^2)	100–Year 1–Hour Rainfall (in)	100–Year Peak Discharge (cfs)	100–Year Unit Peak Runoff (cfs/mi^2)	Stream Length (mi)	Elevation Difference (ft)	Relief Ratio (ft/mi)	Fire Factor[d]	Log DY	A–T Factor	Debris Yield (yd^3/mi^2)	Debris Volume (yd^3)
Equation [a]													
DB1	949.2	1.48	1.34	–	–	3.803	1507	396.2	6.5	4.31	1.0	20,382	30,165
DB2	1425.4	2.23	1.34	–	–	3.845	1166	303.2	6.5	4.27	1.0	18,578	41,429
DB10	131.0	0.20	1.34	–	–	0.873	306	350.7	6.5	4.12	1.0	13,229	2,646
DB9	1838.0	2.87	1.34	–	–	4.360	2765	634.3	6.5	4.49	1.0	30,734	88,207
DB9A	293.0	0.46	1.34	–	–	1.307	932	713.1	6.5	4.38	1.0	23,747	10,924
DB5	822.0	1.28	1.34	–	–	2.519	667	264.7	6.5	4.19	1.0	15,466	19,796
DB8	362.4	0.57	1.34	–	–	1.597	1222	765.2	6.5	4.41	1.0	25,776	14,692
Equation [b]													
DB6[c]	5133	8.02	–	3394.6	423.3	8.16	1024	125.5	4.0	4.19	0.65	15,355	123,147

Note:

(a) LADCOE Equation 1: Log DY = 0.65(Log P) + 0.62(Log RR) + 0.18(Log A) + 0.12 (FF), for watersheds 0.1 to 3.0 mi^2 in size

(b) LADCOE Equation 2: Log DY = 0.85(Log Q) + 0.53(Log RR) + 0.22 (FF) + 0.4 (Log A), for watershed 3.0 mi^2 to 10 mi^2 in size

(c) An A–T Factor 0.65 was applied due to larger watershed size

(d) An assumed condition of less than one year after 100% burn, except for DB6 which assumes only 2/3 of the watershed is susceptible to burn

Detention Basins

The purpose of detention basins proposed in this plan is to reduce peak flow rates in the downstream storm drain system through the use of temporary detention storage. This peak flow reduction allows the use of smaller, less costly downstream facilities. A combination detention/debris basin (DB 11) is proposed for the upper portion of the Tuscany Hills Specific Area.

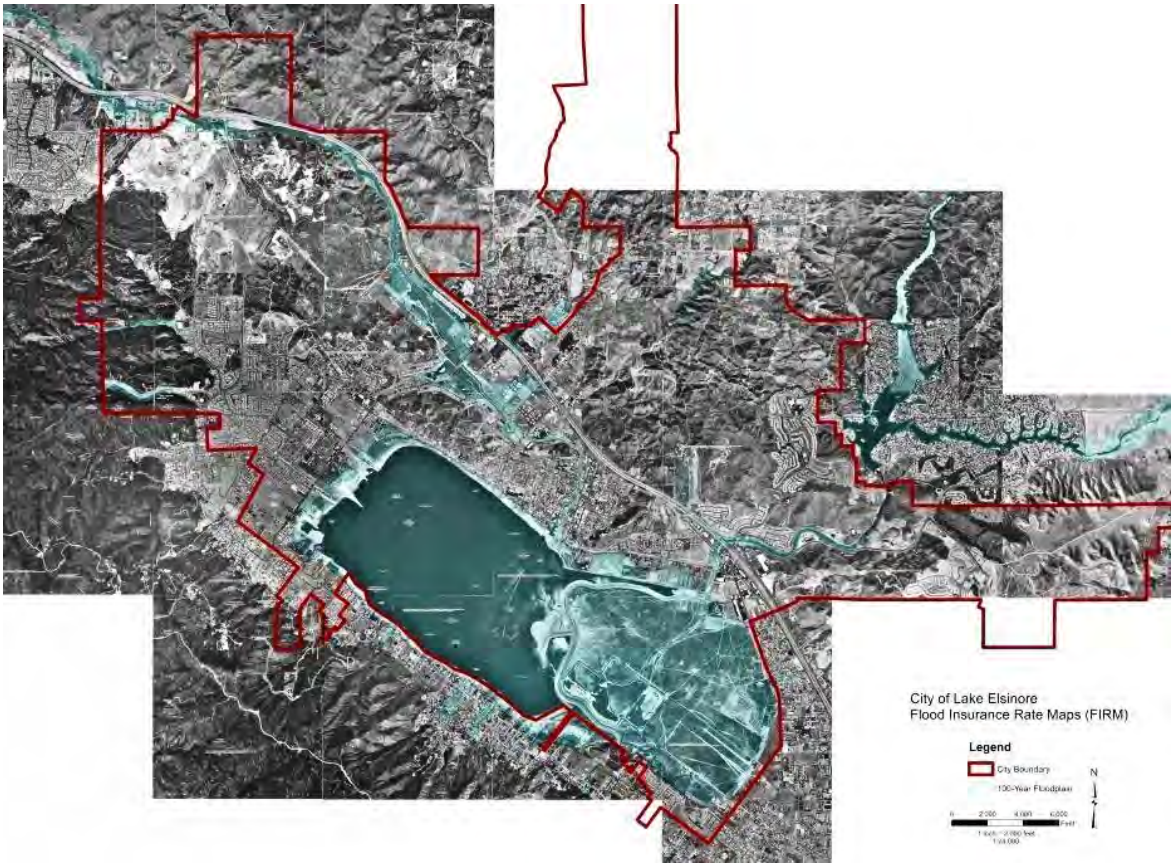
■ Flood Plain and Flood Insurance Rate Maps (FIRMs)

The following Flood Insurance Rate Maps (FIRMs) are within the City of Lake Elsinore.

1. 06065C2681G
2. 06065C2034G
3. 06065C2033G
4. 06065C2016G
5. 06065C2006G
6. 06065C2008G
7. 06065C2019G
8. 06065C2038G
9. 06065C2039G
10. 06065C2043G
11. 06065C2042G
12. 06065C2061G
13. 06065C2041G
14. 06065C2037G
15. 06065C2029G
16. 06065C2017G
17. 06065C2007G
18. 06065C2036G
19. 06065C2028G
20. 06065C2009G
21. 06065C2026G

Figure 3-7 is a compiled FIRMs within the City limits.

Figure 3-7
Flood Plain & Flood Insurance Rate Maps



The following Specific Flood Hazard Area (SFHA) flooding sources have been identified based on the above FIRMs. The development within these areas needs to be in full compliance with the current National Flood Insurance Policy (NFIP) guidelines.

1. Lake Elsinore Overflow and Spillway Channel
2. Rice Canyon
3. McVicker Canyon
4. Sedco Hills Creek
5. Wash D
6. Arroyo Del Toro Creek
7. Stovepipe Canyon Creek
8. Temescal Wash

Rice Canyon

Flooding from Rice Canyon is shown on FIRM Panels 06065C2017G and 06065C2008G and would be caused by the failure of an earthen berm that is intended to direct the flows to the northeast and into Temescal Wash. The berm failure allows the flow to breakout to the southeast resulting in an area of expansive sheet flow.

McVicker Canyon

McVicker Canyon Channel Zone A floodplain is shown on FRIM Panels 06065C2016G, 06065C2008G, 06065C2017G, and 06065C2009G. The flooding as shown on the FIRMs is indicative of a typical sheet flows on the alluvial fan below the mouth of the canyon. Review of recent aerial photography of the area shows channel improvements which may alleviate the hazard to these flood prone areas.

SECTION 4 - PROPOSED MDP FACILITIES AND ALTERNATIVES

A master drainage plan addresses the current and future drainage needs of a given community. The proposed facilities may include channels, storm drains, levees, basins, dams, wetlands or any other conveyance capable of economically relieving flooding problems within the plan area. The plan includes an estimate of facility capacity, sizes and costs.

MDP's are prepared for a variety of purposes. First, the plans provide a guide for the orderly development of the City and resolution of flooding issues. Second, they provide an estimate of costs of construction for each established MDP zone. These plans are used by the City's Management, Community Development and Public Works Departments, Planning Commissioners and the City Council to guide development and determine Capital Project expenditures for each budget year. Finally, the plans will be used to establish Area Drainage Fees for each MDP zone, which provide for equitable distribution of facility cost.

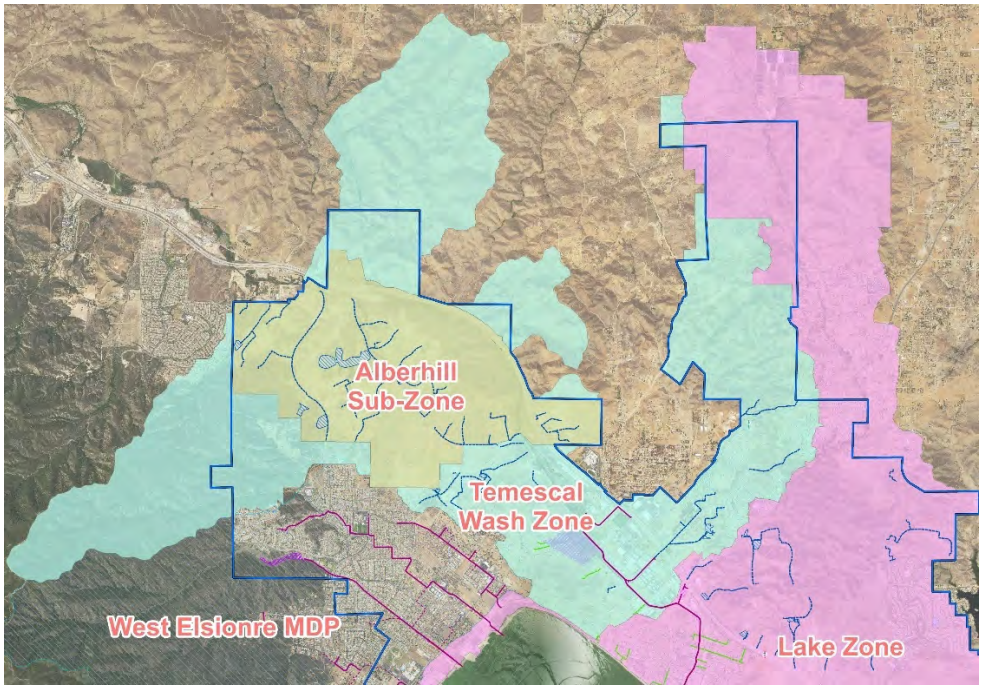
The City of Lake Elsinore MDP update consolidates the existing 51 drainage districts to three (3) new and two (2) existing MDP Zones. New zones are: Temescal Wash Zone, Lake Zone and East Lake Zone. Within the Temescal Wash Zone, an Alberhill Sub-Zone is established to accommodate its unique development potentials and characteristics. The existing Riverside County Flood Control and Water Conservation District West Elsinore MDP and Lakeland Village MDP will remain unchanged.

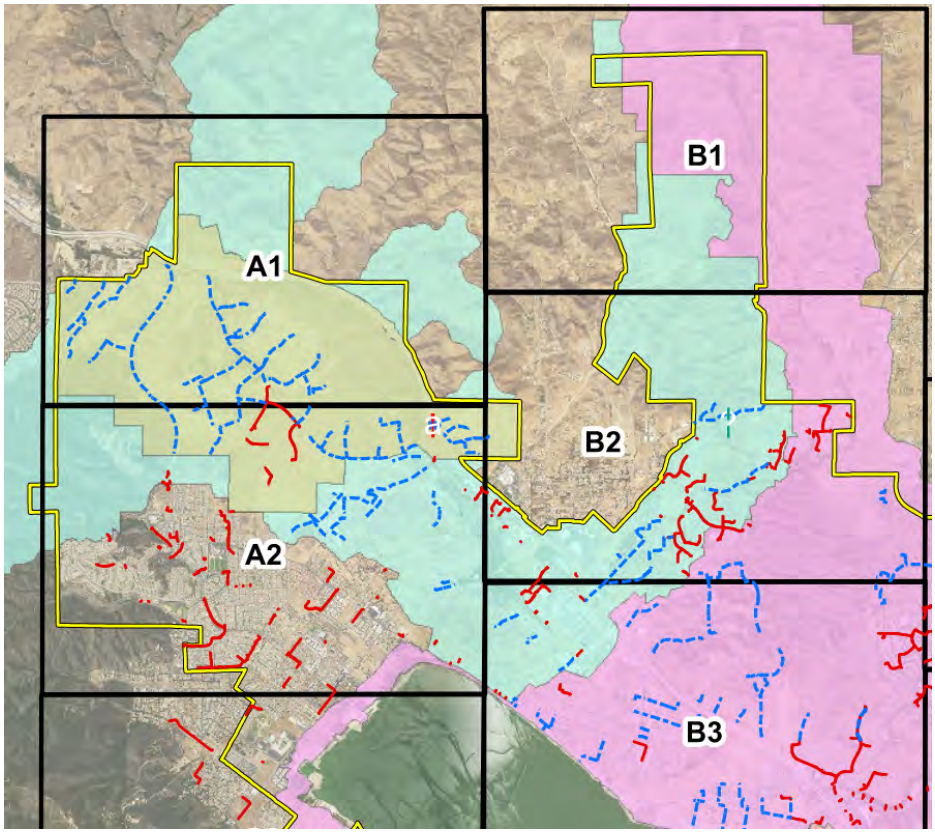
■ Temescal Wash Zone

The Temescal Wash Zone, named for its receiving water Temescal Wash, encompasses an approximately 13,230-acre watershed at the northwestern end of the Lake. Within its watershed, an area of approximately 9,000-acre is within the City Boundary, of which 2,240 acres are separated into Alberhill Sub-Zone. It is generally bordered by the city boundary to the north and west, the West Elsinore MDP to the south and the Lake Zone to the east. Within the Temescal Wash Zone, located at the northwest corner of the City, an Alberhill Sub-Zone is established due to its unique development potentials and intensity and independence of the MDP facilities. In this report, the MDP facilities for the Alberhill Sub-Zone are excluded from the Temescal Wash Zone and treated as a stand alone zone.

The proposed Temescal Wash MDP facilities are comprised of four (4) debris basins and Ten (10) storm drain systems. Two of the debris basins located north of Freeway I-15 (DB1 and DB2) will benefit both Temescal Wash Zone and Alberhill Sub Zone, the cost of these two debris basins are shared equally between Temescal Wash Zone and Alberhill Sub Zone. The location, alignment and size of the Temescal Wash Zone MDP facilities are shown on Grid Map sheets A2, B2 and B3 and Figure 4-1. The estimated total cost for Temescal Wash MDP facilities is approximately $31,135,562.

Figure 4-1
Temescal Wash Zone MDP Facilities





Line T01 Storm Drain System

Line T01 Storm Drain system consists of a mainline storm drain and two laterals. The upstream portions of the drainage system are located within Vesting Tentative Tract Map (VTTM) No. 36557. Line T01 begins near the northeast tract boundary and collects runoff from the offsite areas to the west in a 48" RCP. From there, the 48" RCP extends in a southerly direction for a distance of approximately 500 feet to the confluence with T01-01. At the T01-01 confluence, the 48" RCP transitions into a 72" RCP and extends in a northeasterly direction for a distance of approximately 1,800 feet and outlets into a natural wash at the tract's northern boundary. From there, Line T01 is a natural unimproved channel for a distance of approximately 3,000 feet until it crosses an unnamed Road (dirt road crossing) near Nichols Road. Line T01 transitions into a 72" RCP and extends in an easterly direction for a distance of approximately 1,400 feet and outlets into Temescal Creek. Lateral T01-01 begins near the southwestern boundary of VTTM 36557 and joins with an existing 36" storm drain from the adjacent development. From there the 36" RCP extends easterly along Terra Cotta Road for a distance of approximately 1,300 feet and confluences with Line T01. Lateral T01-02 begins near the intersection of Dryden Street and Arnold Avenue as a 36" RCP. From there the 36" RCP extends northwesterly along proposed Terracina Drive and transitions into a 42" RCP at proposed Sicily Drive. The 42" RCP continues along proposed Terracina Drive for a distance of approximately 400 feet then outlets into the in-tract water quality/detention basin.

The estimated cost for the proposed Line T01 is approximately $3,870,000.

Line T02 Storm Drain System

Line T02 Storm Drain system consists of a mainline storm drain and two laterals. The upstream portions of the drainage system (Laterals T02-01 and T02-02) are located within Vesting Tentative Tract Map (VTTM) No. 36557. The upstream origin of Line T02 begins near the northwest boundary of VTTM 36557 at the proposed in-tract water quality/detention basin outlet as a 66" RCP. From there the 66" RCP follows an existing wash in a northeasterly direction for a distance of approximately 2,100 feet. At Baker Street, the 66" RCP transitions into a 78" RCP and continues in a northwesterly direction for a distance of approximately 950 feet and outlets into the Temescal Wash. Lateral T02-01 begins near the intersection of Bulluno Way and proposed Venice Lane (per VTTM 36557) at the edge of the development to collect runoff from offsite hillside areas as a 42" RCP. From there the 42" RCP extends northeasterly along proposed Venice Lane and turns northwesterly and follows the northern tract boundary and confluences with Line T02. Lateral T02-02 begins at the intersection of proposed Porta Marina Lane and Swan Avenue as a 36" RCP. From there the 36" RCP extends northwesterly along Swan Avenue and turns northeasterly at Dryden Street. At Sicily Drive, the 36" RCP transitions into a 42" RCP, and then extends in a northerly direction towards Dolbeer Street as a 48" RCP. At the south end of Dolbeer Street, the 48" RCP transitions into a 54" RCP and extends northerly along Dolbeer Street and then turns easterly at proposed Florence Drive. From there the 54" RCP follows Florence Drive for approximately 1,300 and turn northerly and outlets into the in-tract water quality/detention basin.

The estimated cost for the proposed Line T02 is approximately $5,412,000.

Line T03 Storm Drain System

Line T03 consists of a single mainline storm drain. Approximately 225 acres of sub-watershed drain to Line T03, with its upstream 161.1 acres zoned as rural mountainous residential and low density residential, and its downstream 63.9 acres zoned as manufacturing. The natural, well defined drainage courses will be utilized for the rural low density areas. An underground storm drain system will convey the storm runoff from the natural drainage course through the manufacturing zone to Temescal Wash.

Line T03 begins as a 66" RCP and extends northerly along its natural drainage course for a distance of approximately 900 feet. At Baker Street, the 66" RCP transitions into a 72" RCP and follows Baker Street in a northwesterly direction for a distance of approximately 450 feet. From there, the 72" RCP transitions into a 78" RCP and extends in a northerly direction for approximately 500 feet and outlets into the Temescal Wash.

The estimated cost for the proposed Line T03 is approximately $1,723,000.

Line T04 and T05 Storm Drain System

Line T04 and T05 are located at southwesterly of District's Gunnerson Pond, near upstream end of Temescal Wash, zoned mostly hillside residential. Currently there is no existing storm drain facility for this 138-acre sub-watershed. Our field investigation indicated that this area experiences some hillside storm runoff flooding, erosion, street flooding and ponding at varies locations.
Line T04 is a 36" RCP storm drain, begins at Herbert Street, extends southeasterly 220 feet to McBride Avenue, and extends approximately 310 feet easterly along McBride Avenue, crosses Gunnerson Street and outlets into the Gunnerson Pond. Line T05 is a single mainline storm drain on Shrier Drive. Its size varies from 54" RCP to 60" RCP, with total length approximately 1000 feet, and also outlets into the Gunnerson Pond.

The estimated costs for Line T04 and T05 are approximately $196,000 and $642,000 respectively.

Line T06 Storm Drain System

Line T06 is a 42" RCP single line storm drain. It begins at the intersection of Stecher Avenue and Foster Street, extends approximately 1250 feet northerly along Foster Street, outlets to the EVMWD pond easterly of Gunnerson Pond. The upstream end of Line T06 consists of 61.4 acres of steep hill side zoned as rural mountainous residential, the well-defined natural water courses will be utilized for storm runoff conveyance.

The estimated cost for the proposed Line T06 is approximately $519,000.

Line T07 Storm Drain System

Line T07 is a single line storm drain. It begins at intersection of Strickland Avenue and Palm Drive as a 36" RCP, extends approximately 250 feet northwesterly along Strickland Avenue, at Bastron Avenue, 36" RCP transitions to 42" RCP, it continues in a northeasterly direction for approximately 450 feet, then outlets to the existing EVMWD drainage ditch.

The estimated cost for the proposed Line T07 is approximately $292,000.

Line T08 Storm Drain System

Line T08 is a single line storm drain system; it can also be identified as Chaney Street Storm Drain. It begins at the intersection of Strickland Avenue and Chaney Street as a 36" RCP, extends approximately 360 feet northwesterly along Chaney Street, at Treleven Avenue, 36" RCP transitions to 54" RCP, it continues northerly along Chaney for approximately 550 feet, then discharges to the 42" stub out of Outlet Channel.

Currently, Chaney Street at Treleven Avenue and Strickland Avenue intersections experience some street flooding and ponding during and after a rain storm. The construction of Line T08 with its inlets and catch basins will reduce or eliminate the flooding. The capacity of existing 42" stub out at the southeast quadrant of Chaney Street and Outlet Channel shall be verified during the final design of the Line T08.

The estimated cost for the proposed Line T08 is approximately $432,000.

Line T09 Storm Drain System

Figure 4-2 Line T09 Lower Portion Exhibit

Line T09 is a storm drain system also known as Third Street Storm Drain. The upper portion of the Line T09 begins at Cressida Street basin outlet as a 48" RCP (Tract 26476, MB 403/7-29) extends approximately 760 feet southwesterly along a natural ravine, transitions to 60" RCP for approximately 1,030 feet, transitions to 66" RCP and continues westerly along a natural water course for approximately 1,600 feet, then discharges to the defined water course / open space Lot "C" per Tract 25479, MB 367/95-113. h

The lower portion of the Line T09 system consists of one main line and two laterals. The proposed Line T09 begins at northerly boundary of TTM 32537; it travels southerly between lots 9 and 10 as a 72" RCP, then continues westerly and southerly along "A" Street for approximately 920 feet. At the intersection of "A" Street and Welch Drive, it extends southwesterly following Welch Drive for approximately 700 feet, turns southeasterly along Conard Avenue for 550 feet then turns

southwesterly on Third Street for approximately 1300 feet. At the intersection of Third Street and Cambern Avenue, the 72" RCP Line T09 confluents with Line T09-02, and transitions to 78" RCP and extends 1,140 feet on Third Street. It transitions to a 96" RCP, Continue further southwesterly on Third Street for 290 feet, confluences with Line T09-01 at south of Dexter Avenue, travels toward I-15 for 260 feet. A Jack and Bore or tunneling operation is proposed for the 96" RCP crossing under the I-15 Freeway, then transition to a 5'x10' RCB for 310 feet, and finally transitions to double 14' wide x 4.5' high RCB to join the existing double RCB at Collier Avenue.

Since the Line T09 System is the most costly system within the Temescal Wash Zone, the design alternatives were reviewed during the preliminary and final design of the Third Street Storm Drain. The current alignment and freeway crossing method was selected as the most viable alternative. Furthermore, the upper portion of the Line T09 may be replaced by an enhanced natural drainage channel and open spaces, if the proposed land planning incorporates such a design feature.

Line T09-01 is a single line storm drain lateral, it's upstream portion within Tentative Tract Map 35422 consists of approximately 2,000 feet of 36" RCP, a 720 feet of double 48" RCP and three on-site detention and water quality basins. At TTM 35422 southwesterly boundary, the double 48" RCP transitions to a 60" RCP, travels in a westerly direction to discharge into mainline T01 south of the intersection of Third Street and Dexter Avenue.

Line T09-02 is also a single line storm drain lateral of 48" RCP, approximately 410 feet in length on Cambern Avenue. This lateral is designed to collect and convey the storm drain runoff at the low point of Cambern Avenue to Line T09 to enable the development of the Walmart site.

The estimated cost for the proposed Line T09 System is approximately $12,803,000.

Line T10 Storm Drain System

Line T10 Storm Drain System is located immediately north of State Route 74, with Crumpton Road on the east, and the City boundary on the west. It's located at south end of North Peak Specific Plan, zoned mostly for commercial use. The Line T10 System consists of a storm drain mainline, one lateral and one debris basin. Debris Basin DB10 is located at the upstream terminus of Line T10-01 and has a drainage area of 131 acres, sediment storage volume of approximately 1.7 acre-feet and an approximate right-of-way of 0.4 acres.

The upstream segment of Line T10 Storm Drain begins at a natural low point on Mauricio Street east of Crumpton Road as a 36" RCP. It travels southerly for 300 feet then transitions to a 42" RCP, turns westerly along the natural stream line for a distance of approximately 1,480 feet. The 42" RCP then transitions to 48" RCP and continues in a westerly direction for a distance of 1,600 feet. After confluence with Line T10-01, the 48" RCP increases to a 78" RCP for 330 feet, and discharges at the City boundary approximately 500' north of SR 74.

Line T10-01 begins at the outlet of the proposed Debris Basin DB10 as a 48" RCP runs southwesterly along the natural water course for a distance of 480 feet and transitions to a 66" RCP for a distance of 370 feet, then confluences with Mainline T10.

The estimated cost for the proposed Line T10 System is approximately $2,652,000.

Debris Basins DB1 and DB2

Debris Basins DB1 and DB2 are located approximately 1,800 feet north of the intersection of I-15 freeway and Lake Street, at northerly boundary of Alberhill Ranch Specific Plan. Debris Basin DB1 has a drainage area of 949 acres with an estimated debris volume of 18.7 ac-ft. Debris Basin DB2 has a drainage area of 1,425 acres with an estimated debris volume of 25.6 ac-ft. These two basins benefit both Temescal Wash Zone and Alberhill Sub-Zone. More importantly, when constructed and maintained, they will reduce the silt and debris and improve the water quality of the Temescal Wash. The estimated cost is approximately $1,471,000 and $2,014,000 respectively. At the recommendation of the City, the costs for these two debris basins are shared by Temescal Wash Zone and Alberhill Sub-Zone equally.

Debris Basins DB5

Debris Basins DB5 is located south of Nichols Road and north of I-15. Debris Basin DB5 has a drainage area of 822 acres with an estimated debris volume of 12.3 ac-ft. Currently, after each storm event, silt and debris wash over to the Elsinore Outlet Center through existing Caltrans culverts, placing heavy demands on City's maintenance and operation resources and budget. By placing DB5 on an alignment upstream of the Caltrans 14'x6' Box Culvert, it will intercept and store the debris in the DB5, reduce the impact to the Outlet Center and demand on the city resource, and improve the water quality of the Temescal Wash.

The estimated cost for DB5 is approximately $968,000.

Debris Basins DB10

Debris Basins DB10 is located at the upstream end of MDP T10-01 System. Debris Basin DB10 has a drainage area of 131 acres with an estimated debris volume of 1.7 ac-ft. Since most of the DB10 drainage areas are undeveloped land, DB10 will not only benefit water quality, maintenance and operation, but also reduce the size of MDP T10-01 and T10, so 100-year storm event runoff will not need to be bulked due to the debris loading.

The estimated cost for DB10 is approximately $134,000.

■ Alberhill Sub-Zone

Alberhill Sub-Zone is located within the Temescal Wash MPD Zone and is made up of several Specific Plans (SPs). Located within this MDP Sub-Zone are the Alberhill Village SP, Alberhill Ranch SP, and the Murdock Alberhill Ranch SP. The Alberhill Sub-Zone is located in the northwestern portion of the city, bounded by the West Elsinore MDP to the south, Santa Ana Mountains to the west, northern city boundary to the north, and Temescal Creek to the east. The Alberhill Sub-Zone encompasses approximately 2,240 acres and includes nine (9) separate sub-watersheds which drain into the Temescal Wash as shown on Grid Sheets A1 and A2.

The area is primarily comprised of undeveloped land that is currently being mined for its mineral resources (clay sand, and aggregate mining), and as a result most of the area is highly disturbed due to the current and past mining operations. Alberhill Ridge Vesting Tentative Tract Map (VTTM) No. 35001 is located on the east side of Lake Street proposes a 400 acre medium density residential development. Alberhill Villages, located on the west side of Lake Street proposes a 1,400 acre development. It includes plans for a multifaceted community consisting of a university campus, recreational lake, park areas, and residential developments ranging from low density estates lots to high density multi-family lots, and mixed-use commercial and public institutions and schools. The proposed MDP facilities within the Alberhill Sub-Zone mostly utilize the alignment, type and size of the storm drain depicted in the supplemental drainage studies for the Specific Plans and Tentative Maps.

The proposed MDP facilities are comprised of five (5) debris basins, eleven (11) storm drain systems and nine (9) discharge points at the Temescal Creek. Two of the debris basins located north of the I-15 Freeway (DB1 and DB2) will benefit both Temescal Wash Zone and Alberhill Sub Zone, the cost of these two debris basins are shared equally between Temescal Wash Zone and Alberhill Sub Zone.

The proposed underground storm drains consist of reinforced concrete pipes ranging in size from 36 inches to 108 inches in diameter. Reinforced concrete boxes were used when the capacity of a 108 inch diameter pipe was exceeded. Open channels are trapezoidal shape with concrete paving on the sides and bottom. The sides slope upward from the bottom at a rate of one foot vertically for every 1.5 feet horizontally. The location, alignment and size of the proposed Alberhill Sub-Zone MDP facilities are depicted on Grid Map sheets A1 & A2. The estimated total cost is approximately $66,000,000.

Line A01 Storm Drain System

Line A01 Storm Drain is located in Watershed A01 of the Alberhill Villages SP and consists of a single 36” diameter RCP extending approximately 950 feet from its upstream terminus (adjacent to the existing Horsethief Canyon development) to its downstream outlet at the city boundary. From this point it is assumed that the flows will follow their natural drainage course (a distance of 1,400 feet) to Temescal Creek.

Line A02 Storm Drain System

Line A02 Storm Drain System is located in Watershed A02 of the Alberhill Ranch SP and consists of a mainline, one lateral and a debris basin. Line A02 Debris Basin (DB8) is located at the upstream terminus of Line A02 and has a sediment storage volume of approximately 9.0 acre-feet. Line A02 Storm Drain is an open channel with a bottom width of 8 feet and a height of 4 feet. It begins at the proposed debris basin and runs in a northeasterly direction, crosses two proposed streets, for a distance of about 3,000 feet and terminates at the city boundary. From this point it is assumed than the flows will follow their natural drainage course (a distance of 1,200 feet) to Temescal Creek. Lateral A02-01 varies in size from a 36" diameter pipe at its upstream end to a 48" diameter pipe at its confluence with Line A02. The overall length is approximately 2,400 feet.

Line A03 Storm Drain System

Line A03 Storm Drain System consists of a single mainline storm drain and is located in Watershed A03 of the Alberthill Ranch SP. It has a total drainage area of approximately 72 acres at its most downstream outlet point. Line A03 Storm Drain varies in size from a 36" diameter pipe at its upstream end to a 48" diameter pipe at its downstream terminus at the city boundary for a distance of approximately 2,300 feet. From this point it is assumed than the flows will follow their natural drainage course (a distance of 900 feet) to Temescal Creek.

Line A04 Storm Drain System

Line A04 Storm Drain System is located in Watershed A04 of the Alberhill Ranch SP and consists of a mainline, one lateral and two debris basins. Line A04 Debris Basin DB9 is located at the upstream terminus of Line A04 and has a sediment storage volume of approximately 54.7 acre-feet and an approximate right-of-way of 11.5 acres. The upstream segment of Line A04 Storm Drain is an open channel with a bottom width of 20 feet and a height of 4 feet. It begins at the proposed Debris Basin DB9 and runs northerly along the west side of Lincoln Street for a distance of 3,000 feet and ends at Debris Basin DB9A.

Debris Basin DB9A is located approximately 1,500 north of the intersection of the future Lincoln Street and the future extension of Nichols Road and has a sediment storage volume of approximately 6.8 acre-feet and an approximate right-of-way of 1.4 acres. Downstream of Debris Basin DB9A, Line A04 is a double 10 feet wide by 10 feet high reinforced concrete box (RCB) that runs northerly along the alignment of Lincoln Street for a distance of approximately 6,900 feet and terminates at Temescal Creek.

Lateral A04-01 varies in size from a 42" diameter pipe at its upstream end to a 66" diameter pipe at its confluence with A04. The overall length is approximately 2,600 feet.

Line A05 Storm Drain System

Line A05 Storm Drain System consists of a mainline storm drain, six laterals, and five sub-laterals and is located in Watershed A05 of the Alberhill Villages SP and Alberhill Ridge VTTM 35001. The overall drainage area at its downstream outlet at Temescal creek is approximate 1.8 square

miles. The upstream origin of Line A05 begins at an existing detention basin located just north of the intersection of Lake Street and Nichols Road, and runs in a northerly direction along the alignment of Lake Street and terminates at Temescal Creek, for a distance of approximately 1.1 miles. Line A05 varies in size from a 78" diameter pipe at its upstream end to a 108" diameter pipe at the confluence with Line A05-02. At the Line A05-02 confluence, the 108" RCP transitions to a 12 feet wide by 10 feet high RCB. From there, the 12'x10' RCB extends northerly along Lake Street and transitions to a double 10 feet high by 10 feet wide RCB at the A05-1 confluence. From the Line A05-01 confluence to the outlet at Temescal Creek, the size remains constant at a double 10 feet wide by 10 feet high RCB.

The upstream origin of Lateral A05-01 begins at the intersection of proposed Alberhill Ridge Road and "JJ" Street (per Alberhill Ridge VTTM 35001) as a 36 inch RCP. From there, the 36 inch RCP follows the alignment of Alberhill Ridge Road in a northwesterly direction for a distance of approximately 1,700 feet (with a short reach of 42 inch RCP) where it confluences with Storm Drain Line A05.

The upstream origin of Lateral A05-02 begins at the intersection of proposed "AA" Street and "GG" Street (per Alberhill Ridge VTTM 35001) as a 36 inch RCP. From there, Lateral A05-02 follows the alignment of "AA" Street and "A" Street in a westerly direction for a distance of approximately 2,250 feet, where it confluences with Storm Drain Line A05 and varies in size from a 36" RCP to 72" RCP. Lateral A05-02-01 begins at the intersection of "Z" Street and "V" Street as a 36" RCP. From there, the 36 inch RCP follows the alignment of "V" Street in a northwesterly direction for a distance of approximately 600 feet (with a short reach of 42 inch RCP) where it confluences with Storm Drain Line A05-02.

The upstream origin of Lateral A05-03 begins at about 1,000 feet south of the intersection of the future Nichols Road and Street C (per Alberthill Villages SP) as a 42" RCP and runs northerly along the alignment of Street "C" for approximately 2,000, feet then turns easterly along an unnamed street for a distance of approximately 2,400 feet where it confluences with Storm Drain Line A05. Lateral A05-03 varies in size from a 42" RCP to a 72" RCP at its downstream confluence. Lateral A05-03 has two sub-laterals: A05-03-01 and A05-03-02. Lateral A05-03-01 begins at approximately 750 feet west of Street C, varies in size from a 36" RCP to a 48" RCP and ends at the confluence with Lateral A05-03 for a distance of approximately 1,150 feet. Lateral A05-03-02 begins at approximately700 feet west of Street C as a 36" RCP and follows the alignment of Nichols Road to the confluence with Lateral A05-03.

Lateral A05-04 begins at the intersection of Street D and Nichols Road (per Alberhill Villages SP) as a 36" RCP. From there the 36" RCP extends northwesterly for approximately 1,750 feet to a point where it confluences with Storm Drain Line A05.

Lateral A05-05 begins at the intersection of "AA" Street and "BB" Street (per Alberthill Ridge VTTM 35001) as a 36" RCP and immediately transitions to a 42" RCP. From there the 42" RCP extends westerly along "BB" Street and transitions into a 54" RCP at the intersection of "GG" Street and "BB" Street. The 54" RCP continues westerly along "BB" Street and then transitions into a 60" RCP at the intersection of "AAA" Street and "BB" Street, and continues as a 60" RCP to the confluence with A05-05-1 where it transitions into a 72" RCP. The 72" RCP extends southerly

along “BB” Street until it confluences with Line A05 at Lake Street. Lateral A05-05-01 begins near the intersection of “N” Street and “B” Street as a 42” RCP. From there the 42” RCP extends southerly along “B” Street until it confluences with Lateral A05-05.

Lateral A05-06 begins at the intersection of “CC” Street and “ZZ” Street (per Alberhill Ridge VTTM 35001) as a 36” RCP. From there the 36” RCP extends southerly along “CC” and transitions into a 42” RCP at the intersection of “PP” Street and “CC” Street. The 42” RCP continues southerly along “CC” Street, crosses Alberhill Ridge Road and transitions into a 60” RCP at the intersection of “J” Street and “C” Street. The 60”then continues along “C” Street and transitions into a 66” RCP at the intersection of “T” Street and “C” Street. From there the 66” RCP extends approximately 800 feet along “C” Street, then transitions into a 72” RCP continues along “C” Street and confluence with Line A05 at Lake Street.

Storm Drain Line A06

The upstream origin of Storm Drain Line A06 begins at the proposed park located at the northwest corner of the intersection of Lake Street and Alberhill Ranch Road. Line A06 begins as a 36” RCP and extends through the park for a distance of about 1,400 feet and transitions into a 42” RCP, then follows along the northern park boundary to Street D where it transitions into a 48” RCP. The 48” RCP then extends northerly along Street D and turns easterly at Nichols Road and transitions into a 54” RCP at approximately 650 feet west of Lake Street. The 54” RCP continues along Nichols Road and confluence with the existing storm drain along Lake Street.

Storm Drain Line A07

The upstream origin of Storm Drain Line A07 begins at approximately 1,100 feet northeast of the intersection Nichols Road and Alberhill Ridge Road (per Alberhill Ridge VTTM 35001) as a 36” RCP. From there the 36” RCP extends southwesterly for approximately 1,100 feet and turns northwesterly on Lake Street where it confluences with an existing storm drain on Lake Street.

Line A08 Storm Drain System

Line A08 Storm Drain System consists of a mainline storm drain and three lateral storm drains. The overall drainage area at its downstream outlet at Temescal Creek is approximate 205 acres. The upstream origin of system A08 begins approximately 900 feet southwest of the intersection of Alberhill Ridge Road and Nichol Road as a 36” RCP. From there the 36” RCP runs easterly along Nichols Road and transitions into a 72” RCP at the confluence with A08-03 and continues easterly along Nichols Road. At the confluence with A08-02, the 72” RCP transitions into a 78” RCP, continues easterly for approximately 1,900 feet and terminates in a natural wash along the south side of Nichols Road.

Lateral A08-01 begins at the intersection of “F” Street and “A” Street (Tract Map Nos. 30836 & 37553) as a 36” RCP. From there, the 36” RCP extends southerly along “A” Street for approximately 400 feet and transitions into a 42” RCP. The 42” RCP extends southerly along “A” Street until it confluences with Line A08 at Nichols Road. Lateral A08-02 begins at approximately 1,700 feet north of Nichols Road as a 36” RCP. From there, the 36” extends southerly along a

natural wash for approximately 600 feet and transitions into a 42" RCP. The 42" RCP continues along the wash until it confluences with Line A08 at Nichols Road. Lateral A08-03 is a 36" RCP, begins at approximately 980 feet north of Nichols Road, and extends southerly confluences with line A08 at Nichols Road.

Line A09 Storm Drain System

Line A09 consists of a single mainline storm drain. The overall drainage area at its outlet at Temescal Creek is approximately 84.8 acres. The upstream origin of storm drain Line A09 begins at the intersection of "O" Street and "P" Street (Tract Map Nos. 30836 & 37553) as a 36" RCP. From there the 36" RCP extends southerly along "O" Street and transitions into a 42" RCP at "C" Street. The 42" RCP extends easterly along "C" Street and then turns southerly at "D" Street. From there the 42" RCP extends southerly along "D" Street and transitions into a 48" RCP at the intersection of "N" Street and "D" Street. The 48" RCP continues southerly along "D" Street and transitions into a 54" RCP prior to Nichols Road. The 54" RCP then turns easterly along Nichols Road and terminates in Temescal Creek.

Line A10 Storm Drain System

Line A10 consists of a mainline storm drain and two laterals. Line A10 begins at approximately 1,900 feet east of the I-15 Freeway on Nichols Road as a 36" RCP. The 36" RCP extends westerly along Nichols Road for about 900 feet and transitions into a 42" RCP then continues along Nichols Road and transitions into a 54" RCP at the A10-02 confluence. The 54" RCP continues westerly on Nichols Road for about 450 feet then turns northerly and follows the northbound freeway onramp and connects with an existing double 54" RCP at the I-15 Freeway (Caltrans). The upstream origin of Lateral A10-01 begins at the mouth of the natural canyon area, approximately 1,200 feet east of the I-15 Freeway as a 42" RCP. From there, the 42" RCP extends westerly and confluences with Line A10. Lateral A10-02 begins in the proposed parking lot area of the future retail center (Per Alberhill Ranch SP Amendment #3) as a 36" RCP. The 36" RCP extends approximately 1250 feet to the northwest and confluences with Line A10. Lateral A10-03 collects runoff at the mouth of the offsite canyon area where it intersects the edge of pavement. Lateral A10-03 is a 36" RCP, approximately 300 feet and confluences with Line A10 just north of Nichols Road.

Line A11 Storm Drain System

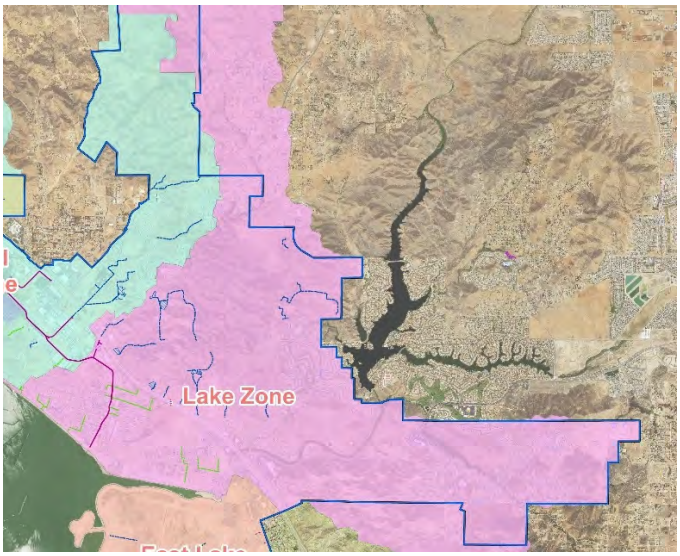
Line A11 consists of a single mainline storm drain. The upstream origins begin at the canyon mouth of the hills approximately 800 feet to the east as a 48" RCP. The 48" RCP extends southwesterly towards the I-15 Freeway and confluences with the existing Caltrans 48" RCP.

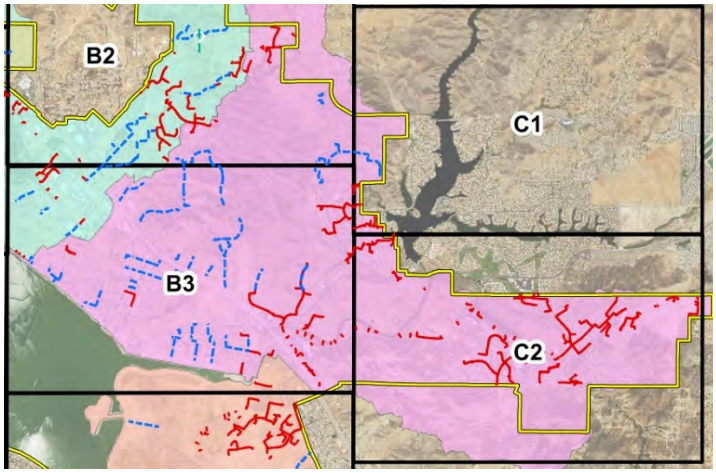
■ Lake Zone

Lake Zone is located in the northeasterly part of the City, encompasses an approximately 9,036-acre watershed. Its receiving water is Lake Elsinore, directly or indirectly through Canyon Lake or Lower San Jacinto River connecting Canyon Lake to Lake Elsinore. The Specific Plans within the Lake Zone are Spyglass Ranch SP, Tuscany Hills SP, Canyon Creek (La Strada) SP, Canyon Hills SP, Canyon Estates SP, City Center SP; The Specific Plans partially within the Lake Zone include North Peak SP, Ramsgate SP and East Lake SP. These Specific Plans are in various development stages, while the areas within Canyon Hills SP are mostly build out, North Peak and Canyon Estates remain in their natural, undeveloped conditions.

The proposed Lake Zone MDP facilities are comprised of one (1) debris basin, one (1) debris/ detention basin and twenty-three (23) storm drain systems. The location, alignment and size of the Lake Zone MDP facilities are depicted on Grid Map sheets A2, A3, B2, B3, C1 and C2 as shown on Figure 4-3 below. The estimated total cost for Lake Zone MDP facilities is approximately $ 32,422,000.

Figure 4-3
Lake Zone MDP Facilities





Line L-1 to L-5 Storm Drain Systems

Line L-1 to L-5 systems are located at the north shore of the Lake, west of the District's Outlet Channel. This area comprises mostly older residential neighborhoods with school, park and light commercial uses mixed in. Currently there is no existing storm drain facility for this area. Our field investigation indicated that this area experiences some street flooding and ponding at varies locations along Lakeshore Drive and Heald Avenue. Line L-1 to L-3 sub-watersheds drain directly to the Lake, Line L-4 and L-5 sub-watersheds drain to the lower Outlet Channel then discharge to the Lake, as shown on Grid Sheet B3.

Line L-1 is a single line 36" RCP storm drain totaling 710 feet in length, begins at Heald Street, extends westerly to Adam Avenue, and extends southerly to Lakeshore Drive, then southeasterly along Lakeshore Drive and discharges into the Lake.

Line L-2 system starts at the intersection of Heald Avenue and Mohr Street, travels approximately 660 feet southerly along Mohr Street, turns westerly along Lakeshore Drive for 200 feet, confluences with Line 2-1, then turns southerly for a distance of 290 feet and discharges into the Lake. Line L2-1 is a 36" RCP single line storm drain which begins at the intersection of Heald and Townsend Street, extends 360 feet along Townsend, turning southeasterly on Lakeshore Drive and confluences with Line L-2.

Line L-3 is a single mainline storm drain. It size varies beginning as a 36" RCP along Lindsay Street for a length of 1050 feet, then turns west along Limited Avenue and transitions to a 42" RCP. From there the 42" RCP extends westerly for a distance of 670 feet, at the intersection of Limited Avenue and Lakeshore Drive, Line L-3 turns southerly for approximately 300 feet and outlets to the Lake.

Since Line L-1, L-2 and L-3 all directly discharge runoff to the Lake, appropriate water quality treatments are required at the each discharge point.

Line L-4 is a 36" single line storm drain which begins at the intersection of Langstaff Street and Pottery Street, travels along Pottery to the east for a distance of 420 feet, and outlets to an existing 24" stub out on Outlet Channel.

Line L-5 is a 36" single line storm drain which begins at Langstaff Street and terminates at Flint Street, west of Outlet Channel, outlets to an existing stub out of the channel.

The estimated costs for Line L-1 to L-5 systems are approximately $2,269,000.

Line L-6 Storm Drain System

Line L-6 storm drain system consists of a mainline storm drain and an existing 54" Caltrans culvert and 600' feet of Caltrans concrete lined drainage ditch. The upstream origin of Line L-6 begins approximately 520' north of the existing 54" Caltrans culvert, along Elsinore Hill Road proposed by Tentative Tract Map 35337, Spyglass Ranch as a 36" RCP, and discharges into the existing 54" pipe culvert south of the I-15 Freeway. Line 6 reassumes its alignment at the end of Caltrans ditch near the north end of Lookout Street as a 42" RCP. From there the 42" RCP extends 330 feet southerly on Lookout Street, turns westerly along Flint Street as a 48" RCP for 340 feet, increases its size to a 54" RCP for a distance of approximately 1,240, then discharges into the Outlet Channel.

The estimated cost for the proposed Line L-6 system is approximately $1,235,000.

Line L-7 Storm Drain System

Similar to the Line L-6 system, Line L-7 storm drain system consists of a mainline storm drain and three existing Caltrans culverts and a section of natural drainage ditch along the south side of the I-15 Freeway. The upstream origin of Line L-7 begins approximately 1070' north of the existing 39" Caltrans culvert, along a natural valley as a 36" RCP, and discharges into the existing 39" pipe culvert north of the I-15 Freeway. Line 7 reassumes its alignment near the north end of Adobe Street as a 42" RCP. From there the 42" RCP extends 790 feet southerly along Adobe Street, turns westerly along Pottery Street as a 54" RCP for 1410 feet. At the intersection of Pottery Street and Ellis Street, Line L-7 increases its size to a 60" RCP along Pottery Street for a distance of approximately 1,070 feet and discharges into the Outlet Channel.

The estimated cost for MDP Line L-7 system is approximately $2,309,000.

Line L-8 and L-9 Storm Drain Systems

Line L-8 and L-9 systems are located east of the District's Outlet Channel. This area comprises mostly older residential neighborhoods with approximately 33 acres of steep hillside at its easterly end. Currently there is no existing storm drain facility for this area. Our field investigation indicated that this area experiences some street flooding, ponding and hillside erosion at various locations.

Line L-8 is a single line 36" RCP storm drain totaling 650 feet in length, which begins at Main Street, extends westerly along Summer Avenue, and outlets to the Outlet Channel.

Line L-9 system is a single line 36" RCP storm drain totaling 600 feet in length, which begins at Main Street, extends westerly along Franklin Street, and outlets to the Outlet Channel.

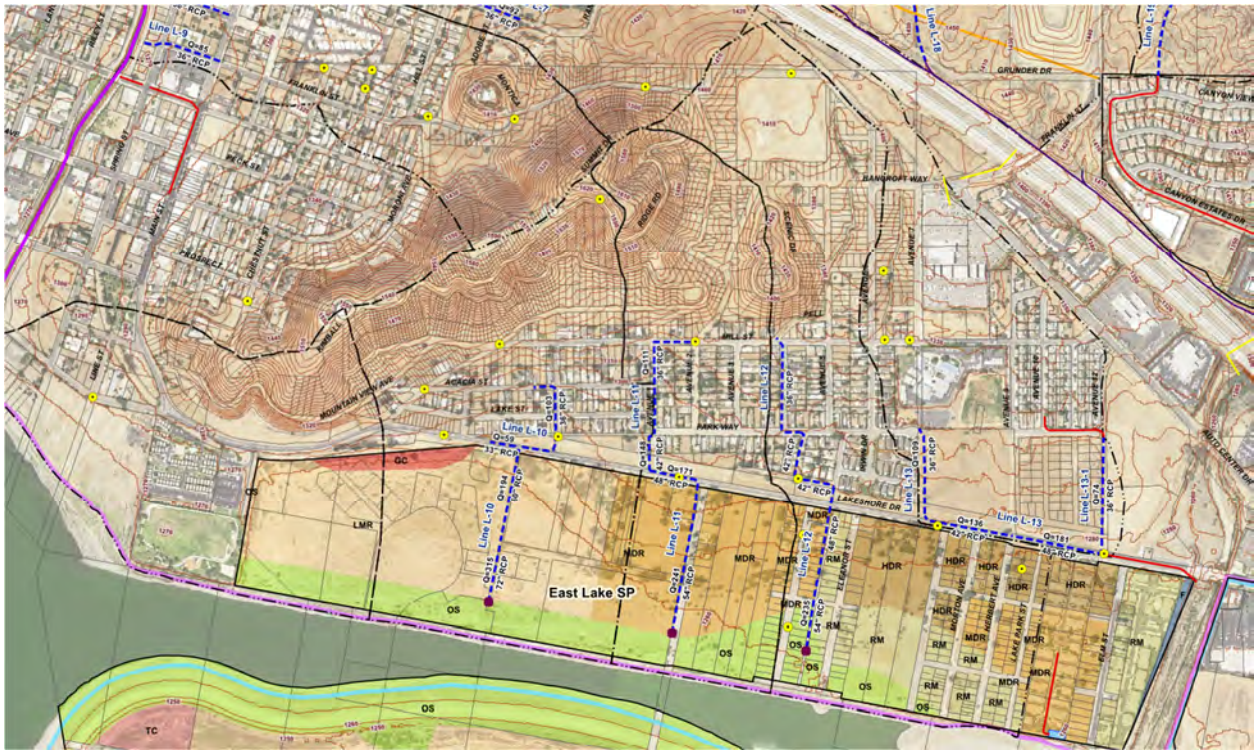
The estimated costs for Line L-8 and Line L-9 are approximately $535,000.

Line L-10 to L-13 Storm Drain Systems

Line L-10 to L-13 systems are located at the northeast corner of the Lake, between Ridge Road and the San Jacinto River inlet channel. This area is comprised of mostly older residential neighborhoods with an undeveloped steep hillside to the north, and a school and commercial site to the east. Currently there are few existing storm drains within Line L-13 sub-watershed. Our field investigation indicated that this area experiences some street flooding, ponding on Mill Street near the Railroad Canyon Elementary School site and along Lakeshore Drive. Hillside erosion and storm runoff which floods residents have also occurred on Avenue 6 and 7, along Country Club Blvd. and Acacia Street. The areas south of Lakeshore Drive, east of Lakepoint Park are within the East Lake Specific Plan. The land use within the SP is still evolving.

Line L-10 to L-13 Systems can be found on Grid Map Sheet B3, and also shown on Figure 4-4.

Figure 4-4
Lake Zone MDP Line L-10 to L-13



Line L-10 is a single mainline storm drain system which begins at Acacia Street extends southerly along High Street, crosses Lakeshore Drive and outlets to the Lake. Line L-10 size varies from 36" RCP upstream to 72" RCP at the outlet near the Lake. The estimated cost for Line L-10 is approximately $1,343,000.

Line L-11 system is a single mainline storm drain system, which begins at Mill Street and Avenue 2, extends westerly to Avenue 1, turns southerly along Avenue 1 to Lakeshore Drive, travels along Lakeshore Drive in an easterly direction, turns south again along Lucene Street and outlets to the Lake. Line L-11 size varies from 36" RCP upstream to 54" RCP at the outlet near the Lake. The estimated cost for Line L-11 is approximately $1,300,000.

Line L-12 system is a single mainline storm drain system, which begins at Mill Street and Avenue 4, extends southerly to Parkway, turns easterly along Parkway then turns southerly on Pepper Street to the intersection of Pepper and Dawe Street. From there Line L-12 travels along Dawe Street easterly for a distance of 280 feet to Avenue 6, then turns southerly for a distance of approximately 1200 feet and outlets to the Lake. Line L-12 size varies from 36" RCP upstream to 54" RCP at the outlet near the Lake. The estimated cost for Line L-12 is approximately $1,252,000.

Line L-13 storm drain system consists of a mainline storm drain and one lateral. Currently there is some street flooding and roadside erosion along Avenue 6, Avenue 7 and Mill Street. Existing local storm drains and catch basins are on Mill Street that conveys the storm runoff to the concrete ditch along westerly side of the Railroad Canyon Elementary School site, and outlets near the Park Way Cul-De-Sac. The upstream origin of Line L-13 begins at Park Way Cul-De-Sac as a 36" RCP, travels southerly 650 feet to Lakeshore Drive. From there the Line L-13 pipe size increases to 42" RCP follows Lakeshore Drive in an easterly direction for 660 feet, increases to 48" RCP for

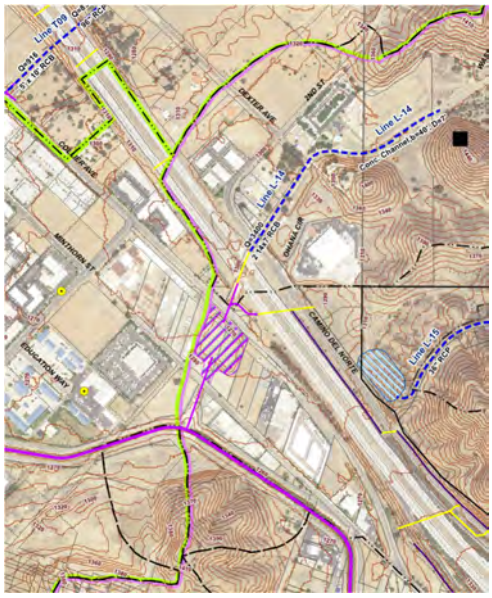
a distance of 730 feet, confluences with Lateral L-13-1 and connects /outlets into the existing 75" RCP Storm Drain. Lateral L-13-1 begins at the outlet of an existing storm drain at Park Way and Avenue 12 as a 36" RCP. From there the 36" RCP follows the Avenue 12 alignment for a distance of approximately 850 feet and then confluences with Line L-13.

The estimated cost for Line L-13 system is approximately $1,140,000.

Line L-14 Storm Drain System

Line L-14 Storm Drain System is a major drainage facility proposed to extend the Wasson Canyon Channel Stage 1 facilities constructed by the District. The existing Wasson Canyon Channel facilities began at south side I-15 Wasson Canyon Bridge as a collector channel, transitions to an 18 foot wide and 10.5 foot high RCB crosses under Collier Avenue to a debris basin, then discharges into the Outlet Channel at its ridge point. Theoretically, Wasson Canyon storm runoff will split evenly, 50 % draining to Lake Elsinore and 50% draining to Temescal Wash. Currently there are no other existing master plan drainage facilities upstream of the I-15 Freeway Wasson Canyon Bridge.
Addressee

Figure 4-5
Lake Zone MDP Line L-14 and Wasson Canyon Sub-watershed



Wasson Canyon sub-watershed is comprised of approximately 8 square miles of land, with a 100-year peak flow of 3400 CFS, draining generally north to south. The mid and upper portion of the canyon has a well-defined natural water course with year-round vegetation. At its lower (south) end, south of Rosetta Canyon Drive, Wasson Canyon becomes flatter and less defined. Some properties and city streets at south end of Wasson Canyon experienced some flooding and erosion damage in the past. Based on the unit hydrographic studies, debris basin DB 6 analysis, and input from the City, Line L-14 system is proposed.

Initially, the Line L-14 system was designed as a double 14' x7' RCB with total length of 1,960 feet with a debris basin DB6 at its upstream end. The total estimated cost for the RCB system and DB 6 is approximately $8,908,000 and $ 5,979,000 respectively.

Due to the high cost of the Line L14 System, an alternative study of combined RCB (at Camino Del Norte road crossing) and concrete lined channel was conducted. With the open channel alternative, debris can be removed from the channel, and the existing debris basin south of the I-15 Freeway can be utilized for silt and misc. trash removal. The estimated size of the lined trapezoidal channel is 40 feet wide at the bottom with 1.5:1 side slopes and a depth of 7 feet. Due to the significant cost savings, this alternative is selected for MDP Line L-14.

The estimated cost for Line L-14 system is approximately $3,740,000.

Line L-15 Storm Drain System

Line L-15 is a single mainline 36" RCP storm drain totaling 2,710 feet in length, proposed by Spyglass Ranch, Tract 35337. The estimated cost for Line L-15 is approximately $938,000.

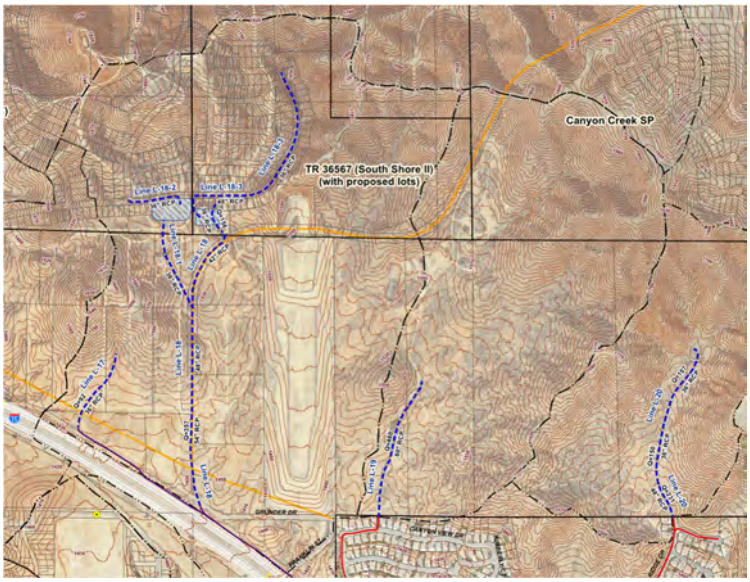
Line L-16 Storm Drain System

Line L-16 system consists of a mainline storm drain and a Lateral L-16-1, proposed by Tract 31593 South Shore I and Tract 36567 South Shore II in conjunction with on-site detention and water quality basins. Line L-16 system discharges into Wasson Canyon drainage course.

The estimated cost for Line L-16 system is approximately $4,670,000.

Line L-17 – Line L-20 Storm Drain Systems

Figure 4-6
Lake Zone MDP Line L-17 to Line L-20



Line L-17 is a single mainline 36" RCP storm drain totaling 800 feet in length, located north of the I-15 Freeway, west of Franklin Street.

The estimated cost for Line L-17 system is approximately $290,000.

Line L-18 storm drain system consists of a mainline and three Laterals. The upstream portion of the Line L-18 system (Laterals L-18-2 and L-18-3 and two water quality basins) as shown on Figure 4-6 was proposed by Tract 36567, South Shore II.

Line L-18 begins at Lateral L-18-3 basin outlet structure travels along future La Strada Road in a southerly direction to Grunder Drive, then outlets to the existing Caltrans concrete ditch.

The estimated cost for Line L-18 system is approximately $2,775,000.

Line L-19 is a single mainline 60" RCP storm drain totaling 1,370 feet in length, located north of Canyon View Drive, extending from the existing 72" storm drain constructed in conjunction with the development of Canyon Creek Specific Plan.
The estimated cost for Line L-19 system is approximately $976,000.

Line L-20 is a single mainline storm drain. Totaling 800 feet in length, located north of Scenic Ridge Drive, extending from the existing 66" storm drain. Line L-20 varies in size from a 36" RCP at its upstream end to a 48" RCP at the downstream end and has an overall length of approximately 1,730 feet.
The estimated cost for Line L-20 system is approximately $667,000.

Line L-21 Storm Drain System

Line L-21 Storm Drain System consists of a single mainline storm drain and is located in sub-watershed L-21 of the Tuscany Hills SP. The upstream origin of Line L-21 begins approximately 850 feet southwest of the intersection of Greenwald Avenue and Little Valley Road as a 48" RCP. From there the 48" RCP extends in a southerly direction along the proposed streets for a distance of approximately 850 feet and outlets in a proposed water quality basin.

The estimated cost for Line L-21 system is approximately $528,000.

Detention Basin DB11

The purpose of this detention basin is to reduce peak flow rates in the downstream storm drain system through the use of temporary detention storage. This peak flow reduction allows the use of smaller, less costly downstream facilities. A combination detention/debris basin is proposed for the upper portion of the Tuscany Hills Specific Area. The basin will reduce the downstream flow rate due to the temporary storage effect (hydrograph attenuation) and due to the removal of sediments (un-bulked). In addition it will be much easier and less costly to clean out a basin than it would be to clean out an underground drainage system. The Tuscany Hills Debris/Detention Basin DB11 has a volume of approximately 25.0 acre-feet and an approximate right-of-way of 5.3 acres.

Line L-22 Storm Drain System

Line L-22 storm drain system consists of a mainline storm drain and one lateral. The upstream origin of Line L-22 begins near the northwest boundary of the Tuscany Hills SP at the proposed Debris/Detention Basin DB11 outlet as a 42" RCP. From there the 42" RCP follows the proposed streets in a southeasterly direction and outlets into a proposed water quality/detention basin. Line

L-22 varies in size from a 42” RCP at its upstream end to a 66” RCP at the downstream end and has an overall length of approximately 4,300 feet. Lateral L22-1 begins at the western boundary of Tuscany Hills SP as 36” RCP. From there the 36” RCP follows the proposed street alignment for a distance of approximately 2,200 and then confluences with Line L-22.

The estimated cost for Line L-22 system including DB 11 is approximately $5,907,000.

Line L-23 Storm Drain System

Line L-23 storm drain system consists of a single mainline storm drain. The upstream origin of Line L-23 begins at the western boundary of the Tuscany Hill SP and collects offsite runoff from the hills to the west and conveys it through the development and discharges the runoff in a natural wash to the south. Line L-23 varies in size from a 36” RCP at its upstream end to a 42” RCP at the downstream end and has an overall length of approximately 15100 feet.

The estimated cost for Line L-23 system is approximately $550,000.

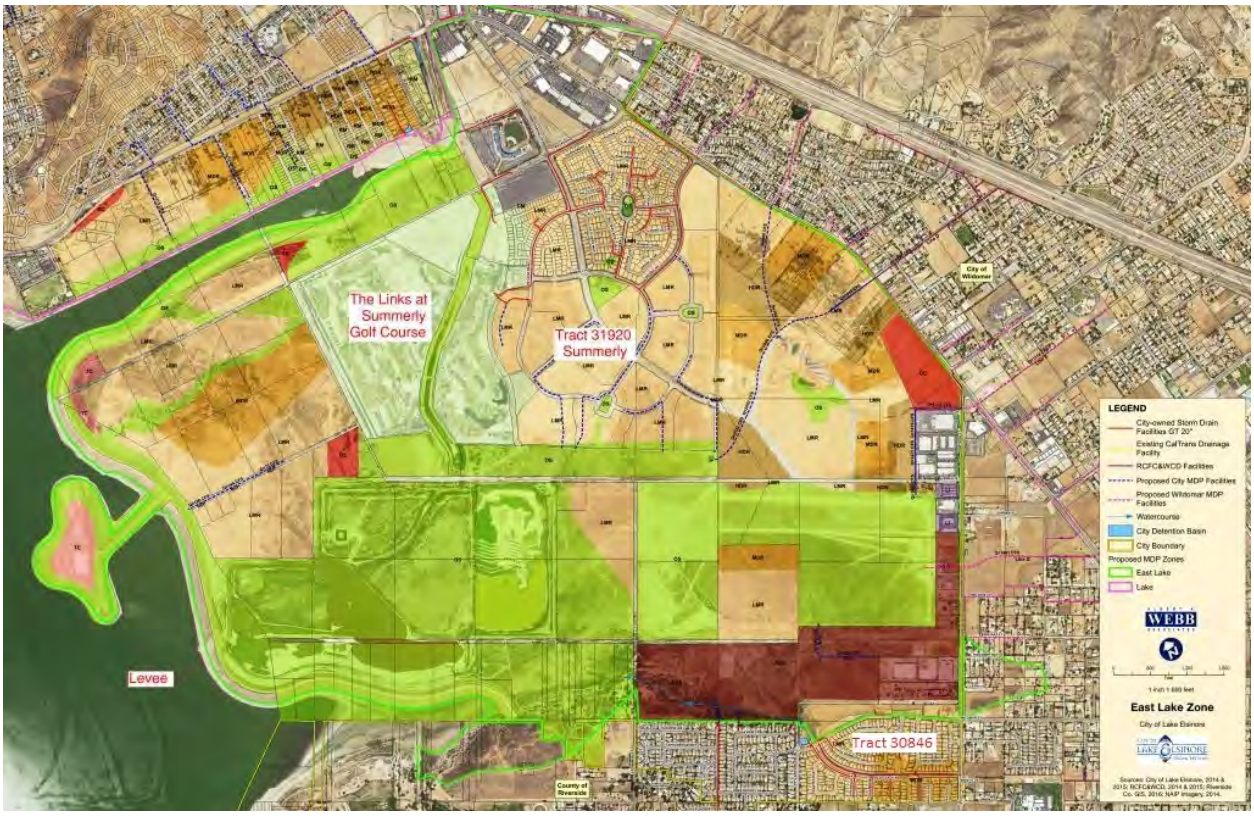
■ East Lake Zone

The East Lake Zone, named for the East Lake Specific Plan, covers approximately 3000-acres at the southeastern end of Lake Elsinore. It is generally bordered by the city boundary to the south and east, the lake to the west and the San Jacinto River Inlet Channel to the north. Most of the East Lake Zone lies within a 100-year flood plain; as a result, the East Lake Zone has been significantly impacted during wet seasons.

A joint powers authority named Lake Elsinore Management Authority was formed in the late-1980s, it led the efforts to stabilize the fluctuating level of water in the lake. As a component of those efforts, the levee along the East Lake Zone northern boundary was constructed in 1995. The levee effectively reduced the size of the water surface by about half resulting in reduction of lake evaporation. The levee also provided flood protection for the East Lake Zone.

The development within the East Lake area is primarily governed by the approved East Lake Specific Plan, its development agreements and amendments. The East Lake SP Amendment 8 established that the lowest floor in all development areas shall be raised above the FEMA 100-year flood plain elevation of 1267 feet mean sea level. To allow for regional flood storage, the set aside open space and park will be graded to an elevation of 1240 or below, no import earth shall be used to raise the building pad areas.

Figure 4-1
East Lake Zone



Within the East Lake Zone, the existing developments include a master planned residential neighborhood, “Summerly” (Tract 31920); an 18-hole golf course “The Links at Summerly”; a limited mix of industrial and commercial; an air strip with hangers and supporting facilities and medium-density residential developments at southeast corner.

Currently, existing drainage facilities that provide some level of flood protection within this zone are as follows:

City Facilities
Pete Lehr Drive Storm Drain (54” RCP)
Storm Drain systems associated with Tract 31920 Summerly developments
Storm Drain systems associated with Tract 30846 developments
Ontario Way Storm Drain (84” RCP)

District Facilities
Palomar Channel (Tract 30846)
SEDCO MDP Line D (daylight channel)
SEDCO MDP Line E (daylight channel)

Located across Mission Trail and Corydon Street in the City of Wildomar is the Riverside County Flood Control and Water Conservation District SEDCO MDP. The storm runoffs from SEDCO area with approximate 2,675 acres of land discharge to the back basin, the area behind the levee bounded by the City limits, with Wildomar on the north, east and south in the East Lake Zone. This discharge of runoff has a significant impact to the proposed land use and flooding within the back basin of the East Lake Zone. The District’s Master Drainage Plan for the SEDCO Area dated March 1982 proposes Lines A, B and C. These facilities were reevaluated with City of Wildomar MDP, and the 100-year peak discharge rates provided by the City of Wildomar on December 11, 2019, are used for sizing the proposed storm drain facilities.

Wildomar Drainage Facility - Discharge Summary

			Wildomar MDP			
No.	Sedco SD	Outlet Locaton	Q100 (cfs)	Area (acre)	Tc (min.)	Remarks
1	LINE A	Mission Trail and Sylvester Rd	248	98.1	13.4	Outlet to Mission Trail toward Summerly, existing City Storm Drain on Mission Trail appears not designed for any additional flow
2	LINE B	Mission Trail and Elberta Rd	222	86.4	14.3	Outlet to Mission Trail toward Summerly, existing City Storm Drain on Mission Trail appears not designed for any additional flow
3	LINE C	Mission Trail and Sedco Blvd	237	94.3	14.0	Outlet to Vacant Land
4		Mission Trail and Olive St.	252	99	12.8	Per Wildomar Prelim Hyd S2, Node 248
5	LINE D	Mission Trail and Vine St.	1280	523.3		Existing RCFCD Facility, Wildomar Q is sumation of the S2 less Olive St Q
6	LINE E	South of Corydon St & Mission	1218	573.9	21.9	Existing RCFCD Facility at downstream
7	LINE G	North of Corydon St & Melinda Ln.	1413	1128	53.5	Outlet to Private Property per Sedco
		Total	**4870 CFS**	**2603 ACRES**		Summary of Storm Runoffs from Wildomar to East Lake

The proposed Storm Drain Line E-1 and Line E-2 systems are designed to accept the Wildomar MDP Line A through E peak flows, convey the runoffs to the designated open spaces for storm water storage, mitigation and ultimately discharging to the lake.

Line E-1 Storm Drain System

The Line E-1 Storm Drain System is located west of the Mission Trail / City boundary and east of "Summerly" developments.

Line E-1-1 is a single cell 12' (width) x6' (depth) RCB, the upstream end begins at Mission Trail and Sedco Blvd, as an outlet for combined Line A, B & C of the Sedco MDP storm drain. Line E-1-1's overall length is approximately 2,100 feet at its confluence junction with Line E-1.

Line E-1 is a double-cell RCB system, with its size varying from a double 8' x7' at Mission Trail and Vine Street to a double 10'x8' at its outlet. The Line E-1 upstream segment, approximately 1,850 feet in length, has the capacity of 1,515 CFS for combined Line D and Olive Street Storm Drain per the Wildomar MDP study. The downstream segment from the confluence point with Line E-1-1 to its outlet is approximately 2,400 feet.

The existing Sedco MDP Line D was designed and constructed in the mid-1980s. It was drastically undersized according to the Wildomar MDP study. The existing Line D daylight channel at the west of Mission Trail will need to be removed for Line E-1 construction.

The estimated cost for the proposed Line E-1 system is approximately $14,635,000.

Line E-2 Storm Drain System

The Line E-2 Storm Drain System is located south of the intersection of Mission Trail and Corydon Road. The proposed Line E-2 is a double-cell RCB which ranges from double 8'x6' to double 8'x7' RCB, with an approximate overall length of 2,150 feet. Line E-2 is intended to convey storm runoffs from Sedco Line E through East Lake developments to the open spaces.

Per the Wildomar MDP study, Sedco MDP Line E has a 100-year storm peak rate of 1318 CFS. However, the portion of Sedco Line E constructed in 2004 was designed for 450 CFS. The existing Sedco Line E consists of a daylight channel, a segment of 149 feet of 72" RCP with bulkhead at the upstream end, and a 42" RCP lateral with 4 catch basins at Mission Trail and Lemon Street with total design capacity of 68 CFS.

Currently Corydon Street experiences severe flooding during rain storms, mainly due to the lack of drainage facilities. Only 5% of the 100-storm is conveyed through the existing Line E and its laterals, the bulk of the storm conveyance on Corydon Street is surface flow, which creates un-safe driving conditions.

At the request of the City, Webb provided an interim solution with 2 design options to alleviate Corydon flooding. The recommendations and exhibits are provided in Appendix X for reference.

The estimated cost for the proposed Line E-2 system is approximately $4,686,000.

Line E-3 Storm Drain System

The Line E-3 Storm Drain System is located in the Airport Use Area of the southeasterly corner of the East Lake Zone. Line E-3 consists of a single mainline storm drain. It varies in size from a 54" RCP upstream end to a 66" diameter RCP at its downstream, terminus within open space for a distance of approximately 1,500 feet. The Line E-3 watershed includes an approximate 24 acre drainage area from the City of Wildomar at the southeasterly area of Corydon Street.

The estimated cost for the proposed Line E-3 is approximately $958,000.

Line E-4 Storm Drain System

The Line E-4 Storm Drain System is located in the west side of the East Lake Zone, where the current land use is low to medium density residential. Line E-4 consists of a single mainline storm drain, which varies in size from a 48" RCP upstream end to a 66" diameter at its outlet. This area is surrounded by open space. The areas adjacent to open space can be graded to drain to the open space via surface flow. It is anticipated that land use will be modified in the near future. The proposed Line E-4 will need to be adjusted accordingly.

The estimated cost for the proposed Line E-4 is approximately $1,153,000.

A summary of the proposed facilities and their estimated cost is shown below.

Line E-1	$ 14,635,000
Line E-2	$ 4,686,000
Line E-3	$ 958,000
Line E-4	$ 1,153,000
Total	$21,432,000

Alternative Studies

The proposed Line E-1 and Line E-2, utilizing Reinforced Concrete Box culverts, are the most costly and also the most versatile systems. The alternatives of using concrete lined trapezoidal channels or earthen channels are examined and analyzed for their feasibility, both hydraulically and economically.

a. Concrete Lined Trapezoidal Channel

This alternative uses concrete lined open channels with channel side slope 1.5 to 1; base width 6' to 20' and depth 6' to 7'. The open channels will have two maintenance access roads, one on each side of the channel, the estimate right of way requirements vary between 43' to 75' in width. The channel will transition to a RCB of equivalent capacity where it crosses roadway. A total of 4 roadway crossings are assumed for the cost estimate comparison.

b. Un-lined Trapezoidal Earthen Channel

The earthen channel will require 4:1 side slope and much wider bottom base width to achieve a non-erosive velocity. If earthen channels are used for Line E-1 and Line E-2, the bottom width of

the earthen channels will range from 30' to 90', the total width of the channel will need to be as wide as 190'. Conceptually, the earthen channel may provide opportunity for infiltration and bio-treatment within the channel footprints, and be less costly. However, due to its width, it requires much longer transition structures at roadway crossings, and acquisition of more Right-of-Way.

A summary of the alternative studies is presented in the table below:

East Lake MDP Cost Alternative Summary

		Wildomar MDP	Required Add'l Imp	East Lake MDP		Alt 1 - RCB	Alt 2 - Concrete Trap Channel		Alt 3 - Earth Channel 4:1	
Wildomar MDP	East Lake MDP	Q100 (cfs)		Q100 (cfs)	Length (ft)	Size (ft)	Bottom Width (ft)	D (ft)	Bottom Width (ft)	D (ft)
LINE A	LINE E1-1	248	Extend Line A & B to Line C on Mission Trail by Wildomar	688-784	2100	12'x6'	6	6	30	5.5
LINE B		222								
LINE C		237								
LINE O	LINE E1	252	Extend Line O to Line D on Mission Trail	1515	1850	2-8'x7'	12	7	56	6.5
LINE D		1290								
	LINE E1	2249	(Sum of Line A-D)	2426-2552	2400	2-10'x8'	20	7	90	7
LINE E	LINE E2	1318		1318-1466	2150	2-8'x7'	10	7	56	6.5
LINE G		1661	Extend Line G to Open Space & grade to drain	–						
		5228		**451 Added**	**8500**					
R/W Take (ac)						3.5	12.5		30.2	
R/W Cost	($100,000 /ac)					$ 350,000	$ 1,250,000		$ 3,020,000	
Total Cost						**$ 17,136,561**	**$ 9,236,689**		**$ 11,806,000**	
MDP Fee						**$ 15,205**	**$ 8,196**		**$ 10,476**	

Alternative 1 are all RCB, may require less R/W take if alignment is within the roadway, assume 50% o fthe alignment within Street R/W

Alternative 2 are concrete trap channel, assume roadway/ channel crossing at 4 locations, channel transition to RCB at crossings

Alternative 3 are earth trap channel, assume roadway/ channel crossing at 4 locations, channel transition to RCB at crossings

*East Lake Zone Total Area = 2751 Ac, Exclude Summerly Development and all Open Space Areas, Net Area = 1127 Ac

Conclusions

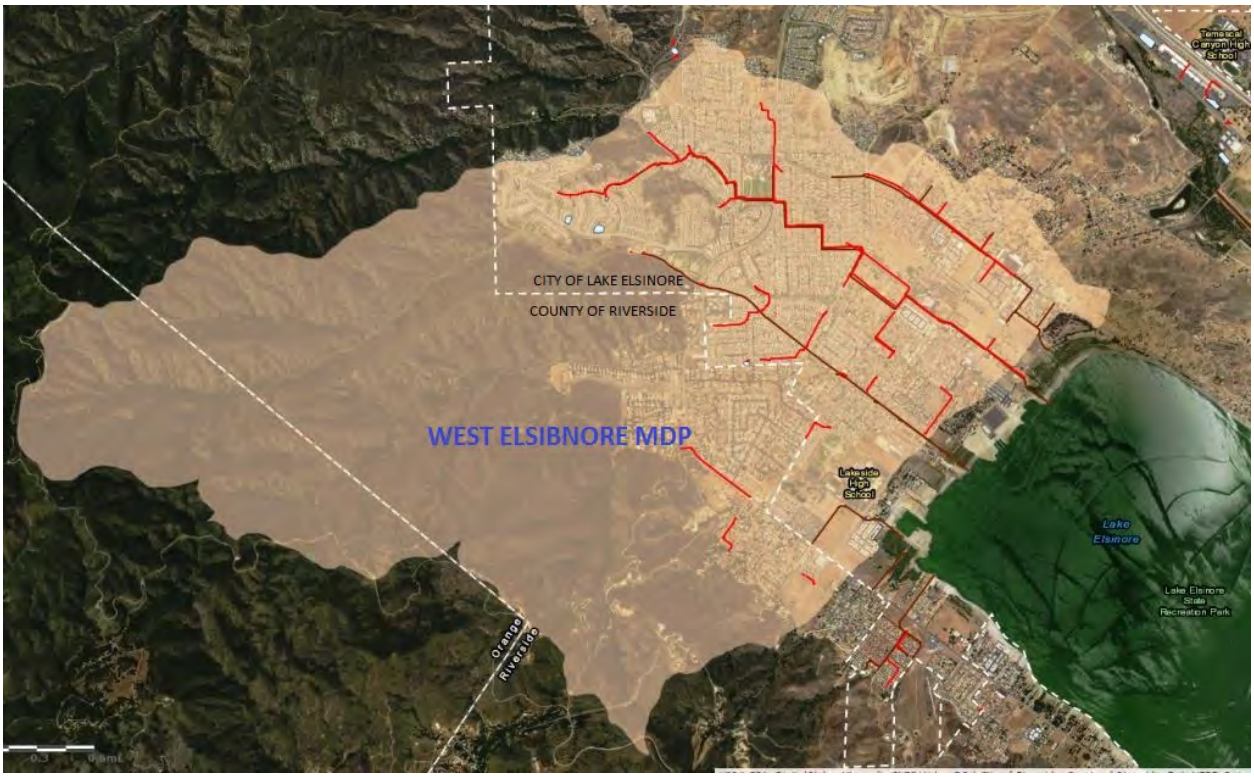
The above alternatives and their associated costs were presented to the City Engineer and stake holders for consideration. Even though the open channel alternatives are less costly, they can be unsightly, aesthetically unpleasing, have a higher maintenance cost, less safe for the public compared to the underground facilities, and dissect the land and post more restrictions to the future developments. The City considers utilizing RCB for Line E-1 and Line E-2 as the most viable alternative for the East Lake Zone.

It is important to understand that the proposed East Lake MDP facilities alone will not adequately protect the area from flood hazards, unless either the upstream facilities per the Wildomar MDP are in place to collect and convey the storm flow to the designated connection points or the interim intercepting / collecting facilities are constructed to serve the same purposes.

■ Existing West Elsinore MDP and ADP

"**West Elsinore Master Drainage Plan**" and "**West Elsinore Area Drainage Plan**" were prepared by Riverside County Flood Control and Water Conservation District (District), with the Area Drainage Fee approved in 1986 and updated in June 12, 1993. The drainage area covered by this MDP consists of approximately 10.5 square miles, where nearly 40% of the drainage area is within the City boundary. Currently, most of the MDP facilities are constructed, and areas within the city boundary are mostly developed, except the steep hillside area.

Figure 4-5
West Elsinore MDP



The MDP update does not propose any change to the existing West Elsinore MDP. However, since the ADP fee was last updated in June of 1993, an adjustment to the current construction cost index is warranted.

According to the Engineering News Record published Construction Cost (LA) Price Index Value, for September 2021, Index Value is 13,212.48; for June 1993, Index Value is 6,426.76. The increase on cost is 1.735. Therefore, ADP fee of $ 5,567/ac in 1993 will be adjusted to $ 11,445/ac as of September 2021.

■ Background

The primary purpose of the MDP update is to identify engineering solutions that will control flooding and drainage problems within the City. In addition, the MDP identifies potential locations for future water quality treatment facilities, estimates the cost of facilities, and identifies funding sources to facilitate orderly and economically-prudent development of the area.

This section serves as a general overview of the environmental setting of the MDP area as well as a review of some of the environmental analyses and documentation that may be required. The intent of this chapter is to inform the decision-making process of siting MDP facilities so that environmental constraints can be identified and ideally, avoided.

It should be noted that individualized analysis on a project-by-project basis pursuant to the regulations at the time, will be necessary once specific facility sites have been identified to determine the site-specific environmental constraints.

■ Aesthetics

The City's most notable aesthetic resource is Lake Elsinore itself, a 3,000-acre natural lake. This large, shallow, natural Lake is the terminus of the San Jacinto River. As development in the region increased over the past 100 years, Lake Elsinore and the many hot springs around the Lake became popular recreation destinations. During the peak of initial settlement in the region and recreational development at Lake Elsinore, Federal and State agencies, as well as private groups stocked a wide variety of fish species in the lake with the goal of drawing people to Lake Elsinore by providing recreational fishing opportunities. The City's aesthetic setting is characterized by urbanized development of various densities occurring within varied topographical features and interspersed with open space areas.

Scenic resources within and surrounding the City include the Cleveland National Forest (Santa Ana Mountains) that defines the westerly boundary with beautiful, rugged hillsides, canyons, and rocky outcroppings. Distant ridgelines of Mt. San Antonio and Mt. San Gorgonio as well as open space around Temescal Creek and the Gavilan Hills Plateau are aesthetically important.

The California Department of Transportation (Caltrans) currently identifies both Interstate 15 and State Route 74 as eligible for listing as State Scenic Highways, but they are not officially designated as such (Lake Elsinore General Plan FEIR).

Components of the proposed MDP could potentially affect scenic vistas and other scenic resources within the project area. The open channels, debris basins on the hillsides, and water quality basins could be visible and could have an effect on a scenic vista, which would require analysis and consideration. Although underground drainages would not be visible after construction is completed, construction debris, and construction equipment may temporarily affect the aesthetic quality of the immediate area. Therefore, depending on where future drainage facilities are located, there could be aesthetic impacts that would need to be evaluated on a project-by-project basis.

■ Air Quality

The proposed MDP area is located within the South Coast Air Basin (SCAB), which encompasses all of Orange County and portions of Los Angeles, San Bernardino, and Riverside Counties. The SCAB is under the jurisdiction of the South Coast Air Quality Management District (SCAQMD). The Climate Action Plan (CAP) is the City of Lake Elsinore's long-range plan to reduce local greenhouse gas emissions that contribute to climate change. The CAP identifies the activities in Lake Elsinore that generate greenhouse gas emissions, quantifies these emissions, and projects their future trends. It also describes local greenhouse gas emissions targets for the years 2020 and 2030, consistent with the State of California's emission-reduction targets, as well as strategies and measures to meet these targets.

As each component of the MDP is designed, appropriate project-specific analyses of air quality impacts and greenhouse gas emissions during both construction and operational phases may be needed.

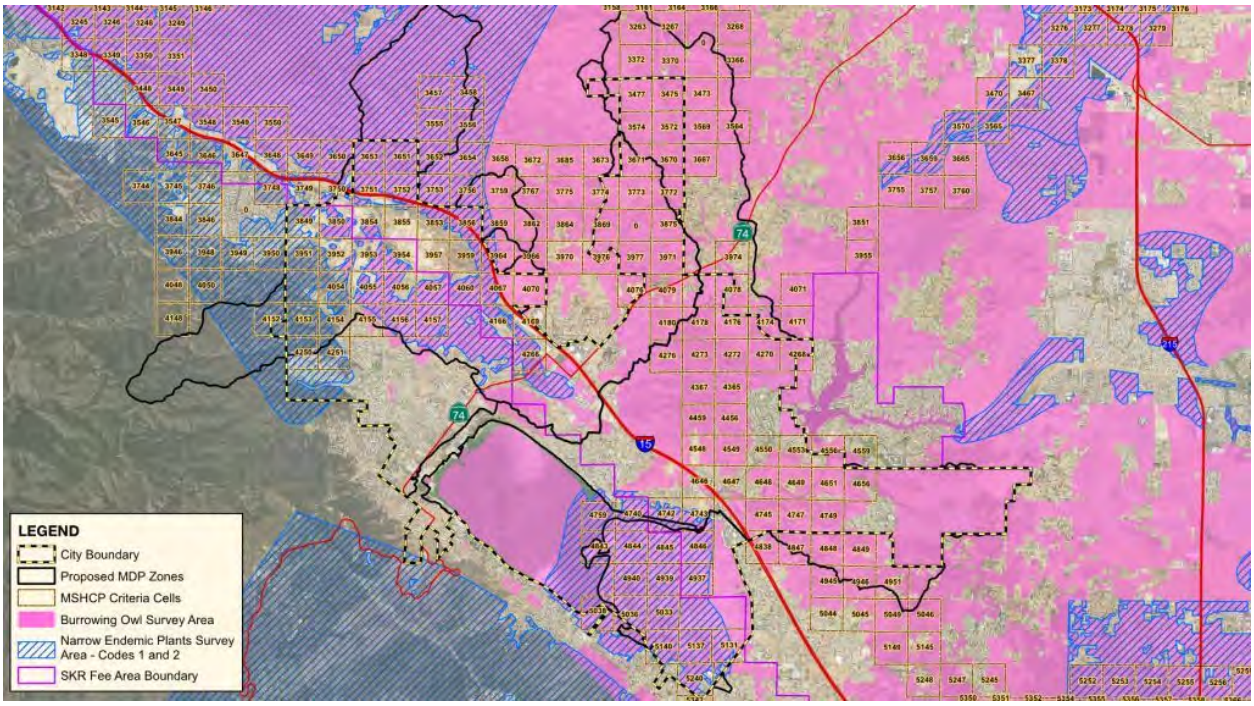
■ Biological Resources

Approximately 16 different natural vegetative communities occur in the City and its SOI. In addition, 19 plants and a minimum of 38 animals within the City and/or the SOI's habitats are accorded the "special status" designation because they are unique, have relatively limited distribution in the region, or have high wildlife value as defined by Federal, State, and local government conservation programs.

Lake Elsinore is a signatory to the Joint Powers Agreement that governs the Regional Conservation Authority that oversees the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). The proposed MDP area is within the Elsinore Area Plan, Mead Valley Area Plan, and Lake Mathews/Woodcrest Area Plan of the MSHCP, including many portions within criteria cells. As each component of the MDP is designed, appropriate project-specific analyses of biological resources and project impacts during both construction and operational phases, may be needed. The proposed MDP zones contain MSHCP Criteria Cells, burrowing owl survey areas, and narrow endemic plant survey areas as shown in **Figure 5-1**. Preparation of a General Habitat Assessment, MSHCP Consistency Analysis, Determination of Biologically Equivalent or Superior Preservation (DBESP) report, Focused Surveys, Presence/Absence Surveys, and/or Pre-Construction Clearance Surveys may be required as the MDP is constructed, depending on the site-specific circumstances.

The proposed MDP area northeast of Lake Elsinore falls within the Stephens' kangaroo rat (SKR) Fee Area outlined in the Riverside County SKR Habitat Conservation Plan (HCP), which includes fees pursuant to County Ordinance 663.10 for the SKR HCP Fee Assessment Area as established and implemented by the County of Riverside.

Figure 5-1
MSHCP Criteria Cells and Survey Areas and SKR fee area

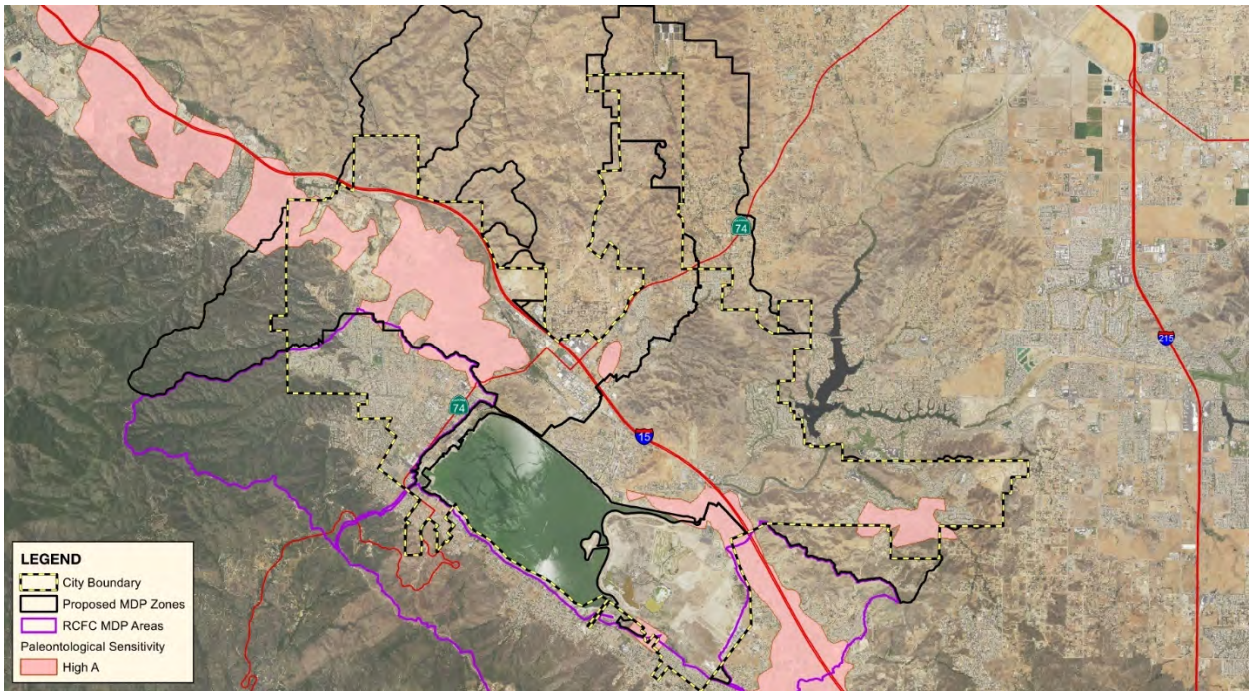


■ Cultural Resources

Archaeological resources are defined as the material remains of an area's prehistoric (aboriginal/Native American) or historical (European or Euro-American) human activity. Archaeological resources are recognized as non-renewable resources significant to our culture and are afforded protection by Federal and State law primarily through conformance with the California Environmental Quality Act (CEQA).

The Riverside County paleontological resources sensitivity mapping shows areas of high paleontological sensitivity ("High A") in Quaternary deposits north of Lake Elsinore along the west side of the I-15 corridor (**Figure 5-2)**. Another small strip of High A land is found along the I-15 corridor east of Lake Elsinore in the northeast portion of the East Lake Zone. The Temescal Wash Zone contains a large portion of this High A land. Geologic formations or mapped rock units in these areas may contain significant paleontological resources. These include rocks of Silurian or Devonian age and younger that have potential to contain remains of fossil fish, and Mesozoic and Cenozoic rocks that contain fossilized body elements and trace fossils such as tracks, nests and eggs.

Figure 5-2
MDP Zone with Paleontological Sensitivity



The City of Lake Elsinore has also identified geologic units that are known to contain important paleontological resources in the Alberhill Ranch area in the northwest portion of the City, and within the Temescal Wash Zone of the proposed MDP. In this localized area, the Silverado Formation of Paleocene age (approximately 66 to 55 million years old) is considered highly sensitive for invertebrate and plant material. The fossil plants from this unit have been studied for more than half a century.

Historical sites from mining, transportation, recreation, and ranching/homesteading sources are represented throughout the proposed MDP area. The number of previously identified historical sites is much smaller than prehistoric sites making it more difficult to determine areas of known or established sensitivity.

Construction and operation of any MDP facility would be required to comply with State law about accidental findings of human remains per State Health and Safety Code §7050.5. If human remains are encountered during construction, no further disturbance shall occur until the Riverside County Coroner has made a determination of origin and disposition pursuant to Public Resources Code §5097.98. If the County Coroner determines that the remains are not historic, but prehistoric, the Native American Heritage Commission must be contacted to determine the most likely descendent for this area. Once the most likely descendent is determined, treatment of the Native American human remains will proceed pursuant to Public Resources Code 5097.98 (Lake Elsinore General Plan FEIR, RCIP).

As each component of the MDP is designed, appropriate project-specific analyses of cultural resources and project impacts during both construction and operational phases, may be needed. Compliance with Assembly Bill 52 (AB 52), which requires tribal consultation may also be required.

■ Geology and Soils

The MDP area is located within a seismically-active region of California. Fault zones affecting the MDP area include the San Andreas, San Jacinto, Elsinore, and Cucamonga Fault Zones. The following types of ground failure could occur within the City of Lake Elsinore, its SOI, and the proposed MDP area due to seismic activity: fault rupture, seismic ground shaking, liquefaction, lateral spreading, ground lurching, and seismically-induced ground settlement (Lake Elsinore General Plan FEIR).

The area also is susceptible to geologic hazards. Development along hillsides is particularly susceptible to landslides, as they are considered to be a basic geologic hazard for such development. Expansive soils are often associated with geologic units having marginal stability and can occur in low-lying alluvial basins, as well as along hillside areas. Such soils are known to exist in the City and its SOI and therefore may be present within the proposed MDP area. Soil corrosion is a complex phenomenon, with a number of variables involved. The City of Lake Elsinore requires testing for corrosive soils as part of the soils and geotechnical reporting demanded of all new construction projects. Subsidence is often caused by the overdraft of groundwater aquifers, and in the Elsinore Valley, subsidence has been attributed to groundwater pumping.

As each component of the MDP is designed, appropriate project-specific analyses of geologic conditions and project impacts during both construction and operational phases, may be needed. Project-specific geotechnical investigations would likely be required to provide design recommendations to construct with consideration of any geologic constraints.

■ Hydrology and Water Quality

The proposed MDP is within the San Jacinto River sub-watershed of the larger Santa Ana River watershed. The primary natural surface water features within the City planning area are Lake Elsinore, the San Jacinto River, and Temescal Wash. Railroad Canyon Reservoir (aka Canyon Lake)—a manmade facility— infrequently releases flows to the San Jacinto River, which then discharges intermittently into Lake Elsinore. During periods of high water elevations, Lake Elsinore discharges into Temescal Wash that flows north and eventually connects with the Santa Ana River.

The Elsinore groundwater basin is primarily supplied by infiltration of rainfall in the surrounding watershed. Other sources of inflow include infiltration along the San Jacinto River channel upstream of Lake Elsinore and agricultural and residential return flows. Municipal pumping for potable water is the only major outflow from the Elsinore groundwater basin.

A primary purpose of the proposed MDP is to outline engineering solutions to mitigate flooding in the City of Lake Elsinore and SOI. As each component of the MDP is designed, appropriate project-specific analyses of hydrologic conditions and project impacts to water quality during both construction and operational phases, may be needed. Project-specific hydraulic and/or hydrology studies would likely be needed.

The State Water Resources Control Board, in compliance with Clean Water Act Section 303(d), maintains a list of impaired waterbodies. Lake Elsinore is listed due to the presence of four constituents: high nutrient levels from unknown point sources, organic enrichment/low dissolved

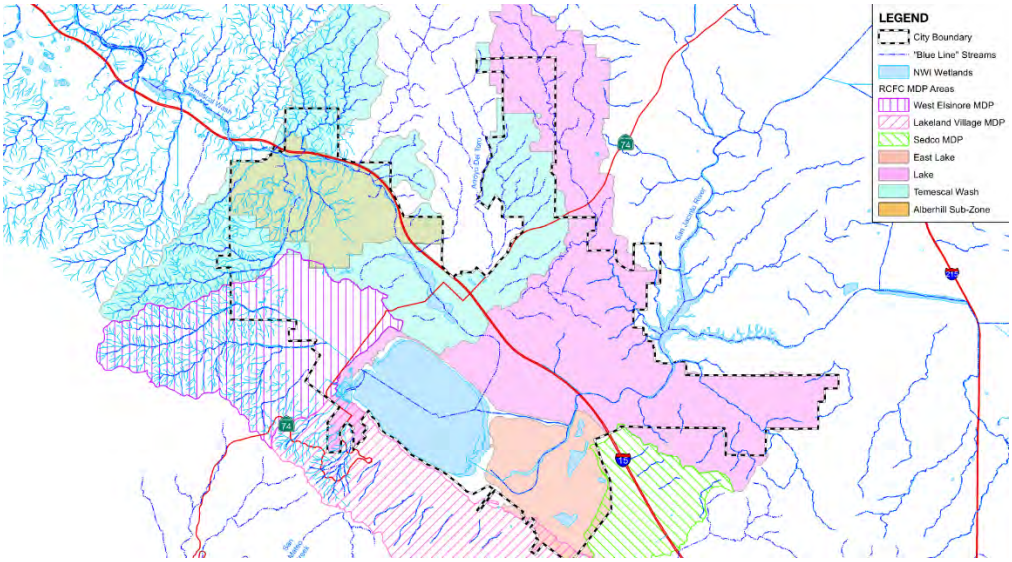
oxygen from unknown point sources, sedimentation/siltation from local urban runoff and storm sewers, and toxicity from unknown non-point sources. Fluctuating water levels in Lake Elsinore and algal blooms triggered by excess nutrients and low dissolved oxygen concentrations have impaired the ecology and recreational use of Lake Elsinore. The source of the sedimentation and siltation within the lake are from urban runoff and stormwater. According to the Regional Water Quality Control Board (RWQCB), improvement to the water quality in the lake can only be achieved through water quality monitoring and restoration programs. Some of the future MDP facilities are anticipated to ameliorate the ongoing water quality concerns in the Lake Elsinore watershed. As each component of the MDP is designed, appropriate project-specific analyses of potential discharges of pollutants during both construction and operational phases, may be needed.

■ Wetlands

Wetland and riparian/riverine features in the study area include Lake Elsinore (located in the south-central portion of the City), the Temescal Wash, and the San Jacinto River. In addition, the area contains numerous smaller ephemeral drainages, washes, ditches, creeks, springs, areas of perched water and scattered vernal pools. Many of these resources are not located within MSHCP criteria cells and may or may not be associated with sensitive species and/or distinctive, "high-value" habitat. Wetland, riparian and riverine areas are addressed by the MSHCP, and regulated by the RWQCB, California Department of Fish and Wildlife, and the U.S. Army Corps of Engineers.

Impacts to wetlands or Waters of the U.S./State from proposed MDP facilities should be minimized, if not avoided, to the extent practicable. Otherwise, permanent impacts to jurisdictional waterways that require regulatory permits would require mitigation. Determining adequate methods of providing mitigation should be done as early as possible in the project development process. Depending on the site, mitigation can be provided by local mitigation banks and in-lieu fee programs. Drainages and wetlands that may be subject to these regulations are shown in **Figure 5-3**.

Figure 5-3
MDP Zones with Wetland and "Blue Line" Streams



As each component of the MDP is designed, appropriate project-specific analyses of wetlands and/or riparian/riverine areas that may or may not be jurisdictional to regulatory agencies during both construction and operational phases, may be needed. In addition, jurisdictional delineations may be needed to determine the limits of regulatory oversight for impacts to Waters of the U.S. and/or Waters of the State.

■ Other Environmental Considerations

As each component of the MDP is constructed, consideration may be needed for one or more of the following topics during project design:

- Agriculture and Forest Resources;
- Hazards and Hazardous Materials;
- Land Use and Planning;
- Mineral Resources;
- Noise;
- Population and Housing;
- Public Services;
- Recreation;
- Traffic and Transportation; and/or
- Utilities and Service Systems.

■ References

City of Lake Elsinore, The City of Lake Elsinore General Plan, Adopted December 13, 2011. (Available at http://www.lake-elsinore.org/index.aspx?page=909, accessed on February 18, 2016.)

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County of Riverside, Riverside County Land Information System (RCLIS), (Available at http://mmc.rivcoit.org/MMC_Public/Viewer.html?Viewer=MMC_Public , accessed on February 18, 2016.)

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Jillian Feyk-Miney, Assistant Environmental Analyst

■ Cost Summary

Probable cost estimates were prepared as part of the MDP. A cost summary for the MDP facilities is shown in table below. The estimated costs were based on the ENR Index adjustment and 2021 Planning Cost Sheets of the District. The components of the cost include construction, right-of-way acquisition, 22% of lump sum items such as mobilization, water control, traffic control, etc., 12% of contingencies and 28% of combined engineering, administration and mitigation.

Lake Elsinore Master Drainage Plan Facility Cost Summary

Zone	Construction Total	Administration, Engineering, Mitigation (28%)	Subtotal (1)	Debris Basin (2)	Right-of-Way (3)	Total(4)
Alberhill Sub Zone	$ 44,734,005	$ 12,525,521	$ 57,259,526	$ 6,720,535	$ 2,020,215	$ 66,000,276
Temescal Wash	$ 22,164,010	$ 6,205,923	$ 28,369,933	$ 2,425,114	$ 340,515	$ 31,135,562
Lake Zone	$ 23,070,480	$ 6,459,734	$ 29,530,214	$ 1,966,631	$ 925,000	$ 32,421,846
East Lake Zone	$ 16,418,696	$ 4,597,235	$ 21,015,931	$ -	$ 416,000	$ 21,431,931
West Elsinore						
City Total	**$ 106,387,190**	$ 29,788,413	**$ 136,175,603**	$ 11,112,281	$ 3,701,730	**$ 150,989,614**

(1) Cost based on RCFC&WCD 2021 Cost Project Planning Costs Worksheet
(2) Estimated cost based on average from Lakeland Village MDP
(3) $100,000 per acre Raw Land Cost for Right-of-Way cost
(4) Total Construction Cost with Eng & Admin and Debris Basins

The estimated costs for each zone or sub-zone are listed below:

East Lake Zone

MDP East Lake Zone Cost Summary

Facility	Subtotal	Debris Basin	Right-of-Way	Total
Line E-1	$ 14,334,822		$ 300,000	$ 14,634,822
Line E-2	$ 4,569,680		$ 116,000	$ 4,685,680
Line E-3	$ 958,377			$ 958,377
Line E-4	$ 1,153,052			$ 1,153,052
Total	**$ 21,015,931**	$ -	$ 416,000	**$ 21,431,931**

Alberhill Sub-Zone

MDP Temescal Wash Zone - Alberhill Sub-Zone Cost Summary				
Facility	Subtotal	Debris Basin	Right-of-Way	Total
Line A01	$ 363,857			$ 363,857
Line A02	$ 2,720,342	$ 707,987	$ 225,000	$ 3,653,329
Line A03	$ 892,208			$ 892,208
Line A04	$ 24,535,817	$ 4,830,047	$ 1,748,700	$ 31,114,564
Line A05	$ 17,649,039			$ 17,649,039
Line A06	$ 1,882,036			$ 1,882,036
Line A07	$ 496,326			$ 496,326
Line A08	$ 4,942,342			$ 4,942,342
Line A09	$ 1,677,064			$ 1,677,064
Line A10	$ 1,731,813			$ 1,731,813
Line A11	$ 368,682			$ 368,682
(DB -1&2)/2 (1)		$ 1,182,501	$ 46,515	$ 1,229,016
Total	**$ 57,259,526**	**$ 6,720,535**	**$ 2,020,215**	**$ 66,000,276**

(1) the Cost of Debris basins 1 & 2 is shared between Alberhill Sub-Zone and Temescal Zone

Temescal Zone

MDP Temescal Wash Zone Cost Summary				
Facility	Subtotal	Debris Basin	Right-of-Way	Total
Line T-1	$ 3,869,694			$ 3,869,694
Line T-2	$ 5,412,255			$ 5,412,255
Line T-3	$ 1,723,459			$ 1,723,459
Line T-4	$ 195,547			$ 195,547
Line T-5	$ 641,847			$ 641,847
Line T-6	$ 518,613			$ 518,613
Line T-7	$ 291,522			$ 291,522
Line T-8	$ 432,133			$ 432,133
Line T-9	$ 12,802,781			$ 12,802,781
Line T-10	$ 2,482,083	$ 133,731	$ 35,700	$ 2,651,514
DB -5		$ 967,583	$ 258,300	$ 1,225,883
(DB -1&2)/2 (1)		$ 1,323,801	$ 46,515	$ 1,370,316
Total	**$ 28,369,933**	**$ 2,425,114**	**$ 340,515**	**$ 31,135,562**

(1) the Cost of Debris basins 1 & 2 is shared between Alberhill Sub-Zone and Temescal Zone

Lake Zone

MDP Lake Zone Cost Summary				
Facility	Subtotal	Debris Basin	Right-of-Way	Total
Line L-1 to L-5	$ 2,268,771			$ 2,268,771
Line L-6	$ 1,235,007			$ 1,235,007
Line L-7	$ 2,308,851			$ 2,308,851
Line L-8, L-9	$ 534,736			$ 534,736
Line L-10	$ 1,342,502			$ 1,342,502
Line L-11	$ 1,300,098			$ 1,300,098
Line L-12	$ 1,251,734			$ 1,251,734
Line L-13	$ 1,139,857			$ 1,139,857
Line L-14	$ 3,339,916		$ 400,000	$ 3,739,916
Line L-15	$ 937,746			$ 937,746
Line L-16	$ 4,669,989			$ 4,669,989
Line L-17	$ 290,081			$ 290,081
Line L-18	$ 2,775,166			$ 2,775,166
Line L-19	$ 976,019			$ 976,019
Line L-20	$ 666,518			$ 666,518
Line L-21	$ 527,623			$ 527,623
Line L-22	$ 3,415,709	$ 1,966,631	$ 525,000	$ 5,907,341
Line L-23	$ 549,890			$ 549,890
Total	**$ 29,530,214**	**$ 1,966,631**	**$ 925,000**	**$ 32,421,846**

Debris Basin and Detention Basin

Debris Basin	Drainage Sytem	Drainage Area	Debris Vol	R/W Area (1)	R/W Cost	Constr Cost Total (2)	Total Cost
(name)	(name)	(ac)	(ac-ft)	(ac)	($100,000/ac)	($)	($)
DB1	-	949	18.7	3.93	$ 392,700	$ 1,078,340	$ 1,471,040
DB2	-	1425	25.6	5.38	$ 537,600	$ 1,476,231	$ 2,013,831
DB5	-	822	12.3	2.58	$ 258,300	$ 709,283	$ 967,583
DB6	Line L14	5133	76.0	15.96	$ 1,596,000	$ 4,382,560	$ 5,978,560
DB8	Line A02	362	9.0	1.89	$ 189,000	$ 518,987	$ 707,987
DB9	Line A04	1838	54.7	11.49	$ 1,148,700	$ 3,154,290	$ 4,302,990
DB9A	Line A04	293	6.7	1.41	$ 140,700	$ 386,357	$ 527,057
DB10	Line T10-01	131	1.7	0.36	$ 35,700	$ 98,031	$ 133,731
DB11 (3)	Line L22	497	25.0	5.25	$ 525,000	$ 1,441,631	$ 1,966,631
(DB1 &2) (4)		2374	44.3	9.30	$ 93,030	$ 2,554,571	$ 2,647,601
(DB1 &2)(0.5)		1187	22.2	4.65	$ 46,515	$ 1,277,286	$ 1,323,801

(1) Estimated R/W needed based on average from Lakeland MDP at 0.21 acre per each ac-ft debris volume
(2) Estimated cost based on average from Lakeland Village MDP dated in May, 2016. ENR Construction Price Index of 1.185 is used to adjust construction cost to September, 2021
(3) Estimated detention storage volume needed
(4) DE1 & DB2 cost to be shared by Alberhill Sub-zone and Temescal Wash Zone 50/50

■ ADP Fees

An area drainage fee is a financing mechanism used to offset taxpayer costs for proposed drainage facilities. The fees are imposed on new development within the plan area. The **Subdivision Map Act** and **AB1600** requires that agencies imposing fees have a general drainage plan for the fee area, a special fund for the fees and an equitable distribution of the fees prior to implementation.

ADP fees are established using the MDP facility cost for each zone and distributed to the developing areas. The open spaces and areas already developed and build out or "near build out" are exclude from the ADP fee calculations.

Lake Elsinore Area Drainage Fee Summary

Zone	MDP Cost Total	MDP Zone Area (Acres)	**Area Drainage Fee**
Alberhill Sub Zone	$ 66,000,276	2272	**$ 29,049**
Temescal Wash	$ 31,135,562	2451	**$ 12,703**
Lake Zone	$ 32,421,846	3340	**$ 9,707**
East Lake Zone	$ 21,431,931	1127	**$ 19,017**
West Elsinore			**$ 11,445**
City Total	**$ 150,989,614**		

■ GIS Data Base

Utilizing and developing the GIS data base is an integrated and essential part of the MDP developments.

Throughout the MDP update process, Webb's GIS experts have been facilitating and supporting the MDP study effort. GIS Data Collector was created and utilized for geo-referencing locations and facilities of field investigation photos and field notes. A base map for the MDP was created utilizing City's topographic contours, the Districts contours and GIS data base for parcels, General Plan Land Use and existing drainage facilities.

New feature classes for MDP boundaries, drainage fee areas, known drainage issue locations, and SD inlet locations were created and will be added to City's Storm Drain geodatabase as a new Feature Dataset.

■ Additional Funding Sources

The Area Drainage Fees established hereon will be imposed on the development projects in connection with conditions of approval of the projects as the Drainage Mitigation Fee.

In addition to ADF, other funding sources maybe available to the community for flood protections, water quality mitigation and ground water recharge.

FEDERAL PROGRAMS

Economic Development Administration, Public Works and Economic Adjustment Assistance Program

"This program provides assistance to help distressed communities attract new industry, encourage business expansion, diversify local economies, and generate long-term, private sector jobs. Among the types of projects funded are water and sewer facilities, primarily serving industry and commerce; access roads to industrial parks or sites; port improvements; business incubator facilities; technology infrastructure; sustainable development activities; export programs; brownfields redevelopment; aquaculture facilities; and other infrastructure projects. Specific activities may include demolition, renovation, and construction of public facilities; provision of water or sewer infrastructure; or the development of storm water control mechanisms (e.g., a retention pond) as part of an industrial park or other eligible project."

Website: https://www.eda.gov/funding-opportunities/

Federal Emergency Management Agency (FEMA), Flood Mitigation Assistance Program

This program has "the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP)."

Website: https://www.fema.gov/flood-mitigation-assistance-grant-program

Federal Emergency Management Agency (FEMA), Pre-Disaster Mitigation Program

This program provides assistance to implement a sustained pre-disaster natural hazard mitigation program to reduce overall risk to the population and structures from future hazard events, while also reducing reliance on Federal funding in future disasters.

Website: https://www.fema.gov/pre-disaster-mitigation-grant-program

National Fish and Wildlife Foundation, Environmental Solutions for Communities

The program supports "projects that link economic development and community well-being to the stewardship and health of the environment. This 5-year initiative is supported through a $15 million contribution from Wells Fargo that will be used to leverage other public and private investments with an expected total impact of over $37.5 million. Funding priorities for this program include: (1) supporting sustainable agricultural practices and private lands stewardship; (2) conserving critical land and water resources and improving local water quality; (3) restoring and managing natural habitat, species and ecosystems that are important to community livelihoods; (4) facilitating investments in green infrastructure, renewable energy and energy efficiency; and (5) encouraging broad-based citizen participation in project implementation."

Website: http://www.nfwf.org/environmentalsolutions/Pages/home.aspx

U.S. Department of Housing and Urban Development, Community Development Block Grants/Entitlement Grants

"The objective of this program is to develop viable urban communities, by providing decent housing and a suitable living environment, and by expanding economic opportunities, principally for persons of low and moderate income. Recipients may undertake a wide range of activities directed toward neighborhood revitalization, economic development and provision of improved community facilities and services."

Website:
http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs

U.S. Department of the Interior, Cooperative Watershed Management Program

The goal of the program "is to enhance water conservation, including alternative uses; improve water quality; improve ecological resiliency of a river or stream; and to reduce conflicts over water at the watershed level by supporting the formation of watershed groups to develop local solutions to address water management issues."

Website: http://www.usbr.gov/watersmart/cwmp/

U.S. Environmental Protection Agency, Clean Water State Revolving Fund

The fund "provides a permanent source of low-cost financing for a wide range of water quality infrastructure projects. These projects include municipal wastewater treatment and collection, nonpoint source pollution controls, decentralized wastewater treatment systems, green infrastructure, estuary management."

Website: https://www.epa.gov/cwsrf

STATE PROGRAMS

California Department of Water Resources, Flood Control Subventions Program

This program "provides financial assistance to local agencies cooperating in the construction of federally authorized flood control projects."

Website: http://www.water.ca.gov/floodmgmt/funding/subventions.cfm

California Department of Water Resources, California Safe Drinking Water Bond Law of 1988

This program provides "loans and grants to water systems with projects that help to meet Safe Drinking Water Standards. Such projects include planning, water conservation, water loss detection, capital improvements, and corrosion control."

Website: http://water.ca.gov/grantsloans/grants/prop81sdw/index.cfm

California State Water Resources Control Board, Clean Water State Revolving Fund Program (CWSRF)

This program assists in financing projects which include, but are not limited to the construction of publicly-owned treatment facilities, such as: wastewater treatment, local sewers, sewer interceptors, water reclamation and distribution, storm water treatment, combined sewers, and landfill leachate treatment.

Website: http://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/index.shtml

California State Water Resources Control Board, Drinking Water State Revolving Fund Program (DWSRF)

This program funds the planning/design and construction of drinking water infrastructure projects including: treatment systems, distribution systems, interconnections, consolidations, pipeline extensions, water sources, water meters, and water storages.

Website: http://www.waterboards.ca.gov/drinking_water/services/funding/SRF.shtml

California State Water Resources Control Board, Storm Water Grant Program (SWGP)

The program promotes the beneficial use of storm water and dry weather runoff by funding storm water and dry weather runoff projects advancing water quality and realizing multiple benefits from the storm water and dry weather runoff as a resource.

Website: http://www.waterboards.ca.gov/water_issues/programs/grants_loans/swgp/

California Infrastructure and Economic Development Bank (I-Bank) State Revolving Fund (ISRF) Loan Program

The program provides a loan program for infrastructure projects and economic expansion projects. Infrastructure projects include city streets, county highways, drainage, water supply and flood control, educational facilities, environmental mitigation measures, parks and recreational facilities, port facilities, power and communications, public transit, sewage collection and treatment, solid waste collection and disposal, water treatment and distribution, defense conversion, public safety facilities, state highways, military infrastructure, and goods movement-related infrastructure.

Website: http://www.ibank.ca.gov/infrastructure_loans.htm

LOAN FINANCING PROGRAMS

Pay-as-you-go

"Under a pay-as-you-go approach, revenues from impact fees would generate funding for construction. Impact fees would be collected and deposited in a special fund until enough money accumulates to begin a construction project. The size of the construction outlay may make pay-as-you-go a difficult approach or, at a minimum, require project phasing and supplementary funding from other sources. A drainage fee per acre (developer impact fee) could be established for new development or redevelopment projects for this purpose. The impact fee amount would be regulated by Section 66000 of the California Government Code, which governs impact fees relative to not being more than the costs that can be attributed to each new user."

Assessment Districts

"Assessment Districts formed under the conventional statutes (Improvement Acts of 1911, Municipal Improvement Act of 1913, and the Improvement Bond Act of 1915) provide some of the less costly financing available because of the real estate security. Assessment districts do not require a vote, but do require notice and a protest at a required hearing by more than 50 percent of the property owners within the proposed district can stop the proceedings. Assessment districts can be initiated by a petition of property owners or by City Council action. Only improvements that provide a special benefit to properties can be assessed to a property. Improvements that provide a general regional benefit to property outside the district would not be eligible to be included in an assessment district or would have to be funded by contributions outside the assessment district."

■ Conclusions and Recommendations

Based on the studies and investigations made for this report, it is concluded that:

1. The City of Lake Elsinore has experienced serious flooding problems in the past. As the City continues to urbanize, the risk of flood damage is expected to increase unless the flood protection and drainage facilities identified in the report are constructed in an orderly manner.

2. A drainage system is required to safely convey stormwater runoff through the City with the least interruption to public services. The MDP presented in this report is such a system and is deemed the most feasible of the alternatives studies.

3. The proposed MDP lends itself to staged construction as funds become available.

4. The proposed MDP offers a comprehensive long-term plan to provide stormwater facilities that are necessary to protect life and property from flood hazards in the City.

5. The total cost of the recommended improvements, including construction, right-of-way acquisition, engineering, administration, and contingencies is estimated to be **$ 150,990,000**.

It is recommended that: the Master Drainage Plan be updated and Area Drainage Fees for each MDP zone, as set forth herein, be adopted by the City Council and be used as a planning level guide for future developments in the study area.

Implementation of the above recommendations will provide the City of Lake Elsinore with a properly functioning storm drain system.

■ Future Growth of the City

Future growth of the City may be reflected in many aspects, such as an increase in the population; amendment of the approved specific plans; change of land use; change of development densities; filing and approval of the new specific plans and tentative tract/ parcel maps and expanding of the city boundary through the annexation process. Since this report is based on the current land use and city boundary, land use change and new annexations will have an impact on the MDP and ADF. When these impacts become significant, the City shall develop the ADF policies for the newly annexed properties or conduct a new MDP update or partial update to accommodate the changes.

■ Limitations

The hydrologic analysis presented herein has been prepared in accordance with guidelines established by the District. The design criteria established for this study were discussed with the City and pre-approved by the Interim City Engineer.

This document has been prepared at a level of detail appropriate for the scope of work. The methodology employed in the analysis was selected as suitable for the characteristic of the watershed; designated land use and proposed developments and existing drainage infrastructure. Our field investigation identified current flooding issues and deficiencies. This report presents some short term solutions and future drainage improvements to alleviate flooding.

The MDP facilities described herein are conceptual in nature. The MDP provides a conceptual solution that addresses drainage problems within the City based on various engineering, environmental and economic considerations. By no means does the MDP represent the only feasible solution. The alignment and location of the facilities proposed in this report are general. Precise facility locations will be dictated by conditions and other factors existing at the time of design. More detailed analysis performed at the design stage will determine final facility sizing.

The use of this document is limited to addressing the purpose and scope previously defined by the City of Lake Elsinore. The analyses presented in this report are not intended to be used for the detailed design. Webb shall not be held responsible for any unauthorized application of the report and the contents herein.

The opinions and conclusions presented in this report have been derived in accordance with the current standards of civil engineering practice, and from information and concurrence provided by the City of Lake Elsinore. No other warranty is expressed or implied.

APPENDIX A - Field Investigation Report

CITY OF LAKE ELSINORE MDP

Field Investigation Report

(CIP Project No. 120)

Prepared for:

Prepared by:

October, 2016

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SECTION 1 - INTRODUCTION

This field report for the Lake Elsinore Master Drainage Plan is intended to provide a comprehensive overview of the existing drainage issues and drainage facilities located within the City of Lake Elsinore (City). The drainage issues include street and private property flooding, erosion, long-term ponding, drainage facility maintenance issues, and hillside runoff. The drainage facilities include City-owned storm drains and channels, Riverside County Flood Control District-owned storm drains and channels, homeowner association-owned basins, and the inlets and outlets associated with each. The field surveys and documentation provided in this report were collected from January to March 2015.

■ Methodology

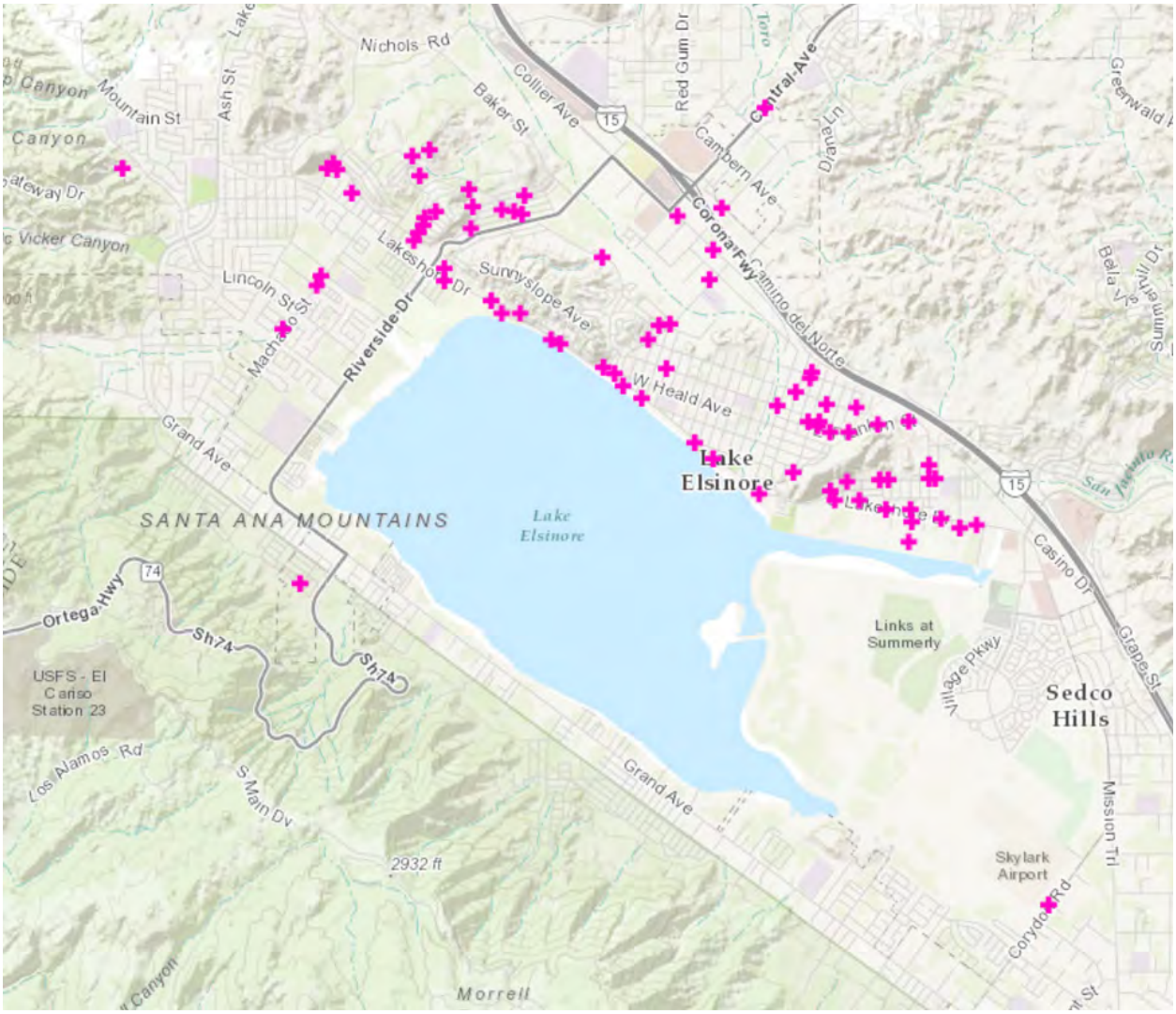
Most of the drainage issue locations and drainage facility locations were identified by City staff prior to the field surveys. The drainage issue locations were collected by City maintenance and engineering staff based on past resident complaints and prior knowledge and experience in the area. The type and location of various storm drain facilities are based on as-built plans in the City's possession. The locations were input into an electronic map using GIS software to keep collected information easily accessible. During the field surveys, all notes and pictures were collected using the ArcGIS Collector mobile application. This application operates on any mobile phone or data-enabled tablet and uploads information to the GIS map in real-time.

All of the field surveys were conducted by at least one engineering staff member from Albert A. Webb Associates (Webb) along with at least one engineering staff member from the City.

■ Drainage Issue Locations

Webb surveyed and documented approximately 79 drainage issue locations. These locations are characterized by any combination of street flooding, private property flooding, dirt or roadway erosion, long-term ponding, hillside runoff, and maintenance issues. Nearly all of the drainage issue locations are located between Interstate 15 and the northeast side of the lake. The northeast side of the City is largely an older area and there are few to no storm drain facilities. There are also several hilly areas in the area that seem to exacerbate the flooding and runoff problems. Figure 1 shows the locations of observed drainage issues throughout the City.

Figure 1
City of Lake Elsinore Drainage Issue Locations



- **Street Flooding.** Street flooding in the City is primarily caused by low points in or near the street. Although the climate is relatively arid, water often remains in the street for days and even weeks after a rain event. This is especially true on gravel roads and on streets with low points in or near dirt shoulders.

Image 1
Street and shoulder flooding on Collier Avenue near Chaney Street

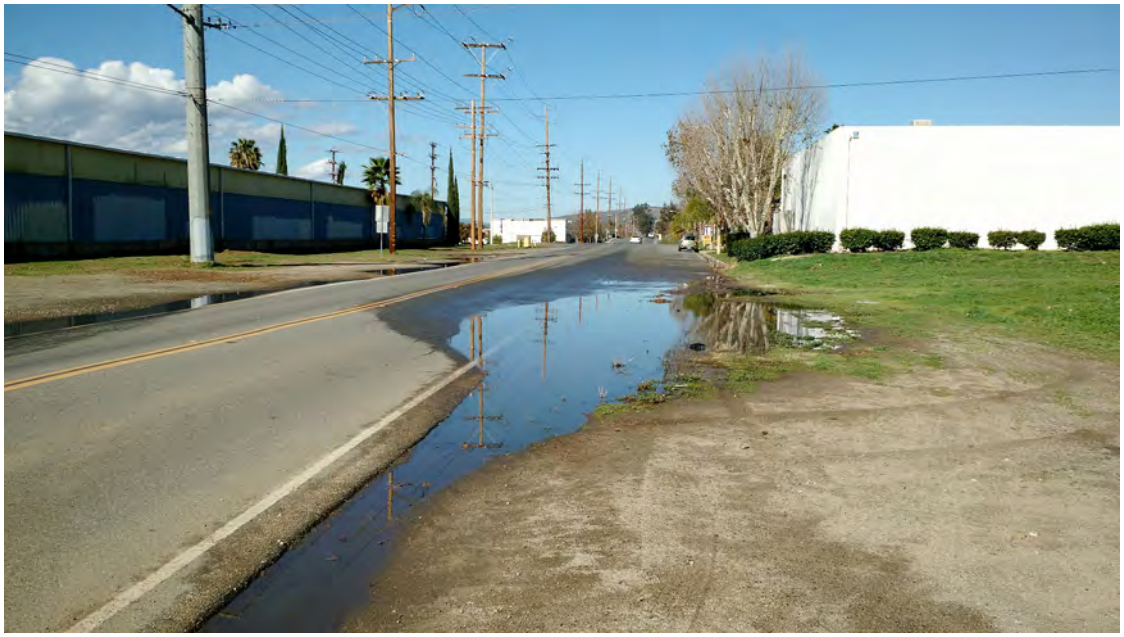


Image 2
Street flooding on Lakeshore Drive at Matich Street

- **Private Property Flooding.** Private property flooding and water damage in the City mainly occurs near hills and in areas of low elevations. Water often flows down hills or streets and runs through or ponds in private property. This kind of flooding usually occurs when property is at lower elevations than the street or when the street is lacking curbs or berms to properly channelize the water.

Image 3
Private property at lower elevation than storm drain inlet on Heald Avenue

Image 4
Street flow on Ellis Street drains down slope into property at lower elevation

- **Erosion.** Street and dirt erosion is most commonly found on streets with no curb or berm to properly channelize water. Water flows in the dirt at the edge of the street creating ravines. This water can get underneath the street and cause pavement damage. Erosion is also found wherever an undeveloped hillside meets a street. Dirt and debris from the hill are carried by the water and are deposited on downstream streets and property.

Image 5
Dirt shoulder erosion adjacent to pavement on Franklin Street

Image 6
Dirt deposited at the low point at Main Street and Prospect Avenue

- **Long-Term Ponding.** Vacant lots and low-sitting gutter areas are susceptible to long-term ponding. Vacant lots are undeveloped and are generally at lower elevations than the surrounding streets and properties. Poorly designed, constructed, or maintained gutter facilities also lead to long-term ponding. Similar to flooded streets, ponding can last for days or weeks before completely evaporating. This can affect property access and require constant maintenance.

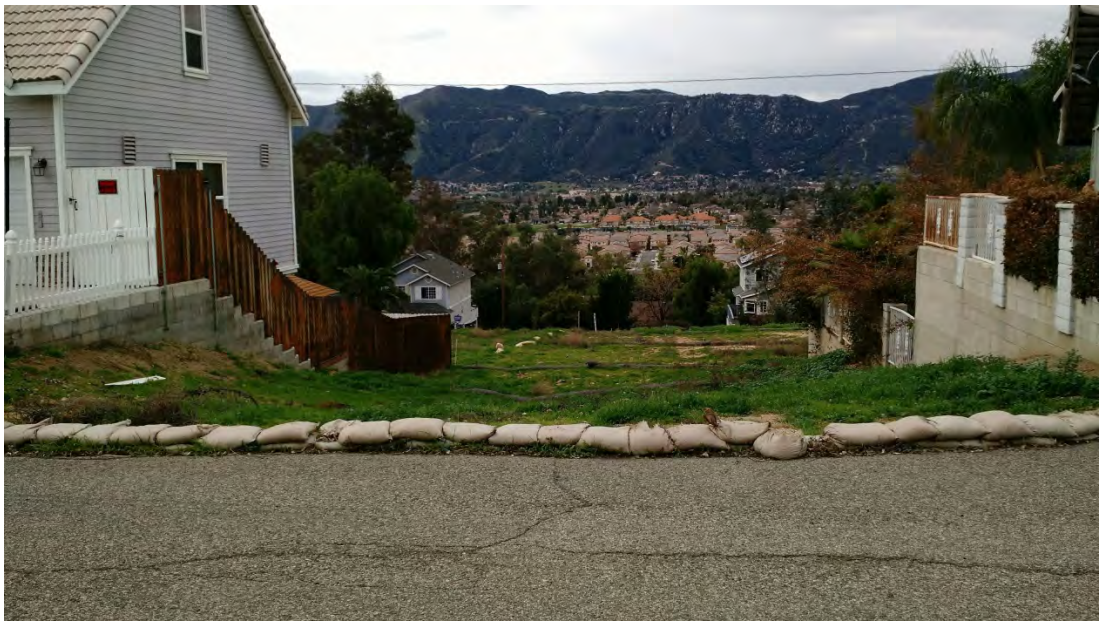
Image 7
Overflow culvert discharges into vacant lot and nearby properties on Gunnerson Street

Image 8
Street low point in front of property at Sumner Avenue and Mohr Street

- **Hillside Runoff.** Runoff from the hills is one of the top drainage issues in the City. It contributes a high volume of water into the City and usually carries dirt and debris. Some hills are quite steep and the water runoff comes downstream with force. Dirt ravines and erosion are far more likely to occur in the presence of high-speed water. Efforts to slow or divert the hill runoff usually consist of sandbags which often break and require constant maintenance.

Image 9
Sandbag placement on Chestnut Street to slow down runoff and catch debris

Image 10
Sandbag line on Bell Avenue to keep water from running into vacant lot



- **Maintenance Issues.** There are many locations that the City's maintenance staff handles on a regular basis. The staff places sandbags in runoff areas near hills, vacuums problematic ponding areas, and clears runoff debris from streets and blocked storm drains. Maintenance of drainage areas is constant and never-ending. During the field surveys, staff noticed broken sandbags and blocked storm drains. The broken sandbags are a constant maintenance item due to breakage and other damage that occurs during rain events and daily use. The blocked storm drains seem to be neglected and have heavy buildup of dirt, debris, and unchecked plant growth.

Images 11 and 12
Storm drain outlets blocked with dirt on Pierce Avenue and on Collier Avenue

■ Drainage Issue General Remedies

Most of the drainage issues occur from only a few causes. The most common causes of the surveyed drainage issue locations are low points on the street or property, lack of curbs and/or gutter facilities, unimproved land, and insufficient maintenance of existing facilities.

Street flooding is often caused by streets not having proper slopes and crowns. Some streets in the City were found to have low points within the traveled way. The slopes of the pavement can be improved by paving, but care should be taken to not simply put the water on the shoulder of the road. Water can often pond or erode dirt shoulders if not properly channelized.

The City uses a mix of asphalt concrete berm, curb, and curb/gutter combinations throughout the City to help channelize water that runs off of the street. However, many locations simply have dirt shoulders without any curb or gutter facility. This is leading to ponding, dirt erosion, and dirt runoff. Constructing berms, curbs, and gutters can help channelize the water along the street and towards storm drain facilities.

There are many vacant and unimproved lots and areas throughout the City. These unimproved lots contribute to dirt runoff during rain events and often leave gaps in curbs, gutters, and other drainage facilities when neighboring adjacent occupied properties. The City has been placing sandbags to keep water draining along the street, but it is a temporary solution that often fails. More permanent solutions such as berms, curbs, and gutters can be added to these lots to assist in drainage. Also, the addition and preservation of grasses and other plants can reduce the amount of water runoff and dirt erosion from these areas.

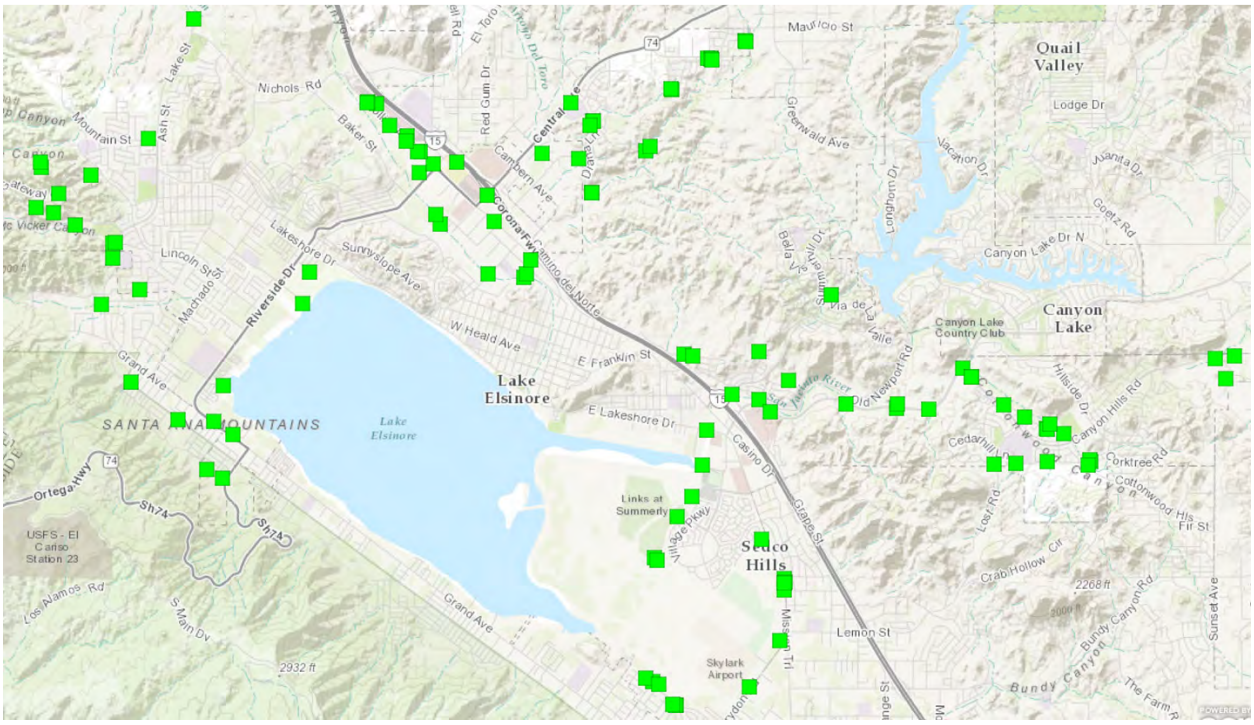
As stated in the next section, a survey of all known storm drain inlets and outlets larger than 36” in diameter was conducted. Nearly all of the inlets and outlets surveyed had some kind of blockage due to excessive sediment, debris, foliage, or a combination of the three. It is clear that there was no regular maintenance for these facilities. An effort should be made to completely clear all of the blocked inlets and outlets as the blockages cannot be cleared on their own. In addition, regularly scheduled maintenance of the facilities should be done in order to keep the facilities operating as intended.

SECTION 3 - DRAINAGE INLETS AND OUTLETS

■ Field Review

Webb surveyed and documented approximately 109 inlet or outlet locations throughout the City to verify size, location, and condition of each. Included in the survey are large culverts, weirs, inlets and outlets in basins, and storm drain channels. Regarding inlets and outlets, Webb only surveyed pipes 36” inches in diameter or larger to restrict the field review to only mainlines and large pipes. The inlets and outlets were found evenly throughout the City. Figure 2 shows the locations of surveyed inlets and outlets throughout the City.

Figure 2
City of Lake Elsinore Storm Drain Inlet and Outlet Locations



- **Inlets and Outlets.** Most of the inlets and outlets surveyed consist of a 36”+ diameter pipe in a winged headwall configuration. The survey also found corrugated steel pipe inlets in basins, low-lying areas, and at ends of small storm drain channels. The condition of the inlets and outlets ranged from clean to completely blocked. As stated in the previous section, many inlet and outlet locations are not well maintained which leads to buildup of sediment and debris. The outlets also drain to a variety of different areas including basins, dirt channels, rivers, and surrounding low-lying areas.

Image 13

Outlet Headwall in the Links at Summerly Golf Course

Image 14

Inlet Headwall with Debris Blockage near Canyon Ridge Drive

Image 15

Two Drain Inlets inside a Basin off Sugarbush Lane

Image 16
Corrugated Steel Pipe Outlet into Eroding Dirt Channel off Grunder Drive

Image 17

Storm Drain Inlet Under Construction at End of Open Channel near Obaria Way

Image 18
Storm Drain Inlet in a Detention Basin off Hermosa Drive

- **Culverts.** The survey found several large culverts throughout the City. Most consisted of multiple large-diameter pipes. The culverts are found underneath roadways or are part of overflow facilities in more remote locations. Most of the culverts are clear of debris with the few exceptions with some degree of blockage. The culverts may be better maintained than the inlets and outlets or experience less runoff.

Image 19
3x54" Culvert underneath Canyon Estates Drive

Image 20
3x48x96” Box Culvert underneath Grand Avenue

Image 20
Box Culvert underneath Collier Avenue with Sediment and Debris

- **Weirs.** The survey found many weirs in the City, most of which were overflow for basins. Two other weirs stood out during the field review based on their size. All weirs appeared to be in good condition.

Image 21
Overflow Weir on far side of Basin near 3rd Street

Image 22
Large Overflow Weir in McVicker Canyon

Image 23
Large Overflow Weir atop Culvert near Canyon Hill Community Park

- **Basins.** There are many storm water basins throughout the City. Most of the basins are located in newly-developed residential areas where storm water treatment is required. Nearly all of the basins are HOA-maintained. Generally, the basins include an inlet, an outlet drain at higher elevation, and an overflow weir. Some of the basin inlets utilized concrete velocity-reducing structures to reduce erosion while others utilized concrete sediment trap basins. The basin outlets were usually vertical corrugated steel inlets which allowed storm water to be stored in the basin until it reached the top of the outlet. Many of the basins are clearly lacking routine maintenance as trees and an abundance of other vegetative growth and debris have propagated in the basins. Routine maintenance by the HOA or the City should be completed to keep the basins clear and effective during storms.

Image 24
Concrete Inlet Structure into Basin near Acanthus Drive

Image 25
Raised Corrugated Steel Outlet Structure in Basin near Acanthus Drive

Image 26
Concrete Sediment Trap Inlet Structure in Basin near McVicker Canyon Park Road

- **Channels.** Most of the channels in the City are large structures built by the Riverside County Flood Control and Water Conservation District (RCFCD). All of these channels drain into or towards Lake Elsinore. The channels are either dirt-lined or concrete-lined. Most of the channels are clear of debris. Some sediment and debris blockage can be found near some of the inlets and outlets of the culverts. Figure 3 shows the locations of the RCFCD lines.

Figure 3
Riverside County Flood Control and Water Conservation Distrct Facility Locations

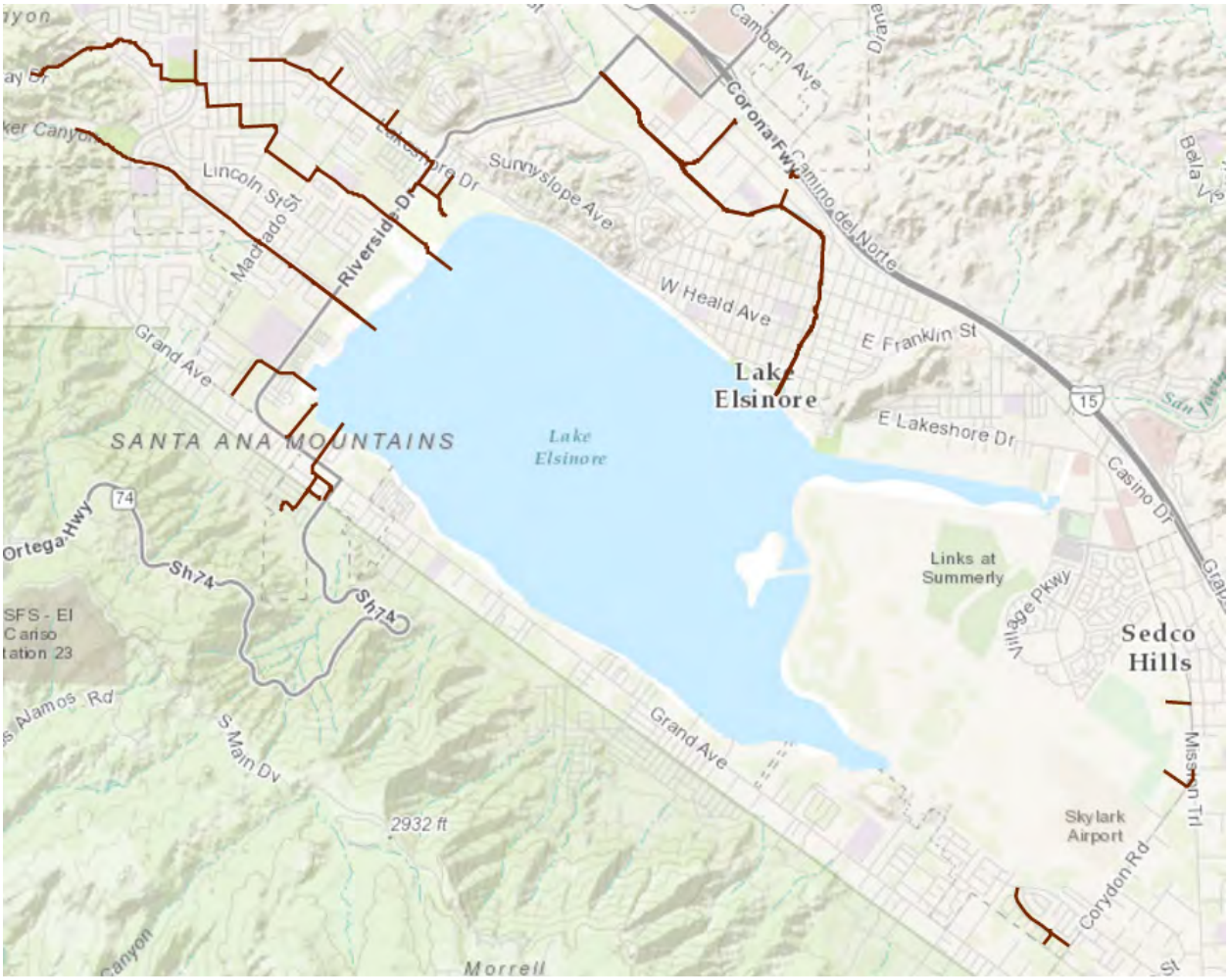


Image 27
Sediment Buildup at Culvert Outlet at Grand Avenue

Image 28
Clean Trapezoidal Channel at Grand Avenue

Image 29
Dirt and Rock-Lined Channel at Lehr Drive

Image 30
Open Channel Area at Channel Split near Minthorn Street

Other Facilities. Two unique storm drain facilities were documented during the course of the surveys. A rubber dam system was found in the Outlet Channel near Minthorn Street and Wasson Channel at the high point of the Outlet Channel. Its purpose is to direct the EVMWD recycled water either discharges into the Lake or to the Temescal Wash for maintaining the water level of the Lake. This rubber dam system can be inflated or deflated, and is a dry weather recharging system, not intended for flood control purposes.

In addition, a large steel door (roughly 120" in diameter) covering a storm drain outlet was found near Lakeshore Drive. It is thought that the door is to prevent high water in the channel from flowing into the outlet pipe. The steel door may also force water to drain slowly out of the outlet to reduce erosion in the San Jacinto River outlet area.

Image 31
Rubber Dam in Channel near Minthorn Street

Image 31 A
Rubber Dam in Outlet Channel near Minthorn Street

Image 32
Large Steel Door on Outlet near Lakeshore Drive

Image 33
RCFCD Arroyo Del Toro Channel near I-15 and Riverside Drive

SECTION 4 - RECOMMENDATIONS

Throughout the field surveys, it was increasingly obvious that routine maintenance of the storm drain facilities, in general, was not being adequately performed. Many drainage issues could be remedied or helped with proper maintenance of existing facilities. Even some HOA-maintained facilities show a lack of regular, if any, maintenance. Full-grown trees and foliage can hide the inlets and outlets and make it impossible to see the bottom of the basin. A plan and schedule for regular maintenance by the City and/or HOAs should be in place and followed to ensure proper performance of drainage facilities.

Regular maintenance of the facilities will not be enough, however. During the survey, many of the hillsides were almost barren with some freshly scarified. Much of the blockages in the facilities are caused by runoff dirt and sediment. The dirt and sediment will quickly return if the hillsides do not have enough vegetation to hold the dirt. The City should allow foliage to grow on the hillsides to reduce the runoff water and sediment that reaches the storm drains.

Streets with and without curb/dike should be inventoried to determine which streets would benefit from channelizing water along the street instead of the shoulder. Dirt shoulders easily erode and can cause damage to the pavement of the streets. Eroding dirt shoulders also contribute to sediment runoff. Channelizing the storm water along the streets can more efficiently direct storm runoffs into storm drain facilities.

Frequent flooding areas on the street or in private property should be more thoroughly researched on a case-by-case basis to determine cost-effective means of providing relief.

Implementation of the above recommendations will provide the City of Lake Elsinore with a properly functioning storm drain system.

MDP-City Wide Drainage Issues

No.	Location	Flooding			Ex. Storm Drain			Primary Issue	Remarks	Mitigation Measure	Photo
		ST	PP	Debris	SD	CB	Cond.				
1	3rd St / Dexter Ave	Y						Street flooding	flooding entire intersection. nearby development. shoulder grading	Possible costco fixing with sd. Intersection and dirt shoulders are very flat.	Y
2	Line St / Lakeshore	Y	Y		Y	Y		Standing water	Ponding on street from street and hill runoff. CB on other side of street. Need to catch and redirect. Long term ponding at intersection	Add berm or C&G to direct water to a new CB that links into existing CB and SD across the street	Y
3	Pepper / Dawes	Y	Y		N	N		Standing water	LP T-junction, standing water on street, long term ponding. T-intersection taking runoffs btwn Ave 3 to Ave 6. Pond till spill to Lakeshore	Need major storm drain facility	Y
4	High St / Parkway	Y	Y		Y	Y		Standing water	LP T-junction, standing water on street, long term ponding. 6" or 8" SD outlet not found, not in working condition	Need major storm drain facility	Y
5	Country Club / Mill St	Y	Y	Y	N	N		Hillside runoff, Street flooding	Hillside runoffs sheet cross street flooding property. Runoffs erode road, cross yard drain to Lakeshore	Need major storm drain facility	Y
6	Mill St / Ave 1	Y	Y	Y	N	N		Hillside runoff, Street flooding	Hillside runoffs flooding St & PP with silt and debris	May need SD facility. Excessive dirt may require high maintenance	Y
7	Mill St / Ave 2	Y	Y	Y	N			Hillside runoff, Street flooding	Hillside runoffs flooding St & PP with silt and debris	May need SD facility. Excessive dirt may require high maintenance	Y
8	Strickland Ave / Foster St							Other	homeowner built rip rap and grading. None to little flooding		
9	E/S Spring / N/O Sumner	Y			N	N		Street flooding	No C&G	Low area near street. Add berm or C&G and CB to join ex SD nearby on Sumner	Y
10	Lakeshore / Elm to Country club	Y			N	N		Street flooding	Street very flat, unsafe driving cond.	Add berm, C&G, or concrete dike to collect water and divert to new SD	Y
11	Marian / Lakeshore to End	Y	Y		N	N		Road and PP Damage	Runoff from Lakeshore eroding edge of pavement and affecting two homes on Marian	Berm or C&G to direct water away from edges of street. CB and SD to collect water before it reaches homes	
12	Lake Park St / Flooding houses on Herbert St	N	Y		N	N		PP Damage	Runoff from Lakeshore goes down Lake Park Street and flows into 3 backyards	Possible high point(s) on Lake Park street stops water from flowing to lake. Grading may allow water to continue	
13	W/O 1331 Mill St - Drain	Y	Y	Y	18"	Y		Street flooding	Street flooding at school site. 18" outlet to bubbler CB, debris at inlet of 18" RCP, pond over sidewalk, unsafe	Extend and conn. Exist 18" to SD Main on Mill	Y
14	E/O 1341 Mill St / Ave 7	Y	Y	Y	30"	N		Hillside runoff	Mass silt & debris drain to inlet. 30" SD on Mill, 1/3 inlet silt up. Hillside and Ave 7 erosion	Need desilting facility & imp on Ave 7	Y
15	Ave 6 at Cole Ave			Y	N	N		Hillside runoff	Ave 6 upstream runoffs drain downhill near Cole, erode natural channel outlet at Mill. Causes erosion and downstream flooding	Add C&G on Ave 6, use street convey the runoffs	Y
16	Acacia / Country club		Y	Y	N	N		Hillside runoff	Runoff from hillside flood house. Skewed T intersection	Need x-gutter and C&G on south of Acacia	Y
17	Chestnut / S/O Prospect	Y	Y	Y	N	N		Hillside runoff	Runoff from EVMWD street. crosses street, heavy silt and flooding goes to Prospect and Main. May need to catch or redirect at source and at Main	Need to catch or redirect runoffs at source and at Main	Y
18	1209 Sumner	Y						Standing water	HIGH PRIORITY. Deep ponding. Cross gutter or undersidewalk drain	Need to install cross gutter or undersidewalk drain	
19	Dutton St / Mid block area	Y						Standing water	CB and inlet located poorly. Silt on street	New catch basin at low points	
20	339 Chestnut	Y	Y	Y				Street flooding	Street is steep and has no drainage facilities. Water runs into PP and ponds	New CB and SD to catch water before it leaves Franklin street	
21a	Pottery - Main St / Rancho							Other	Water running down street into single CB. SD only from end of Pottery to FC channel	More CBs and SD on Pottery street to lessen amount of water that reaches last CB.	Y
21b	Pottery - Main St / Rancho	Y	Y					Hillside runoff	Runoff and ponding and flooding. No development in near future. Vegetation to take care of silt.		Y
21c	Pottery - Main St / Rancho							Standing water	Water running down sides of street. 1 CB at end of street. paving soon	Add C&G to keep water moving on Pottery to CB.	Y
22	N/S Flint - Lookout / Main St		Y					Hillside runoff	Runoff into PP lowspot, ponding	Add berm or C&G to keep water from PP	Y

No.	Location	Flooding			Ex. Storm Drain			Notes	Remarks	Mitigation Measure	Photo
		ST	PP	Debris	SD	CB	Cond.				
1	18740 Collier-Both sides of the road	Y						Street flooding	Both sides flooding. Low spot in street. Channel dump onto street. Nearby flood control facility	Install catch basins at low point and add storm drain	Y
25	E/S Collier / N/O Crane - by bus stop	Y	Y					Standing water	Water from channel ponds on driveway/street. Trees and dirt fill in channel	Perform maintenance to clear out channel and pipes. It may be possible that former channel is completely filled in with dirt.	Y
26	565 Chaney - area in front	Y						Standing water	Street and land runoff onto street. Can continue existing berm	Extend existing berm	Y
27	Trelevn / Chaney		Y					Hillside runoff	Goes through PP and ponds behind berm		Y
28	Gedge - Strickland / Gutakes	Y						Street flooding	Runoff from Chaney	Road is flat. Runoff from hills can be caontrolled and captured with CB and SD.	Y
29	Chaney - W/S Strickland / Hill St	Y		Y				Hillside runoff	Runoff down Chaney street from unimproved areas. Ponding and dirt debris	SD and CB on Chaney down to RCFC channel to north	Y
30	Lakeshore / Lowell in turn pocket	Y						Standing water	High ponding. May need CB. CG same height as crown. Possible existing SD	May need maintain existing SD and add catch basins	Y
31	W/S Davis / N/O Lakeshore							Hillside runoff	No berm. Water runs into dirt and silt builds up on street.	Add berm, cross gutter. May need CB.	Y
32	Lakeshore - Davis / Matich	Y						Street flooding	Ponding in street with dirt	Use berm and cross gutter.	Y
33	Bushman / Lakeshore	Y						Street flooding	Runoff from hills with dirt. Use berm and inlets. Damaged existing drain pipe	Repair existng storm drain and add berm and inlets	Y
34	Lakeshore - Bushman / Illinois	Y						Street flooding	Runoff from hills. Lakeshore Dr can flood due to lake of SD and flatness	May need major storm drain facility or series of small drains on north side.	
35	Cowell - Lakeshore / Lakeview	Y			Y	Y		Hillside runoff	Runoff from hills and steep street towards lake. Existing CB on one side at Lakeshore. Dirt runoff.	Determine if another CB needed on other side of Cowell or on Ryan Ave to reduce volume of water	
36	Manning - Ryan / Lakeshore							Hillside runoff	Runoff from hillside and street street bringing dirt and debris. Water cuts across street and creates dirt ravine on west side.	Add berm or C&G and CB at bottom of street. Cross gutter	
37	Illinois - Lakeshore / Lakeview	Y	Y					Hillside runoff, ponding	Runoff from hills and steep street. Runs near/on PP and then down Illinois. Water ponds at Illinois and Lakeshore.	Continue berm around to Lakeshore. Remove low spot from street corners.	
38	Heald / Adams	N	Y					Hillside runoff	Water from street flowing into PP. Culvert under street. CB not at low point	Need to change street grade or add CB at low point	
39	Heald - W/O Chaney to 1st house	Y	Y		Y	Y		Standing water	Water flowing down street and into PP and ponding.	Add berm or C&G to keep water from homes. Add CB and link to existing CB and SD down the street.	
40	12792 Lash - runoff from hillside	N	Y					Hillside runoff	Water runs into open space and into multiple PP. Overside drain on Bailey. Remove and bring water to Dryden	May need major storm drain facility	
41	16801 Holeborrow	N	Y					Hillside runoff	Runoff hill into PP	May need major storm drain facility	
42	16809 Bell	N						Hillside runoff	Runoff down hill into PP	May need major storm drain facility	
43	Pope circle area	Y	Y					Street flooding	Flooding street, land, PP, about two feet. Deep flooding for weeks	May need major storm drain facility	
44	LaShell - Pinnell / Bromley	N						Hillside runoff	Runoff down street into low basin areas. Possible overside drain and berm into low area to slow down water.	May need major storm drain facility	
45	Bromley north to LaShell	N						Hillside runoff	Silt and water run down dirt road	May need major storm drain facility	
46	Robert / Shrier								Related to uphill runoff on LaShell	May need major storm drain facility	
47	Shrier / Gunnerson	Y	Y					Street flooding	Overflow from basins floods road about 1 foot deep. Whole street flooded. Floods PP.	May need major storm drain facility	Y
48	McBride / Gunnerson	Y	Y					Standing water	Runoff from streets and hills ponding on street. Crosses street to PP	May need major storm drain facility	Y
49	Herbert St area	Y	Y						Same issues as Gunnerson points	May need major storm drain facility	X

No.	Location	Flooding			Ex. Storm Drain			Notes	Remarks	Mitigation Measure	Photo
		ST	PP	Debris	SD	CB	Cond.				
50	Bennett St area	N						Hillside runoff	Runoff from hill down street and into PP. Needs infrastructure improvements before much can be done		Y
51	Ingalls Cir - spill way along road edge	Y						Hillside runoff	Slight ponding on street. Roadway damage	Overside drain needs replacement with rip rap.	Y
52	McPherson / Pierce	Y						Hillside runoff	Ponding on street. Inlet on street may be clogged. Outlet clogged. May need clearing and rip rap. Maybe size upgrade	May need unclogg existing inlet and outlet	
53	29235 Gunder	N	Y					Hillside runoff	Water runs down hill, across street, into PP.	Install CB and drain to Valley. Repair dike	Y
54	Lash / Dryden	N	Y					Hillside runoff	Water running down hill and across street into PP	Berm or C&G to direct water downhill towards SD on Lakeshore	
55	Dryden between Lash / Cimaron St	N	Y					Hillside runoff	Water running down hill and across street into PP	Berm or C&G to direct water downhill towards SD on Lakeshore	
56	29700 Hursh	Y	Y					Street flooding	Channel running into streets. Flooding PP. Flooding street. Street is low point. Cross gutter and channel improvements	May need to add cross gutter and improve channel	
57	31625 Machado near guard rail	Y						Standing water	Low point and flat street. Clean shoulder to allow for flow. Street taper cause ponding. Maintenance issue	RCFCD Line C in Le Gaye, Machado and Joy, may need to add catch basins and inlets	Y
58	Machado / LeGaye	Y			Y			ponding			
59	32137 Machado	Y	Y		Y			Standing water	Same issue as other Machado. Ponding in low spot at street taper	Exist. SD 500' west, widening st 350' or add SD & CB	
60a	Franklin-Easthill to Ave. 6	Y	Y					Hillside runoffs	Hillside runoffs flooding PP and ST. Erosion from hillside and road runoff. Can use SD or curb	Low pt. at Street, no CB, Need to add SD and CB	Y
60b	Franklin-Easthill to Ave. 6	Y	Y					Hillside runoffs	Hillside runoffs flooding PP and ST. Erosion from hillside and road runoff.	Low pt. at Street, no CB, Need to add SD and CB	
60c	Franklin-Easthill to Ave. 6	Y	Y					Hillside runoffs	Hillside runoffs flooding PP and ST. Erosion from hillside and road runoff. Development soon. Offramp and businesses.	Low pt. at Street, no CB, Need to add SD and CB	
61	Corydon at Melinda Lane	Y	Y	Y	2-24"	N	G	Property flooded by culvert discharge	2-24" Culvert, Rip-Rap at outlet, Storm runoff spreading and flooding the property	Channelize downstream from the culvert	Y
62	3rd St / Pasadena	Y		Y				Ponding at Knuckle	Ponding at knuckle leads to heavy debris and pavement damage. Pavement shows aligator cracking and failure in area.	After an approved project PM 36551 constructed, ponding will be resolved. Pavement should be repaired	
63	Olive / Mission Trail		Y		Y				Drainage ditch and inlet at Wildomar side need to be maintained	Drainage ditch and culvert discharges runoffs to private property. Both cities to look into cleaning responsibilities	
64	17770 Ryan near Bushman		Y		N	N		Hillsite runoffs and street above	Property flooded by the runoffs from hillsite and street above	Natural watercourse from hill site runs through property. Need to grade channel to Bushman, add berm to protect property. Rita email 11/24/15	Y
65	Stoneman St/ Palomar St Pepper Tree RV Trailer Park	Y	Y					RV Park Site flooding	Source from RCFC Stoneman Channel	Maybe grade a berm to prevent flooding the site per Rita's email 12/16/15	Y
66	Corydon Flooding between Mission Trail and Melinda Lane	Y			Y	Y		Heavey rain in 1-2016 caused servere flooding	Due to lack of upstream facilities and existing SEDCO Line E was not fully utilized	See Memo and interim improvement options and cost estimate	

ALBERT A. WEBB ASSOCIATES

Memorandum

To: Jason Simpson, Financial Manager, City of Lake Elsinore

From: Lin McCaffrey, P.E. Albert A. Webb Associates

Date: January 25, 2016

Re: Corydon Road Flooding Issues

Corydon Flooding Issues and Interim Solutions

During the rain event first week of January, 2016, a section of Corydon Street between Mission Trail and Melinda Lane adjacent to the City of Lake Elsinore easterly boundary experienced a heavy flooding. Webb has reviewed the area topographic map, existing drainage facilities in conjunction with Prelim Wildomar MDP hydrology information, and conducted a preliminary drainage studies and design options. Below are our findings and recommended storm drain improvements:

Findings:

1. There are approximate 1700 acres watershed (Wildomar Line E and Line G) from Wildomar drains cross Corydon Street, discharges into the Lake.

2. The watershed is partially developed with mostly residential, some commercial land use and 30% to 40% of the vacant land.

3. Wildomar MDP Q100 for Line E is 1,318 CFS, for Line G is 1,661 CFS (fully developed condition), total Q100 is approximate 3,000 CFS.

4. Except Caltrans Storm Drain Culverts on I-15, SEDCO Basin and Line F at east of I-15, the only existing drainage facility is SEDCO Line E, a 72” RCP, a 42” RCP on Mission Trail and daylight channel with a design capacity of 450 CFS.

5. The existing Line E collecting system has 4 catch basins at east side intersection of Mission Trail and Lemon Street with estimated capacity of 100 CFS. The existing Line E is most likely under-utilized for the currently conditions.

6. Due to lack of upstream collecting system, increase capacity of Line E or construct portion of Line G will not effectively alleviate Corydon flooding.

Recommendations:

1. Fully utilize the existing Line E capacity by adding additional catch basins and drainage inlet on Corydon.

2. Construct a storm drain system on Corydon with catch basins and inlets to reduce the flooding. Two interim design options are provided pending on the funding and preferred storm drain outlet location and alignments. See Exhibits Option 1 and Option 2. The estimated cost for the Option 1 and Option 2 are approximately $794,000 and $973,000 respectively.

OPTION 1

	Location	Dia	Length (ft)
Prop. SD	Corydon St	30"	149
Prop. SD	Corydon St.	36"	483
Prop. SD	Corydon St.	30"	163
Prop. SD	Corydon St.	30"	217
Prop. SD	Cereal St	48"	909
"Laterals" from Inlets and CB's		382	

OPTION 2

	Location	Dia	Length (ft)
Prop. SD	Corydon St.	48"	151
Prop. SD	Corydon St.	36"	386
Prop. SD	Corydon St.	42"	480
Prop. SD	Easement to Airport	48"	612
Prop. SD	Cordyon St	30"	149
Prop. SD	Corydon St.	30"	483
"Laterals" from Inlets and CB's		733	

G:\2014\14-0320\GIS\Corydon_Rd_Improvements.mxd; Map created 25 Jan 2016

LEGEND

- City Boundary
- Proposed Facilities
- Inlet
- Catch Basin
- Existing RCFC&WCD Facilities

ALBERT A. WEBB ASSOCIATES

0 250 500
Feet

1 inch = 250 feet

Corydon Road Drainage Improvement OPTION 1

City of Lake Elsinore

Sources: RCFC&WCD, 2014 & 2015; Eagle Aerial, 2012.

G:\2014\14-0320\GIS\Corydon_Rd_Improvements_OPT2.mxd; Map created 25 Jan 2016

LEGEND

- City Boundary
- Proposed Facilities
- Inlet
- Catch Basin
- Existing RCFC&WCD Facilities

ALBERT A. WEBB ASSOCIATES

0 250 500
Feet

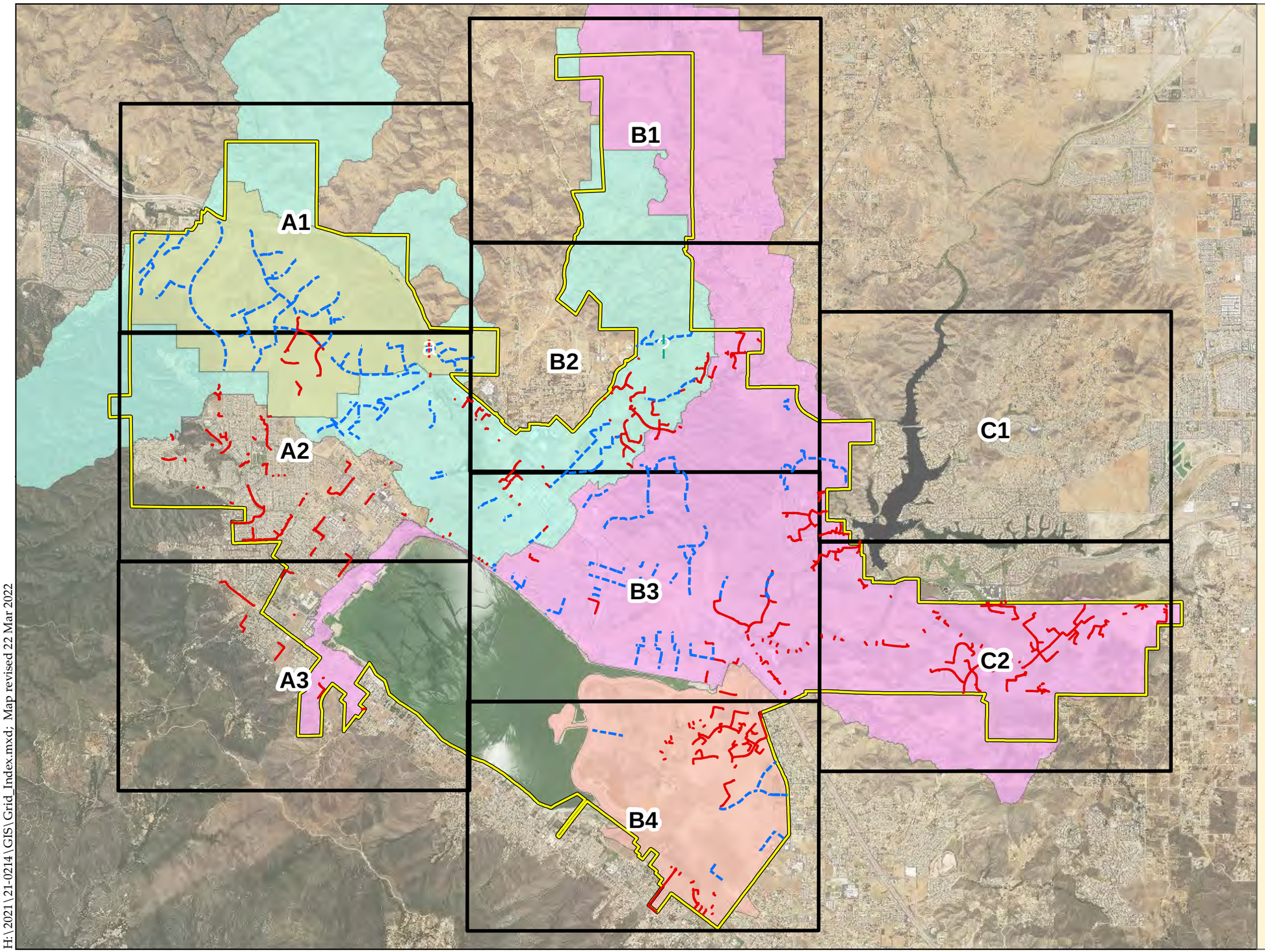
1 inch = 250 feet

Corydon Road Drainage Improvement OPTION 2

City of Lake Elsinore

Sources: RCFC&WCD, 2014 & 2015; Eagle Aerial, 2012.

APPENDIX B – Exhibits



LEGEND

- Map Grids
- East Lake
- Lake
- Temescal Wash
- Alberhill Sub-Zone
- City Boundary
- Proposed City MDP
- Existing City Lines >20"

Grid Index Map

0 3,000 6,000 9,000

Feet

CITY OF LAKE ELSINORE DREAM EXTREME

ALBERT A. WEBB ASSOCIATES

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H:\2021\21-0214\GIS\Grid_A1_AlberhillNo_.mxd; Map revised 22 Mar 2022

LEGEND

- Proposed City MDP Facilities
- Proposed City MDP Basins
- Proposed Debris Basin Locations
- Drainage Issue Locations
- Existing City Storm Drain Facilities
- Existing RCFC Facilities
- Proposed RCFC Lines

Existing CalTrans Drainage Facilities

- RCP, APC, CSP, RCB
- Ditch

- RCFC Basins
- Proposed Roads

Proposed MDP Zones

- Temescal Wash
- Lake
- East Lake
- Alberhill Sub-Zone
- Watershed Subareas
- 10-ft Contours
- SP/Tract Boundaries
- Parcels
- City Boundary

0 600 1,200 1,800
Feet

Grid A2
South Alberhill/ West Lake Area

Sources: City of Lake Elsinore, 2014 & 2015; RCFC&WCD, 2014 & 2015; Riverside Co. GIS, 2016; NAIP Imagery, 2014.

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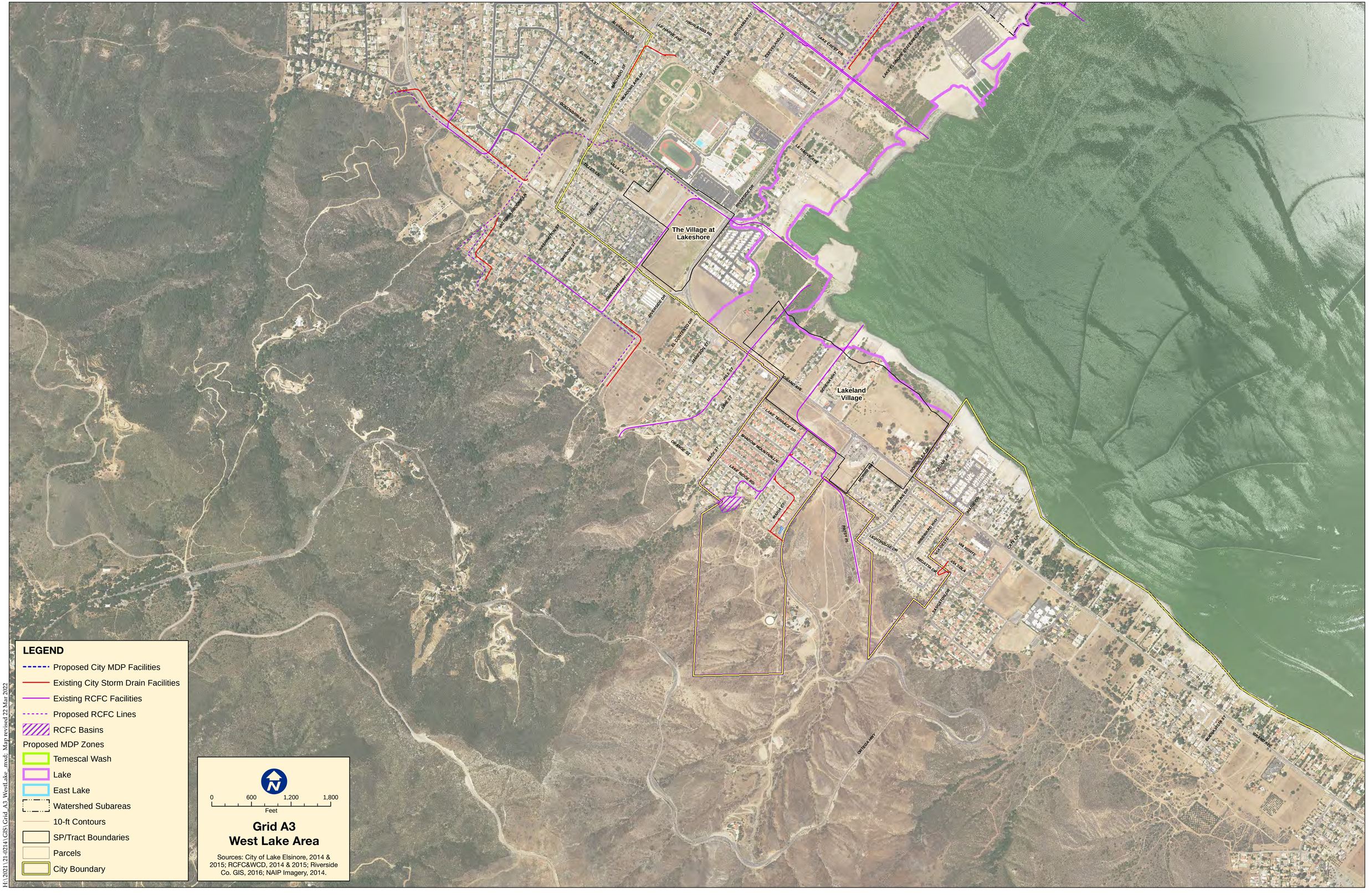
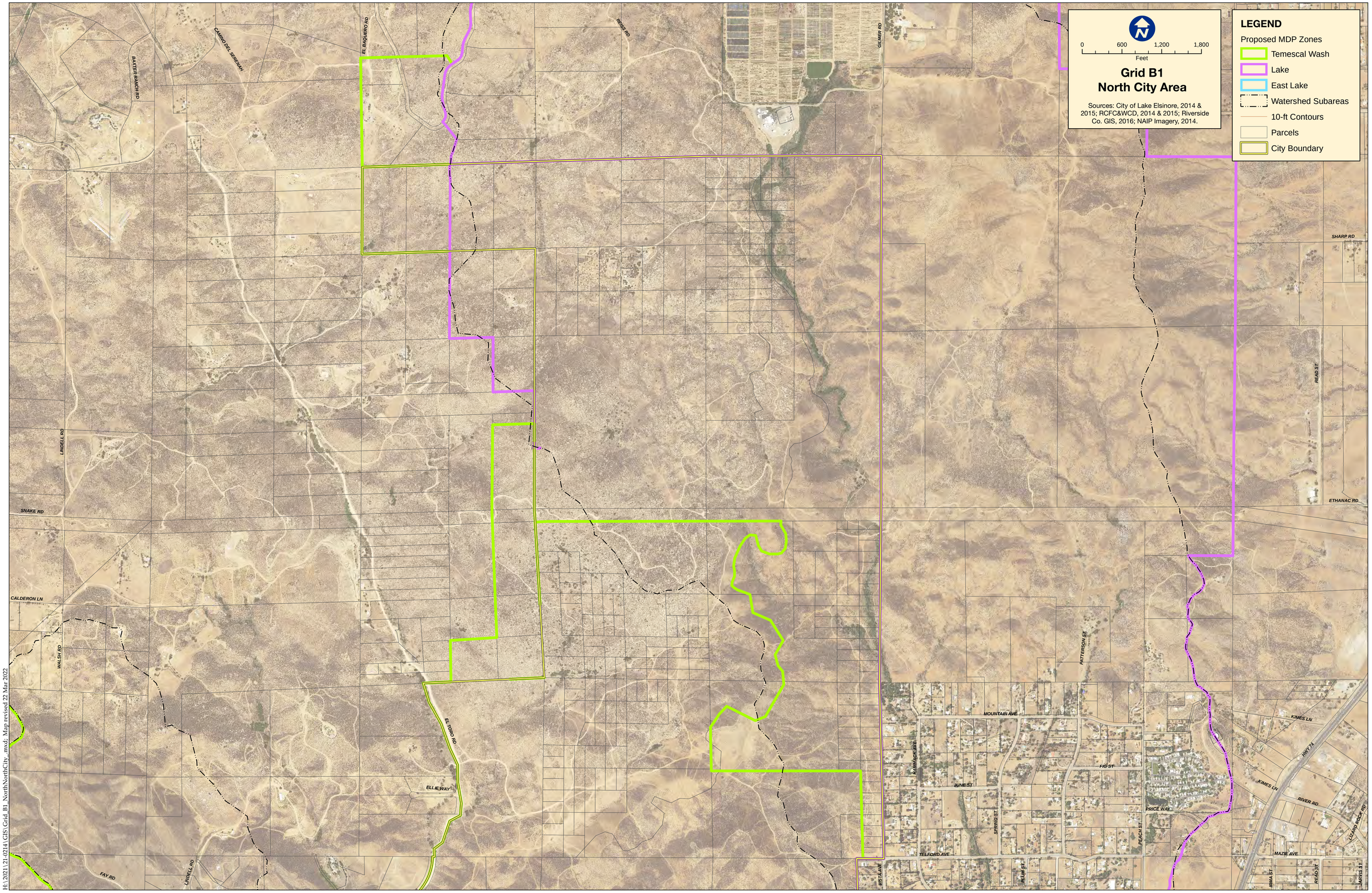

The Village at Lakeshore
Lakeland Village
LEGEND
Proposed City MDP Facilities
Existing City Storm Drain Facilities
Existing RCFC Facilities
Proposed RCFC Lines
RCFC Basins
Proposed MDP Zones
Temescal Wash
Lake
East Lake
Watershed Subareas
10-ft Contours
SP/Tract Boundaries
Parcels
City Boundary
0
600
1,200
1,800
Feet
Grid A3
West Lake Area
Sources: City of Lake Elsinore, 2014 & 2015; RCFC&WCD, 2014 & 2015; Riverside Co. GIS, 2016; NAIP Imagery, 2014.
H:\2021\21-0214\GIS\Grid_A3_WestLake_mxd, Map revised 22 Mar 2022



H:\2021\21-0214\GIS\Grid_B1_NorthNorthCity_mxd, Map revised 22 Mar 2022

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DB6

TR 31593 "South Shore I" (with proposed lots)

Ramsgate SP

Spyglass Ranch SP (TR 35337) (with proposed lots)

Canyon Creek SP

TR 36567 (South Shore II) (with proposed lots)

East Lake SP

Diamond SP

Elsinore City Center

LEGEND

- Proposed City MDP Facilities
- Proposed City MDP Basins
- Proposed Debris Basin Locations
- Proposed WQ Treatment Facilities
- Drainage Issue Locations
- Existing City Storm Drain Facilities
- Existing RCFC Facilities
- Proposed RCFC Lines
- Proposed Wildomar MDP Facilities

Existing CalTrans Drainage Facilities

- RCP, APC, CSP, RCB
- Ditch

- RCFC Basins
- Proposed Roads

Proposed MDP Zones

- Temescal Wash
- Lake
- East Lake
- Watershed Subareas
- 10-ft Contours
- SP/Tract Boundaries
- Parcels

0 600 1,200 1,800
Feet

Grid B3
North Lake Area

Sources: City of Lake Elsinore, 2014 & 2015; RCFC&WCD, 2014 & 2015; Riverside Co. GIS, 2016; NAIP Imagery, 2014.

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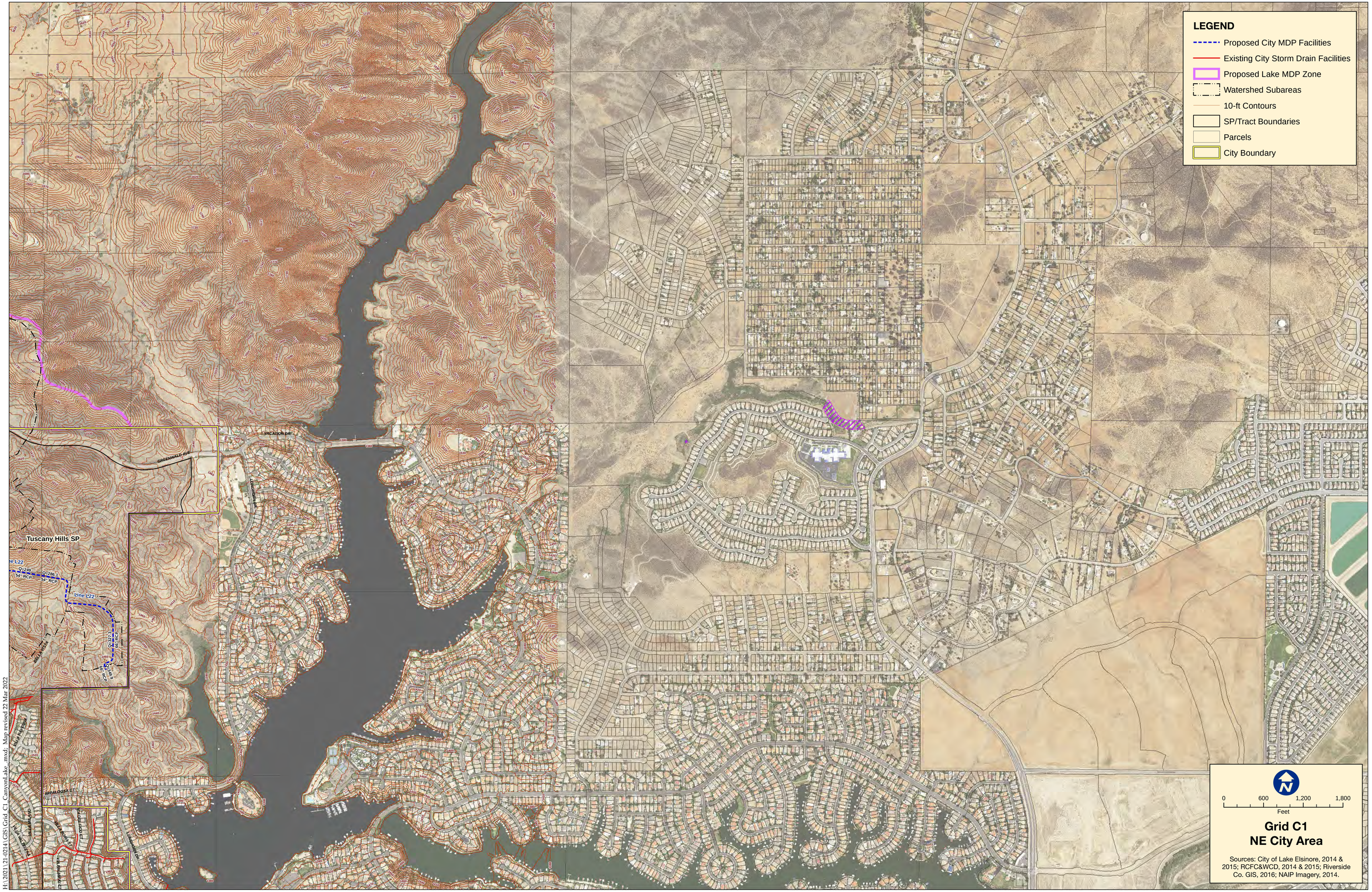

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Tuscany Hills SP

Canyon Creek SP

Canyon Hills SP

Q=769 cfs

Q=463 cfs

Q=114 cfs

Q=483 cfs

Q=226 cfs

Q=657 cfs

Q=290 cfs

Q=141 cfs

LEGEND

- Existing City Storm Drain Facilities
- Existing City Basins
- Proposed Lake MDP Zone
- Watershed Subareas
- Flowlines
- 10-ft Contours
- SP/Tract Boundaries
- Parcels
- City Boundary

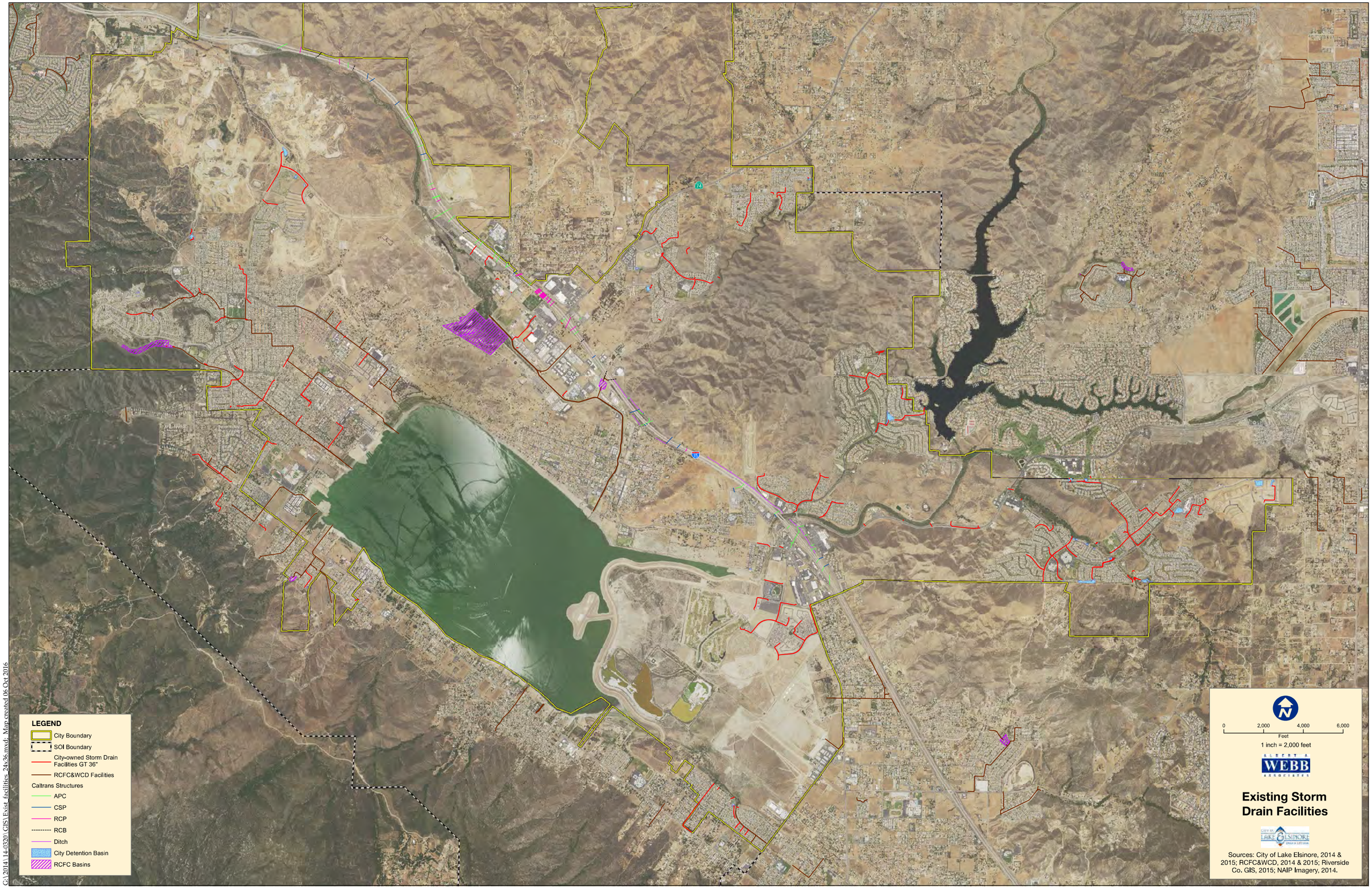
0 600 1,200 1,800

Feet

Grid C2
SE City Area

Sources: City of Lake Elsinore, 2014 & 2015; RCFC&WCD, 2014 & 2015; Riverside Co. GIS, 2016; NAIP Imagery, 2014.

H:\2021\21-0214\GIS\Grid_C2_EastCity_mxd: Map revised 22 Mar 2022



G:\2014\14-0320\GIS\Exist_facilities_24x36.mxd; Map created 06 Oct 2016

LEGEND

CalTrans Culverts

- APC
- CSP
- RCP

Other CalTrans Structures

- RCB
- Ditch
- City Storm Drains (>36")
- RCFC Facilities
- RCFC Basins
- City Detention Basin
- 10-ft City Contours
- City Boundary

ALBERT A. WEBB ASSOCIATES

0 1,000 2,000 3,000

Feet

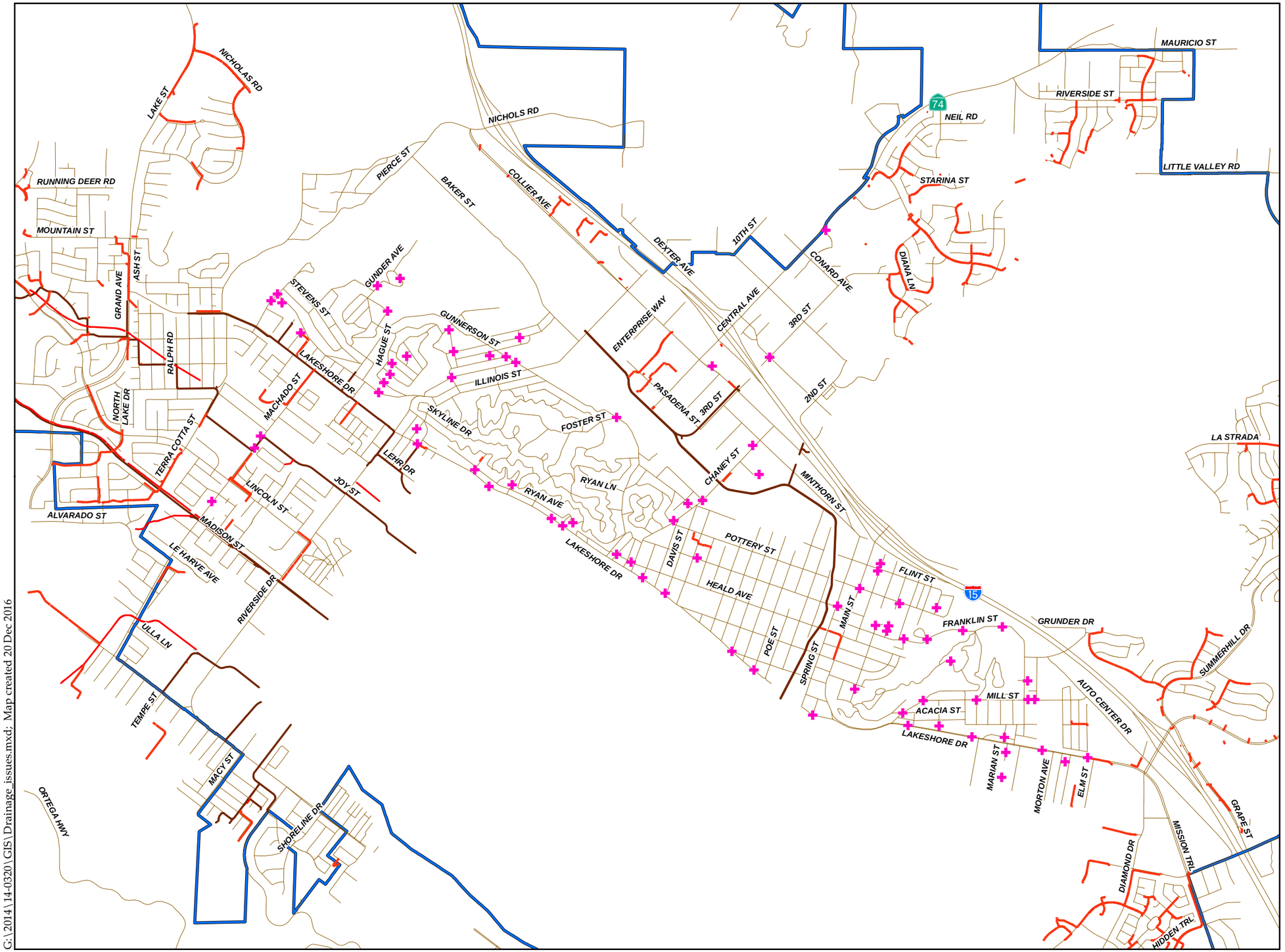
Not to Scale

CalTrans Culverts

City of Lake Elsinore

Sources: CalTrans, 2015; City of Lake Elsinore, 2014-16; RCFC&WCD, 2014; USDA NAIP, 2014.

G:\2014\14-0known\GIS\CalTransCulverts.mxd: Map revised 20 Dec 2016



G:\2014\14-0320\GIS\Drainage_issues.mxd; Map created 20 Dec 2016

LEGEND

- Drainage Issues
- City-owned Storm Drain Facilities GT 20"
- RCFC&WCD Facilities in City Limits
- City Boundary

ALBERT A. WEBB ASSOCIATES

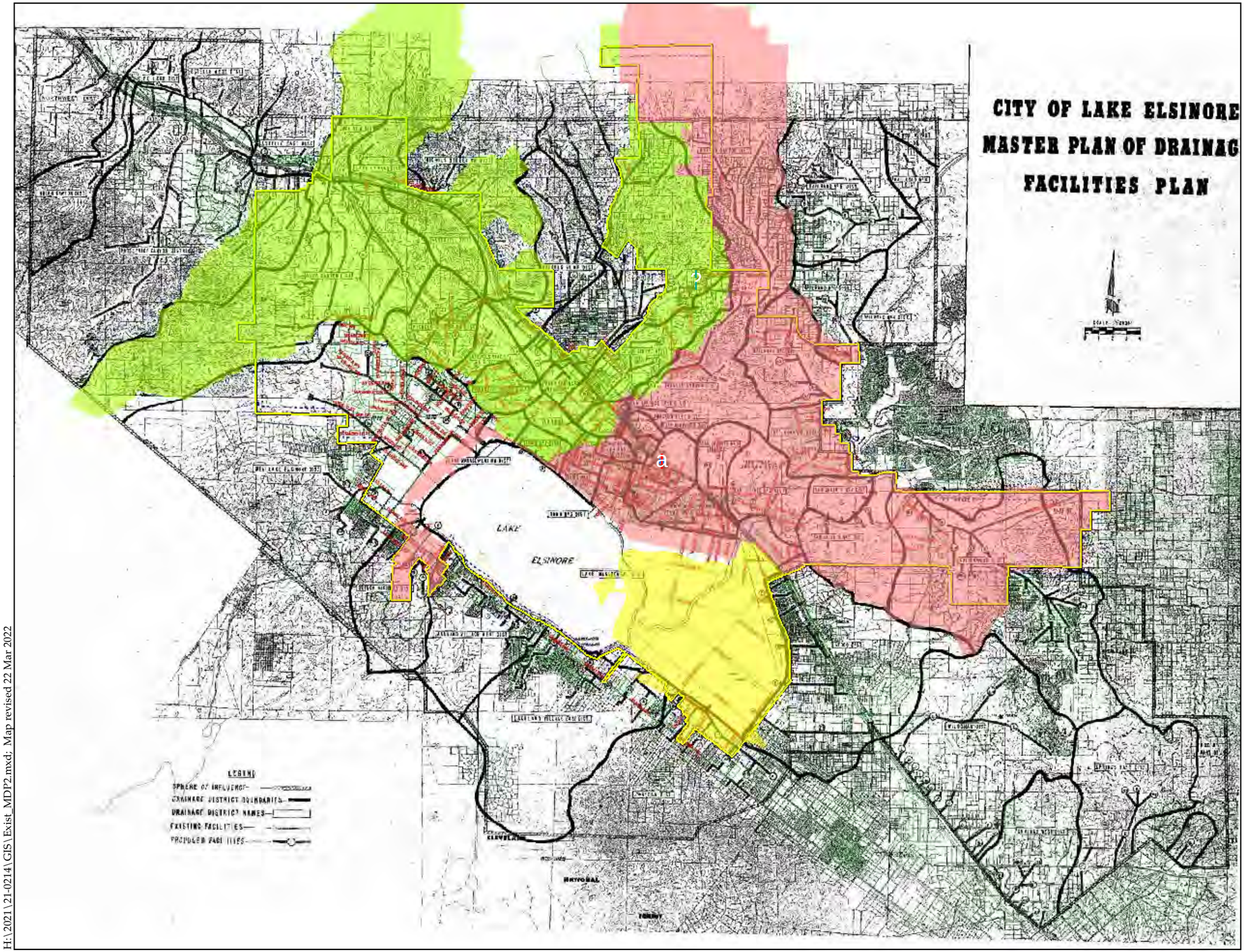
N

0 2,000 4,000 6,000
Feet

Drainage Issue Areas

City of Lake Elsinore

Sources: City of Lake Elsinore, 2014-16; RCFC&WCD, 2014; Riverside Co. GIS, 2015.



LEGEND

Proposed MDP Zones

- Temescal Wash
- Lake
- East Lake
- City Boundary

ALBERT A. WEBB ASSOCIATES

0 1 2 3

Miles

Existing MDP Map

City of Lake Elsinore

Source: City of Lake Elsinore

H:\2021\21-0214\GIS\Exist_MDP2.mxd; Map revised 22 Mar 2022

LEGEND

- City Boundary

Proposed MDP Zones

- Temescal Wash
- Lake
- East Lake

RCFC MDP Areas

- West Elsinore MDP
- Lakeland Village MDP
- Sedco MDP

Soil Hydro Group

- A
- B
- C
- D
- N

0 2,000 4,000 6,000 8,000

Feet

Soil Hydro Groups and Proposed MDP Zones

Sources: USDA NRCS SSURGO, 2008; Riverside Co. GIS, 2015.

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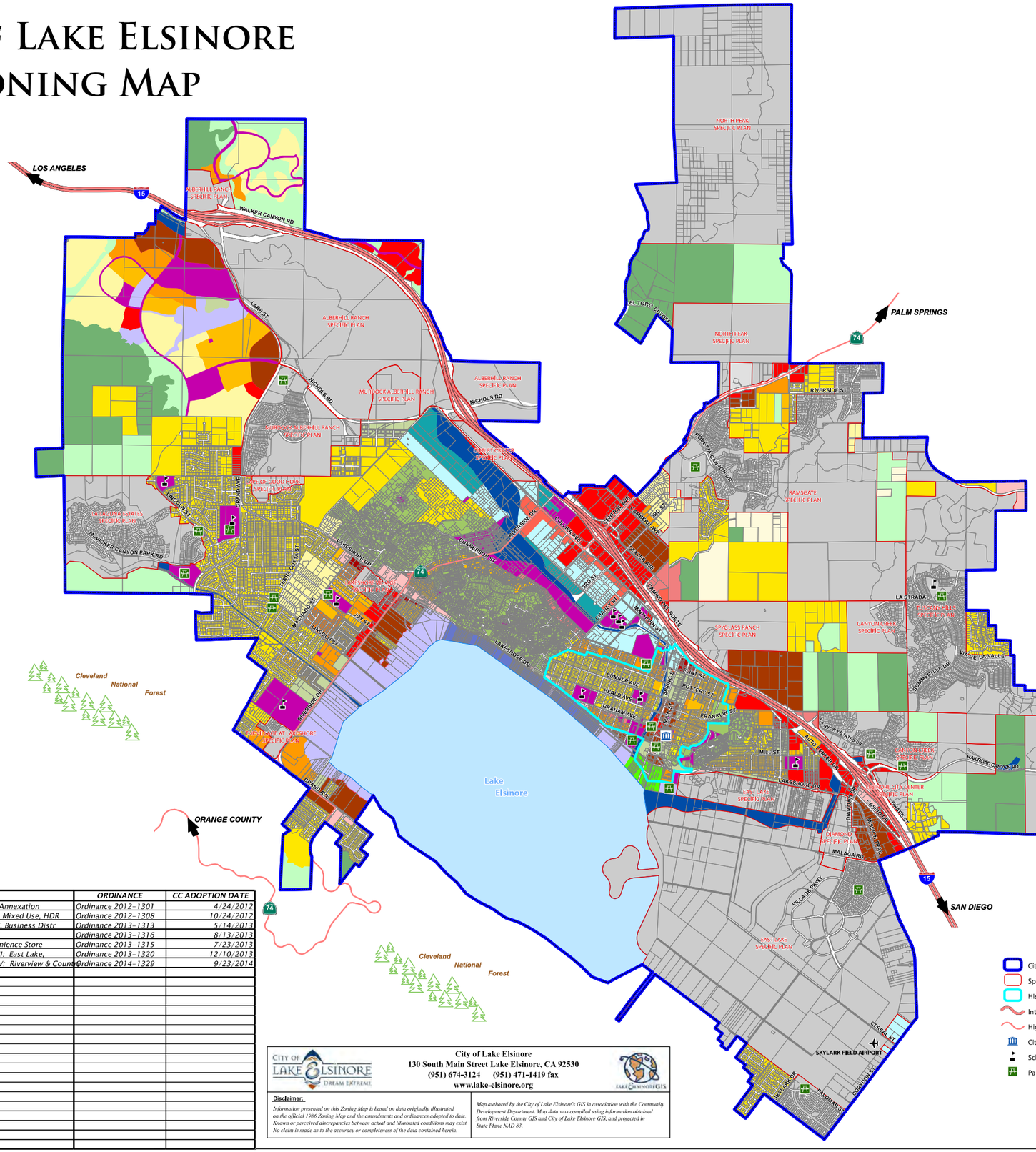
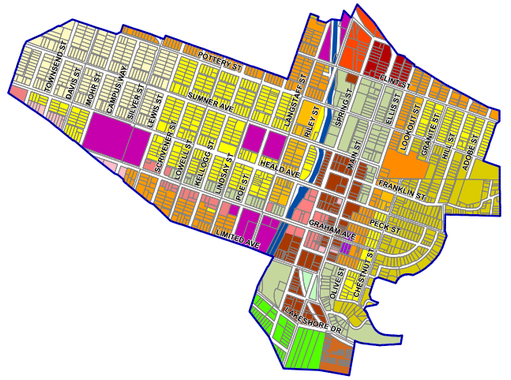
City of Lake Elsinore Zoning Map

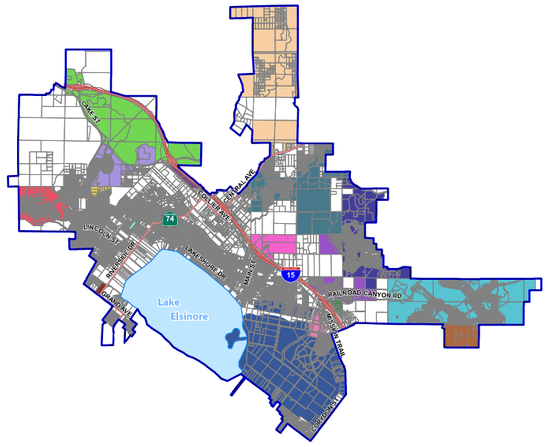


HISTORIC DOWNTOWN AREA ZONING



- R1 - Single Family Residential
- R3 - High Density Residential
- RMU - Residential Mixed Use
- CMU - Commercial Mixed Use
- C1 - Neigborhood Commercial
- C2 - General Commercial
- CO - Commercial Office
- BP - Business Professional
- M1 - Limited Manufacturing
- PI - Public/Institutional
- F - Floodway
- OS - Open Space
- LMD - Low Medium Density Residential
- MD - Medium Density Residential
- MHD - Medium High Density Residential
- HD - High Density Residential
- EC - Existing Condo Complex
- EMH - Existing Mobile Home Complex
- NC - Neighborhood Commercial
- TC - Tourist Commercial
- GC - Gateway Commercial
- DR - Downtown Recreational

SPECIFIC PLAN BOUNDARIES



- Alberhill Ranch
- Canyon Creek
- Canyon Estates
- Canyon Hills
- Cape of Good Hope
- Diamond
- East Lake
- Elsinore City Center
- La Laguna Estates
- Lakeshore Village
- Murdock Alberhill Ranch
- North Peak
- Outlet Center
- Ramsgate
- Spyglass Ranch
- The Village at Lakeshore
- Tuscany Hills

Note: Please refer to adopted Specific Plan to obtain accurate Zoning and Land Use Designations.

REVISION	ORDINANCE	CC ADOPTION DATE
ZC 2012-01 Third Street Annexation No. 81 Pre-Annexation	Ordinance 2012-1301	4/24/2012
ZC 2012-03 Consistency Zoning Project, Phase I, Mixed Use, HDR	Ordinance 2012-1308	10/24/2012
ZC 2013-01 Consistency Zoning Project, Phase II, Business Distr	Ordinance 2013-1313	5/14/2013
SPA 2013-02 East Lake SPA 10, Planning Area 46	Ordinance 2013-1316	8/13/2013
ZC 2013-03 Downtown Master Plan, 7-11 Convenience Store	Ordinance 2013-1315	7/23/2013
ZC 2013-04 Consistency Zoning Project, Phase III: East Lake,	Ordinance 2013-1320	12/10/2013
ZC 2014-04 Consistency Zoning Project, Phase IV: Riverview & Countr	Ordinance 2014-1329	9/23/2014

City of Lake Elsinore
130 South Main Street Lake Elsinore, CA 92530
(951) 674-3124 (951) 471-1419 fax
www.lake-elsinore.org

Disclaimer:

Information presented on this Zoning Map is based on data originally illustrated on the official 1986 Zoning Map and the amendments and ordinances adopted to date. Known or perceived discrepancies between actual and illustrated conditions may exist. No claim is made as to the accuracy or completeness of the data contained herein.

Map authored by the City of Lake Elsinore's GIS in association with the Community Development Department. Map data was compiled using information obtained from Riverside County GIS and City of Lake Elsinore GIS, and projected in State Plane NAD 83.

CITY LAYERS

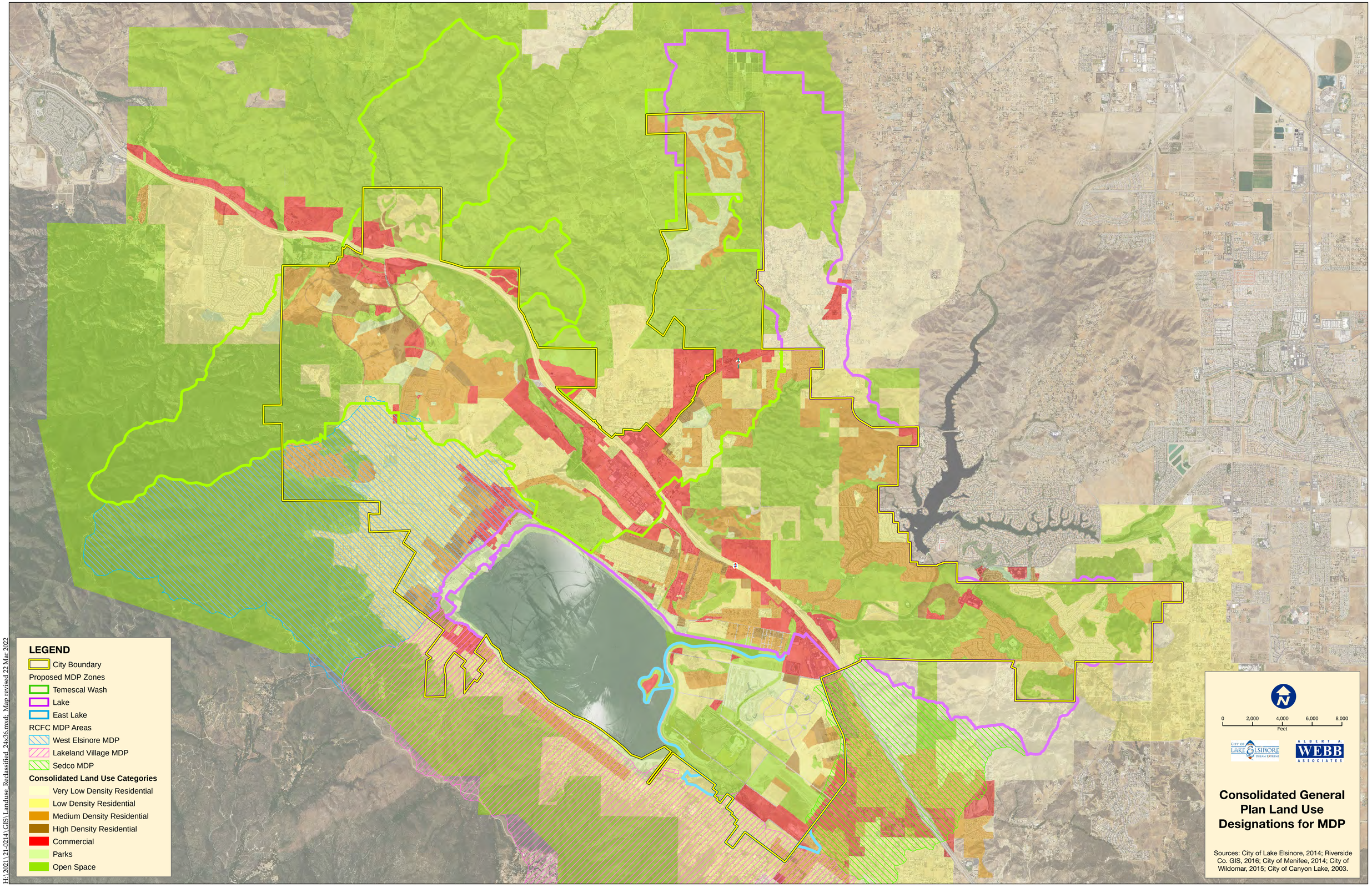
- City Boundary
- Specific Plan Boundaries
- Historic Downtown District Boundary
- Interstate 15
- Highway 74
- City Hall
- Schools
- Parks

CITY ZONING

- RMR - Rural Mountainous Residential
- RH - Hillside Single Family Residential
- RR - Rural Residential
- RE - Residential Estate
- R1 - Single Family Residential
- R2 - Medium Density Residential
- R3 - High Density Residential
- MC - Mobile Home Community
- RMU - Residential Mixed Use
- CMU - Commercial Mixed Use
- C1 - Neigborhood Commercial
- C2 - General Commercial
- CM - Commercial Manufacturing
- CO - Commercial Office
- CP - Commercial Park
- BP - Business Professional
- M1 - Limited Manufacturing
- M2 - General Manufacturing
- M3 - Mineral Resources/Related Manufacturing
- L - Lakeshore
- PI - Public/Institutional
- F - Floodway
- OS - Open Space
- R - Recreation
- SP - Specific Plan
- SPA - Specific Plan Area

DOWNTOWN ZONING

- LMD - Low Medium Density Residential
- MD - Medium Density Residential
- MHD - Medium High Density Residential
- HD - High Density Residential
- EC - Existing Condo Complex
- EMH - Existing Mobile Home Complex
- NC - Neighborhood Commercial
- TC - Tourist Commercial
- GC - Gateway Commercial
- MU - Mixed Use
- DR - Downtown Recreational


LEGEND
City Boundary
Proposed MDP Zones
Temescal Wash
Lake
East Lake
RCFC MDP Areas
West Elsinore MDP
Lakeland Village MDP
Sedco MDP
Consolidated Land Use Categories
Very Low Density Residential
Low Density Residential
Medium Density Residential
High Density Residential
Commercial
Parks
Open Space
0
2,000
4,000
6,000
8,000
Feet
Consolidated General Plan Land Use Designations for MDP
Sources: City of Lake Elsinore, 2014; Riverside Co. GIS, 2016; City of Menifee, 2014; City of Wildomar, 2015; City of Canyon Lake, 2003.
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Alberhill Sub-Zone

Temescal Wash Zone

West Elsionre MDP

Lake Zone

East Lake Zone

Sedoc MDP

Lakeland Village MDP

LEGEND

Proposed MDP Zones

- East Lake
- Lake
- Temescal Wash
- Alberhill Sub-Zone, Tem. Wash
- Capital Improvement Facilities
- Proposed City MDP Facilities
- Proposed City MDP Basins

RCFC MDP Areas

- West Elsinore MDP
- Lakeland Village MDP
- Sedco MDP
- RCFC&WCD Facilities
- RCFC Proposed Lines
- City Detention Basin
- RCFC Basins
- City Boundary

ALBERT A. WEBB ASSOCIATES

0 2,000 4,000 6,000 Feet

1 inch = 2,166 feet

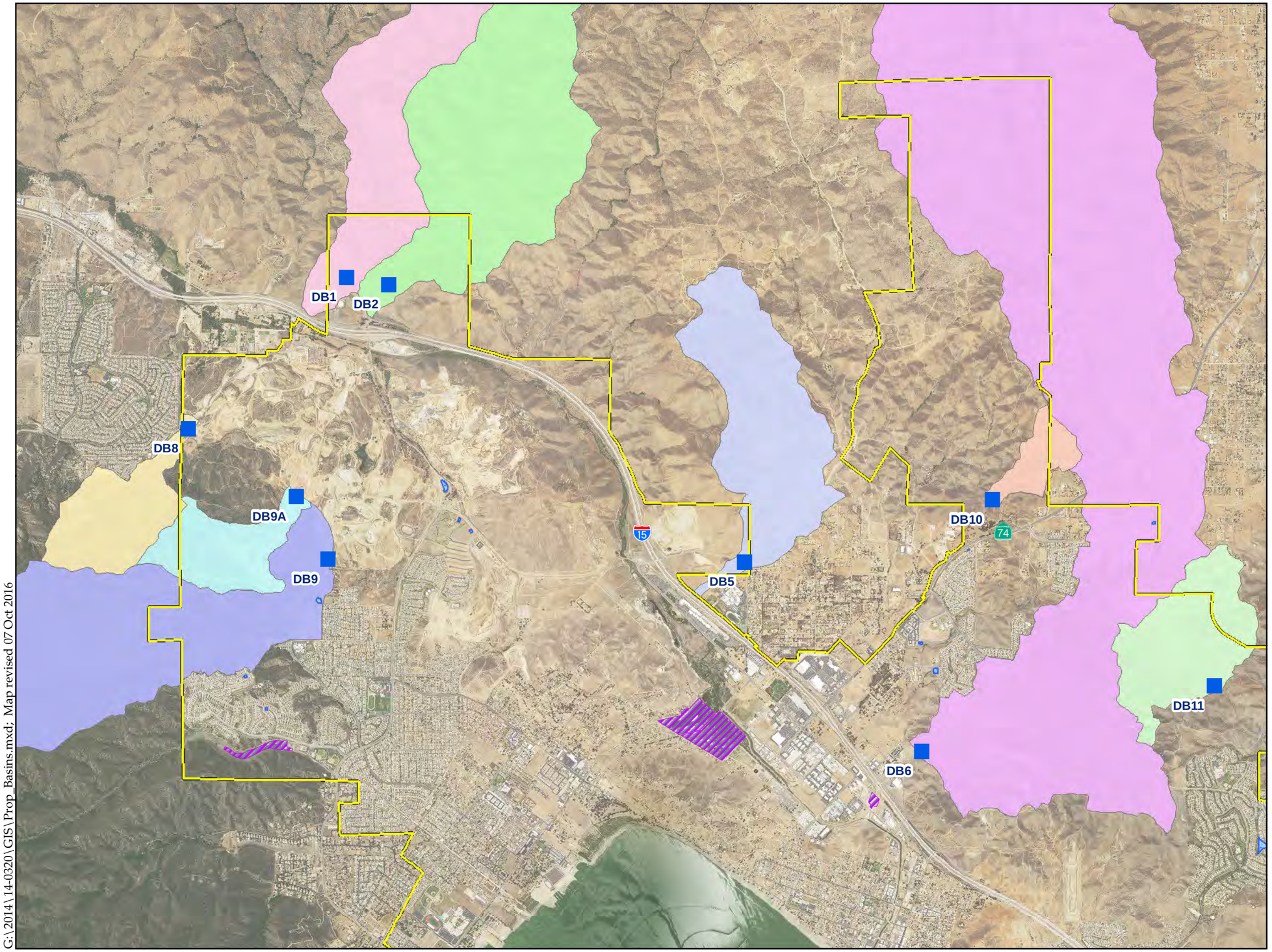
Proposed MDP Districts

City of Lake Elsinore

CITY OF LAKE ELSINORE DREAM EXTREME™

Sources: City of Lake Elsinore, 2014 & 2015; RCFC&WCD, 2014 & 2015; Riverside Co. GIS, 2015; NAIP Imagery, 2014.

H:\ 2021\21-0214\GIS\MDP_Districts_30x36.mxd; Map revised 22 Mar 2022



G:\2014\14-0320\GIS\Prop_Basins.mxd; Map revised 07 Oct 2016

LEGEND

- Proposed Debris Basins
- City Boundary
- City Detention Basin
- RCFC Basins

Watersheds/Subwatersheds

- A1
- A2
- A4-2
- A5-1
- A8
- A9
- A9A
- A10
- A11

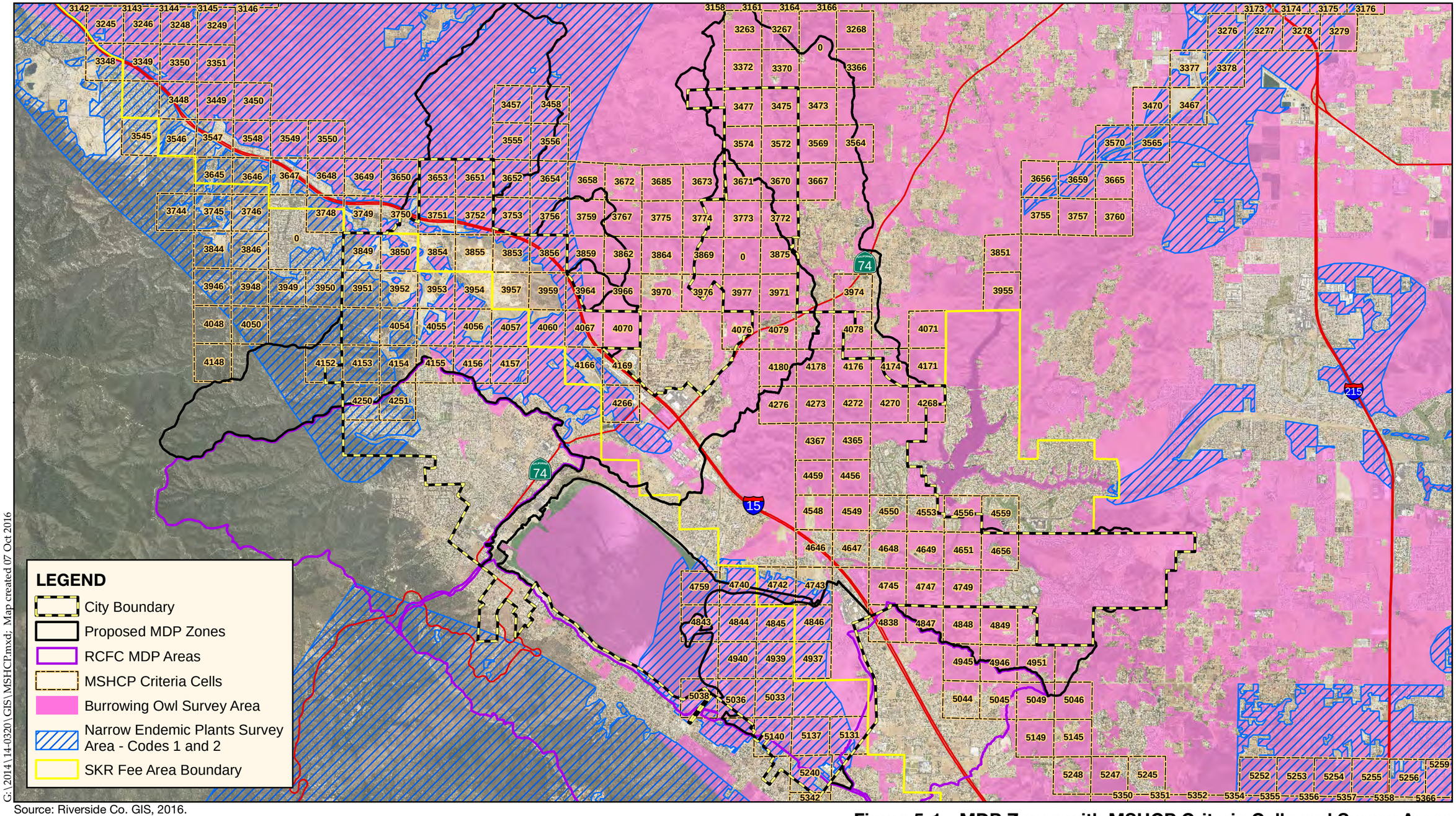
ALBERT A. WEBB ASSOCIATES

0 2,000 4,000 6,000 8,000
Feet

Proposed Debris Basins

City of Lake Elsinore

Sources: City of Lake Elsinore, 2014 and 2015; USDA NAIP 2014

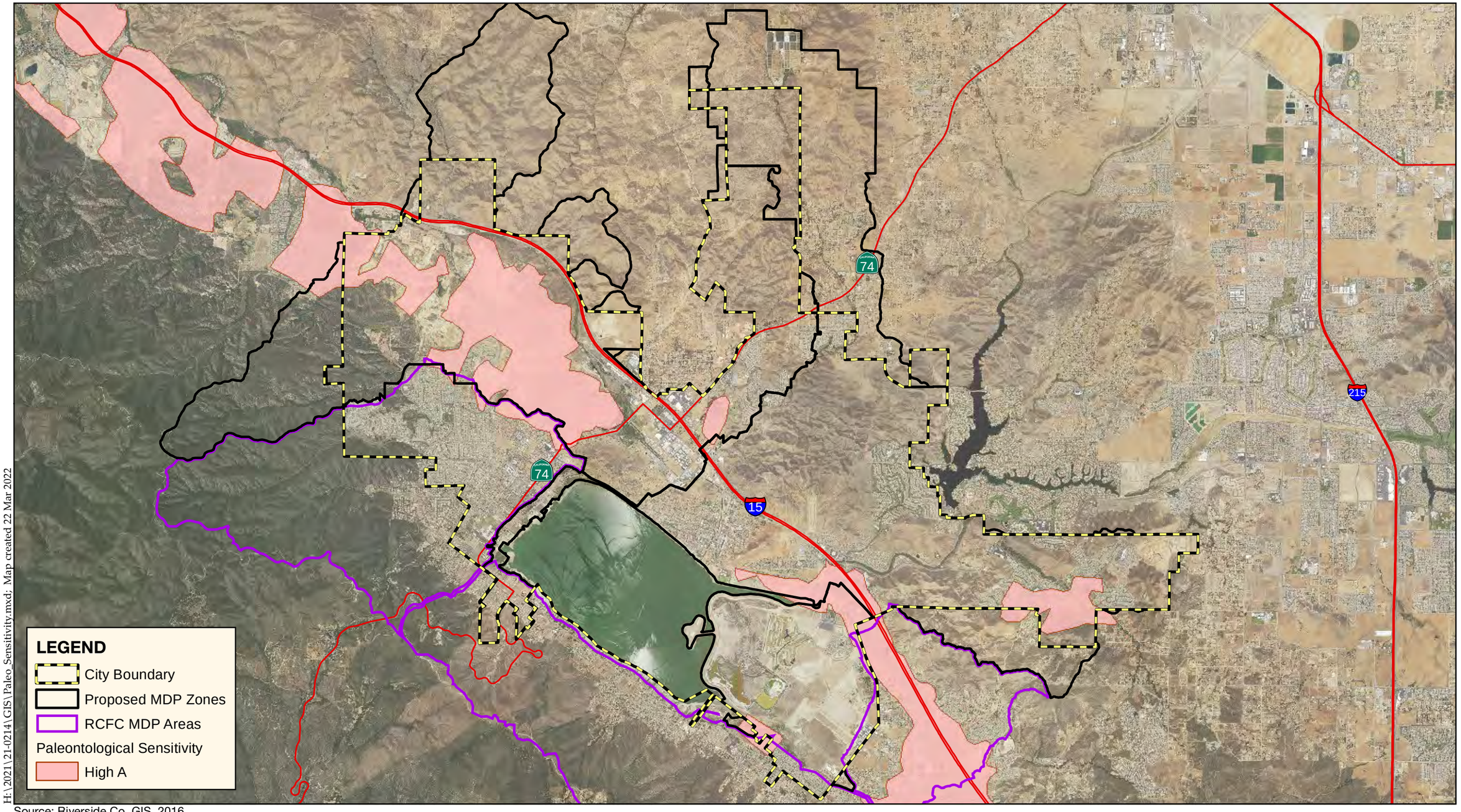


G:\2014\14-0320\GIS\MSHCP.mxd; Map created 07 Oct 2016

Source: Riverside Co. GIS, 2016.
USDA NAIP, 2014.

Figure 5-1 - MDP Zones with MSHCP Criteria Cells and Survey Areas
Lake Elsinore Master Drainage Plan

ALBERT A. WEBB ASSOCIATES

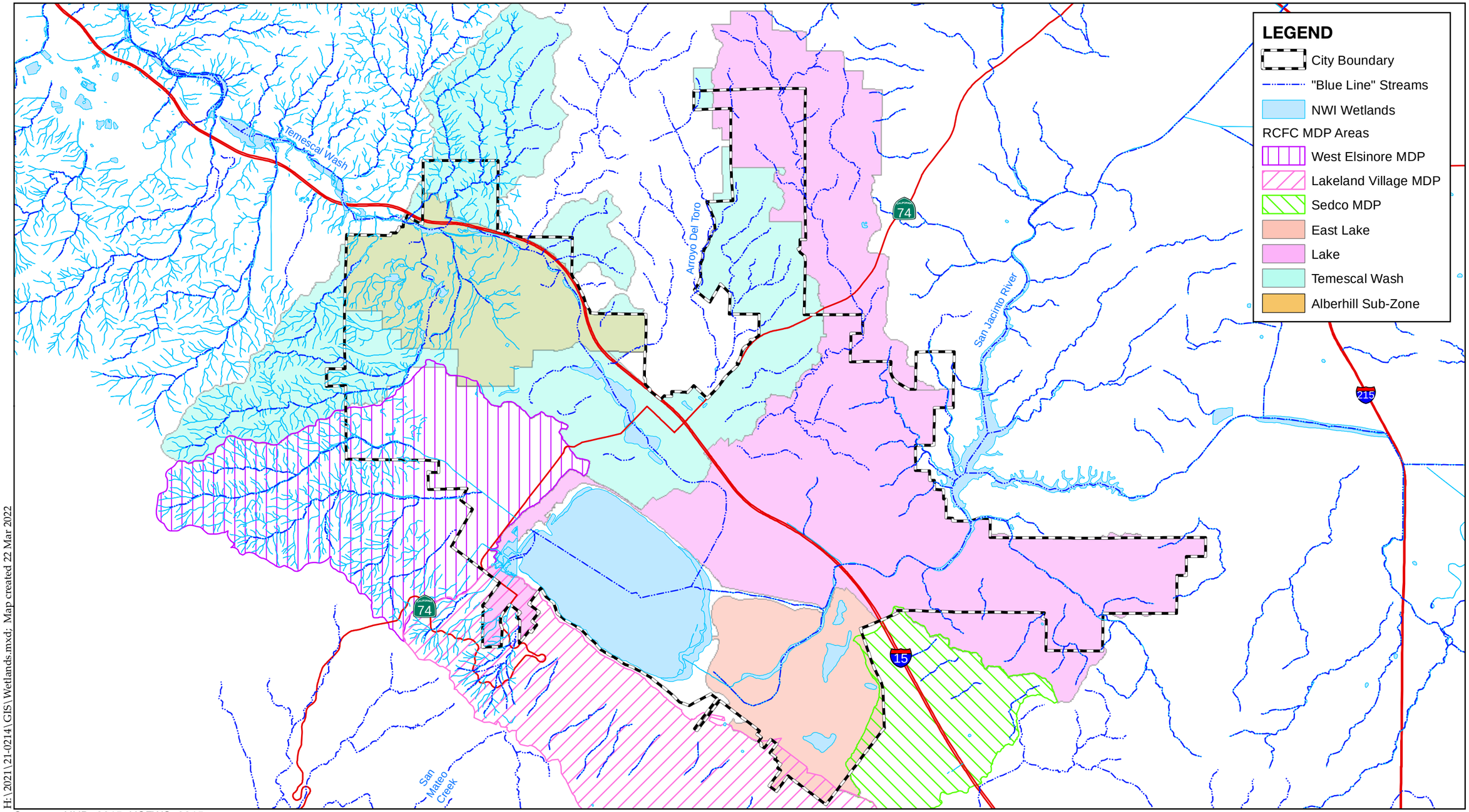


H:\2021\21-0214\GIS\Paleo_Sensitivity.mxd; Map created 22 Mar 2022

Source: Riverside Co. GIS, 2016.
USDA NAIP, 2014.

Figure 5-2 - MDP Zones with Paleontological Sensitivity
Lake Elsinore Master Drainage Plan

ALBERT A. WEBB ASSOCIATES



H:\2021\21-0214\GIS\Wetlands.mxd; Map created 22 Mar 2022

Sources: NHD, 2015; USFWS, 2015; Riverside Co. GIS, 2016.

0 1 2 3 Miles

Figure 5-3 - MDP Zones with Wetlands and "Blue Line" Streams

Lake Elsinore Master Drainage Plan

ALBERT A. WEBB ASSOCIATES