Lake Forest 2040

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CITY OF LAKE FOREST GENERAL PLAN UPDATE

EXISTING CONDITIONS REPORT

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FIGURES

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CHAPTER 1
INTRODUCTION

The City of Lake Forest General Plan identifies the community's vision for the future and provides a framework to guide decisions on growth, development, and conservation of open space and resources in a manner consistent with the quality of life desired by residents and businesses.

This General Plan Existing Conditions Report provides an overview of Lake Forest's physical, environmental, economic, and demographic setting, as of mid-2018.

City staff, the General Plan Update consultant (De Novo Planning Group), and its team of subconsultants have worked together to ensure that this is an accurate and reliable source of information. This document is intended to serve as a comprehensive reference for community members, policymakers, staff, the City's General Plan Advisory Committee, and the consultant team throughout the General Plan Update process.

The City of Lake Forest's General Plan Update is a multi-year process that will include a comprehensive review and revision of the City's existing General Plan, which establishes a vision for the future of the City. This process also includes the preparation of an Environmental Impact Report (EIR), which investigates the possible impacts of the General Plan Update policy changes to the surrounding physical environment. This Existing Conditions Report document provides information about these components and establishes the existing setting for the EIR.

This Chapter includes the following topics:

1.1 EXISTING CONDITIONS REPORT CONTENTS

To prepare a meaningful General Plan, existing conditions must be understood and documented. The Existing Conditions Report identifies development patterns, natural resources, socioeconomic conditions, and environmental constraints in the City and identifies the regulatory environment for each topic. This report will be a resource for the City Council, Planning Commission, General Plan Advisory Committee, City staff, and the De Novo Planning Group team throughout the process of preparing the General Plan Update and Environmental Impact Report. The Existing Conditions Report makes extensive use of maps, graphics, and user-friendly non-technical terms to help make it accessible to the general public.

The Existing Conditions Report provides background data and will serve as a technical framework, while the General Plan will focus on goals, policies, and implementation programs. The information collected for the Existing Conditions Report will also be used as the basis for the "existing setting" sections of the General Plan EIR.

The following topic areas are addressed in the Existing Conditions Report:

Chapter 2 Land Use and Community Character

The Land Use Chapter addresses land use planning topics, including issues related to current General Plan land use patterns, existing (on-the-ground) land uses, and placemaking/community character. The information in this Chapter provides both a historical and current perspective on land use and is intended to assist the General Plan Update process by providing both historical context and a baseline of existing land use information. This information will be used when formulating and considering amendments to the City's current land use pattern, or when considering alternate growth and land use scenarios for the City.

Chapter 3 Demographic and Market Trends

The Demographic and Market Trends discussion provides information about the City's residents and commercial real estate market trends and conditions. The purpose of this information is to describe the City, its residents, and business activity from an economic market perspective. This section discusses the current economic base of the City, business in industrial and commercial core areas, and local employment conditions. This section identifies the employment and industry sectors present in the City, jobs by employment and industry sector, and employment trends. It also addresses fiscal considerations in the City, especially as they relate to the City's current General Fund expenditures and revenues.

Chapter 4 Mobility

The Mobility Chapter describes the circulation network serving the City. Existing conditions are described for roadway operations, pedestrian-bicycle facilities, transit service, and multimodal operations. This Chapter includes a review of relevant transportation planning documents describing the Lake Forest area including the current Transportation Element, Lake Forest's current Capital Improvement Program, and the Southern California Association of Governments (SCAG) Regional Transportation Plan/ Sustainable Communities Strategy (RTP/SCS). Federal, State, regional, and local regulations pertaining to traffic and circulation in Lake Forest are also described.

Chapter 5 Air Quality, Greenhouse Gas, and Climate Change

This Chapter discusses the regulatory setting, regional climate, topography, air pollution potential, and existing ambient air quality for criteria air pollutants, toxic air contaminants, odors, and dust. This section also discusses the applicable Federal and State ambient air quality standards and attainment statuses, recent trends in ambient air quality, and the nature and location of existing sensitive receptors. Information presented in this section is based in part on information gathered from the South Coast Air Quality Management District (SCAQMD) and the California Air Resources Board (CARB).

Various gases in the Earth's atmosphere, classified as atmospheric GHGs, play a critical role in determining the Earth's surface temperature. Solar radiation enters Earth's atmosphere from space, and a portion of the radiation is absorbed by the Earth's surface. The Earth emits this radiation back toward space, but the properties of the radiation change from high-frequency solar radiation to lower-frequency infrared radiation. The City of Lake Forest must carefully consider the impact of GHGs on the local environment and develop plans and policies to address climate change and plan for a more resilient future. These topics are explored in this Chapter.

Chapter 6 Environmental Justice

The Environmental Justice Chapter analyzes the role of disadvantaged communities (DACs) and addresses a wide range of topics related to the health and well-being of city residents and workers. A community's overall health depends on many factors, including the environment in which people live and work. A healthy living environment reduces risks and facilitates healthy lifestyles. Critical determinants of healthy living environments, which will be used to develop a community health baseline, include:

- Public health indicators – vulnerable populations, asthma, obesity, diabetes, and chronic disease;
- Active lifestyle opportunities – walking and bicycling to services, and availability of recreational facilities;
- Community design – safe neighborhoods and public spaces, affordable housing, and sustainable development;
- Healthy lifestyle determinants – local foods, healthy shopping options, number of fast food restaurants, medical and mental health services; and
- Environmental quality – clean air and water.

The context of each determinant in promoting healthy communities is described and supporting information that describes existing conditions in Lake Forest is provided, based on available information and reports. This section also includes a summary description of current efforts that the City is undertaking to promote sustainability and healthy community strategies.

Chapter 7 Community Services and Facilities

The Community Services and Facilities Chapter describes the existing conditions and regulatory context regarding community services and utilities, including water, wastewater, drainage and flood control, education, public safety services, schools, and parks and recreational resources within the City. These facilities and services provide a framework that supports growth and development in the City. This Chapter describes existing service levels, available resources, and planned expansion of services and infrastructure.

Chapter 8 Hazards, Safety, and Noise

The Hazards, Safety, and Noise Chapter includes a listing of key significant issues that will ultimately guide the preparation of the Safety Element of the General Plan. This Chapter provides a summary of the existing setting and conditions associated with natural and man-made hazards that may pose a danger to city residents, employees, and visitors including: dangers from hazardous materials sites (i.e., landfills, superfund sites, pipelines and sites with the potential for chemical explosion); fire hazards; emergency response; aircraft hazards; and flood hazards. Known hazardous conditions listed in available State and County databases are also described.

Additionally, this Chapter includes descriptions of the characteristics of sound and noise and a description of transportation, stationary, and construction noise sources within the City's Planning Area. A description of the noise monitoring survey results, tabularized noise exposure contours, and an existing conditions noise contour map that reflects traffic and stationary noise sources are included. This section also summarizes current information on ground vibration thresholds and summarizes the existing vibration environment.

Noise measurement locations were selected to quantify noise levels along major thoroughfares, near significant stationary noise sources, in developing areas, and in other areas that have been problematic in the past. Based on the results of the noise monitoring and the traffic data, noise contours associated with major roadways have been mapped based on the U.S. Federal Highway Traffic Noise Prediction Model. Noise levels associated with stationary and railroad sources were identified in tabular format, and background noise levels within the community are quantified. A summary of the regulatory framework related to noise, including Federal, State, and City laws, ordinances, plans, policies, and standards is also provided.

Chapter 9 Conservation

The Conservation Chapter discusses conservation issues related to biological resources, geologic and mineral resources, hydrology and water quality, and cultural and visual resources in and around the City. This Chapter also discusses open space as it relates to the preservation of natural resources as part of the biological resources discussion, open space associated with managed production of surface water and groundwater resources as part of the hydrology discussion, and open space associated with public health related to geologic and hydrologic hazards as part of the geologic resources and hydrology discussions, respectively. Federal, State, and local regulations that pertain to each of these topics are also described.

1.2 GENERAL PLAN OVERVIEW

State law requires every city and county in California to prepare and maintain a planning document called a General Plan. A General Plan is a "constitution" or "blueprint" for the future physical and economic development of a county or city. All future planning decisions and project approvals must be consistent with the General Plan, including, but not limited to: Area Plans, Master Plans, subdivisions, public works projects, public services, and zoning decisions. A General Plan has four defining features:

General. As the name implies, a General Plan provides general guidance for future land use, transportation, infrastructure, environmental, and resource decisions.

Comprehensive. A General Plan covers a wide range of social, economic, infrastructure, and natural resource issues. There are seven State mandated topics that General Plans must cover including: land use, circulation, housing, conservation, open space, safety, and noise. The Lake Forest General Plan Update will include goals, policies and implementation programs to address the seven state mandated topics. The City also intends to prepare stand-alone elements to address three optional topics: economic development, fiscal sustainability, and community health and wellness. While the final format is subject to change, the Lake Forest General Plan is expected to include the following elements:

1. Land Use and Community Design
2. Housing (***no changes to the adopted 2013 housing element***)
3. Mobility
4. Safety and Noise
5. Public Facilities and Growth Management
6. Recreation and Resources
7. Economic Development
8. Fiscal Sustainability
9. Community Health and Wellness

Long-Range. A General Plan provides guidance on achieving a long-range vision of the future for a city or county. To reach this envisioned future, the General Plan includes goals, policies, and implementation programs that address both near-term and long-term needs. The City of Lake Forest General Plan Update will look ahead approximately 20 years, while also recognizing that things can change over time and the City be able to adapt.

Integrated and Coherent. The goals, policies, and implementation programs in a General Plan must present a comprehensive, unified program for development and resource conservation. A General Plan uses a consistent set of assumptions and projections to assess future demands for housing, employment, public services, and infrastructure. A General Plan has a coherent set of policies and implementation programs that enables citizens to understand the vision of the General Plan, and enables landowners, businesses, and industry to be more certain about how future planning decisions will be made and implemented.

1.3 USING THE GENERAL PLAN

The General Plan is used by the City Council, appointed Boards, Commissions, and Committees, and City staff on a regular basis to make decisions with direct and indirect land use implications. It also provides a framework for inter-jurisdictional coordination of planning efforts among officials and staff of the City and other government agencies such as the County, State and Federal agencies.

The General Plan is the basis for a variety of regulatory mechanisms and administrative procedures. California planning law requires consistency between the General Plan and its implementation programs. Implementation programs and regulatory systems of the General Plan include zoning and subdivision ordinances, capital improvement programs, specific plans, environmental impact procedures, and building and housing codes.

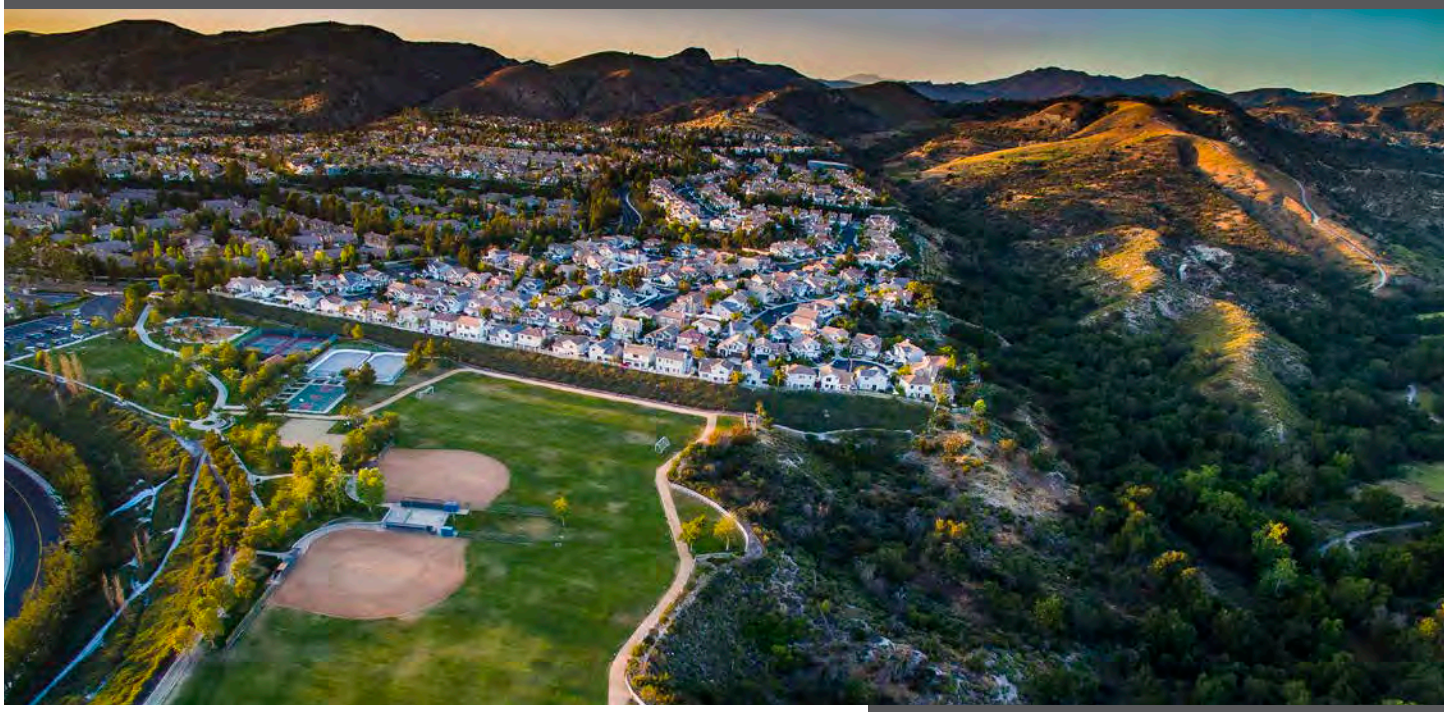
Over time, the City's population will change, its goals will be redefined, and the physical environment in which its residents live and work will be altered. In order for the General Plan to be a useful document, it must be monitored and periodically revised to respond to and reflect changing conditions and needs. As such, a General Plan should be comprehensively updated approximately every 15-20 years to reflect current conditions and emerging trends.

The City's General Plan should also be user-friendly. To this end, the Lake Forest General Plan Update will be divided into two primary documents: the Existing Conditions Report and the Goals and Policies Report.

As described above, this Existing Conditions Report provides a summary of a range of conditions in Lake Forest as they exist in 2018, and provides the baseline framework for the development of the General Plan's goals, policies, and implementation programs.

The Goals and Policies Report is the essence of the General Plan. It contains the goals and policies that will guide future decisions within the City. It also identifies a full set of implementation programs that will ensure the goals and policies in the General Plan are carried out.

CHAPTER 2
LAND USE AND COMMUNITY CHARACTER



This chapter addresses land use, including issues related to the current General Plan, existing land use patterns, local planning context, and community character. The information in this chapter provides a current perspective on land use in Lake Forest and is intended to assist the General Plan update process by providing a baseline of existing land use information to be used when formulating and considering amendments to the City's current land use pattern. For the purposes of the Lake Forest General Plan Update, the Planning Area is defined as the area within the City's Sphere of Influence that is included in the analysis and planning for the approximate 20-year horizon of the City's General Plan Update.

This chapter includes the following topics:

Figures are located at the end of the chapter.

State Regulatory Framework

California General Plan Law

Government Code Section 65300 requires that each county and city adopt a General Plan "for the physical development of the county or city, and any land outside its boundaries which bears relation to its planning."

The General Plan is a comprehensive long-term plan for the physical development of the county or city and is considered a "blueprint" for development. The General Plan provides a statement of the community's development, economic, circulation, and environmental goals and includes

diagrams and text setting forth objectives, standards, policies, and programs. The General Plan must contain seven State-mandated elements: Land Use, Open Space, Conservation, Housing, Circulation, Noise, and Safety. It may also contain any other elements that the City wishes to include; Lake Forest has decided to also include elements addressing Economic Development, Fiscal Sustainability, Community Design, and Community Health and Wellness. The land use element designates the general location and intensity of designated land uses to accommodate housing, business, industry, open space, education, public buildings and grounds, recreation areas, and other land uses.

For the past several years, the Governor's Office of Planning and Research (OPR) has been engaged in a process to update the State General Plan Guidelines (GPG). After multiple drafts and public reviews, the GPG update was released on August 2, 2017. This guidance is the first comprehensive update in fourteen years and includes legislative changes, new technical advisories, guidance documents, and additional resources. The GPG serves as the "how to" resource for drafting a General Plan. For mandatory and common optional elements of the General Plan, the GPG sets out each statutory requirement in detail, provides OPR recommended policy language, and includes online links to city and county General Plans that have adopted similar policies. OPR plans to next update the GPG in 2018 with additional guidance for communities on environmental justice, climate change, and recommendations for the development of an optional water element. The Lake Forest General Plan will be prepared in accordance with all applicable laws and regulations, including the 2017 GPG.

California Environmental Quality Act

The California Environmental Quality Act (CEQA) was developed to protect the quality of the environment and the health and safety of persons from adverse environmental effects. Discretionary projects are required to be reviewed consistent with the requirements of CEQA to determine if there is potential for the project to cause a significant adverse effect on the environment. Depending on the type of project and its potential effects, technical traffic, noise, air quality, biological resources, and geotechnical reports may be needed. If potential adverse effects can be mitigated, a Mitigated Negative Declaration is required. If potentially adverse effects cannot be mitigated, an Environmental Impact Report is required. These documents have mandated content requirements and public review times. Preparation of CEQA documents can be costly and, despite maximum time limits set forth in the Public Resources Code, can extend the processing time of a project by a year or longer.

Regional Regulatory Framework

Local Agency Formation Commission of Orange County

In 1963, the State Legislature created a Local Agency Formation Commission (LAFCO) for each county, with the authority to regulate local agency boundary changes. Subsequently, the State has expanded the authority of a LAFCO. The goals of a LAFCO include preserving agricultural and open space land resources and providing for efficient delivery of services. The Orange County LAFCO has authority over land use decisions in the County of Orange affecting local agency boundaries. Its authority extends to the incorporated cities, including annexation of County lands into a city, and special districts within the County. The City of Lake Forest is adjacent to unincorporated areas of Orange County.

In addition, LAFCO conducts Municipal Service Reviews (MSRs) for services within its jurisdiction. An MSR typically includes a review of existing municipal services provided by a local agency and its infrastructure needs and deficiencies. It also evaluates financing constraints and opportunities, management efficiencies, opportunities for rate restructuring and shared facilities, local accountability and governance, and other issues.

Orange County Airport Land Use Commission

The Airport Land Use Commission (ALUC) was established to provide for appropriate development of areas surrounding public airports in Orange County. It is intended to minimize the public's exposure to excessive noise and safety hazards, and to ensure that the approaches to airports are kept clear of structures that could pose an aviation safety hazard.

Orange County ALUC has adopted a series of Airport Environs Land Use Plans (AELUPs) for each of the airports in Orange County which include John Wayne Airport (JWA), Fullerton Municipal Airport (FMA) and Joint Forces Training Base Los Alamitos. Additionally, there is an AELUP for Heliports.

Under California Government Code Section 65302.3(a), General Plans must be consistent with any airport land use plan adopted pursuant to Public Utilities Code Section 21675. The City of Lake Forest is not within an Airport Influence Area for any Orange County airport, and as such, no significant compatibility issues between City planning issues and airport compatibility concerns are expected.

County of Orange General Plan

Orange County adopted its most current General Plan in 2005, with a number of amendments since that time. The County's General Plan provides a comprehensive set of goals, policies, and implementing actions to guide the County's growth. The County's General Plan includes the following elements: Land Use, Transportation, Public Services and Facilities, Resources, Recreation, Noise, Safety, Housing, and Growth Management.

Local Regulatory Framework

City of Lake Forest Zoning Ordinance

Title 9 of the Lake Forest Municipal Code is the City's Planning and Zoning Ordinance. The Planning and Zoning Ordinance carries out the policies of the General Plan by classifying and regulating the uses of land and structures within the City, consistent with the General Plan. The Planning and Zoning Ordinance is adopted to protect and promote the public health, safety, comfort, convenience, prosperity, and general welfare of residents and businesses in the City.

Zoning provides a legal mechanism for local government regulation of the land uses described in the General Plan Land Use Map. In addition to providing specific regulations related to minimum lot size, building heights, setbacks, lot coverage, etc., for each zoning district, the Zoning Ordinance also lists the uses that would be acceptable or could be considered in each district, as well as those that would be considered unacceptable. For some uses, further regulations are established. Zoning regulations designate the process to be used when a permit must be applied for in order to consider approval of a particular land use in a district.

Subdivision Code

A subdivision is any division of land for the purpose of sale, lease or finance. The State of California Subdivision Map Act (Government Code § 66410) regulates subdivisions throughout the state. The goals of the Subdivision Map Act are as follows:

- To encourage orderly community development by providing for the regulation and control of the design and improvement of a subdivision with proper consideration of its relationship to adjoining areas.
- To ensure that areas within the subdivision that are dedicated for public purposes will be properly improved by the subdivider so that they will not become an undue burden on the community.
- To protect the public and individual transferees from fraud and exploitation.

The Map Act allows cities some flexibility in the processing of subdivisions. Lake Forest controls this process through the subdivision regulations in the Municipal Code Title 7 (referred to as the Lake Forest Subdivision Code). These regulations ensure that minimum requirements are adopted for the protection of the public health, safety and welfare; and that the subdivision includes adequate community improvements, municipal services, and other public facilities. Lake Forest's subdivision provisions support the Subdivision Map Act and, in so doing, also support implementation of the City's General Plan.

Planned Communities

Lake Forest has been primarily developed as a series of Planned Communities prior to incorporation. The Planned Communities comprising the incorporated City include Lake Forest, El Toro, Baker Ranch, Pacific Commercentre, Rancho de los Alisos, Rancho Serrano, Serrano Highlands, Foothill Ranch, and Portola Hills. Pre-incorporation development agreements apply to a number of the Planned Communities in Lake Forest and identify permitted levels of development based on the provision of public facilities and infrastructure. The land use designations identified in the Current Land Use Element are consistent with the development densities identified in the development agreements.

Opportunities Study

In 2003, the City of Lake Forest initiated the Opportunities Study to study the implications of re-designating vacant land within the City that was entitled for business and industrial use on 5 properties in Lake Forest (Shea Baker Ranch, Portola Center, Serrano Summit, The Pinnacle, and Whistler Ranch). The zoning changes allow for a new plan with residential uses and facilities such as a Sports Park and Civic Center.

The Opportunities Study focused on approximately 800 acres of what was then vacant land located in the City of Lake Forest, north and south of the Foothill Transportation Corridor and adjacent to the former Marine Corps Air Station (MCAS) El Toro. The study area was formerly encumbered by the 65 Community Noise Equivalent Level (CNEL) contours, which imposed land use restrictions due to the aircraft noise generated by airplanes taking off from the now defunct Marine base.

In June of 2008, the City Council took the first steps to complete the development of Lake Forest, gaining over $100 million in public benefits for the community. After 5 years of study, analysis and negotiations, the City Council voted to certify the Opportunities Study Final Program Environmental Impact Report, and approved a General Plan Amendment and zone changes for approximately 800 acres of land located near the 241 Toll Road.

2.1 PLANNING AREA

The **City Limits** includes the area within the City's corporate boundary, over which the City exercises land use authority and provides public services. A City's **Sphere of Influence** (SOI) is the probable physical boundary and service area of a local agency, as adopted by a Local Agency Formation Commission (LAFCO). An SOI may include both incorporated and unincorporated areas within which a city or special district will have primary responsibility for the provision of public facilities and services. Lake Forest's SOI is contiguous with its City Limits. For the purposes of the Lake Forest General Plan Update, the **Planning Area** is defined as the area within the City's Sphere of Influence/City Boundary that is included in the analysis and planning for the approximate 20-year horizon of the City's General Plan Update.

The City's boundary has expanded significantly since the City was incorporated and the first General Plan was prepared. In the early 2000s, the City annexed areas north of the Foothill Transportation Corridor within its Sphere of Influence, including Portola Hills and Foothill Ranch, resulting in its contiguous City boundary and SOI. Figure 2-1 shows the Lake Forest City Limits, and the General Plan Planning Area boundaries.

2.2 CURRENT GENERAL PLAN

The City's current General Plan was adopted in 1994 and has been amended periodically since that time. The Safety and Noise Elements were updated in 2001; the Circulation Element was updated in 2008; the Land Use, Housing, and Conservation and Open Space Elements were amended in 2010; and the Housing Element was amended again in 2014 in accordance with applicable state regulations.

Land Use Element

Land uses in Lake Forest have been developed based on the Land Use Map, along with the goals, policies, and strategies established by the City of Lake Forest General Plan. The City's General Plan Land Use Element includes issues, goals, policies, and implementation measures that guide land use and planning decisions within the City. For a full list of the City's goals and policies, please see the City's Current General Plan.

Housing Element

Housing Element Law (Government Code Sections 65580 through 65589.8) requires local governments to adopt a Housing Element that addresses existing and projected housing needs, including their share of the regional housing need. A Housing Element must include an analysis of existing and projected housing needs, identification of governmental and non-governmental constraints to the provision of housing, an inventory of sites appropriate to accommodate the City's housing needs, identification of resources available to assist with meeting housing needs, a review of the effectiveness of the previous Housing Element, and a plan to address the identified housing needs and constraints.

California General Plan law requires each city and county to have land zoned to accommodate a fair share of the regional housing need. The share is known as the Regional Housing Needs Allocation (RHNA) and is based on a Regional Housing Needs Plan (RHNP) developed by councils of government. The Southern California Association of Governments (SCAG) is the lead agency for developing the RHNP for the area that includes Orange County and the City of Lake Forest. As part of the region's planning efforts, SCAG must allocate housing units within the region consistent with the development pattern included in the 2016-2040 Regional Transportation Plan/ Sustainable Communities Strategy (2016 RTP/SCS or Plan).

The City's Housing Element, adopted in January 2014, provides for the accommodation of the 2014-2021 RHNA that has been assigned to Lake Forest. The total housing growth need for the City of Lake Forest identified for the 2014-2021 planning period is 2,727 units, as summarized in Table 2-1. The City of Lake Forest is not required to ensure that actual development to accommodate the RHNA occurs; however, the City must facilitate housing production by ensuring that land is available and that unnecessary development constraints have been removed.

Housing Element Law requires that cities update their Housing Elements on a specific schedule based on certification status; given that the City has a currently certified Housing Element, updates to the Housing Element are not included in the City's comprehensive General Plan Update. However, the General Plan must remain internally consistent, meaning that the direction provided in the City's Housing Element regarding how the City plans to accommodate future housing needs must be considered and reflected in the other elements of the General Plan.

Table 2-1 2013-2021 Regional Housing Needs Allocation

	Very Low Income[1]	Low Income	Moderate Income	Above Moderate Income	Total
Units	647	450	497	1,133	2,727
Percentage of Total	23.7%	16.5%	18.2%	41.5%	100%

1. Includes extremely-low households, estimated to be one-half the very-low need (323 units)

Source: City of Lake Forest Housing Element, 2014.

Current Lake Forest General Plan Land Use Designations

The City of Lake Forest General Plan Land Use Map (Figure 2-2) designates land uses within the Planning Area. Table 2-2 below summarizes land uses included on the General Plan Land Use Map. A description of each General Plan Land Use designation is provided below.

The term "density" is used for residential uses and refers to the population and development capacity of residential land. Density is described in terms of dwelling units per net acre of land (du/net acre). For example, 50 dwelling units occupying 10 net acres of land is 5.0 du/net acre. Development "intensity," which applies to nonresidential uses, refers to the extent of development on a parcel of land or lot: the total building square footage, building height, the floor area ratio, and/or the percent of lot coverage. Intensity is often used to describe nonresidential development levels; but in a broader sense, intensity is used to express overall levels of both residential and nonresidential development types. In the City's Land Use Element, floor area ratio and building square footage are used as measures of nonresidential development intensity. Floor Area Ratio (FAR) represents the ratio between the total gross floor area of all buildings on a lot and the total area of that lot. FAR is determined by dividing the gross floor area of all buildings on a lot by the land area of that lot. For example, a 20,000 square foot building on a 40,000 square foot lot yields a FAR of 0.50:1. The FAR controls the intensity of use on a lot.

Table 2-2 Current General Plan Land Use Designations

General Plan Designation	Density/ Intensity	Parcel Count[1]	Acres (GIS)	% of Total Acres
Very Low Density Residential	0-2 du/ac	0	0	0
Low Density Residential	2-7 du/ac	13,976	2,351	21.9%
Low-Medium Density Residential	7-15 du/ac	2,221	920	8.6%
Medium Density Residential	15-25 du/ac	330	444	4.1%
High Density Residential	25-43 du/ac	44	16	0.2%
Commercial	1.0 FAR max	257	573	5.3%
Professional Office	1.2 FAR max	28	32	0.3%
Mixed-Use	43 du/ac and 1.2 FAR max	296	135	1.3%
Business Park	1.0 FAR max	192	355	3.3%
Light Industrial	0.60 FAR max	355	734	6.8%
Public Facility	1.2 FAR max	66	344	3.2%
Community Park/Open Space	0.40 FAR max	44	249	2.3%
Regional Park/Open Space	0.10 FAR max	156	1,950	18.2%
Open Space	0.40 FAR max	638	996	9.3%
Transportation Corridor	0.20 FAR max	60	101	0.9%
Roadways (parcelized and non-parcelized)	-	-	1,542	14.4%
Total	-	18,663	10,742	100%

1. Count includes whole or split pieces of parcels.

Source: City Lake Forest GIS Dataset, De Novo Planning Group 2018.

The Current General Plan land use designations include a reference to maximum density and intensity, depending on the use. In addition, nonresidential designations include an "effective intensity of development". These effective levels of development represent an anticipated overall density and intensity of development for Lake Forest and are, therefore, less than the absolute maximum allowed for an individual parcel of land. For various reasons, many parcels in the community have not been developed to their maximum density or intensity and, in the future, maximum development as described in the General Plan can be expected to occur only on a limited number of parcels.

Residential Land Uses

Very Low Density Residential (0-2 du/ac): The Very Low Density Residential land use designation provides for the development of very low density single-family dwellings and accessory buildings. Uses such as second single-family structures, guest houses, churches, public or private schools, family day care homes, public facilities, private recreation facilities, and others that are determined to be compatible with and oriented toward serving the needs of very low density single-family neighborhoods may also be allowed.

The designation allows a maximum of two single-family dwelling units per net acre of land. Development under this land use designation should maintain a very low density character. The average population for this residential designation is approximately 2.91 persons per dwelling unit, which represents a population density range for this land use designation of 1 to 6 persons per acre. The maximum density of this land use category may be exceeded to complement General Plan Housing Element policy in accordance with the density bonus provisions of Section 65915 of the California Government Code, as amended in January 1, 2005 under SB 1818.

Low Density Residential (2-7 du/ac): The Low Density Residential land use designation provides for the development of low density single-family dwellings and accessory buildings. Uses such as second single-family structures, mobile homes, guest houses, churches, public or private schools, family day care homes, public facilities, private recreation facilities, and others that are determined to be compatible with and oriented toward serving the needs of low density single-family neighborhoods may also be allowed.

The designation allows a maximum of seven single-family dwelling units per net acre of land. Development under this land use designation should maintain a low density character. The average population for this residential designation is approximately 2.91 persons per dwelling unit, which represents a population density range for this land use designation of 6 to 21 persons per acre. The maximum density of this land use category may be exceeded to complement General Plan Housing Element policy in accordance with the density bonus provisions of Section 65915 of the California Government Code, as amended in January 1, 2005 under SB 1818.

Low-Medium Density Residential (7-15 du/ac): The Low Medium Density Residential land use designation provides for the development of a wide range of living accommodations, including single-family detached and attached dwelling units, mobile homes, duplexes, and multiple-family dwellings, such as townhomes, condominiums, apartments, and cooperatives. Uses such as churches, public or private schools, community care facilities, family day care homes, public facilities, private recreation facilities, and others that are determined to be compatible with and oriented toward serving the needs of low medium density neighborhoods may also be allowed.

The designation allows a maximum of 15 dwelling units per net acre of land. Development under this land use designation should maintain a low medium density character. The average population for this residential designation is approximately 2.91 persons per dwelling unit, which represents a population density range for this land use designation of 21 to 44 persons per acre. The maximum density of this land use category may be exceeded to complement General Plan Housing Element policy in accordance with the density bonus provisions of Section 65915 of the California Government Code, as amended in January 1, 2005 under SB 1818.

Medium Density Residential (15-25 du/ac): The Medium Density Residential land use designation provides for the development of a wide range of living accommodations, including single-family dwelling units, and multiple-family dwellings, such as townhomes, condominiums, apartments, and cooperatives. Uses such as churches, public or private schools, community care facilities, family day care homes, public facilities, private recreation facilities, and others that are determined to be compatible with and oriented toward serving the needs of medium density neighborhoods may also be allowed.

The designation allows a maximum of 25 dwelling units per net acre of land. Development under this land use designation should maintain a medium density character. The average population for this residential designation is approximately 2.91 persons per dwelling unit, which represents a population density range for this land use designation of 44 to 73 persons per acre. The maximum density of this land use category may be exceeded to complement General Plan Housing Element policy in accordance with the density bonus provisions of Section 65915 of the California Government Code, as amended in January 1, 2005 under SB 1818.

High Density Residential (25-43 du/ac): The High Density Residential land use designation provides for the development of a wide range of living accommodations, including single-family dwelling units and multiple-family dwellings, such as townhomes, condominiums, apartments, and cooperatives. Uses such as churches, public and private schools, community care facilities, family day care homes, public facilities, private recreation facilities, and others that are determined to be compatible with and oriented toward serving the needs of high density neighborhoods may also be allowed.

The designation allows a maximum of 43 dwelling units per net acre of land. Development under this land use designation should maintain a high density character. The average population for this residential designation is approximately 2.91 persons per dwelling unit, which represents a population density range for this land use designation of 73 to 125 persons per acre. The maximum density of this land use category may be exceeded to complement General Plan Housing Element policy in accordance with the density bonus provisions of Section 65915 of the California Government Code, as amended in January 1, 2005 under SB 1818.

Non-residential Land Uses

Commercial (1.0 max FAR): The Commercial land use designation provides for a variety of retail, professional office, and service oriented business activities, many of which are roadway oriented and serve a community wide area and population.

Other uses that are determined to be compatible with the primary uses may also be allowed. Commercial land uses serve local, as well as broader market areas and generally include professional and business offices, retail and commercial services, and community facilities. Site development standards for this land use designation encourage large projects and provide for adequate setbacks, parking, landscaping, buffering from residential land use areas, and other features, which create well designed, efficient, and attractive projects. The effective intensity of development is a floor area ratio of 0.4:1 and the maximum intensity of development is a floor area ratio of 1.0:1.

Professional Office (1.2 max FAR): The Professional Office designation provides for professional offices and other supporting uses. These uses include professional, legal, medical, general financial, administrative, corporate, and general business offices, as well as supportive commercial uses such as restaurants, medical services, community facilities, and similar uses, which together create concentrations of office employment or community activity. Also included are small convenience or service commercial activities intended to meet the needs of the on site employee population. Other uses that are determined to be compatible with the primary uses may also be allowed. The effective intensity of development is a floor area ratio of 0.5:1 and the maximum intensity of development is a floor area ratio of 1.2:1.

Mixed-Use (43 du/ac and 1.2 max FAR): The Mixed Use designation provides opportunities for mixtures of commercial, office, and residential uses in the same building, on the same parcel of land, or within the same area. Allowable uses include those identified in the Commercial and Professional Office designations, and the Low-Medium Density, Medium Density, and High Density Residential designations. When mixtures of uses occur in the same building, retail uses or offices are usually located on the ground floor with residential uses above. The mixed uses are generally located in areas where multiple activities and pedestrian orientation are considered to be desirable objectives. The expected intensity of nonresidential development is a floor area ratio of 0.5:1 and the maximum intensity of development is a floor area ratio of 1.2:1. The expected density is 35 dwelling units per net acre of land and a maximum density of 43 dwelling units per net acre of land is allowed for residential projects.

Business Park (1.0 max FAR): The Business Park designation provides opportunities for a mixture of all those uses allowed under the Commercial, Professional Office, and Light Industrial land use designations. The effective intensity of development is a floor area ratio of 0.35:1 and the maximum intensity of development is a floor area ratio of 1.0:1

Light Industrial (0.60 max FAR): The Light Industrial designation provides for a variety of light industrial uses that are non-polluting and which can co-exist with surrounding land uses and which do not in their maintenance, assembly, manufacturing or operations create smoke, gas, dust, sound, vibration, soot or glare to any degree which might be obnoxious or offensive to persons residing or conducting business in the City.

Allowable uses include: wholesale businesses, light manufacturing and processing, research and development uses, warehousing and storage, distribution and sales, high technology production, retail sales, and related uses. Other uses that are determined to be compatible with the primary uses may also be allowed. The effective intensity of development is a floor area ratio of 0.35:1 and the maximum intensity of development is a floor area ratio of 0.6:1.

Public Facility (1.2 max FAR): The Public Facility designation includes a wide range of public uses distributed throughout the community, such as schools, government offices and facilities, public utilities, libraries, fire stations, sheriff sub stations, cemeteries, hospitals, and other public uses. The effective intensity of development is a floor area ratio of 0.2:1 and the maximum intensity of development is a floor area ratio of 1.2:1.

Community Park/Open Space (0.40 max FAR): The Community Park/Open Space designation provides for public recreational uses designed to meet the active and passive recreational needs of the community. This designation includes all public parkland, open space, and associated public recreational activities, such as indoor and outdoor sports/athletic facilities, museums, theaters, and similar uses. The effective intensity of development is a floor area ratio of 0.1:1 and the maximum intensity of development is a floor area ratio of 0.4:1.

Regional Park/Open Space (0.10 max FAR): The Regional Park/Open Space designation provides for public recreational uses designed to meet the active and passive recreational needs of the community and other nearby areas in the region. This designation includes the Whiting Ranch Regional Wilderness Park and other County of Orange open space along portions of Serrano Creek and Aliso Creek. This designation applies to land that is generally maintained as natural open space with minimal improvements. The effective intensity of development is a floor area ratio of 0.001:1 and the maximum intensity of development is a floor area ratio of 0.1:1.

Open Space (0.40 max FAR): The Open Space designation provides for private open space designed to meet the active and passive recreational needs of the community. This designation includes open space that is held under private ownership, and includes facilities for active and passive recreational activities. Open Space activities include indoor and outdoor sports/athletic facilities, lakes, club houses, meeting rooms, outdoor gathering areas, and similar uses, as well as ornamentally landscaped and natural landscaped open areas. The effective intensity of development is a floor area ratio of 1:0.5 and the maximum intensity of development is a floor area ratio of 0.4:1.

Transportation Corridor (0.20 max FAR): The Transportation Corridor designation applies to the land within the corridors of the San Diego Freeway (Interstate 5), the Foothill Transportation Corridor, and the Southern California Regional Rail Authority, and other arterial highways. Lands within these corridors are reserved for transportation purposes as the primary use. Secondary uses, such as open space linkages and landscaped areas, public and private parking areas, and other transportation related activities and facilities are also allowed. The effective intensity of development is a floor area ratio of .01:1 and the maximum intensity of development is a floor area ratio of 0.2:1.

Land Use Overlays

Mineral Resource Overlay: The Mineral Resource Overlay designation applies to areas classified as an important Mineral Resource (MRZ-2) by the State Department of Conservation—Division of Mines and Geology. This overlay provides for the management and utilization of mineral resources on an interim basis. The underlying land use designation represents the future planned use of the land following reclamation from mining. There is no intensity of development for this overlay, other than the intensity of development for the underlying land use designation.

Business Development Overlay: The Business Development Overlay designation applies to areas designated for Commercial, Professional Office, Business Park, and Light Industrial land uses. The overlay provides for a balance of land uses required for the continued fiscal well-being of the community. Private property owners of land subject to the Business Development Overlay must prove that proposed land use designation changes will not result in a loss of future net revenue for the City. The underlying land use designation represents the future planned use of the land, and there is no intensity of development of this overlay, other than the intensity of development for the underlying land use designation.

Public Facilities Overlay: The Public Facilities Overlay designation applies to areas designated for Commercial, Business Park, and Residential land uses. The overlay includes properties which may be acquired by the City for public facilities. The underlying land use designation represents the planned uses of the land should public facilities not occur at these locations in whole or in part. The Public Facilities Overlay is placed on properties with General Plan Land Use designations that would allow public facilities and parks. The intent of this overlay is to indicate potential sites for future public facilities, government buildings, and community parks.

2.3 EXISTING LAND USE PATTERNS (ON-THE-GROUND)

When discussing land use, it is important to distinguish between planned land uses and existing land uses. The Current General Plan land use designations identify the long-term planned use of land, but do not necessarily present a complete picture of existing land uses. The Orange County Assessor's office maintains a database of existing "on-the-ground" land uses on individual parcels. This information is used as the basis for property tax assessments and is summarized in Table 2-3 and depicted on Figure 2-3.

Table 2-3 Existing Land Uses

Category	Parcel Count	Acres	% of Total Acres
Open-Space and Recreation	695	3,174	35.0%
Single Family Residential	15,230	2,247	24.5%
Roadways (parcelized and non-parcelized)	130	1,718	16.0%
Vacant[1]	510	800	8.7%
Multi-Family Residential	644	676	7.4%
Commercial and Services	323	502	5.5%
Industrial	177	435	5.0%
General Office	110	215	2.4%
Mixed Commercial and Industrial	206	191	2.1%
Agriculture	18	192	2.1%
Education	17	156	1.7%
Facilities	33	148	1.6%
Transportation, Communication, and Utilities	39	118	1.3%
Mobile Homes and Trailer Parks	11	92	1.0%
Water	42	70	0.77%
Mixed Residential	80	7	0.08%
Grand Total	18,265	10,742	100%

1. According to the Orange County Assessor's Office, a number of currently approved and under development projects are identified as "Vacant". These projects include the new Civic Center and portions of Baker Ranch and Portola Hills. When these areas are excluded from the qualification of vacant land, it becomes clear that there is very little vacant unentitled/unplanned land left in the City of Lake Forest.

Source: Orange County Assessor's office, 2018; De Novo Planning Group, 2018

Residential

Residential uses in Lake Forest include Single-Family houses, Multi-Family developments, Mobile Homes and Trailer Parks and Mixed Residential. Single Family Residential is the second most dominant land use type in the City, accounting for 24.5% of the City's land area. Single Family Residential land uses are located throughout the City, as shown on Figure 2-3.

Multi-family Residential refers to parcels that contain more than one housing unit, and attached structures including duplexes, triplexes, fourplexes, condominiums, townhomes, and apartment buildings. The predominate type of multi-family developments in Lake Forest include Low-Rise Apartments, Condos, and Townhomes.

Mobile homes and Trailer Parks account for 92 acres in Lake Forest and only make up 1% of all acreage in the City. Similarly, Mixed Residential only makes up .08% of all City acreage and consists of 80 acres.

Commercial & Services

Commercial and Services uses make up 5.5% (502 acres) of total acres within the City. Commercial uses, as identified by the County Assessor, are varied. The predominate type of commercial land use, based on acreage, is Retail Centers with off-street parking other than strip commercial (268 acres). Retail Strip Development is the second most dominant commercial land use at 152 acres. As shown on Figure 2-3, many of the City's commercial uses are located along and around the City's major transportation corridors. Mixed Commercial and Industrial is also present within the City of Lake Forest, designated for 191 acres.

Industrial

Industrial Manufacturing exists across a total of 435 acres, making up 5% of the City's land uses. Industrial Manufacturing uses include Heavy Industrial (7 acres), Light Industrial (12 acres), Manufacturing (0.19 acres), Manufacturing, Assembly, Industrial Services (404 acres), and Research and Development (10 acres). Manufacturing, Assembly, and Industrial Services makes up a predominant amount of land use designated as Industrial within Lake Forest, accounting for 93 percent. Figure 2-3 shows Industrial uses throughout the City.

Office

Offices uses include General Office Use and Low and Medium Rise Office Use in Lake Forest. Office development includes approximately 215 acres of land. Office uses are located throughout the City as shown on Figure 2-3.

Education

Education uses include Educational Institutions, Elementary Schools, Pre-Schools & Day Care Centers, and Senior High Schools totaling 155 acres. Elementary Schools represent the most development in the education category with 112 acres of land. The category with the second highest amount of development is Senior High Schools, which includes 40 acres. Education uses are located throughout the City as shown on Figure 2-3.

Agriculture Land

The Agriculture land category includes general agricultural uses, horse ranches, nurseries, and other agriculture. Agriculture land makes up 2.1% (191 acres) of the City's total acreage.

Open Space and Recreation

The Open Space and Recreation category of land uses is the most dominant land use category within Lake Forest. Open Space and Recreation accounts for 35% (3,173 acres) of all land acreage. Open Space and Recreation includes Cemeteries, Golf Courses, Local Parks and Recreation, Other Open Space and Recreation, Regional Parks and Recreation. Regional Parks and Recreation is the predominant Open Space and Recreation land use, taking up 48% of the acres within the entire category.

Transportation Communication and Utilities

The Transportation Communication and Utilities category includes Communication Facilities, Electrical Power Facilities, Freeways and Major Roads, Improved Flood Waterways and Structures, Liquid Waste Disposal Facilities, Railroads, Water Storage Facilities, and Water Transfer Facilities. The Transportation Communication and Utilities uses includes 117 acres within the City.

Vacant Lands

Vacant Land is generally unused land. Vacant Lands include 800 acres of land on 510 parcels, and accounts for approximately 8.7% of the total assessed area of the City. Lands in this category are typical void of structures. Note that the Assessor's Office has continued to identify the new Civic Center and areas of Baker Ranch and Portola Hills, which are currently under development, as "Vacant". When these areas are removed from the summary of available "Vacant" land, the total amount of Vacant land is considerably less.

Facilities

The category of Facilities includes Fire Stations, Government Offices, Public Facilities, Religious Facilities, Special Care Facilities, and Other Pubic Facilities. 147 acres of land across 33 parcels in Lake Forest are designated for Facilities. Religious Facilities is the most dominant subcategory of Facilities within Lake Forest, making up approximately 86% of Facility acreage.

2.4 LOCAL PLANNING CONTEXT

As the City of Lake Forest embarks on its General Plan Update, it must consider its relationship to other ongoing projects within the City and in neighboring jurisdictions. To assist with this consideration, the tables in this section present information on known projects that are currently under review in the City of Lake Forest and in the cities of Mission Viejo, Laguna Hills, and Irvine (note that there are currently no known projects under review in the City of Laguna Woods). For the purposes of this analysis, the tables below summarize projects which involve residential and nonresidential development, which includes the construction of new residential units or building square footage and/or significant expansion or redevelopment of a current project. Site permit applications and minor discretionary review projects are not included.

Table 2-4 City of Lake Forest Projects Under Review

Project Name	Location	Description
Saddleback Church Expansion	1 Saddleback Parkway	New 92,391 SF worship center, addition of 26,924 SF classroom, and associated site improvements
Amara at Serrano Summit	S of Commercecentre Dr, between Civic Center Dr and Serrano Summit Dr	101 single family homes in conjunction with TTM 18162 in the previously-approved Serrano Summit residential development
Soria at Serrano Summit	S of Commercecenter Dr, between Civic Center Dr and Serrano Summit Dr	108 townhome condominium homes in conjunction with TTM 18162 in the previously-approved Serrano Summit residential development
Teresina Development	North of Trabuco Road, East of Bake Parkway, northern end of Peachwood	Amendment to Site Development Permit 2008-11 for 85 single family homes in Tract 15594
Coffee Bean	22441 El Toro Rd	New 1,710 SF drive-through restaurant
Boys and Girls Club	N/A	Request to identify requirements for locating at Boys and Girls Club at El Toro Community Park
Great Scott Contractor's Storage Yard	20865 Canada Rd	GPA and Zone Change from OS to LI to establish a contractor storage yard use
Worship Uses	23061 and 23071 El Toro Rd	Two new 3,312 SF single-story buildings to be used as places of worship
Nakase Nursery Redevelopment	APN 612-221-01 at Bake Parkway and Rancho Parkway	Application to allow development of 122-acre site into a mixed-use development with an elementary school, senior affordable rental housing, parks, open space, 4-5 residential products ranging from 5-13 du/ac with approximately 600-800 units.

Source: City of Lake Forest, August 2018

Table 2-5 City of Mission Viejo Projects Under Review

Project Name	Location	Description
Greenstreet	28662 Marguerite Parkway	Commercial retail development of 17,223 SF, approved and under construction
Skyridge	East of El Toro, North of SR-241	Residential - Single Family Homes with 84 units on 28.5 acres, approved and under construction

Project Name	Location	Description
NCA Medical Center	27799 Medical Center Road	108,791 SF medical hospital building, approved and under construction
Crown Valley Vista	27750 Crown Valley	9,623 SF commercial retail development, approved and construction completed
Hampton Inn	28682 Marguerite Parkway	61,241 SF hotel, approved and construction completed
Core Area Vision Plan	Core Area	Vision plan to redevelop the core area of the City into a mixed-use activity center.

Sources: City of Mission Viejo website, August 2018

Table 2-6 City of Laguna Hills Projects Under Review

Project Name	Location	Description
ActivCare Laguna Hills	24888 Alicia Parkway	12 bed assisted living facility

Sources: City of Laguna Hills website, August 2018

Table 2-7 City of Irvine Projects Under Review

Project Name	Location	Description
Portola Springs Neighborhood 5	Portola Springs	168 units (SFR)
Sterling America Investments	2 Osborn Street in Woodbridge	46,800 sf medical office building
Witherspoon Office Buildings	2 & 6 Witherspoon	Add 5,000 sf to the TGS office buildings
Rockefeller Development	Central Park West	285 residential condominium units and 10,000 sf of retail
Millikan Residential Project	16542 Millikan	209 residential units
Pistoia Apartments	17422 Derian Avenue	371 units
Gillette Townhouses	17822 Gillette	137 townhouse units
Gillette Apartments	17832 and 17840 Gillette	336 apartment units
Milani Apartments	18831 Von Karman Avenue	287 apartment units
Diamond Jamboree Center	2701 Alton Parkway	24,618 sf of additional restaurant and retail development
360 Fusion Apartments	2852 McGraw	280 residential units
Park Place	3333 Michelson Drive	198,739 sf office building
Los Olivos	Irvine Center Drive and Bake Parkway	845 apartment units
Sand Canyon and Nightmist	Sand Canyon and Nightmist	80 apartment units

Sources: City of Irvine, Irvine Current Discretionary Projects Under Review, August 2018

Land Uses Surrounding the City of Lake Forest

The City of Lake Forest is surrounded by several local jurisdictions including the cities of Mission Viejo, Laguna Woods, Irvine and unincorporated Orange County. The following land uses are identified along common boundaries and areas near Lake Forest:

- City of Mission Viejo
  - Recreation
  - Business Park/Industrial
  - Commercial Highway
  - High Density Residential
  - Very Low Density Residential
  - Community Facility
  - Commercial Neighborhood
- City of Laguna Hills
  - Freeway Commercial
  - Village Commercial
- City of Laguna Woods
  - Adult Single and Multiple Family Residential
  - Community Facilities
  - Neighborhood Commercial
- City of Irvine
  - Preservation
  - Recreation
  - Public Facilities
  - Research and Industrial
  - Community Commercial
  - Major Highway
- Unincorporated County of Orange
  - General Agriculture
  - Residential Hillside Estates
  - Estates
  - Open Space

2.5 COMMUNITY CHARACTER

The community character of Lake Forest is defined by its special natural environment, family-friendly residential atmosphere, and gathering places like the Sports Park and upcoming Civic Center. People are attached to their communities through the look and feel of a place; some things which are tangible while other qualities are intangible. The City's General Plan will consider the character of Lake Forest and identify goals and policies to maintain the City's high quality of life while looking towards the needs of future generations. Some key considerations related to the formation of Lake Forest's community character include its elevation/topography, the history and quality of its residential neighborhoods (including its Planned Communities), and its visual resources. The first two of these topics are described below, while the City's visual resources, considered a "natural resource" for the City of Lake Forest, are described in more detail in Chapter 9.

Elevation

The elevation in Lake Forest traverses almost 1,500 feet, starting from a low point along I-5 of 260 feet above sea level and rising to 1,752 feet towards Saddleback Mountain. The elevation change is more gradual between I-5 and 241, changing just 500 feet over this large area, while the greatest elevation change occurs north of 241 where elevations rise quickly. This environment creates beautiful views to the mountains and ocean throughout the community. However, the City's unique and undulating topography can pose challenges when planning safety for land use development and viewshed preservation. Careful attention must be paid to preserving and protecting the City's natural environment and recognizing the opportunities that come with changing elevations and slopes. These qualities can also make walking and biking along certain steep routes difficult, a topic which is discussed in greater detail in Chapter 4. Figure 2-4 illustrates the City's topography, Figure 2-5 highlights its elevation, and Figure 2-6 illustrates areas of significant slope percentages.

Residential Areas and Planned Communities

As described earlier in this Chapter, the City of Lake Forest is primarily a residential community with well-established neighborhoods. Lake Forest is home to a number of Planned Communities which significantly shape the City's existing land use pattern and built environment through their own individual community design, monumentation, architecture, and amenities. These areas, along with the City's pattern of growth, are illustrated in Figure 2-7. Early in the area's development, residential neighborhoods first appeared in the El Toro area near I-5. While many residential areas in Lake Forest have homeowners associations (HOAs), many of the community's oldest neighborhoods do not. Residential areas in Lake Forest with and without HOAs are illustrated in Figure 2-8. Some residential areas without HOAs may be multi-family for-rent developments that have their own private maintenance organization.

Age of Structures

Most of the City's housing stock located south of Trabuco Road was developed in the 1950s-1970s, with the oldest homes being located primarily around Muirlands Boulevard and El Toro Road. Houses north of Trabuco Road, including the areas of Foothill Ranch and Portola Hills annexed by the City in the early 2000s, were built later as residential development moved up and away from I-5 and easier access was provided by the Foothill Transportation Corridor. Older housing units are more likely to be in need of repair, as well as focused maintence and neighborhood enhancement goals, policies, and implementation strategies. The median age of the City's residential homes is illustrated based on current Census information in Figure 2-9.

2.6 REFERENCES

The primary sources of data referenced for this section are the following:

American Community Survey, US Census, 2016.

City of Lake Forest. 1992. City of Lake Forest General Plan and associated amendments from 1992-2018. Includes Housing Element Adopted January 2014.

City of Lake Forest. Lake Forest Municipal Code. Codified through Ordinance No. 165, § 1, originally adopted 1996, updated 2007.

Governor's Office of Planning and Research 2017 General Plan Guidelines. Available At: http://www.opr.ca.gov/planning/general-plan/

Orange County Airport Land Use Commission (ALUC) 2018, Airport Environs Land Use Plans. Available At: https://www.ocair.com/commissions/aluc/

Southern California Association of Governments, 2018. Existing land use parcel data provided by SCAG. August 2018.

Conceptual rendering of the new Lake Forest Civic Center

Figure 2-1. Planning Area

Legend

City of Lake Forest

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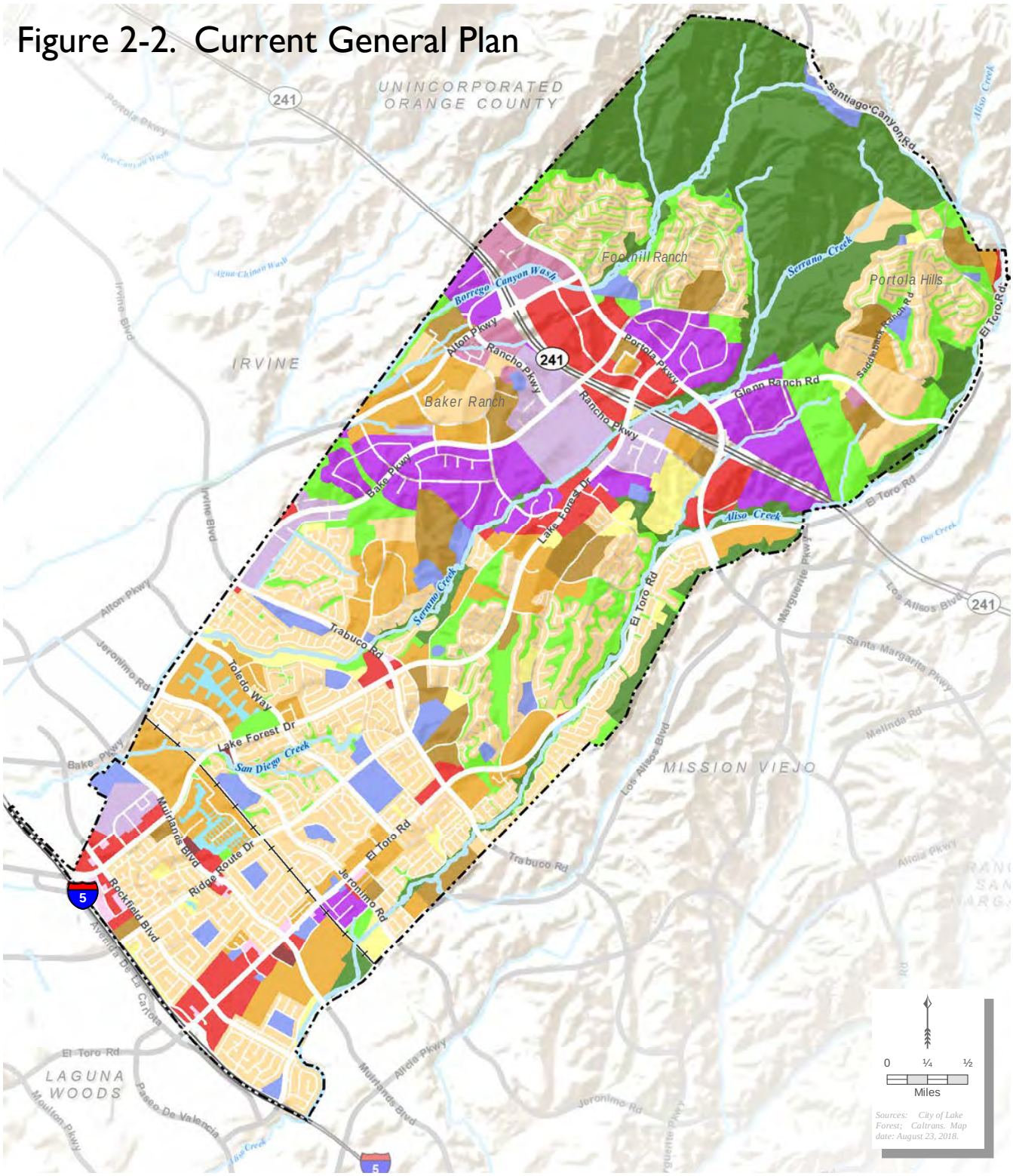
Figure 2-2. Current General Plan



Legend

- Low Density Residential
- Low-Medium Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Professional Office
- Mixed-Use
- Business Park
- Light Industrial
- Public Facility
- Community Park/Open Space
- Regional Park/Open Space
- Open Space
- Lake
- Transportation Corridor

Lake Forest 2040 — Our Vision. Our Plan.

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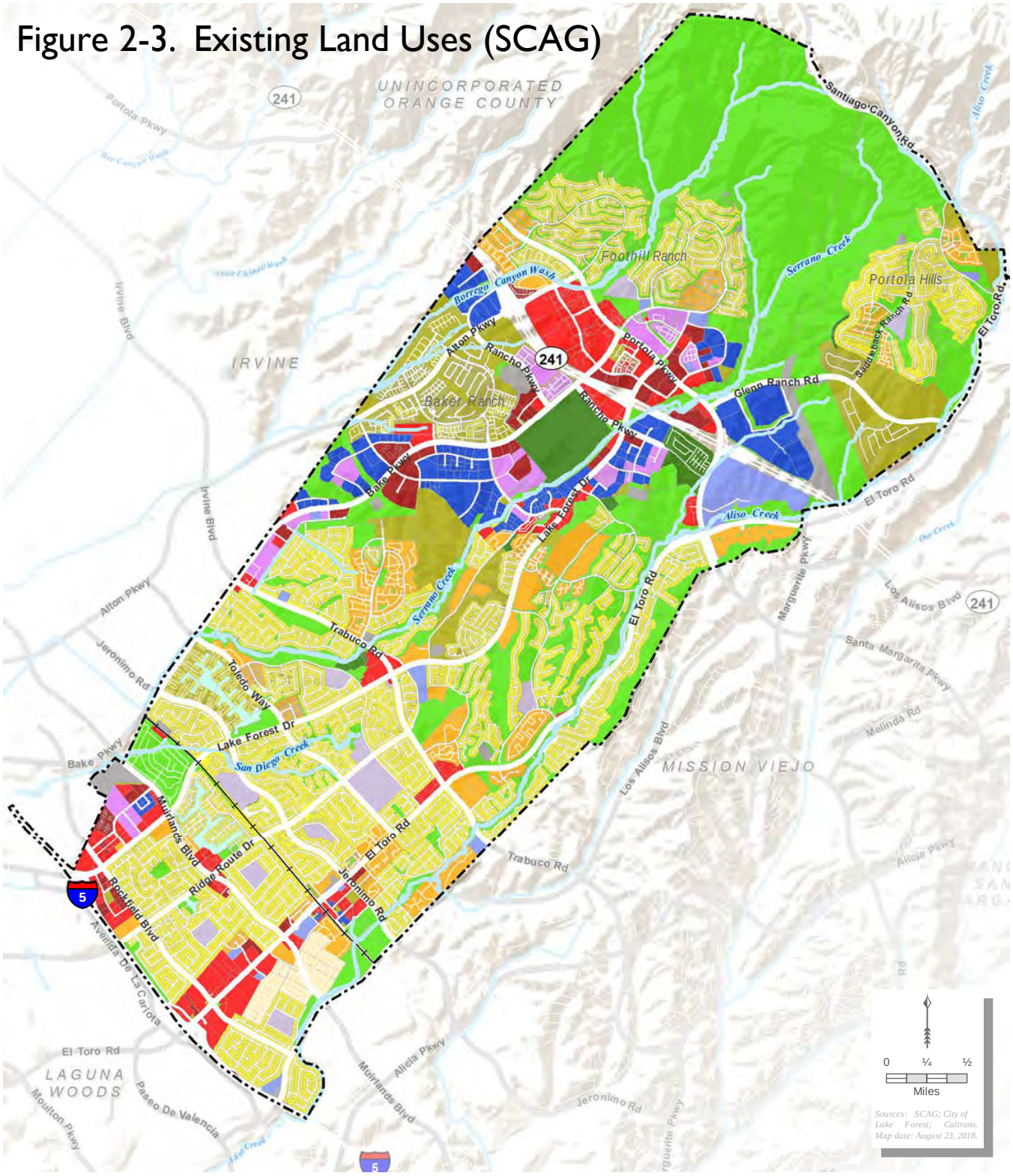
Figure 2-3. Existing Land Uses (SCAG)



- Single Family Residential
- Multi-Family Residential
- Mobile Homes and Trailer Parks
- Mixed Residential
- General Office
- Commercial and Services
- Facilities
- Education
- Industrial
- Transportation, Communications, and Utilities
- Mixed Commercial and Industrial
- Open Space and Recreation
- Agriculture
- Vacant
- Water

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Figure 2-4 Topography

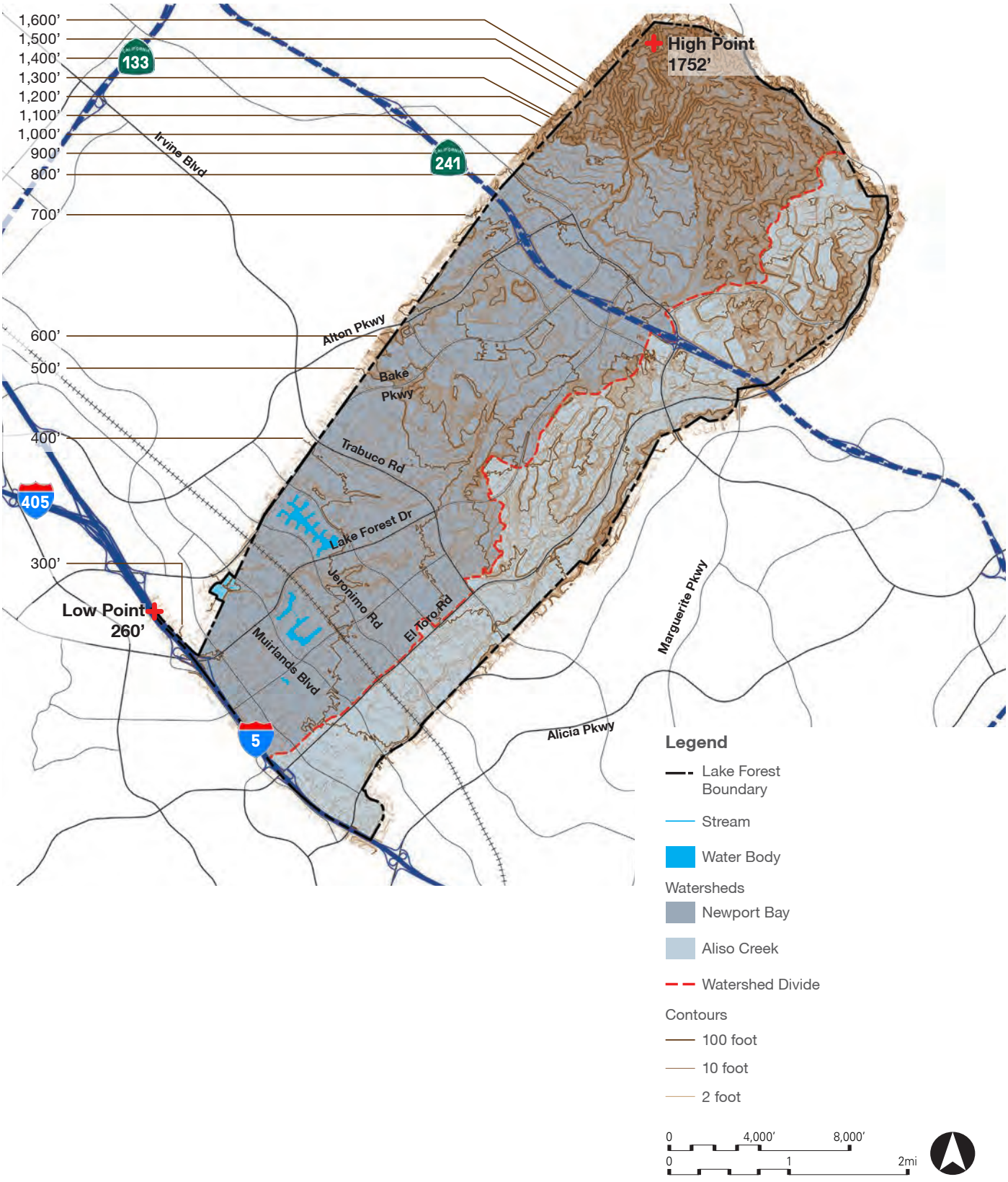

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Figure 2-5 Elevation

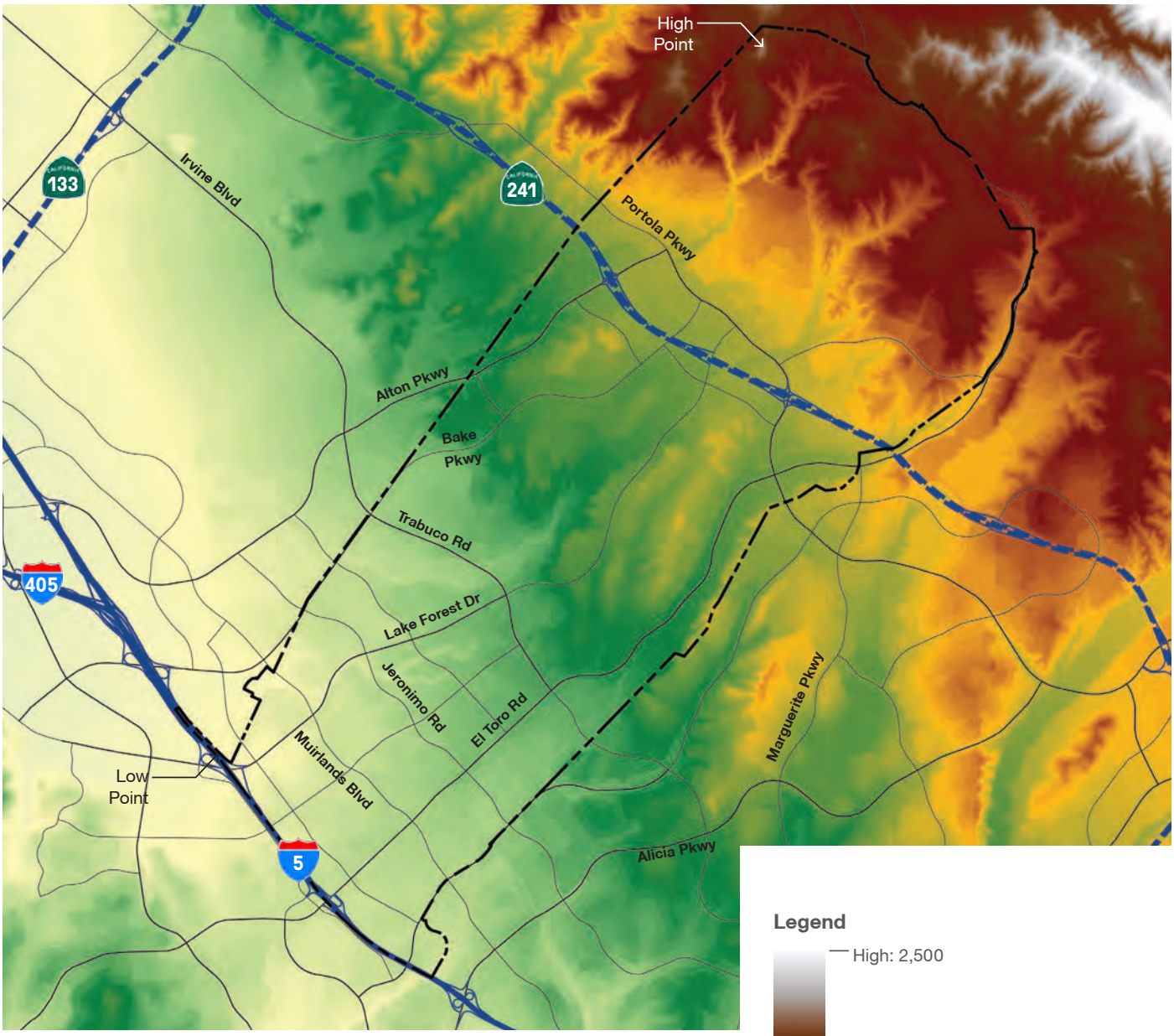

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Figure 2-6 Slope

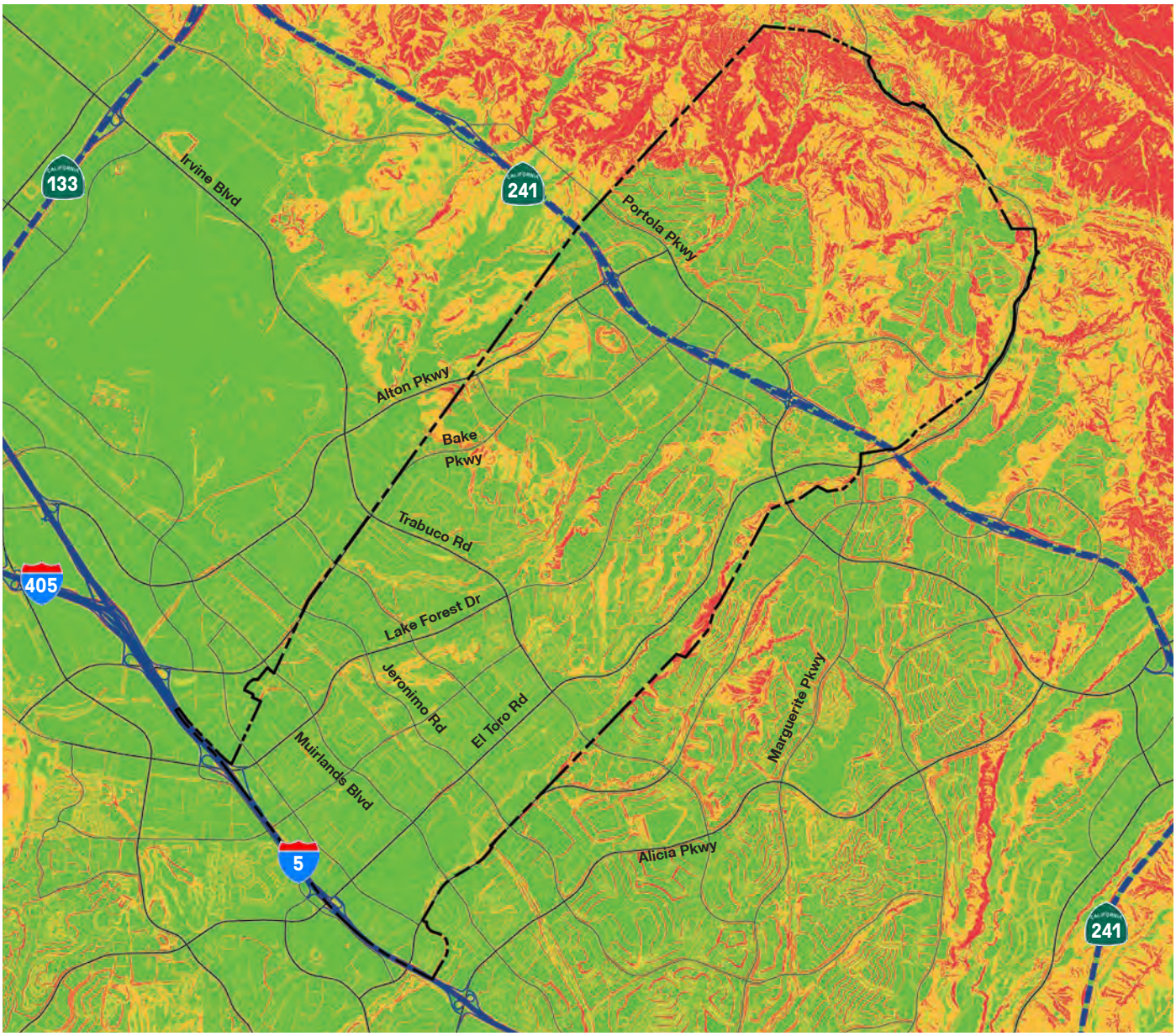

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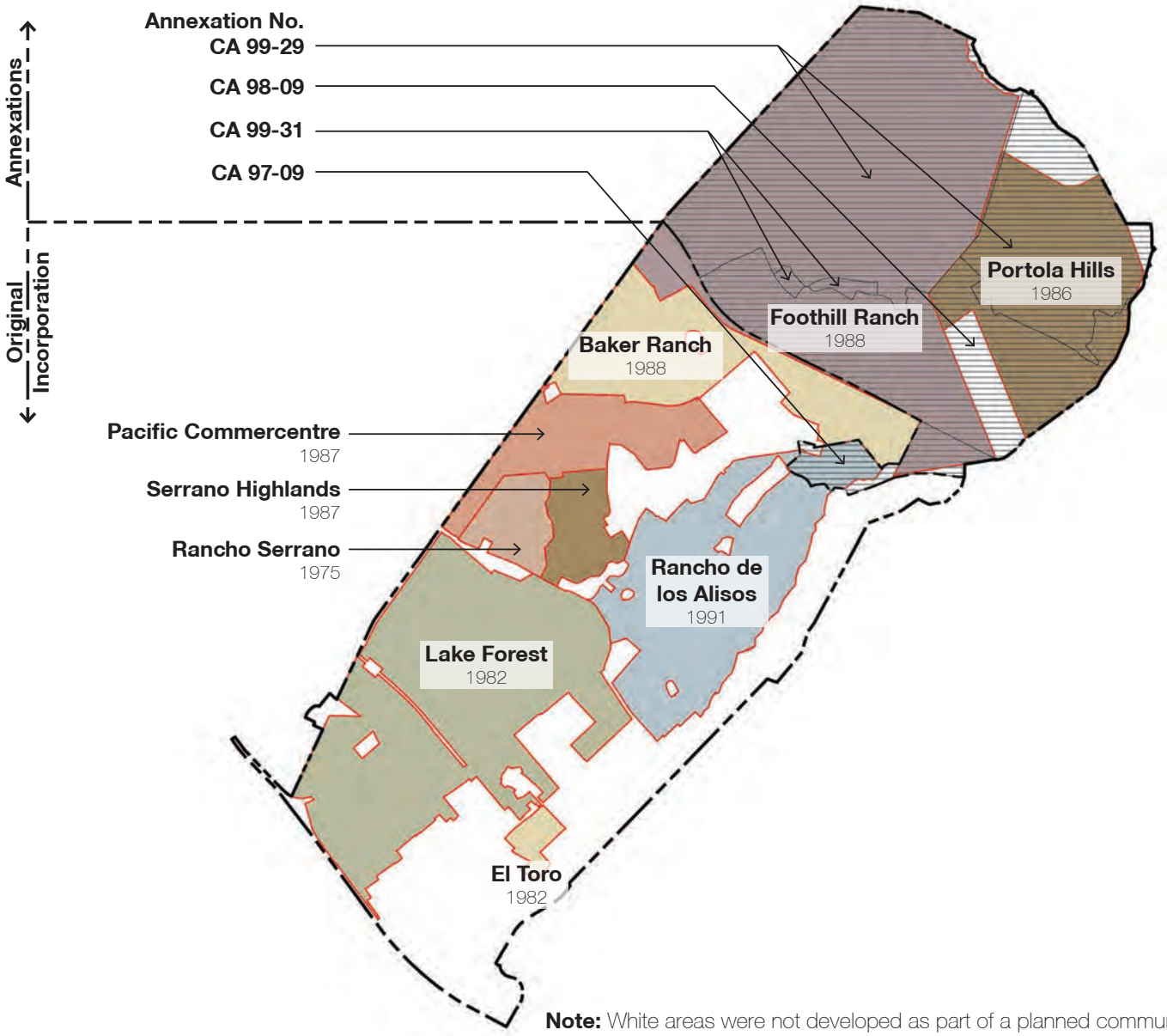
Figure 2-7 Planned Communities



Note: White areas were not developed as part of a planned community

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Figure 2-8 Residential Areas and Homeowners Associations

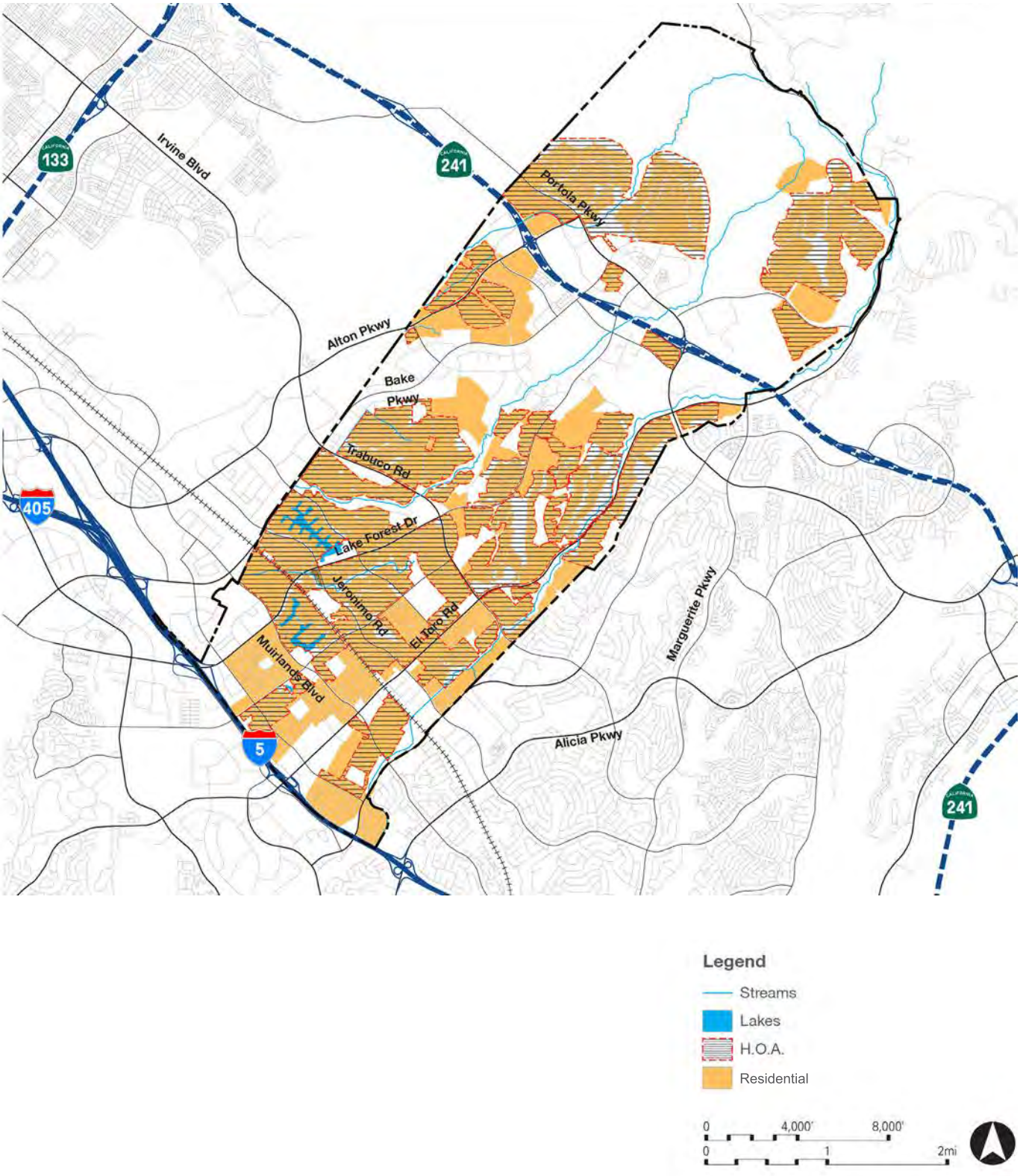

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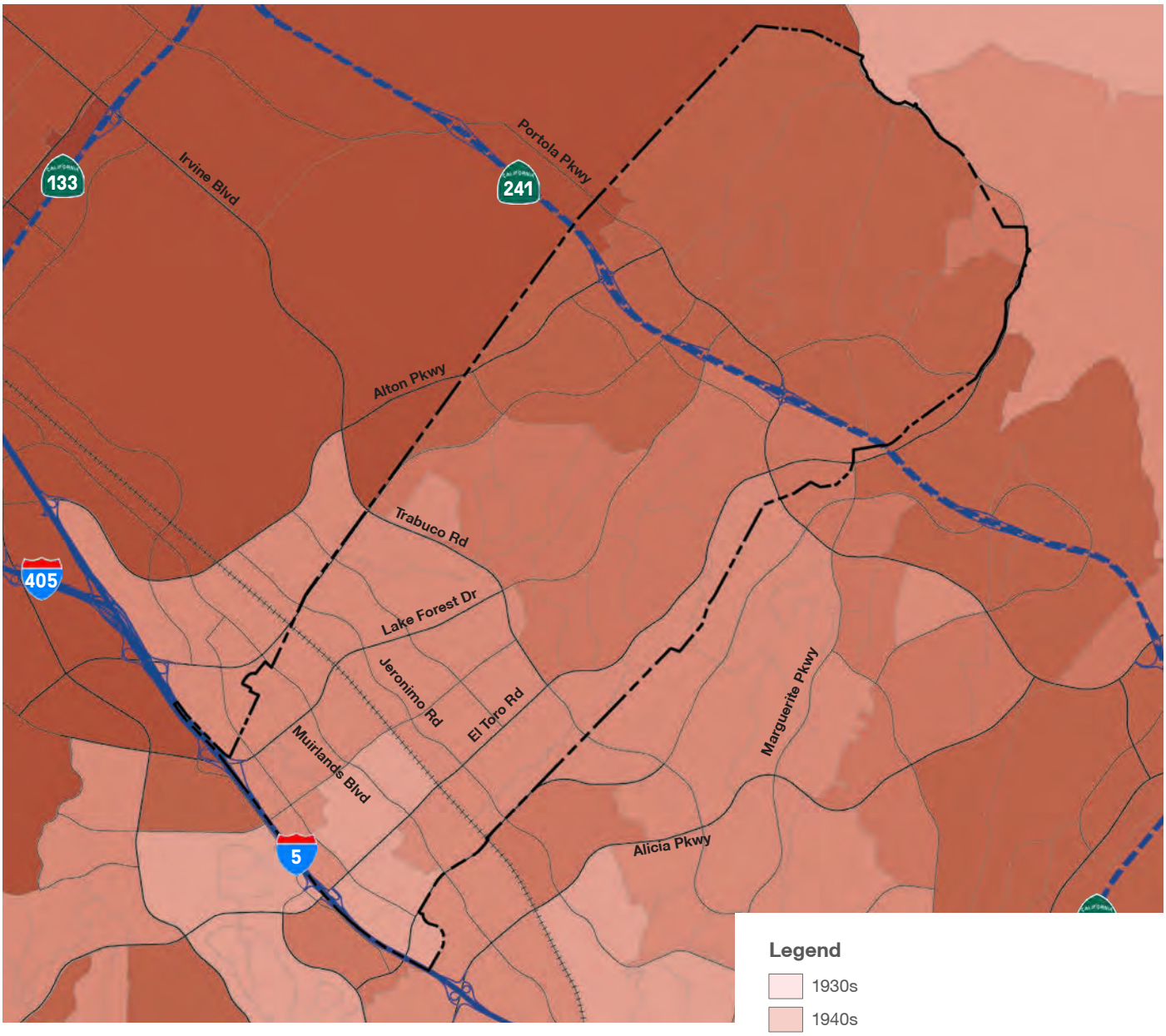
Figure 2-9 Median Age of Residential Unit



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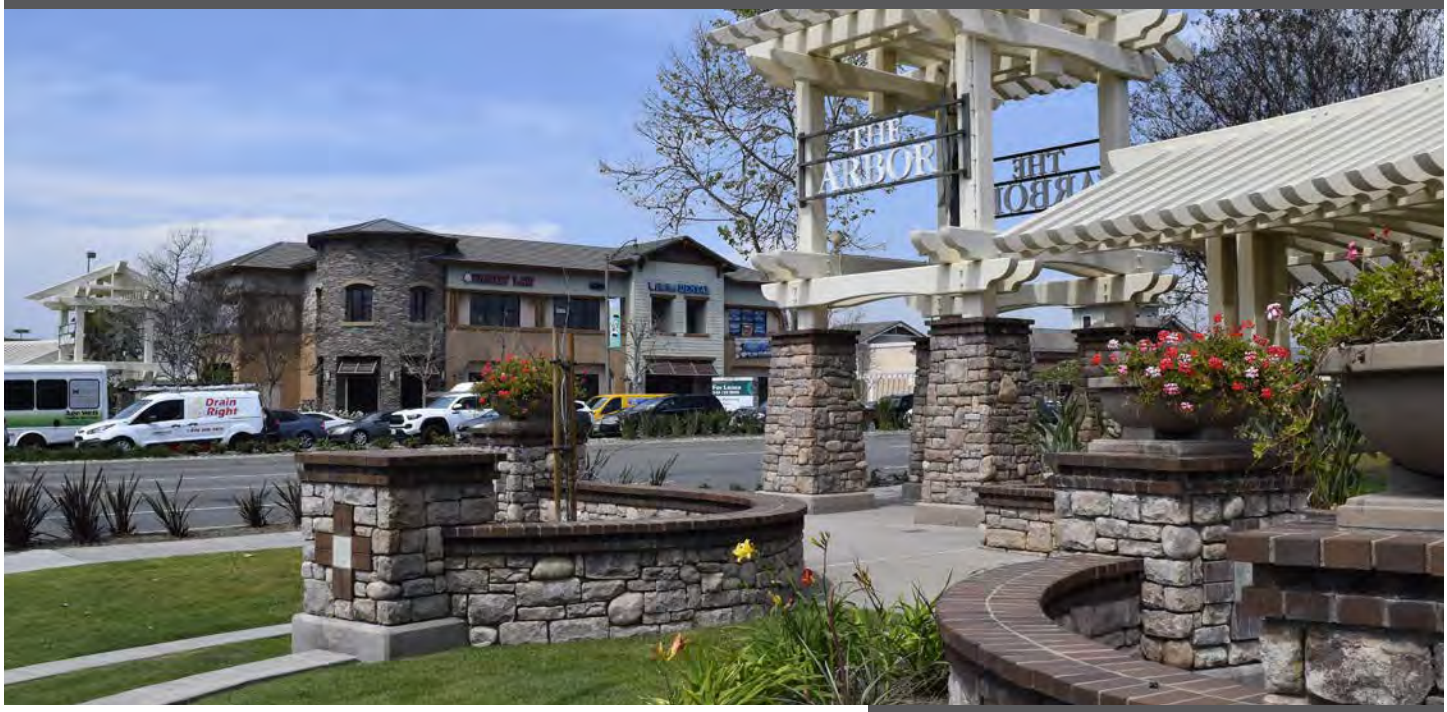
CHAPTER 3
DEMOGRAPHIC AND MARKET TRENDS



This Chapter provides a broad overview of key socio-economic, market, and fiscal trends relevant to the Lake Forest General Plan Update. The primary purpose of economic analysis in the context of the General Plan Update is to ensure that the goals, policies, and land use alternatives are realistic and achievable over the long term. Specifically, the economic analysis will inform the following inter-related General Plan issues:

- Economic Development: What economic sectors have the strongest growth potential in the City? How can the General Plan help promote growth in these sectors, assuming the City is interested in this outcome?
- Land Use (Re-) Development Feasibility: What are the market prospects for various real estate development and investment projects at locations or districts in the City being considered for growth and/or change?
- Economic Impacts of Land Use Policy: What are the economic and market implications of various policies or land use regulations being considered as part of the General Plan Update?
- Fiscal Sustainability: How will various General Plan land use alternatives or policies affect the long-term fiscal health of the City and its ability to effectively provide adequate public services and infrastructure?

This Chapter includes the following topics:

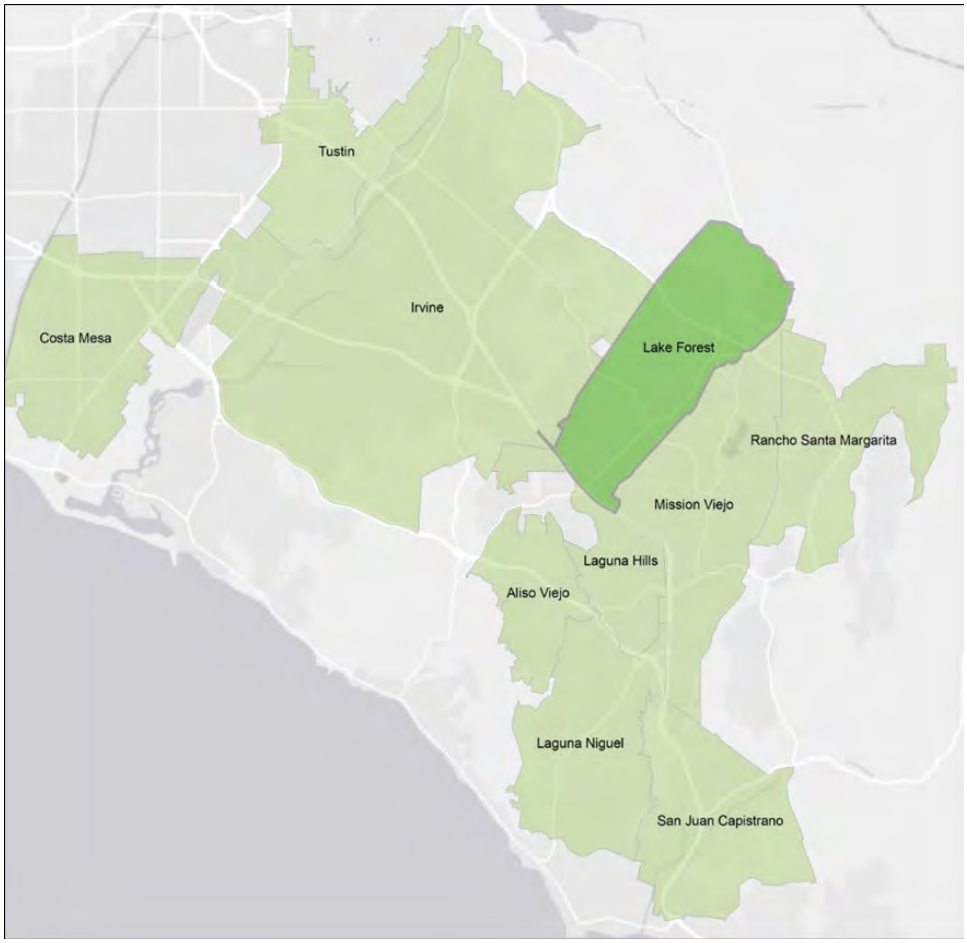
This baseline economic analysis is based on a review of publicly available data from a variety of sources as documented herein. The General Plan Consultant team also interviewed real estate brokers and other market and business professionals active in Lake Forest. Please note that some of the data reported in this Chapter may differ slightly from similar metrics contained in the City's most recent Economic Development Action Plan (FY 2018-2020). These discrepancies are primarily due to differences in the primary data sources used and the time frame associated with particular estimates; for example, the Action Plan relies heavily on ESRI, which is a commercial data source that translates existing data into 2018 figures based on a proprietary methodology.

Geographic Comparison Area

The key findings developed in this analysis relate to Lake Forest's local population and housing demographics and the City's position in a regional Trade Area. The Trade Area represents the immediate geography in which Lake Forest broadly competes for retail shoppers, home buyers and renters, commercial tenants, and office and manufacturing employers. Trade Area boundaries are geographical features that tend to focus a large share of regional circulation and economic activity within.

The City of Lake Forest is located in the Southern area of Orange County about 47 miles southeast of Los Angeles. The total land area is approximately 16 square miles. Lake Forest is within a ten-city Trade Area of as shown in Figure 3-1, which includes the cities of Aliso Viejo, Costa Mesa, Irvine, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, San Juan Capistrano, and Tustin. These Trade Area boundaries are defined based on geographical mobility considerations that tend to focus a large share of regional economic activity. These features include the Interstate 5 to the west and the Santa Ana Mountains to the east. The Trade Area represents the immediate geography in which Lake Forest broadly competes for retail shoppers, home renters and buyers, commercial tenants, and office and manufacturing employers. All economic activity relevant to Lake Forest is not contained within the Trade Area, however, as destinations for employment, specialty retail, and entertainment outside the boundaries also play a significant role in regional economics.

Figure 3-1 Map of Lake Forest and Trade Area



3.1 POPULATION AND HOUSEHOLD GROWTH

As shown in Table 3-1, Lake Forest has experienced significant growth over the last 15 years. A large amount of this growth is through development of most of the remaining "greenfield" areas within its sphere of influence and annexations of several large contiguous communities (e.g., Foothill Ranch and Portola Hills, which when annexed in 2000, had 3,500 and 2,200 units, respectively). Specifically, the City grew by 37 percent between 2000 and 2016, far outpacing both the County (10 percent) and the Trade Area defined above (24 percent). Lake Forest's population currently represents about 10 percent of the total for the Trade Area.

Table 3-1 Historic Population and Household Growth Trends

Category	Lake Forest			Trade Area [1]			Orange County		
	2000	2016	% Ch.	2000	2016	% Ch.	2000	2016	% Ch.
Total Population	58,707	80,658	37%	685,384	847,037	24%	2,846,289	3,132,211	10%
Total Households	20,008	27,551	38%	244,226	300,611	23%	935,287	1,017,012	9%

[1] Trade Area includes Lake Forest, Aliso Viejo, Costa Mesa, Irvine, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, San Juan Capistrano, Tustin

Source: U.S. Census; American Community Survey; Economic & Planning Systems

According to the Southern California Association of Governments (SCAG) projections[1] ,going forward Lake Forest growth will more closely mirror that of the broader Trade Area, as shown in Table 3-2. Specifically, SCAG projects a 16 percent Lake Forest population growth between 2012 and 2040, from 78,500 to 90,700 people, similar to both the Trade Area (18 percent) and County (13 percent). Likewise, employment growth in Lake Forest is forecast to keep pace with that of the Trade Area and County, at around 25 percent over the 28-year period.

It is important to note that the SCAG projections, which are compiled using a number of sources including adopted plans, historical trends, and interviews with local jurisdictions, tend to be more accurate on a regional than local or City level. Consequently, SCAG projections for Lake Forest should be regarded as suggestive rather than determinative. It is likely that through a combination of market changes, catalytic projects, updated land use direction in the General Plan, and other factors, Lake Forest could capture either more or less of expected regional growth than forecasted by SCAG.

Table 3-2 SCAG Population and Employment Projections

Metric	Lake Forest	Trade Area	Orange County
Population			
2012	78,500	738,800	3,071,600
2040	90,700	873,700	3,461,500
% Change from 2012 to 2040	16%	18%	13%
Employment			
2012	39,200	472,700	1,526,500
2040	49,000	601,100	1,898,900
% Change from 2012 to 2040	25%	27%	24%

[1] Trade Area includes Lake Forest, Aliso Viejo, Costa Mesa, Irvine, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, San Juan Capistrano, Tustin

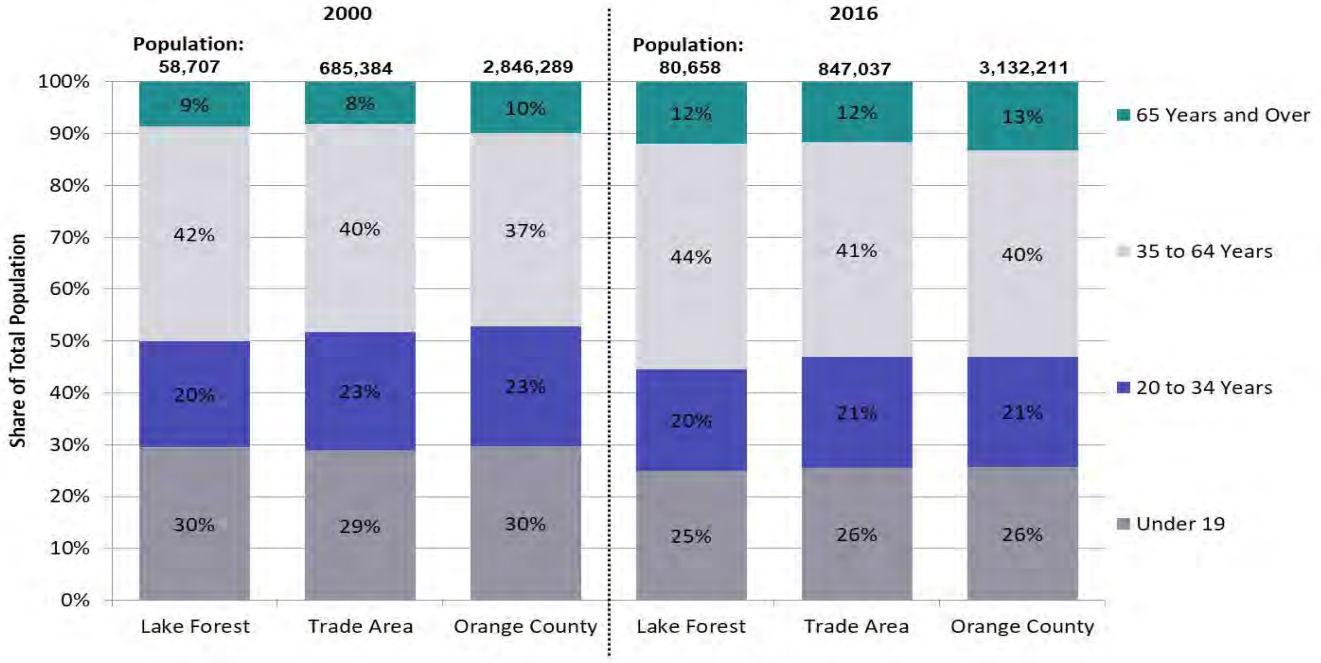
Source: SCAG 2016-2040 Growth Forecast; Economic & Planning Systems

1 SCAG develops, refines and maintains SCAG's regional and small area socio-economic forecasting/allocation models working closely with the Technical Working Group (TWG), the California Department of Finance (DOF), subregions, local jurisdictions, CTCs, the public and other major stakeholders (Source: http://www.scag.ca.gov/DataAndTools/Pages/GrowthForecasting.aspx).

3.2 AGE AND INCOME

Since 2000, the age composition of Lake Forest, the Trade Area, and the County have shown a slight aging trend with the relative share of the under-19 cohort declining while the over-64 cohort increased. As shown in Figure 3-2, Lake Forest residents in the over-64 cohort account for about 12 percent of the population while those under 19 years old made up 25 percent (similar to both the County and Trade Area). In comparison, in 2000 the over 64 cohort accounted for about 9 percent of the population while those under 19 years old accounted for about 30 percent. This trend appears to reflect an increase in "empty nester" households with residents "aging in place" combined with limited housing opportunities for young families. It is worth noting that the share of residents in their earning years (20-64) has remained stable in Lake Forest, the Trade Area, and the County. Meanwhile, Lake Forest has a slightly higher proportion of residents in the 35 - 64 cohort relative to the Trade Area and County, generally the highest earning and spending years.

Figure 3-2 Age Distribution 2000-2016, Lake Forest, Trade Area, Orange County



Source: U.S. Census; American Community Survey; Economic & Planning Systems

Median incomes in Lake Forest are slightly above those for the Trade Area and well above the County as a whole, a condition that seems to have improved over time. As of 2016, Lake Forest's median household income of $98,054 (in 2018 dollars) was 2 percent above the Trade Area median and 18 percent above the County median, as shown in Table 3-3. Since 2000, Lake Forest household median income increased by 36 percent in nominal terms but actually fallen in real terms (i.e. adjusted for inflation) by 6 percent, albeit a slower rate than in either the Trade Area (9 percent) and the County (9 percent). This decrease in real income over this period is consistent with national trends, which in Orange County are also exacerbated by steep increases in housing prices, a major contributor to inflation growth, as measured by the Consumer Price Index (CPI).

Table 3-3 Median Household Income, Lake Forest, Trade Area, Orange County

Year [1] [3]	Lake Forest	Trade Area [2]	Orange County
Nominal Dollars			
2000	$67,967	$68,575	$58,820
2010	$91,040	$86,808	$74,344
2016	$92,415	$90,704	$78,145
% Change '00-'16	36%	32%	33%
Real Dollars			
2000	$104,744	$105,681	$90,648
2010	$106,580	$101,626	$87,034
2016	$98,054	$96,238	$82,913
% Change '00-'16	-6%	-9%	-9%

[1] Nominal values represented in dollar value of given year; real values represented in 2018 dollars.

[2] Trade Area includes Lake Forest, Aliso Viejo, Costa Mesa, Irvine, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, San Juan Capistrano, Tustin

[3] Compared to average household income of $120,697 (2018 dollars) for Lake Forest.

Source: U.S. Census; American Community Survey; Economic & Planning Systems

Age and income distribution can have important implications on the long-term planning goals and outcomes associated with a General Plan. In an aging population, demand for senior-age-appropriate housing and services may increase. To the extent that "aging in place" leads to a lack of turn-over in the housing stock, it can depress property taxes (due to State law related to property assessed value). However, City households are relatively affluent, they also provide a strong source of demand for retail, recreation, and related entertainment activities, with corresponding economic and tax benefits to the City.

3.3 HOUSING SUPPLY

The growth in Lake Forest housing supply mirrored population trends, with a 39 percent increase in inventory since 2000 (compared with 24 percent and 11 percent inventory growth for Trade Area and County respectively), as shown in Table 3-4. The City's housing supply is strongly oriented to single-family homes with 71 percent classified as either detached or attached single-family. Notably, Lake Forest's share of multi-family homes (25 percent) is well below that of Trade Area (35 percent) and the County (33 percent), although the proportion of mobile homes is slightly above average.

The rate of homeownership in Lake Forest is also relatively high with owner-occupied homes making up 68 percent of the total in 2016, compared with 56 percent in the Trade Area and 55 percent in the County. Note that about 20 percent of multi-family units are owner-occupied (condominiums), which is higher than the Trade Area and County (both at 11 percent).

Table 3-4 Housing Supply, Mix, Growth, and Ownership, Trade Area, Orange County

	2016				
	Single-Family (Detached)	Single-Family (Attached)	Multifamily	Mobile Home/ Other	**Total**
Lake Forest	**15,648**	**4,515**	**7,153**	**1,152**	**28,468**
2000-2016 Unit Growth	43%	59%	32%	-11%	39%
Share by Type	55%	16%	25%	4%	100%
Vacancy	3%	1%	7%	0%	4%
Owner-Occupied[1]	86%	74%	19%	95%	68%
Trade Area[2]	**145,508**	**50,523**	**108,947**	**5,456**	**310,434**
2000-2016 Unit Growth	21%	11%	40%	-10%	24%
Share by Type	47%	16%	35%	2%	100%
Vacancy	3%	3%	7%	6%	5%
Owner-Occupied[1]	83%	70%	11%	81%	56%
Orange County	**545,239**	**126,732**	**352,548**	**29,306**	**1,053,825**
2000-2016 Unit Growth	11%	2%	16%	-6%	11%
Share by Type	52%	12%	33%	3%	100%
Vacancy	4%	5%	7%	6%	5%
Owner-Occupied[1]	80%	65%	11%	71%	55%

[1] Calculation from base of all units including vacant units

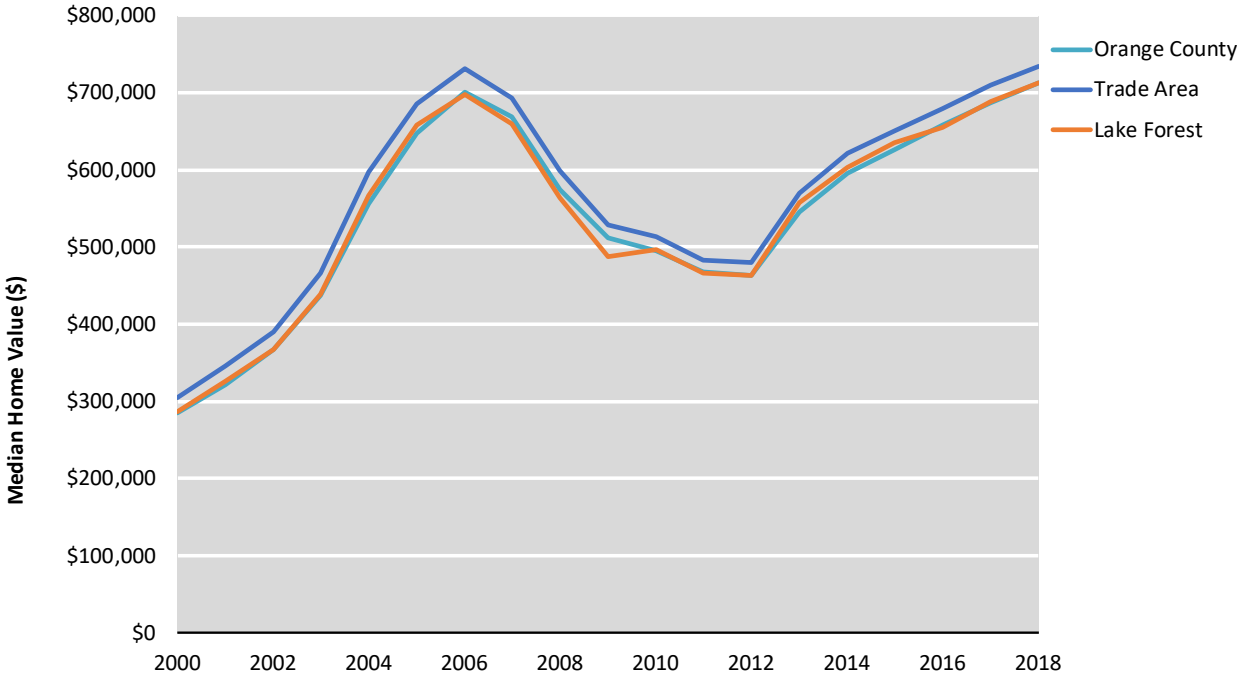
[2] Trade Area includes Lake Forest, Aliso Viejo, Costa Mesa, Irvine, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, San Juan Capistrano, Tustin

Source: U.S. Census; American Community Survey; Economic & Planning Systems

Home values in the Trade Area and the County (based on recorded transactions) have recovered from the 2008 recession to attain highs last reached in 2006 and 2007, as shown in Figure 3-4. Since 2000, the home value rankings of Trade Area cities remained essentially unchanged, indicating established regional tiers of home value with Lake Forest falling roughly in the middle of the set. Median home values in Lake Forest increased 149 percent between 2000 and 2016 (from $286,708 to $713,200), which is faster than the Trade Area rate at 140 percent ($305,538 to $734,370) and equivalent to the County rate at 150 percent ($284,883 to $712,400).

In light of increasing housing costs across the region, emerging professionals and young families often seek ownership opportunities in condominiums rather than single-family detached homes that are most prevalent in Lake Forest, as discussed above. While Lake Forest already has a slightly higher proportion of condominiums relative to total housing than the average for the Trade Area or County, a smaller proportion are actually available for sale on the market. Over the past few years, only 6 to 8 percent of condominiums on the market in the Trade Area were located in Lake Forest, even though the City accounts for roughly 12 percent of the total condominium supply. While Lake Forest has lower-cost condominiums compared to the Trade Area, sales prices are increasing at a faster rate, by 58 percent between 2013 and 2018 from a median sales price of $216,900 to $420,000, compared to 49 percent in the Trade Area from $306,300 to $539,500.

Figure 3-3 Median Home Value in Lake Forest, Trade Area and County (2000-2018)[2]

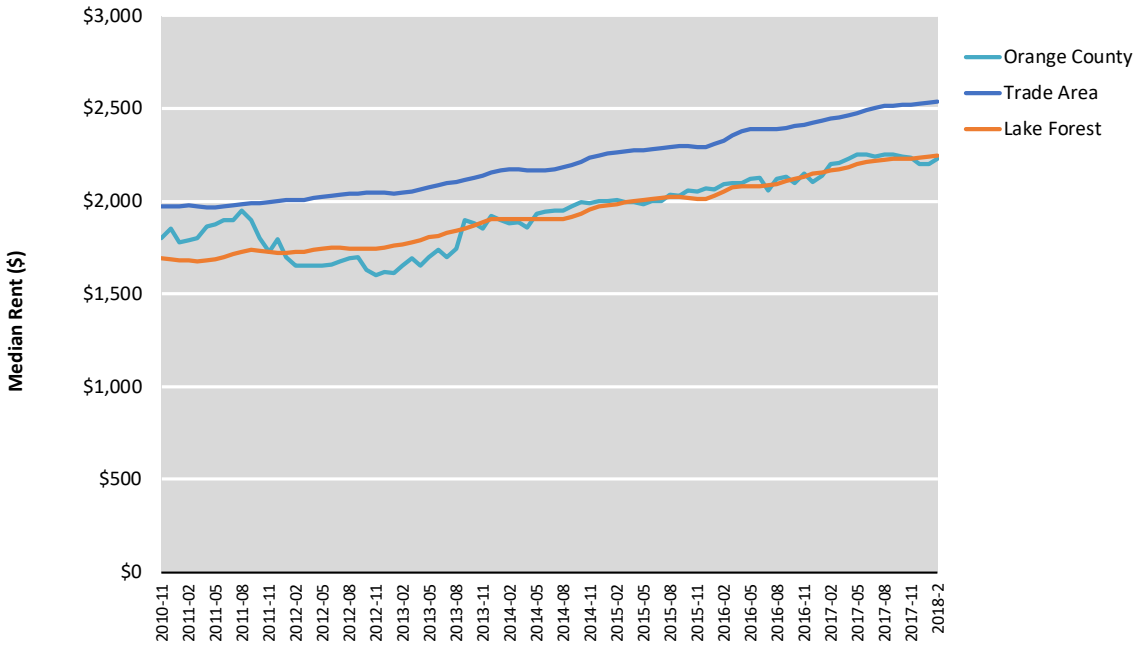


Source: Zillow; Economic & Planning Systems

Unlike residential sale prices, median multi-family rents in Lake Forest, consistently fall well below those in the Trade Area, and trend closer to County as a whole, as shown in Figure 3-4. Lake Forest's median multi-family monthly rent of $2,248 is about 90 percent the Trade Area average, suggesting that the City is a less established multi-family rental market with a smaller inventory of modern and amenitized products. Costa Mesa median monthly rents in 2018 lead the set at $2,861 per unit, followed by Irvine at $2,829, then Aliso Viejo at $2,659, Tustin at $2,535, and Laguna Niguel at $2,496. The Lake Forest housing mix, coupled with the very high median values, suggests that a diversification of housing options with lower priced condos and/or high-quality rental options would likely help the City retain or attract younger residents.

2 *Trade Area home values reflect a simple (unweighted) average of median home values in each jurisdiction within the Trade Area.*

Figure 3-4 Median Rent in Lake Forest, Trade Area, and County (Q4 2010 –2018)[3]



Source: Zillow; Economic & Planning Systems

3.4 COMMUTING

Like many larger cities in Orange County, Lake Forest functions as both a bedroom community and employment hub with major commuting both into and out of the City for work. However, overall more of its employed residents commute to jobs out of the City than come in from elsewhere, resulting in a jobs housing balance and daytime population slightly lower than the Trade Area and County average. Reviewing the "jobs housing balance" of a city or region is one way to analyze if jobs and homes are located sufficiently close together so that the geography (for example, the City of Lake Forest) can realize potential benefits of colocating jobs and houses, such as reduced vehicle miles traveled and improved air quality. In SCAG's report The New Econmmy and Jobs-Housing Balance in Southern California (April 2001), the agency finds that the benefits typically attributed to jobs-housing balance include:

- Reduced driving and congestion
- Fewer air pollution emissions
- Lower costs to businesses and commuters
- Lower public expenditures on facilities and services
- Greater family stability
- Higher quality of life

However, assuming a simple ratio of one job per household is not appropriate when many modern households have more than one person in the workforce. There is no "right" ratio of jobs-to-households. Rather, this indicator should be used to help a place evaluate its current situation and make decisions on how it wants to grow in the future. The City of Lake Forest has a jobs-to-household ratio of 1.40 compared to Trade Area and County ratios of 1.78 and 1.55 respectively (see Table 3-5). However, the Trade Area job / housing ratio is skewed upwards by Irvine (2.7) and Costa Mesa (2.1); without these two cities the average would be 1.14. Nevertheless, due to the disproportionate out-commute pattern among employed residents, the Lake Forest "day-time population" declines to about 90 percent of the residential population, from 80,658 residents to a daytime population of 72,706 people (see Table 3-6)

3 *Trade Area rents reflect a simple (unweighted) average of median listed rents in each jurisdiction within the Trade Area.*

Table 3-5 Jobs to Household Ratio

	Lake Forest	Trade Area	Orange County
Jobs	38,644	534,604	1,578,369
Households	27,551	300,611	1,017,012
Population	80,658	847,037	3,132,211
Jobs/HH Ratio	1.40	1.78	1.55
Jobs/Population	0.48	0.63	0.50

[1] 2015 jobs estimates and 2016 households estimates
Source: LEHD; ACS; Economic & Planning Systems

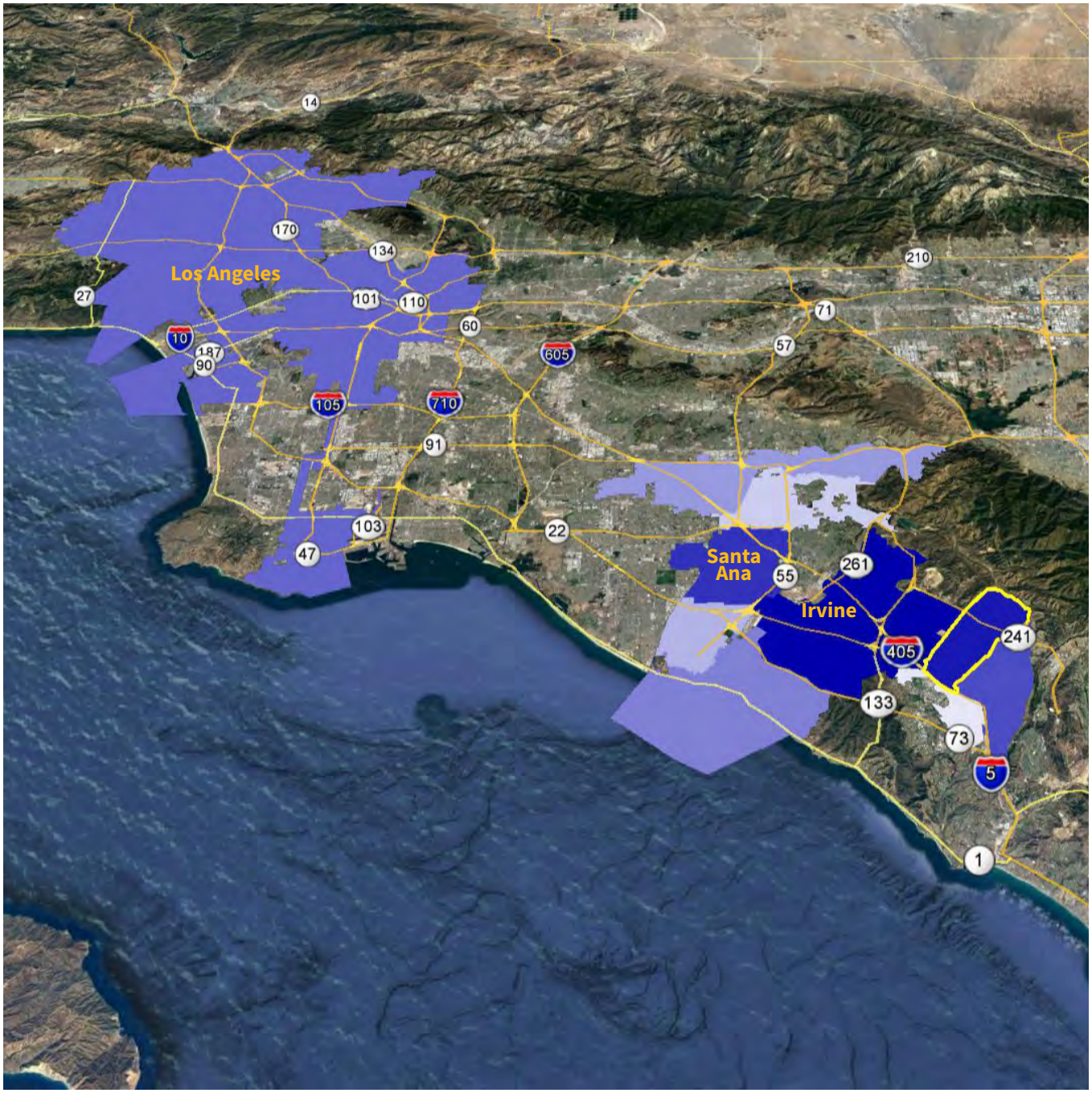
Table 3-6 Lake Forest Day Population Estimate

Item	Amount
Lake Forest Residents	
Non-Working Residents	34,062
Live and Work in City	3,478
Live in City Work Elsewhere	43,118
Total	80,658
Lake Forest Jobs	
Held by Lake Forest Residents	3,478
Held by Others	35,166
Total	38,644
Daytime Population (Jobs + Non-working Residents)	72,706
Day Population % of Residential Population	**90%**

Source: LEHD; ACS; Economic & Planning Systems

Employed Lake Forest residents generally travel in a northwest direction towards employment nodes in Irvine and Los Angeles, as indicated in Figure 3-5. Among these out-commuters, approximately 46 percent work within the Trade Area, within an approximate 30-minute drive. In-commuters come primarily from nearby cities like Santa Ana, Mission Viejo, and Irvine.

Figure 3-5 Workplace Destinations of Lake Forest Residents



Darker areas represent cities where Lake Forest residents are most likely to commute to for work.

3.5 SIZE AND COMPOSITION OF THE LOCAL ECONOMY

With about 38,600 jobs, Lake Forest has the fourth largest economy within the 10 City Trade Area, accounting for about 7 percent of the total employment (see Table 3-7). Irvine is by far the largest employer in the Trade Area with almost half of the total jobs. The Trade Area overall accounts for about a 34 percent of the jobs in Orange County.

Table 3-7 Trade Area Employment Rankings

Jurisdiction	Jobs #	Jobs %
Trade Area		
Irvine	251,234	47%
Costa Mesa	88,518	17%
Tustin	44,790	8%
Lake Forest	***38,644***	***7%***
Mission Viejo	32,244	6%
Aliso Viejo	19,313	4%
Laguna Hills	18,875	4%
Laguna Niguel	14,847	3%
Rancho Santa Margari	13,731	3%
San Juan Capistrano	12,408	2%
Total	**534,604**	100%
County	**1,578,369**	
Trade area as % o County		34%

Source: US Census The Longitudinal Employer-Household Dynamics (LEHD) data. (2015)

Lake Forest's largest employment segments by share (in declining order) are manufacturing, professional services, administrative and support services, and health care, as indicated in Table 3-8. The most recent Economic Development Action Plan describes the City's key industry clusters as "high-tech manufacturing, software development, apparel, professional services, healthcare, and medical manufacturing."[4] Of these, manufacturing and administrative and support services are larger than Trade Area and County average shares. Manufacturing contributes 15 percent of total City employment, which is a higher share than in either the Trade Area (9 percent) or County (10 percent). The generally lower pay scales among manufacturing relative to professional and technical services likely contribute to the City's commute patterns (e.g., many of workers cannot afford to live in the City).

4 *See "Lake Forest Economic Development Action Plan (Fiscal Years 2018- 20)". Page 2.*

Table 3-8 Primary Job Employment Mix

Industry Sector	Lake Forest # (2015)	Lake Forest Share	Lake Forest % Ch. '02-'15	Trade Area # (2015)	Trade Area Share	Trade Area % Ch. '02-'15	Orange County # (2015)	Orange County Share	Orange County % Ch. '02-'15
Total	**38,644**	**100%**	**43%**	**534,604**	**100%**	**18%**	**1,578,369**	**100%**	**12%**
Goods-Producing									
Agriculture, Forestry, Fishing and Hunting	130	0%	-54%	1,616	0%	-66%	2,992	0%	-66%
Mining, Quarrying, and Oil and Gas Extraction	3	0%	-92%	50	0%	-55%	626	0%	34%
Utilities	44	0%	7%	1,092	0%	-28%	6,146	0%	-12%
Construction	2,757	7%	-5%	24,216	5%	2%	92,827	6%	16%
Manufacturing	5,802	15%	62%	50,084	9%	-13%	160,165	10%	-18%
Subtotal	**8,736**	**23%**	**28%**	**77,058**	**14%**	**-12%**	**262,756**	**17%**	**-10%**
Service-Producing									
Wholesale Trade	2,909	8%	18%	35,594	7%	-1%	92,390	6%	4%
Retail Trade	2,995	8%	-10%	50,842	10%	-1%	154,168	10%	0%
Transportation and Warehousing	196	1%	33%	5,695	1%	5%	25,184	2%	-2%
Information	298	1%	-4%	14,469	3%	10%	28,363	2%	-14%
Finance and Insurance	2,768	7%	118%	39,040	7%	27%	85,221	5%	9%
Real Estate and Rental and Leasing	1,056	3%	79%	16,183	3%	15%	38,562	2%	16%
Professional, Scientific, and Technical Services	4,766	12%	109%	73,772	14%	57%	136,346	9%	37%
Management of Companies and Enterprises	870	2%	729%	14,581	3%	17%	33,226	2%	-9%
Administration & Support, Waste Management and Remediation	3,802	10%	33%	47,107	9%	18%	138,775	9%	14%
Educational Services	1,045	3%	-21%	41,338	8%	19%	117,050	7%	12%
Health Care and Social Assistance	3,786	10%	158%	49,880	9%	93%	175,143	11%	66%
Arts, Entertainment, and Recreation	450	1%	88%	7,534	1%	53%	46,657	3%	24%
Accommodation and Food Services	3,643	9%	50%	42,201	8%	37%	158,759	10%	35%
Other Services (excluding Public Administration)	1,197	3%	-3%	14,213	3%	-9%	44,687	3%	-14%
Public Administration	127	0%	210%	5,097	1%	132%	41,082	3%	20%
Subtotal	**29,908**	**77%**	**49%**	**457,546**	**86%**	**26%**	**1,315,613**	**83%**	**17%**

Source: LEHD; Economic & Planning Systems

Between 2002 and 2015, Lake Forest added jobs at a faster rate (43 percent) than either the Trade Area (18 percent) or the County (12 percent). Much of the City's recent job growth can be attributed to the emergence of sectors and employers that were not well represented only ten years ago. Specifically, the recent growth is largely attributed to gains in professional services (109 percent growth and 2,491 jobs, compared to 57 percent and 37 percent for the Trade Area and County), health care (158 percent and 2,319 jobs, compared to 93 percent and 66 percent for the Trade Area and County), and finance and insurance (118 percent and 1,499 jobs, compared to 27 percent and 9 percent for the Trade Area and County). With the exception of Panasonic, the City's largest employer, all of the City's top-10 employers have attained this position in the last ten years (see Table 3-9).

The appeal of Lake Forest to these sectors and employers appears to be attributable to a variety of factors, including convenient freeway access, modern business parks, and strong community amenities (e.g., trails, low crime, convenient retail amenities, upscale housing stock). In some cases, employers may be relocating in order to be closer to their workforce. Finally, the continued growth in nearby markets such as Irvine has provided spill-over benefits, attracting tenants seeking a lower cost and in some cases, a more reclusive identity.

Table 3-9 2016 Top Employers in Lake Forest

Employer	Employees	Share[1]	Sector / Orientation
Panasonic Avionics	2,290	5.9%	Engineers, manufactures, sells, and installs in-flight entertainment
Loan Depot	2,049	5.3%	Home mortgage, refinance, equity, and personal loan products
Oakley Inc.	1,400	3.6%	Develops and manufactures sports performance equipment
Schneider Electric	500	1.3%	Energy management and automation
Spectrum Brands HHI	494	1.3%	Hardware and home improvement
Bal Seal Engineering	423	1.1%	Engineering and manufacturing
Home Depot USA Inc.	348	0.9%	General homegoods
WalMart	340	0.9%	General retail
Alcon Research	315	0.8%	Manufactures medical products
Toshiba America Business Solutions	307	0.8%	Office equipment merchant wholesalers
Total	**8,466**	**21.9%**	

[1] Share of "Total Employment" within the City limits.
Source: FY 2016 Lake Forest CAFR (City Finance Division)

3.6 COMMERCIAL REAL ESTATE MARKET TRENDS

The commercial real estate sector represents a physical manifestation of the Lake Forest economy. Table 3-10 provides an overview of the primary commercial real estate sectors in the City in terms of total inventory. As shown, industrial buildings represent the most predominant commercial real estate product type in terms of square feet, followed by retail, office, and so-called "flex" space. A further description of the market dynamics in each of these real estate sectors is provided below.

Table 3-10 Overview of Lake Forest Commercial Real Estate Sector

Real Estate Product Type	Total Building Square Feet	
	Amount	% of Total
Industrial	4,100,866	53%
Retail	3,153,246	40%
Office	2,840,501	36%
Flex[1]	1,797,864	23%
Total	**7,791,611**	**100%**

[1] Buildings that generally accommodate a mix of industrial, R&D, and office uses.
Sources: Costar; EPS

Industrial and Flex Market

As noted, industrial and flex building space represents the most significant commercial real estate product in Lake Forest. Industrial buildings include those that accommodate users that assemble, process or manufacture products on-site as well as warehousing, distribution, and maintenance facilities. While flex space can include similar uses as industrial, it tends to be more adaptive, often accommodating office, medical, R&D, and even some sales.

Lake Forest's industrial and flex market inventory comprises almost 8 percent of the total Trade Area inventory, as shown in Table 3-11. Note that the average triple-net (NNN) lease rate for industrial space in Lake Forest is comparable to that of the Trade Area. The map in Figure 3-6 shows the Trade Area location of new industrial construction since 2006. Much of the recent growth has been in the Irvine Industrial Complex and Irvine Research Center just north of Lake Forest. Overall, however, the development of new industrial space in both the Trade Area and Lake Forest, has been minimal. This is in part attributable to national decline in manufacturing sectors, but also reflects changing composition of the regional economy, with a shift to R&D and professional/ technical services that have space needs evolving away from traditional industrial buildings.

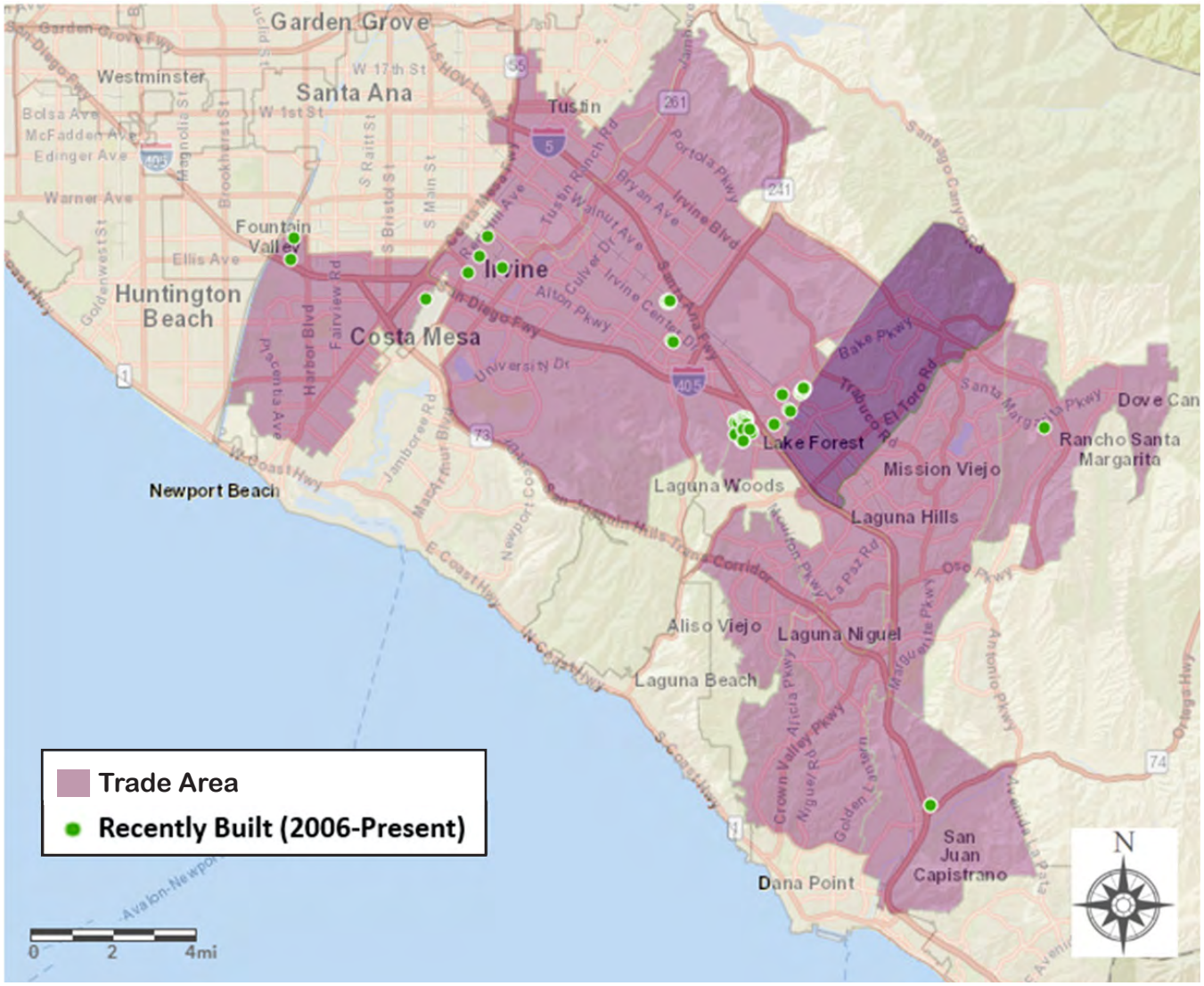
Table 3-11 Industrial Real Estate Trends

Item (as of Q1 2018)	Lake Forest	Trade Area	Orange County
Performance			
NNN Rent per Square Foot	$13.94	$13.63	$11.76
Vacancy	2.5%	3.6%	2.5%
Inventory			
Square Feet	5,898,293	77,351,452	302,966,359
Share of Trade Area	7.6%	100.0%	391.7%
Share of County	1.9%	25.5%	100.0%
Growth 2006 - Q1 2018 Including Pipeline			
Net New Inventory	0	1,023,567	7,884,051
% of Total Inventory	0.0%	1.3%	2.6%

[1] Trade Area includes Lake Forest, Aliso Viejo, Costa Mesa, Irvine, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, San Juan Capistrano, and Tustin.

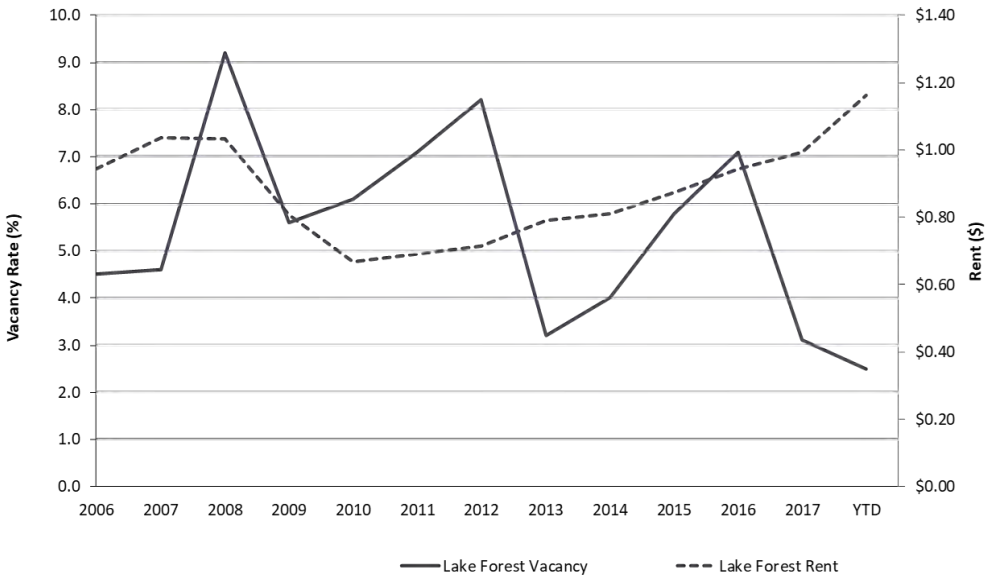
Source: CoStar; Economic & Planning Systems

Figure 3-6 Recent Industrial Inventory



Looking more closely at Lake Forest, steadily rising rents and falling vacancies since 2010 suggest a tightening market and potential demand for new additional space (see Figure 3-7). Indeed, the bulk of new industrial and flex space built in the Trade Area since 2006 were just outside Lake Forest in the City of Irvine. Current trends suggest that this demand will likely favor more flex rather than traditional industrial formats.

Figure 3-7 Industrial Vacancy vs. Rent

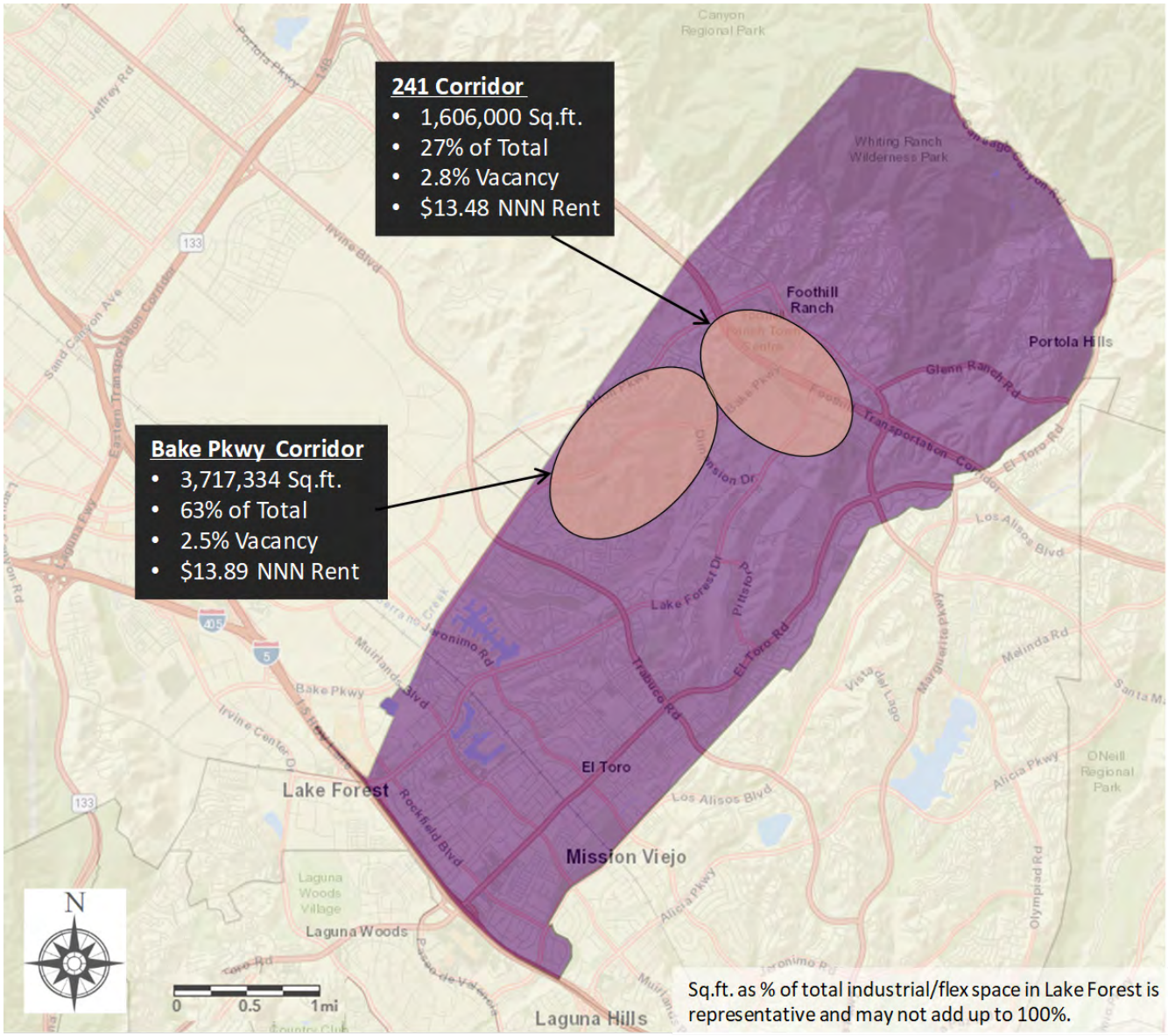


Source: CoStar; Economic & Planning Systems

In terms of the spatial distribution within Lake Forest, the industrial/flex market appears to be primarily clustered around two nodes, as illustrated in Figure 3-8 and described below:

- Bake Parkway Corridor: Over 60 percent of the Lake Forest industrial/flex market is centered around Bake Parkway, and particularly along Commercentre Drive. This area appears to be performing well based on lease rates and occupancy rates.
- 241 Corridor: With a few exceptions, most of the remaining industrial and flex space in Lake Forest is clustered along the 241 Corridor. Lease and occupancy rates are equivalent to those in the Bake Parkway Corridor sub-market, suggesting that these areas currently compete on par.

Figure 3-8 Lake Forest Industrial/Flex Clusters



Office Market

The Lake Forest office sector functions within a relatively mature and successful Trade Area market that is primarily anchored in Irvine. Within this context, Lake Forest has a relatively modest market share, with about 4 percent of the inventory, as shown in Table 3-12. While rents in Lake Forest are below the Trade Area and County average due to its position outside the core node of activity, relatively low vacancy rates are indicative of a healthy market. In addition, both vacancy and lease rates have been steadily improving over the last five years (see Figure 3-9).

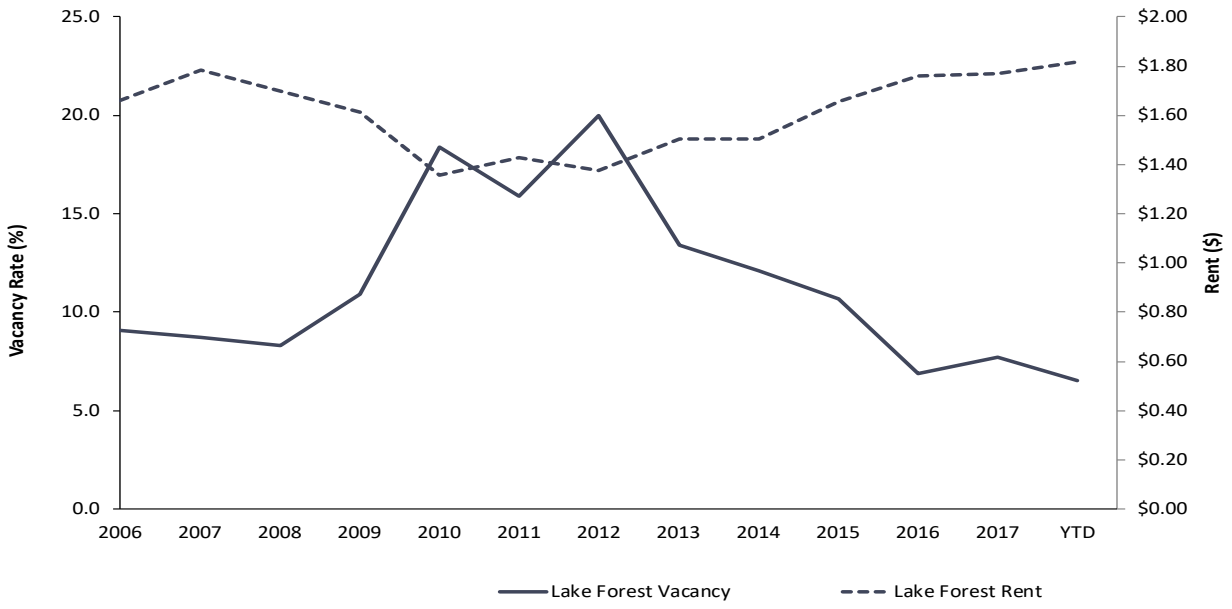
Table 3-12 Office Real Estate Trends

Item (as of Q1 2018)	Lake Forest	Trade Area	Orange County
Performance			
Gross Rent per Square Foot	$21.82	$29.47	$28.01
Vacancy	6.5%	11.2%	9.7%
Inventory			
Square Feet	2,840,173	71,736,521	157,091,381
Share of Trade Area	4.0%	100.0%	219.0%
Share of County	1.8%	45.7%	100.0%
Growth 2006 - Q1 2018 Including Pipeline			
Net New Inventory	0	10,253,939	14,136,429
% of Total Inventory	0.0%	14.3%	9.0%

[1] Trade Area includes Lake Forest, Aliso Viejo, Costa Mesa, Irvine, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, San Juan Capistrano, and Tustin.

Source: CoStar; Economic & Planning Systems

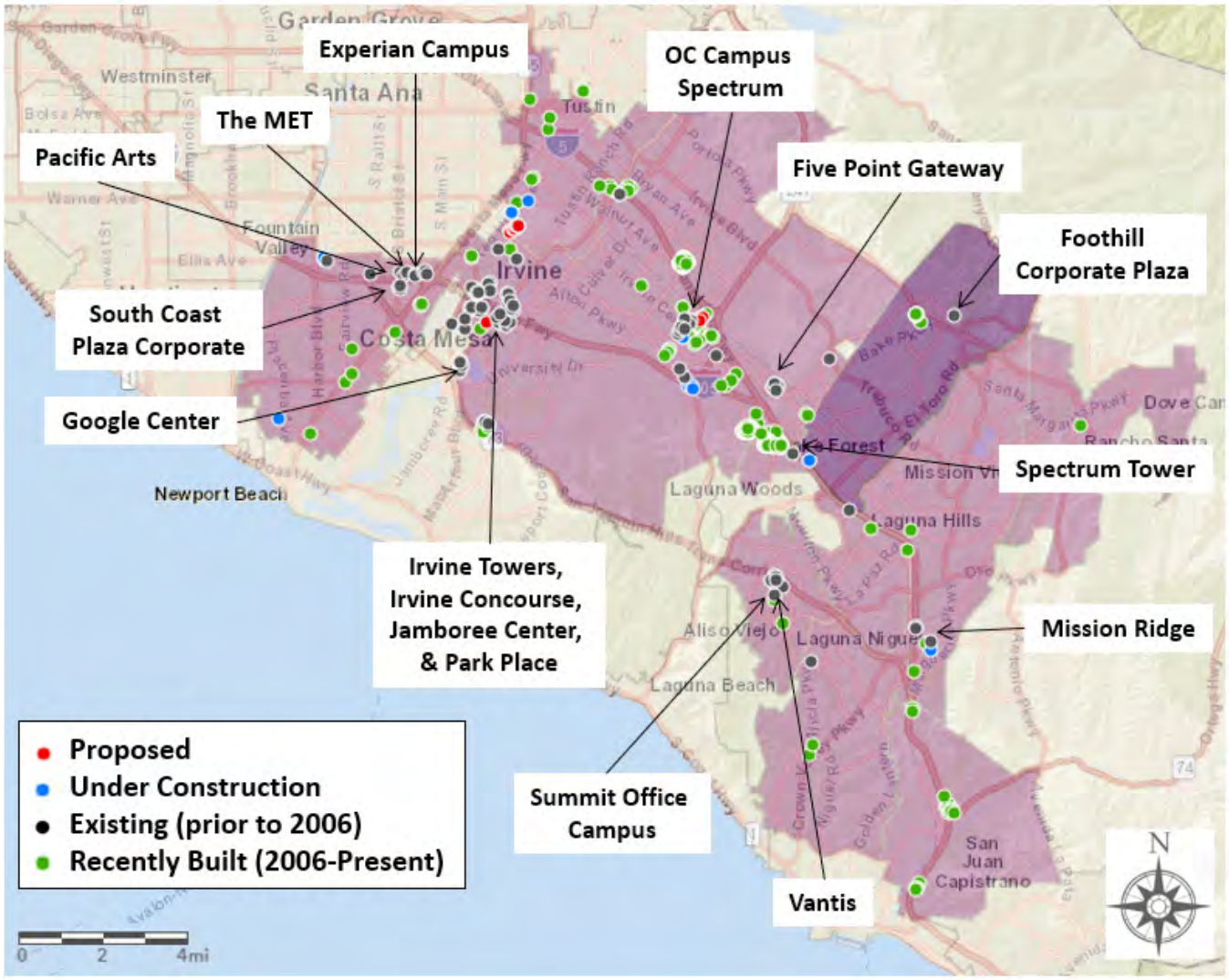
Figure 3-9 Office Vacancy Vs. Rent



Source: CoStar; Economic & Planning Systems

The vast majority of office space in both Lake Forest and the Trade area is provided in a suburban business center format (e.g., master planned developments of 100,000 square feet and larger). The bulk of these clusters are located in Irvine and Costa Mesa near the intersection of the 405 and 55 Freeways, as illustrated in Figure 3-10. Irvine has a dominant share of Business Center inventory in the Trade Area with 63 percent of square footage (about 30 out of 47 million square feet). Costa Mesa is a distant second with 11 percent and 5.2 million square feet, followed by Aliso Viejo with 6.4 percent and 3 million square feet, and then Lake Forest with 4.9 percent and 2.3 million square feet (see Table 3-13).

Figure 3-10 Map of Large Existing Business Centers, and Recent/Proposed Office Inventory Trade Area



Source: Costa

Table 3-13 Total Square Feet of All Business Centers in the Trade Area and City Share

City	Rentable Square Feet	Share of Total
Aliso Viejo	2,998,762	6.4%
Costa Mesa	5,164,663	11.0%
Irvine	29,653,163	63.1%
Laguna Hills	1,848,615	3.9%
Laguna Niguel	476,634	1.0%
Lake Forest	2,293,511	4.9%
Mission Viejo	1,792,622	3.8%
Rancho Santa Margarita	314,285	0.7%
San Juan Capistrano	880,840	1.9%
Tustin	1,575,533	3.4%
Total	**46,998,628**	**100%**

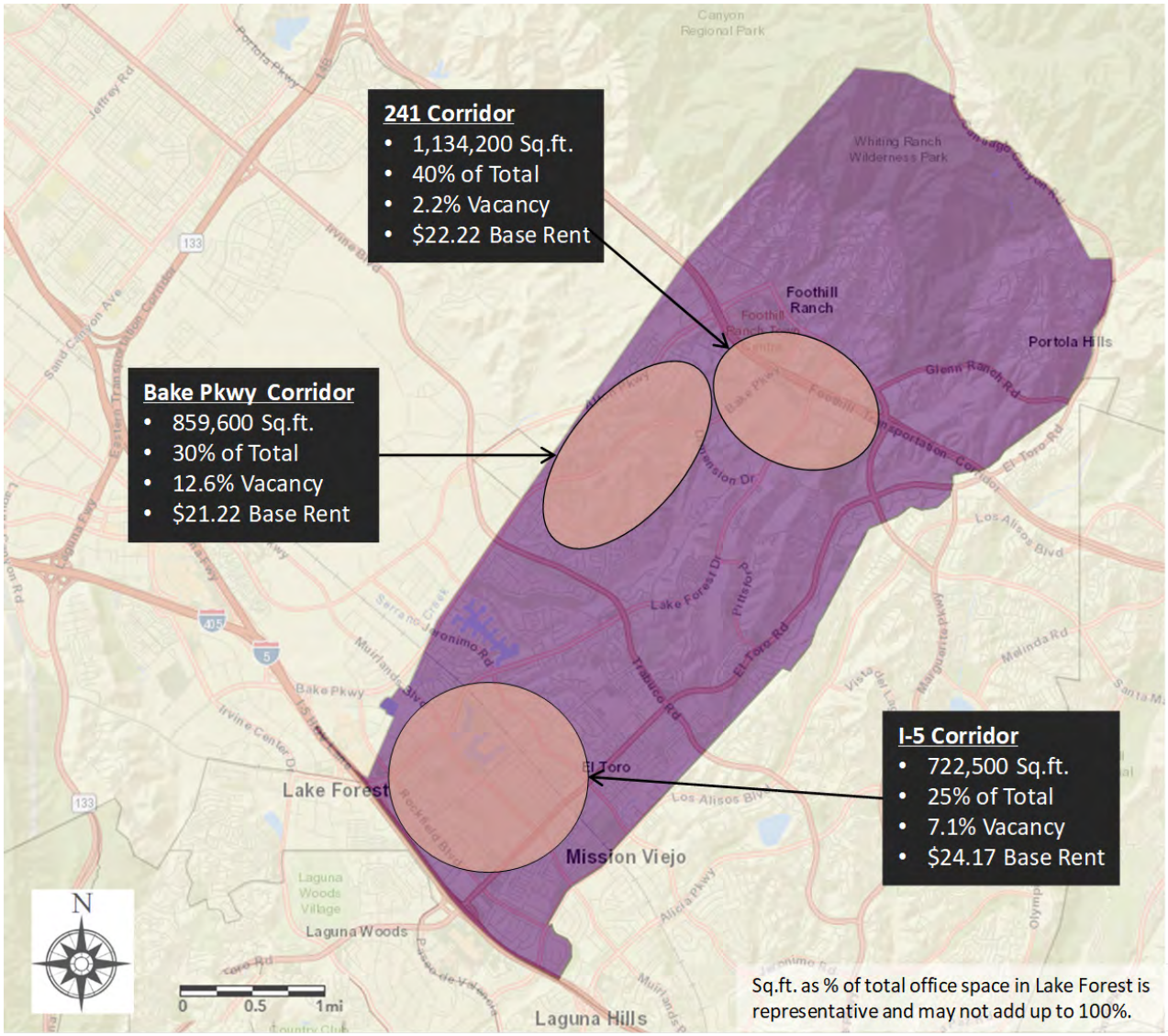
Source: CoStar, Economic & Planning Systems

In terms of development activity, the majority of large business center inventory since 1977 has been constructed in Irvine, with small contributions from Costa Mesa in the 1980s and Aliso Viejo since 2000. Lake Forest's only large business center—Foothill Corporate Plaza (127,600 square feet)—was constructed in 2000. While much of the growth is centered on the historical cluster in Irvine and Costa Mesa, the vector of new growth also appears to extend south along the 1-5 towards Lake Forest, indicating the increasing attractiveness of Lake Forest and its environs for office development (see Table 3-13).

Looking more closely at Lake Forest, the bulk of the office market is clustered in three distinct areas (that partially overlap with the industrial flex clusters described above), as illustrated in Figure 3-11 and described below.

- 241 Corridor: about 40 percent of the Lake Forest office market is clustered along the 241 Corridor which includes the Panasonic Building (the City's largest employer), Foothill Corporate Plaza, and several other modern business centers. This office sub-market currently has the lowest vacancy rate in the City at about 2 percent.
- Bake Parkway Corridor: The second largest office cluster in the City is centered around Bake Parkway, which accounts for about 30 percent of the City's inventory. This area appears to be performing slightly below based on lease rates and occupancy rates.
- I-5 Corridor: While slightly smaller than the other two clusters, the office sub-market located just east of the I-5 appears to be the City's most desirable based on lease rates. The competitive position of this location is likely enhanced by its proximity to Irvine and easy freeway accessibility.

Figure 3-11 Lake Forest Office Sub-Markets



Source: Costar

Accommodations

Lake Forest, and Orange County as a whole, continues to attract a large number of visitors, as indicated by the number and performance of hotels. The Orange County Visitors Association 2017 Annual Report concluded there were 49.5 million visitors who added $12.5 billion to the local economy, or 3.5 percent more dollars than in 2016. Tourist destinations such as Disneyland, Knott's Berry Farm, the Anaheim Convention Center are all within a 30-minute drive of Lake Forest. As discussed in the following section, sales tax makes up 32 percent of City General Fund revenue and the transient occupancy tax makes up 8 percent of revenue.

Locally, hotels are a major contributor to the City's economy and General Fund budget, boosting visitation, business travel and local taxes (e.g. hotel and sales tax). There are currently ten hotels in Lake Forest, totaling about 1,121 room and 700,000 square feet. The largest hotel in the City is Staybridge Suites, which has approximately 188,900 square feet, three stories, and 128 rooms. Courtyard by Marriott, also over 100,000 square feet, has 4 stories and 156 rooms. Projects in the pipeline include a hotel at 23150 Lake Center Drive (proposed project) and Springhill Suites by Marriott (under construction), both of which are near the cluster of hotels by the intersection of San Diego Freeway and Lake Forest Drive. The two hotels in the pipeline will be 65,000 square feet and 14,000 square feet, respectively..

Table 3-14 Lake Forest Hospitality Inventory

Hotel/Motel Name	Building Address	Rentable Building Area (sq.ft.)	Number of Stories	Number of Rooms
Existing Properties				
Hilton Garden Inn	27082 Towne Center Dr	24,100	3	103
The Prominence Hotel and Suites	20768 Lake Forest Dr	38,650	3	60
Holiday Inn	23131 Lake Center Dr	48,000	5	148
Hampton Inn	27102 Towne Center Dr	48,500	3	84
Best Western Plus Irvine Suites Hotel	23192 Lake Center Dr	51,575	4	91
Quality Inn & Suites Irvine Spectrum	23702 Rockfield Blvd	58,602	2	110
Extended Stay America	20251 Lake Forest Dr	60,000	3	119
Candlewood Suites	3 S Pointe Dr	73,434	3	122
Courtyard by Marriott	27492 Portola Pky	108,000	4	156
Staybridge Suites	2 Orchard Rd	188,937	3	128
Average		**69,980**	**3**	**112**
Total		**699,798**	**-**	**1,121**
Pipeline				
N/A (Proposed)	23150 Lake Center Dr	65,000	N/A	N/A
Springhill Suites by Marriot (Under Construction)	23632 Rockfield Blvd	14,000	1	60

Source: CoStar; Lake Forest Economic Development Website; Economic & Planning Systems

As of 2018, the hotels in the Lake Forest pipeline represent 11.3 percent of the total inventory in the City. Meanwhile, the current Lake Forest hotel space accounts for 10.4 percent of the Trade Area inventory and 1.8 percent of the County inventory. The Trade Area has about 6.7 million square feet of hotel space and the County has 39.3 million square feet of hotel space.

Table 3-15 Hospitality in Lake Forest, Trade Area, and Orange County

Item (as of Q3 2018)	Lake Forest	Trade Area	Orange County
Inventory			
Square Feet	699,798	6,719,527	39,254,906
Share of Trade Area	10.4%	100.0%	584.2%
Share of County	1.8%	17.1%	100.0%
Pipeline			
New Inventory	79,000	147,815	2,329,515
% of Total Inventory	11.3%	2.2%	5.9%

[1] Trade Area includes Lake Forest, Aliso Viejo, Costa Mesa, Irvine, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, San Juan Capistrano, and Tustin.

Source: CoStar; Economic & Planning Systems

As shown above, the market occupancy among the selected hotels in Orange County was about 74.4 percent on average between 2010 to 2016. In the more recent years (2014 through 2016), the occupancy rate increased as tourism recovered after the Recession. The average daily rate over the seven-year period averaged $140 per night and the revenue per available room (REVPAR) was approximately $105. The average daily rate and REVPAR were the highest in 2016, at $165 and $127, respectively.

Table 3-16 Orange County - Historical Market Performance of the Competitive Supply

Year	Annual Supply [1]	Market Occupancy	Average Daily Rate	REVPAR
2010	17,192,230	69%	$117	$80
2011	18,214,595	71%	$124	$89
2012	18,976,715	73%	$131	$96
2013	19,040,809	75%	$139	$104
2014	19,312,922	77%	$148	$113
2015	19,480,136	78%	$157	$122
2016	20,343,814	77%	$165	$127
Average	**18,937,317**	**74%**	**$140**	**$105**

[1] Represents about 70 percent of total supply, as estimated by PFK and CBRE.

Source: PKF Consulting USA | CBRE Hotels; Economic & Planning Systems

Compared to Orange County in 2016, the average cost per room per night Lake Forest in 2018 is about $137, or $28 less than the County. The hotel in Lake Forest with the highest cost per room is the Hilton Garden Inn ($227), which is also the smallest hotel. Extended Stay America, which offers day rates as well as long-stay rates for week or month, has the lowest cost per room ($99) on a per-night basis.

Table 3-17 Lake Forest Hotel Average Cost Per Night

Hotel/Motel Name	Average Cost per Room
Hilton Garden Inn [1]	$227
The Prominence Hotel and Suites [2]	$103
Holiday Inn [2]	$189
Hampton Inn [1]	$167
Best Western Plus Irvine Suites Hotel [2]	$93
Quality Inn & Suites Irvine Spectrum [2]	$76
Extended Stay America [2]	$99
Candlewood Suites [2]	$101
Courtyard by Marriott [1]	$161
Staybridge Suites [2]	$152
Average	**$137**

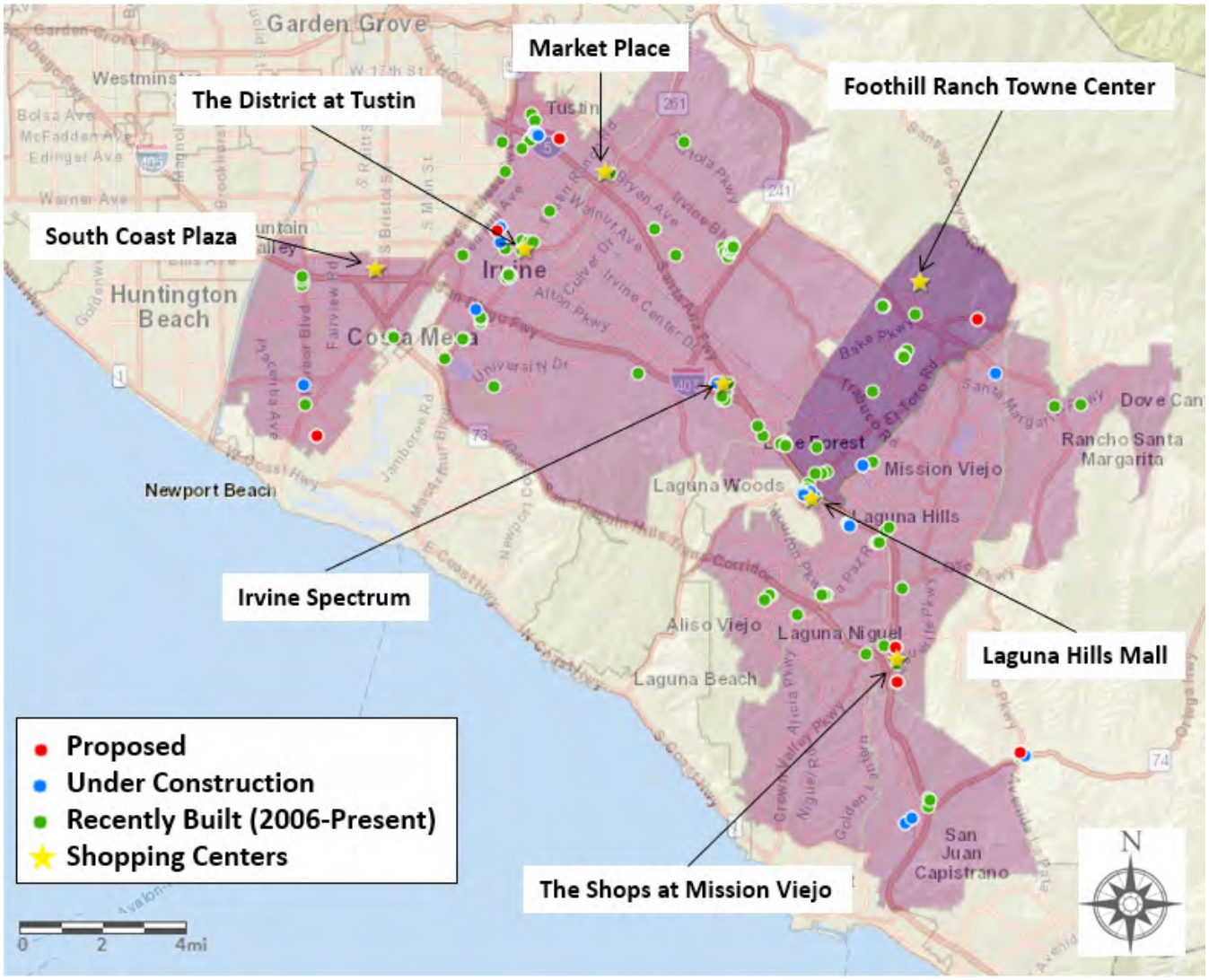
[1] The average room rate according to Hotels.com when booking on November 1 for one night.
[2] The average room rate according to Kayak.com when booking on November 1 for one night.

Source: Hotels.com; Kayak.com; Economic & Planning Systems

Retail

Lake Forest maintains a sizable and relatively healthy retail sector that nonetheless functions within a mature and highly competitive Trade Area with some of the more successful shopping centers in Southern California. The retail Trade Area includes the full range of competitive formats, including major malls, "big box" and power centers, outlets, and more traditional community centers, many of which are relatively modern (e.g., built within the last 10 years). The retail inventory is distributed relatively evenly across the Trade Area with notable clusters along I-5, as illustrated in Figure 3-12. Moreover, the Irvine Spectrum is located just outside Lake Forest city boundaries. This competitive supply, both nearby and regionally, represents a significant market hurdle for any new retail development in Lake Forest.

Figure 3-12 Map of Large Retail Shopping Centers, and Recent Retail Inventory in Trade Area



Source: Costar

The City's 3.2 million retail square feet, accounts for about 7.2 percent of Trade Area inventory, slightly below the City's population share of 9.5 percent. Per capita sales also lag behind both the Trade Area and County average. Nevertheless, the City's retail inventory grew 9.5 percent over the last 12 years, compared with 5.8 percent and 5.1 percent respectively in the Trade Area and County. In addition, Lake Forest retail rents have outperformed the Trade Area and County (see Table 3-18).

The current low vacancies of 4.1 percent, 3.5 percent, and 3.7 percent for the City, Trade Area, and County respectively, coupled with three years of general rent stability, imply in general a market supply equilibrium. While low retail vacancies often signal an opportunity for new construction, a profound and ongoing structural shift in retail at the national level has partially undermined

this traditional growth model. In particular, the growth of e-commerce presents a significant threat to "brick and mortar" retail expansion, particularly in categories such as consumer electronics, appliances, clothing and clothing accessories, and books and music. (See Figure 3-13)

Table 3-18 Retail Real Estate Trends

Item (as of Q1 2018)	Lake Forest	Trade Area	Orange County
Performance			
NNN Rent per Square Foot	$29.41	$28.69	$25.61
Vacancy	4.1%	3.5%	3.7%
Inventory			
Square Feet	3,153,246	41,441,320	144,906,726
Share of Trade Area	7.6%	100.0%	349.7%
Share of County	2.2%	28.6%	100.0%
Growth 2006 - Q1 2018 Including Pipeline			
Net New Inventory	299,509	2,410,861	7,458,588
% of Total Inventory	9.5%	5.8%	5.1%

[1] Trade Area includes Lake Forest, Aliso Viejo, Costa Mesa, Irvine, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, San Juan Capistrano, and Tustin.

Source: CoStar; Economic & Planning Systems

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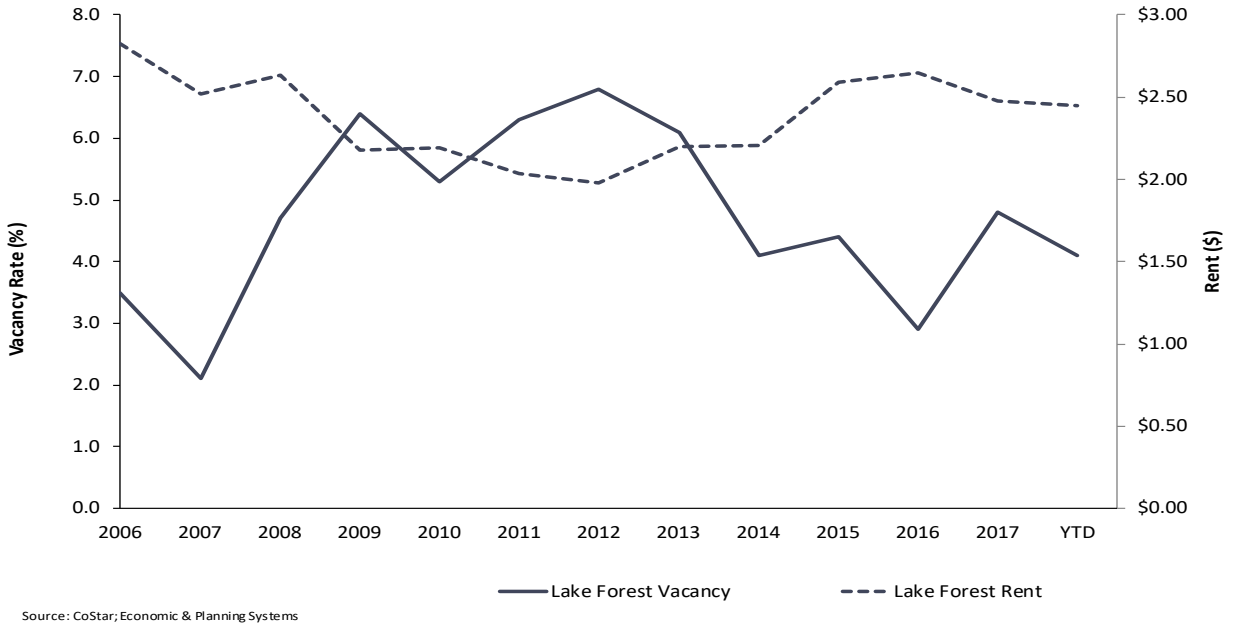
Figure 3-13 Retail Vacancy Versus Rent



Source: CoStar; Economic & Planning Systems

Comparing the Lake Forest taxable sales by major product categories with the Trade Area and County can provide a useful benchmark for assessing relative strengths and weaknesses. As illustrated in Table 3-19, the greatest Lake Forest sales "leakage" occurs in the categories of motor vehicles and parts (8 percent lower than the Trade Area average), home furnishings (4 percent lower than the Trade Area average), clothing (8 percent lower than the Trade Area average), and general merchandise (3 percent lower than the Trade Area average).[5] The City's only notably strong performance in the "Building Material, Garden Equipment and Sales" category is largely attributable to its two Home Depot stores.

The overall retail leakage is primarily attributable to the existence of established retail nodes that already serve the Trade Area well. For example, while Lake Forest has a Mercedes-Benz dealership and Subaru dealership, the major concentrations of auto dealers in the Trade Area are elsewhere in Irvine, Tustin, and Mission Viejo. Likewise, as shown in Table 3-19, major shopping centers Irvine Spectrum and the Laguna Hills Mall are just outside Lake Forest City boundaries. As noted earlier, for significant new retail development to succeed in Lake Forest, it will need to out-compete these existing destinations.

Table 3-19 Taxable Sales per Capita per Category 2016

Category	Lake Forest	Trade Area	Orange County	*Lake Forest vs. Trade Area*	*Lake Forest vs. County*
Total Retail and Food Services	**$10,897**	**$16,462**	**$12,627**	***($5,565)***	***($1,730)***
Building Material, Garden Equip and Supplies	$1,354	$865	$874	*$490*	*$480*
Clothing and Clothing Accessories Stores	$396	$2,199	$1,194	*($1,804)*	*($798)*
Food and Beverage Stores	$787	$843	$726	*($56)*	*$61*
Food Services and Drinking Places	$2,358	$2,669	$2,372	*($311)*	*($15)*
Gasoline Stations	$1,354	$1,133	$1,040	*$221*	*$314*
General Merchandise Stores	$984	$1,871	$1,425	*($887)*	*($441)*
Home Furnishings and Appliance Stores	$472	$1,583	$855	*($1,111)*	*($383)*
Motor Vehicle and Parts Dealers	$1,438	$3,653	$2,739	*($2,215)*	*($1,301)*
Other Retail Group	$1,753	$1,646	$1,402	*$108*	*$351*
All Other Outlets	**$4,986**	**$5,013**	**$4,779**	***($27)***	***$207***
Total All Outlets	**$15,883**	**$21,475**	**$17,406**	***($5,592)***	***($1,523)***

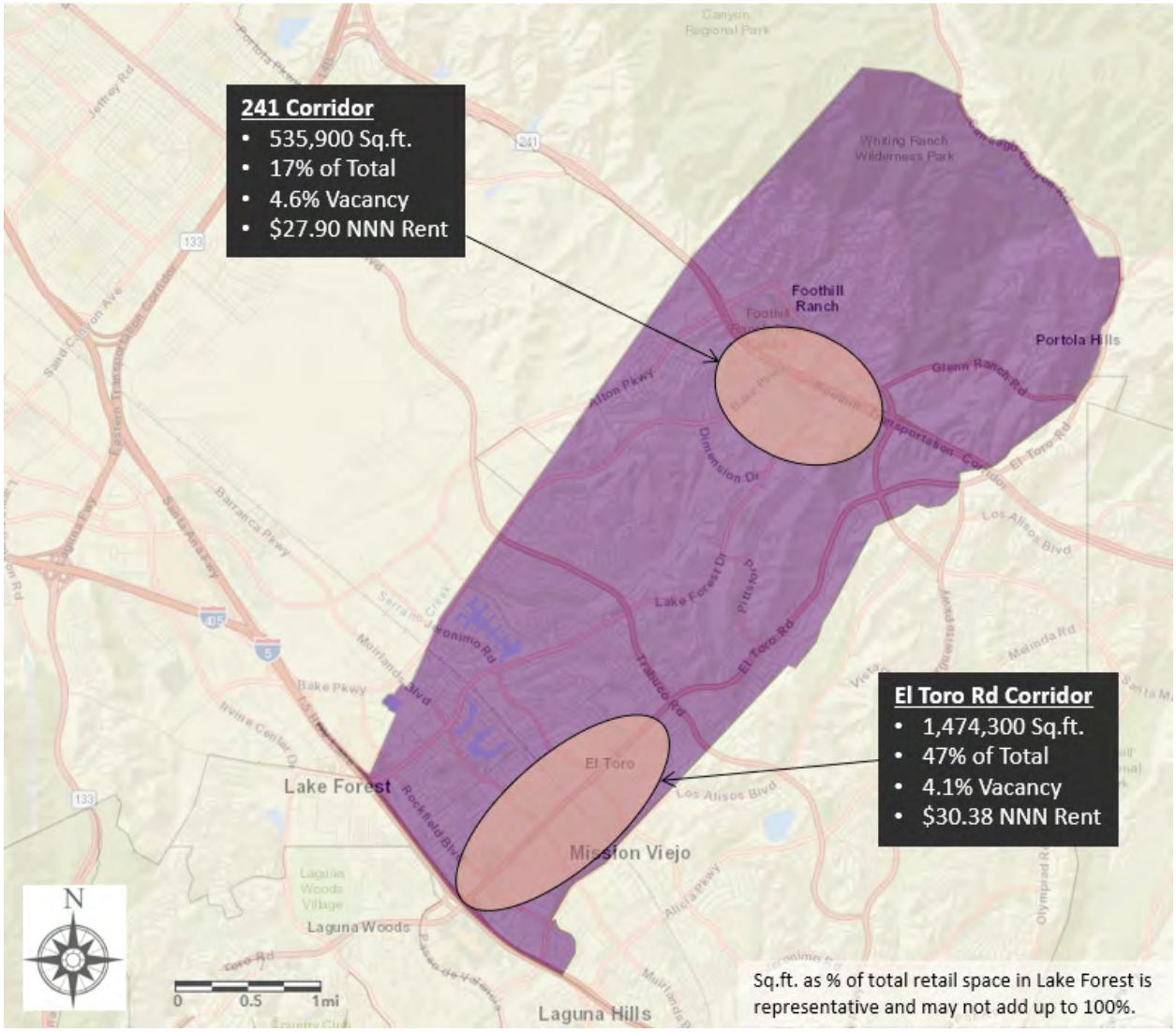
[1] Trade Area includes Lake Forest, Aliso Viejo, Costa Mesa, Irvine, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, San Juan Capistrano, Tustin

Source: Board of Equalization; Economic & Planning Systems

Looking more closely at the spatial distribution of retail within Lake Forest, there are two major clusters of activity, one along the 241 Corridor, centered around Foothill Ranch Towne Center, and the other along El Toro Rd, that includes a number of strip commercial centers with a variety of "big box" anchors (e.g., Ross, Home Depot, Big 5). These two corridors account for about 65 percent of the City's total retail inventory. The remaining 35 percent dispersed throughout the City consists primarily of grocery anchored neighborhood centers and a few smaller one to two building centers.

5 *Leakage is defined as per capita retail sales that fall below the average for the Trade Area or County.*

Figure 3-14 Lake Forest Retail Sub-Markets



Source: Costar

Going forward, Lake Forest, like many other non-destination-oriented communities, will need to continue to pursue a variety of strategies to maintain, let alone grow, its retail sector. The General Plan Update will include an Economic Element that considers the changing landscape of the retail economy over the next decade and incorporates policy-level direction to enable Lake Forest to remain competitive in future retail and commercial environments.

One approach to combating online retail sales erosion is for developers and retail operators to create services and environments that cannot be replicated online. This can be accomplished by retail environments with a strong sense of place, special programming to encourage repeat visits, and other forms of in-person experience. Walkable environments can offer such differentiation and may grow even more attractive as a greater share of professional, retail, and social activity otherwise takes place virtually. This strategy would also likely support the "Shop and Dine Lake Forest" program promoted in the City's Economic Development Action Plan.

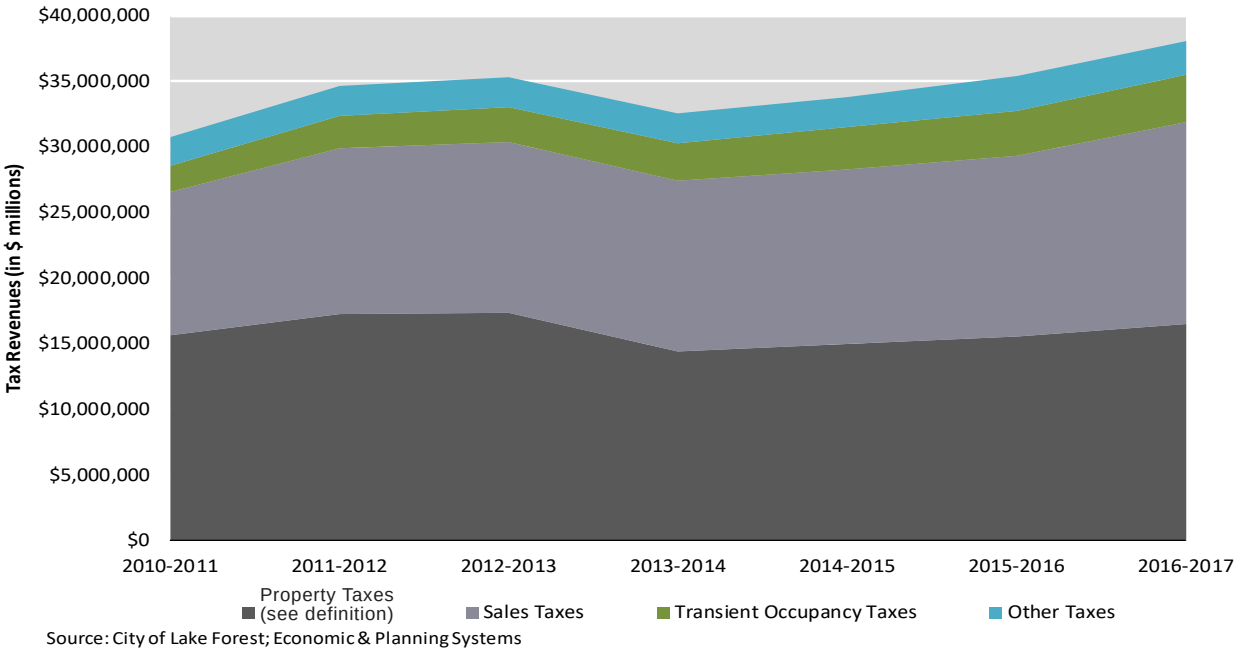
3.7 THE GENERAL PLAN AND THE CITY BUDGET

Understanding the fiscal implications of land use decisions, in terms of type, location, and amount can be an important part of a General Plan Update as these decisions affect the City's fiscal sustainability. This section touches briefly on the City's primary General Fund revenue and expenditures. .

General Fund Revenue Trends

The City's General Fund revenues increased steadily since 2010, reflecting improving economic conditions at both the local, state, and national level. In nominal terms, total General Fund revenues increased by 4.4 percent per year, or 35 percent since FY 2010/11, substantially above the average annual inflation rate of about 1.4 percent during this same period. In FY 2017/2018, General Fund revenues totaled $46.8 million. Transient occupancy (or hotel) and sales tax showed particularly healthy growth during this period at 9 and 5 percent annual growth respectively (see Figure 3-15).

Figure 3-15 Tax Revenue Trends: City of Lake Forest



Source: City of Lake Forest; Economic & Planning Systems

While these trends are encouraging, their implications for the City's long-term fiscal sustainability are more ambiguous. Growth in real (e.g., adjusted for inflation) per capita General Fund revenues provide a better indication of the extent to which improvements are attributable to normal inflation and population trends versus fundamental changes in the fiscal environment. In the case of Lake Forest, real per capita revenues increased by a more modest 2 percent per year (or 15 percent over the six-year period). This level of growth is more in line with the generalized economic recovery that occurred during this same time frame.

In terms of the composition of General Fund revenue, property taxes, which includes traditional property taxes as well as motor vehicle in-lieu backfill and property tax lighting district fees, represent the single largest contributor at roughly 37 percent of revenue, followed by sales tax at 32 percent, as shown in Figure 3-16. Together, property tax (including all three components), sales tax, and TOT represent about 77 percent of the FY 2017/18 General Fund revenues. Key factors affecting potential growth in these three sources is described below.

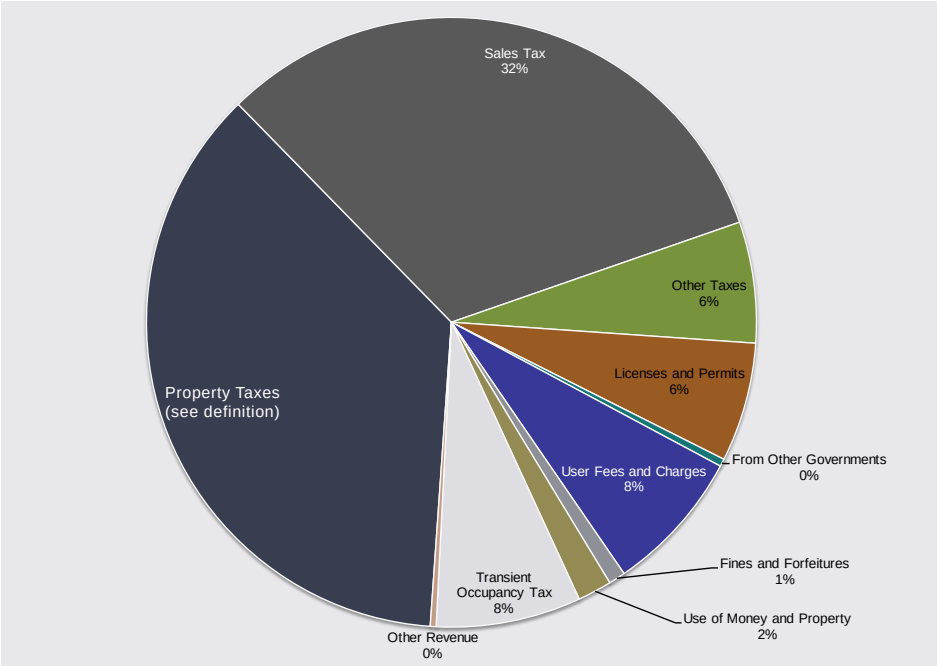
Property Tax (including traditional property tax, motor vehicle in-lieu backfill, and property tax lighting district fees): Lake Forest receives an average of about 4 percent of total property tax revenue collected within the City limits, a relatively modest allocation by California standards. While the General Plan Update can consider opportunities to grow the City's assessed value, its faces strong limitations in changing the property tax rate or tax allocation factor which is regulated by State law. Growth in property assessed value is limited to 2 percent per year absent a market transaction or physical alteration. Consequently, annual growth in property tax above 2 percent generally requires new development or investment property and/or turn-over from market transactions. While the General Plan can have a direct impact on the former, it's influence on the latter is more nuanced.

As recorded in the City's budget, the Property Tax category also includes Motor Vehicle In-Lieu Backfill, which is determined by the State of California and tied to vehicle license fees. The City has little ability to influence the revenue collected through motor vehicles fees, but it can continue to rely upon this revenue stream for future budget years.

Sales Tax: As noted in the prior section, while Lake Forest has a relatively healthy retail sector, substantial Trade Area competition and national changes in consumer behavior stemming from e-commence and other factors, will affect long-term growth. Nevertheless, the General Plan can provide a variety of incentives, tools, and policies that can help this sector strategically adapt to these external forces.

Transient Occupancy Tax: As noted, the City's TOT has shown marked improvement of the last six plus years. Going forward, additional growth in hotel stays will require improved visitation (from both tourism and business travel) combined with appropriate investments in the accommodation sector. The General Plan can play an important role in both through land use policy, initiatives that expand the local economy, and the provision and support of attractive in community amenities.

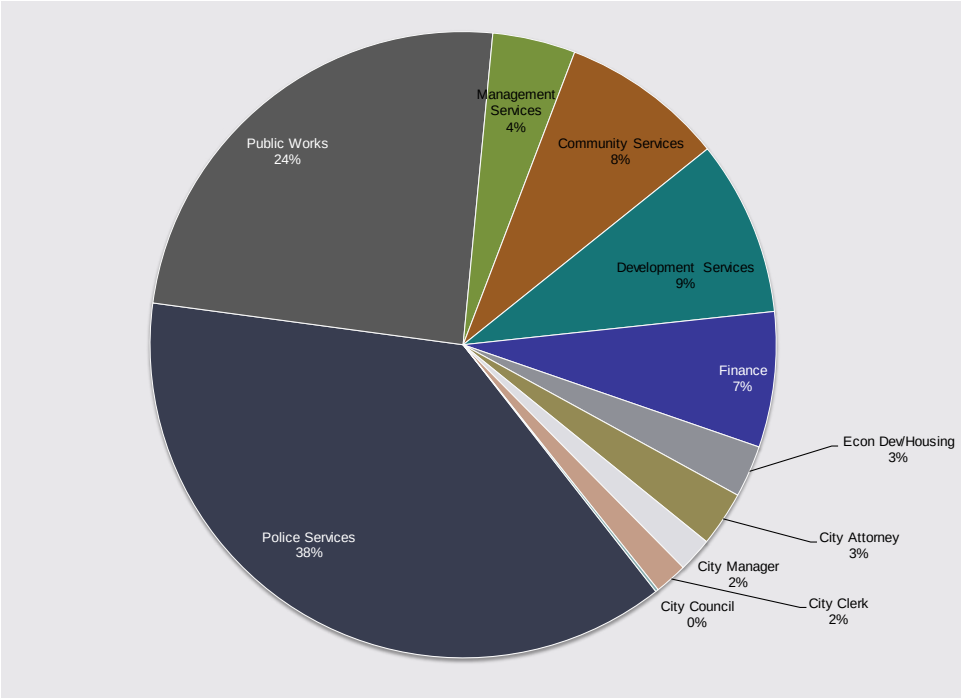
Figure 3-16 General Fund Revenue Categories (2017-2018 Budget)



Source: City of Lake Forest Budget FY 17-18; Economic & Planning Systems

The General Fund is the primary fund to pay for basic city services, programs, and daily operations of the City. General Fund expenditures are shown in Figure 3-17. In a typical year, approximately 50 percent of the budget is spent on the two largest uses, Police Services and Public Works. In FY 2017/2018, the City had an annual budget of $46.2 million, about $600,000 less than General Fund revenues. Of this amount, 38 percent was spent on Police Services and 24 percent was spent on Public Works.

Figure 3-17 General Fund Expenditure Categories (2017-2018 Budget)



Source: City of Lake Forest Budget FY 17-18; Economic & Planning Systems

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CHAPTER 4
MOBILITY

This chapter describes the regulatory framework and existing transportation conditions in the City of Lake Forest. A discussion of pertinent federal, state, regional, and local regulations and plans is presented first. This is followed by a discussion of transportation facilities in Lake Forest that accommodate pedestrians, bicycles, transit, freight, and automobiles, plus an assessment of commute trip patterns, roadway operations, and collisions. Full-page figures are located at the end of the chapter.

This chapter includes the following topics:

Figures are located at the end of the chapter.

4.1 REGULATORY FRAMEWORK

The regulatory framework includes federal, state, regional and local plans relevant to the City of Lake Forest and the California Environmental Quality Act (CEQA) review process for transportation and circulation.

Federal Regulatory Framework

Americans with Disabilities Act

The Americans with Disabilities Act of 1990 (ADA) provides comprehensive rights and protections to individuals with disabilities. The goal of the ADA is to assure equality of opportunity, full participation, independent living and economic self-sufficiency. To implement this goal, the United States Access Board has created accessibility guidelines for public rights-of-way. The guidelines address various issues, including roadway design practices, slope

and terrain issues, pedestrian access to streets, sidewalks, curb ramps, street furnishings, pedestrian signals, parking, and other components of public rights-of-way.

The City of Lake Forest is committed to ensure that people with disabilities have access to City programs, services, activities and facilities. In all of its services, programs, events, activities, facilities, and public meetings, the City strives to eliminate any barriers that prohibit people with disabilities from full access to facilities.

Federal Highway Administration

The Federal Highway Administration (FHWA) is a federal agency that focuses on national highway programs. FHWA administers and manages federal highway programs and establishes national standards. The FHWA publishes the Manual on Uniform Traffic Control Devices (MUTCD) which specifies the standards for street markings, traffic signals, and street signs in the United States. The California Department of Transportation (Caltrans) developed the California MUTCD based on the FHWA MUTCD.

State Regulatory Framework

California Department of Transportation

Caltrans is the primary state agency responsible for transportation issues. One of its duties is the construction and maintenance of the state highway system. Caltrans has established standards for roadway traffic flow and developed procedures to determine if State-controlled facilities require improvements. For projects that may physically affect facilities or require access to a state highway, Caltrans requires encroachment permits before such activity may be undertaken. For projects that would not physically affect facilities but may influence traffic flow and levels of services at such facilities, Caltrans may recommend measures to mitigate the traffic impacts of such projects.

Additionally, the following Caltrans procedures and directives are relevant to transportation improvements in Lake Forest:

- Level of Service Target. Caltrans maintains a target level of service at the transition between level of service (LOS) C and LOS D for all of its facilities.1 Where an existing facility is operating at less than the LOS C/D threshold, the existing measure of effectiveness should be maintained.2
- Caltrans Project Development Procedures Manual. This manual outline pertinent statutory requirements, planning policies, and implementing procedures regarding transportation facilities. It is continually and incrementally updated to reflect changes in policy and procedures. For example, the most recent revision incorporates the Complete Streets policy from Deputy Directive 64-R1, which is detailed below.
- Caltrans Deputy Directive 64 (2001). This directive requires Caltrans to consider the needs of non-motorized travelers, including pedestrians, bicyclists, and persons with disabilities, in all programming, planning, maintenance, construction, operations, and project development activities and products. This includes incorporation of the best available standards in all of the Department's practices.
- Caltrans Deputy Directive 64-R1 (2014). This directive requires Caltrans to provide for the needs of travelers of all ages and abilities in all planning, programming, design, construction, operations, and maintenance activities and products on the state highway system. Caltrans supports bicycle, pedestrian, and transit travel with a focus on "complete streets" that begins early in system planning and continues through project construction and maintenance and operations.
- Caltrans Director's Policy 22 (2001). This policy establishes support for balancing transportation needs with community goals. Caltrans seeks to involve and integrate community goals in the planning, design, construction, and maintenance and operations processes, including accommodating the needs of bicyclists and pedestrians.
- Environmental Assessment Review and Comment. Caltrans, as a responsible agency under the California Environmental Quality Act (CEQA), is available for early consultation on a project to provide guidance on applicable transportation analysis methodologies or other transportation related issues and is responsible for reviewing the traffic impact study for errors and omissions pertaining to the state highway facilities. Caltrans published the Guide for the Preparation of Traffic Impact Studies (December 2002), which established the Measures of Effectiveness as described under "Level of Service Target" above. The Measures of Effectiveness is used to determine significant impact on state facilities. The Guide also mandates that the traffic analysis includes mitigation measures to lessen the potential project impacts on state facilities and the project's fair share responsibility for the impacts. However, the ultimate mitigation measures and their implementations are to be determined upon consultation between Caltrans, the City and the project proponent.

1 *Level of service is explained further in the Study Roadway Segments subsection.*
2 *California Department of Transportation, Guide for the Preparation of Traffic Impact Studies, December 2002.*

OPR General Plan Guidelines

The Governor's Office of Planning and Research (OPR) publishes General Plan Guidelines as a "how to" for cities and counties developing their General Plans. OPR released its updated guidelines in 2017, which includes legislative changes, new guidance, policy recommendations, external links to resource documents, and additional resources. For each General Plan element, the guidelines discuss statutory requirements in detail, provide recommended policy language, and include examples of City and county General Plans that have adopted similar policies.

Assembly Bill 32, Senate Bill 32 and Senate Bill 375

Assembly Bill (AB) 32, also known as the Global Warming Solutions Act of 2006, committed California to reducing greenhouse gas (GHG) emissions to 1990 levels by 2020. The California Air Resources Board (ARB), which is coordinating the response to comply with AB 32, is currently on schedule to meet this deadline. In 2016, Senate Bill (SB) 32 added a new target: reducing statewide emissions to 40 percent below 1990 levels by 2030.

SB 375 provides guidance for curbing emissions from cars and light trucks to help California comply with AB 32. There are five major components to SB 375:

- ARB will guide the adoption of GHG emission targets to be met by each Metropolitan Planning Organization (MPO) in the state.
- MPOs are required to create a Sustainable Communities Strategy (SCS) that provides a plan for meeting these regional targets. The SCS must be consistent with the Regional Transportation Plan (RTP).
- Regional housing elements and transportation plans must be synchronized on eight-year schedules. Also, the SCS and Regional Housing Needs Assessment (RHNA) must be consistent with each other.
- CEQA is streamlined for preferred development types such as mixed-use projects and transit-oriented developments (TODs) if they meet specific requirements.
- MPOs must use transportation and air emission modeling methodologies consistent with California Transportation Commission (CTC) guidelines.

California Complete Streets Act of 2008 (AB 1358)

Originally passed in 2008, California's Complete Streets Act took effect in 2011 and requires local jurisdictions to plan for land use transportation policies that reflect a "complete streets" approach to mobility. "Complete streets" comprises a suite of policies and street design guidelines which provide for the needs of all road users, including pedestrians, bicyclists, transit operators and riders, children, the elderly, and the disabled. From 2011 onward, any local jurisdiction—county or city—that undertakes a substantive update of the circulation element of its General Plan must consider "complete streets" and incorporate corresponding policies and programs. In 2010, OPR released guidelines for compliance with this legislation which provide direction on how circulation elements can best plan for a variety of travel modes such as transit, walking, bicycling, and freight.

Senate Bill 743

On September 27, 2013, Senate Bill (SB) 743 was signed into law.3 The Legislature found that with the adoption of the Sustainable Communities and Climate Protection Act of 2008 (SB 375), the State had signaled its commitment to encourage land use and transportation planning decisions and investments that reduce vehicle miles traveled (VMT) and thereby contribute to the reduction of greenhouse gas emissions (GHG), as required by the California Global Warming Solutions Act of 2006 (AB 32). Additionally, the Complete Streets Act (AB 1358), requires local governments to plan for a balanced, multimodal transportation network that meets the needs of all users. To further the State's commitment to the goals of SB 375, AB 32 and AB 1358, SB 743 adds Chapter 2.7, Modernization of Transportation Analysis for Transit-Oriented Infill Projects, to Division 13 (Section 21099) of the Public Resources Code.

SB 743 started a process that could fundamentally change transportation impact analysis as part of CEQA compliance. These changes will include the elimination of auto delay, level of service (LOS), and other similar measures of vehicular capacity or traffic congestion as a basis for determining significant impacts in many parts of California (if not statewide). Further, parking impacts will not be considered significant impacts on the environment for select development projects within infill areas with nearby frequent transit service. SB 743 includes amendments that revises the definition of "in-fill opportunity zones" to allow cities and counties to opt out of traditional LOS standards established by congestion management programs (CMPs) and requires

3 An act to amend Sections 65088.1 and 65088.4 of the Government Code, and to amend Sections 21181, 21183, 21186, 21187, 21189.1, and 21189.3 of, to add Section 21155.4, to add Chapter 2.7 (commencing with Section 21099) to Division 13 of, to add and repeal Section 21168.6.6 of, and to repeal and add Section 21185 of, the Public Resources Code, relating to environmental quality.

OPR to update the CEQA Guidelines and establish "criteria for determining the significance of transportation impacts of projects within transit priority areas.4 As part of the new CEQA Guidelines, the new criteria "shall promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses." OPR presented alternative metrics in a preliminary discussion draft in summer of 2014 and released a final advisory in April 2018. Key guidance includes:

- VMT is the most appropriate metric to evaluate a project's transportation impact.
- OPR recommends tour- and trip-based travel models to estimate VMT, but ultimately defers to local agencies to determine the appropriate tools.
- OPR recommends measuring VMT for residential and office projects on a "per rate" basis. Specifically, OPR recommends VMT per capita for residential projects and VMT per employee for office projects.
- OPR's recommended impact threshold for residential and office projects is VMT per capita fifteen percent below the City or regional average (whichever is applied). In other words, an office project that generates VMT per employee that is more than 85 percent of the regional VMT per employee could result in a significant impact. This threshold is in line with statewide greenhouse gas emission reduction targets.
- For retail projects, OPR recommends measuring the net decrease or increase in VMT in the study area with and without the project. The recommended impact threshold is any increase in total VMT.
- Lead agencies ultimately have the discretion to set or apply their own significance thresholds, provided they are based on significant evidence.
- Cities and counties still have the ability to use metrics such as LOS for other plans, studies, or network monitoring. However, LOS and similar metrics cannot constitute the sole basis for CEQA impacts.

OPR's guidelines are undergoing final rulemaking and review through the Natural Resource Agency and the Office of Administrative Law. Once the new rules are adopted in mid-2018, cities and other agencies will have a two-year opt-in period before SB 743 compliant CEQA analysis becomes mandatory.

Assembly Bill 417

In October 2013, AB 417 created a statutory CEQA exemption for bicycle plans in urbanized areas. Before the passage of this bill, cities and counties that prepared bicycle plans were required to carry out a CEQA review. AB 417 exempts the following types of bicycle projects in an urbanized area:

- Restriping of streets and highways
- Bicycle parking and storage
- Signal timing to improve intersection operations
- Signage for bicycles, pedestrians, and vehicles
- However, not all bicycle plans are exempt if certain conditions are met (e.g., a new Class I bicycle trail through a sensitive natural area).

Regional Regulatory Framework

Southern California Association of Governments (SCAG)

SCAG is a federally designated MPO and is made up of six counties and 191 cities. SCAG develops long-range regional transportation plans including sustainable communities strategies and growth forecast components, regional transportation improvement programs, regional housing needs allocations, and a portion of the South Coast Air Quality Management Plans.

SCAG approved its most-recent Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) in April 2016, which outlines the long-range vision and the region's transportation system investments through 2040.

Orange County Transportation Authority (OCTA)

The Orange County Transportation Authority (OCTA) coordinates transportation planning efforts throughout Orange County and proides funding for project implementation. Additionally, it prepares the Congestion Management Program (CMP), a plan

4 A "transit priority area" is defined in as an area within one-half mile of an existing or planned major transit stop. A "major transit stop" is defined in Public Resources Code Section 21064.3 as a rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods.

mandated by California law to describe the strategies to address congestion problems on the CMP network, which includes State highways and principal arterials. The CMP Guidelines require analysis of the CMP network and uses level of service standards as a means to measure congestion and to determine how local governments meet CMP standards. OCTA also administers the Master Plan of Arterial Highways (MPAH), which was established in 1956 to ensure that the county's regional highway network would be planned, developed, and preserved in order to supplement the freeway system. The MPAH defines the intended functions and carrying capacities of regional roads in the county. In order to be eligible for Measure M2 funding, a City's General Plan Circulation Element must be consistent with the MPAH; specifically, local circulation elements must maintain an equivalent number of minimum through lanes on each arterial highway that is included as part of the MPAH.

OCTA's Long Range Transportation Plan (LRTP) is a long-range policy document that assesses the county's transportation system over a 20-year horizon and identifies the projects that best address future population, housing, and employment needs. The most recent LRTP was finalized in September 2014 and outlines a vision of multimodal transportation improvements in the county to meet expected demand through 2035, including expanding system choices, improving performance, improving multimodal integration, and ensuring financial sustainability. The 2014 – 2019 OCTA Strategic Plan aims to address the county's short-term (five year) transportation needs and facilitates ongoing planning and implementation within OCTA. The Strategic Plan also sets out OCTA's principals and goals for guiding decision-making and planning.

OCTA also provides bus transit and paratransit services within Orange County, as well as to Los Angeles and Riverside. The OC Transit Vision, published in January 2018, is OCTA's transit-specific master plan that aims to improve transit service for the next 20 years. The plan looks at long-term transit needs, including bus, rail, paratransit, and new types of transportation services and technologies. The plan also identifies the corridors within the county with the highest expected demand and assesses which modes would be appropriate to meet that demand, such as streetcars, bus rapid transit (BRT), or other emerging modes.

OC Active, initiated in March 2017 and currently ongoing, is OCTA's Bike and Pedestrian Plan. The plan's primary goal is to recognize the areas and opportunities for active transportation across the county. The OC Active goals include advancing the strategic walking and biking network, enhancing walking and biking access to transit, improving high-need pedestrian areas, reducing pedestrian and bicyclist collisions, and leveraging funding opportunities for active transportation projects. OCTA is currently conducting bicycle and pedestrian analyses and recommendations and a summary report is expected in summer to fall of 2018.

Orange County Council of Governments (OCCOG)

The Orange County Council of Governments (OCCOG) is a voluntary joint-powers agency that is Orange County's sub-regional planning organization and serves as a channel for local jurisdictions to engage cooperatively on matters such as land use, energy, mobility, air quality, and water. OCCOG's first three-year Strategic Plan, published in May 2016, outlines goals for the organization through 2019 including county advocacy at the regional level. OCCOG also recently completed its Complete Streets Initiative Design Handbook and Funding Toolkit, which aims to help local jurisdictions comply with state Complete Streets legislation, helps guide policy development, and provides design guidance for implementing Complete Streets principles in communities.

Foothill Circulation Phasing Plan (FCPP)

Adopted in September 1987, the Foothill Circulation Phasing Plan (FCPP) provides for roadway construction and improvements in the Foothill area to accommodate new development. Cities in the Foothill area that are subject to the FCPP, including Lake Forest, collect FCPP fees at the time building permits are issued. Roadway construction and improvements are financed and constructed to correspond with development in the Foothill area.

Foothill and Eastern Transportation Corridor Fee Program

The Transportation Corridor Agencies (TCA) operate the publicly-owned toll facilities in Orange County: State Route (SR) 73 (SR-73), State Route 133 (SR-133), State Route 241 (SR-241), and State Route 261 (SR-261). These roads were financed with bonds which are backed by toll revenues and development impact fees. Development impact fees are assessed on new construction in areas that benefit from these four toll facilities. Lake Forest falls within two fee zones: Foothill/Eastern (F/E) Zone A (north of Trabuco Road) and F/E Zone B (south of Trabuco Road), which run parallel to SR-241 and I-5, respectively. Fees are assessed on a per-unit basis for residential development and on a per square footage basis for non-residential square footage and are collected when a building permit is issued.

Metrolink

Metrolink is a regional transportation agency providing passenger rail service to Los Angeles, Ventura, Riverside, San Bernardino, Orange, and San Diego[5] Counties. Metrolink's 10-year Strategic Plan and 5-Year Short Range Transit Plan were approved by the

5 *Metrolink Inland Empire-Orange County Line and Orange County Line service extend to one station in San Diego County*

Metrolink Board of Directors in March 2016. These plans are policy documents that guide transportation funding decisions and establishes goals for the agency in the upcoming years. Metrolink does not provide a station in the City of Lake Forest, but Lake Forest residents can access Metrolink trains at the Irvine and Laguna Niguel/Mission Viejo stations. These stations provide directions to downtown Los Angeles, San Bernardino, and Oceanside.

Local Regulatory Framework

Current General Plan Transportation Element

With the exception of State highways that are under Caltrans' jurisdiction, streets in Lake Forest are generally under the jurisdiction of the City of Lake Forest. The current Lake Forest General Plan, adopted in 1994, is the primary planning document for the City and serves to guide development in the City. The General Plan Circulation Element, updated in 2008, provides the policy framework for the regulation and development of transportation systems, balancing demands for moving people and goods within the City. It addresses vehicular, pedestrian, bicycle, transit, truck, equestrian, and rail transportation. Parking, transportation system and demand management, and infrastructure funding policies are also included.

Lake Forest Transportation Mitigation Program (LFTM)

The Lake Forest Transportation Mitigation Program (LFTM) was established to provide funding for the coordination and phased installation of transportation improvements in the City to mitigate the impacts of specific projects within the City. Fees are based on typical trip lengths and average daily trips for each type of land use. The City conducts a review of LFTM every five years. These updates assess whether any LFTM improvements should be reduced or eliminated and whether improvement costs should be updated or reallocated between projects; no new improvements are added to LFTM during these reviews. The City assesses mitigation needs and allocates fees using the Lake Forest Traffic Analysis Model (LFTAM), which was developed based on the Orange County Transportation Analysis Model (OCTAM), the subregional model developed by OCTA and based on the SCAG regional travel demand model.

Lake Forest Capital Improvement Plan

The City of Lake Forest Capital Improvement Plan (CIP) is a list of projects programmed for funding from identified funding sources for a five-year period. The following transportation capital improvement projects are included currently underway (in design stages, under environmental review, or under construction):

- Sidewalk Repairs (Annual)
- Street Sign Replacements (Anticipated Completion Summer 2018)
- I-5 Interchange Signs

(Oceanside).

4.2 RESIDENT AND WORKER TRAVEL BEHAVIOR

According to data obtained from the 2012 California Household Travel Survey, the majority of residents in Lake Forest use motor vehicles as the primary mode of travel, either as a driver or a passenger. For Lake Forest residents, 92 percent of all resident trips for all trip-purposes were by motor vehicle (71 percent as a driver, 21 percent as a passenger in a vehicle), 2 percent by transit, zero percent by bike, and six percent by walking. For school trips, a significantly higher proportion of trips (24 percent) are accomplished by walking compared to the average for all trip types (six percent). Trips to recreation, dining, and shopping (part of the "Other" category) also have a larger proportion of people traveling via transit than home, work, and school trips. The mode share by general trip purpose for Lake Forest is shown in Table 4-1.

Table 4-1 Lake Forest Mode Share by Trip Type

Home	75%	19%	0%	0%	6%
Work	93%	7%	0%	0%	0%
School	9%	67%	0%	0%	24%
Other	67%	24%	3%	0%	6%
Overall	71%	21%	2%	0%	6%

Source: California Household Travel Survey

Table 4-2 Orange County Mode Share by Trip Type

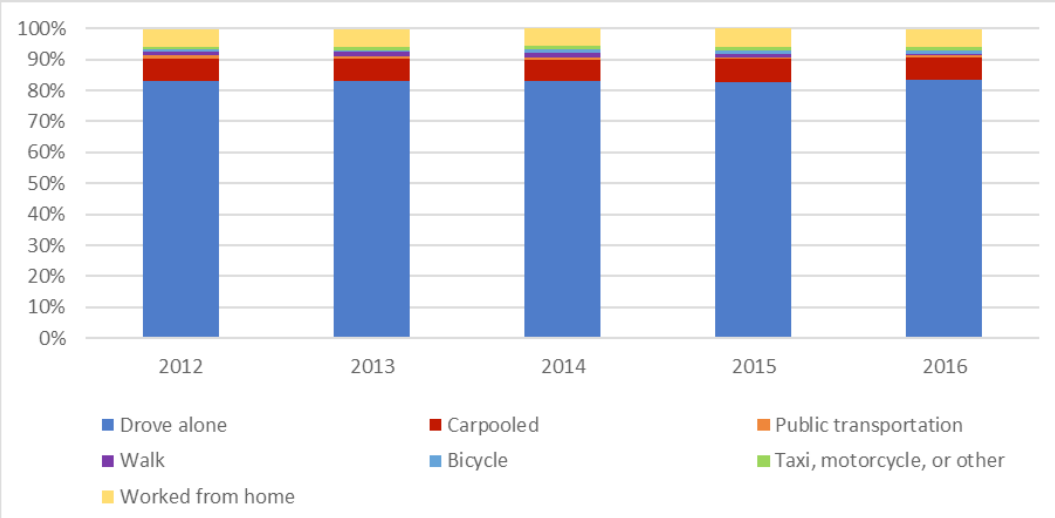
Home	59%	26%	1%	2%	12%
Work	86%	6%	1%	1%	6%
School	15%	58%	4%	3%	20%
Other	54%	28%	5%	1%	12%
Overall	57%	27%	3%	1%	12%

Source: California Household Travel Survey

Compared to Orange County as a whole, there is lower transit use and bicycling for all trip purposes in Lake Forest. Walking accounts for a smaller proportion of all trips in Lake Forest except for school trips. Overall, driving accounts for a higher proportion of trips in Lake Forest compared to the proportion for Orange County as a whole. The mode share by general trip purpose at the county level is shown in Table 4-2.

The mode distribution for Lake Forest commuters has not changed significantly in recent years according to data obtained from the U.S. Census Bureau American Community Survey (ACS). Based on the most recent five-year estimates from the ACS (2012 to 2016), the mode share has been relatively consistent each year, with the percentage of commuters driving or carpooling ranging between 90 and 91 percent and the percentage of those working from home staying at approximately 6 percent. Public transportation as a share of commute trips has decreased somewhat from 1.2 percent to less than one percent while walking as a share of commute trips has decreased from 1.3 percent to 0.5 percent. The bicycling mode share ranges from 0.6 percent to 1.3 percent during these five years.

Table 4-3 Lake Forest Mode Share by Year (2012-2016)



Source: Census, ACS (2012-2016)

Pedestrian facilities

Lake Forest offers several types of facilities and amenities that support walking in the City. The availability and quality of pedestrian facilities vary throughout the City and can be analyzed using seven key factors as shown in Table 4-4.

Table 4-4 Pedestrian Facility Conditions in Lake Forest

Factor	Description	Assessment
 Sidewalk Availability	Sidewalk availability is core to supporting walkability and safety separating pedestrians from vehicles and other modes. In addition, it is important that sidewalks are present on both sides of the roadway and are available along the entire segment rather than end midblock.	Sidewalks are generally provided on both sides of arterial and local streets across the City. A small number of sidewalk coverage gaps exist, including at the Lake Forest Drive overpass at I05, Ridge Route Drive railroad underpass, Trabuco Road bridge at Aliso Creek, and El Toro Road north of Trabuco Road.
 Sidewalk Conditions	Cracked, broken, or otherwise damaged sidewalks can pose a safety hazard and discourage walking.	Sidewalks in the City are in good condition, free of cracks or uplifts.
 Crosswalk Availability	Marked crosswalks can safely accommodate pedestrians that need to cross streets. A lack of marked crosswalks could hinder walkability since pedestrians need to travel greater distances to reach a safe marked crossing point. Drivers may also be less likely to yield to intersections at unmarked crossings.	Marked crosswalks are consistently provided at intersections across the City.
 Shading	Shading, whether natural or artificial, can encourage walking in areas such as Southern California which are relatively warm with limited rainfall, especially in the summer.	Shading is provided across the City in the form of abundant tree landscaping along arterials and local residential streets.
 Flat Grade	Steep hills and ravines can discourage walking, especially for pedestrians with limited mobility.	While there is a gradual elevation increase in the City heading northeast, the City is generally flat without steep grade changes at the pedestrian level. Locations with noticeable grade increases include the Bake Parkway and El Toro Road railroad overpasses, the Lake Forest Drive bridge at I-5, and Glenn Ranch Road.
 Buffer	Buffers which provide separation between pedestrians and moving vehicles can help improve the walking experience, and can include landscaping, parked vehicles, and bulbouts, which serve to both reduce pedestrian crossing distances at intersections and as a traffic calming measure.	Within Lake Forest's residential neighborhoods, buffers consist of grass, other landscaping, and parallel parking. Along arterial roads, parking is generally prohibited, and bike lanes are sometimes present; arterial roads tend not to have street landscaping buffers.
 Amenities	In addition to physical facilities that accommodate walking, useful or interesting amenities along sidewalks create a more interesting walking environment and increase pedestrian comfort. Amenities can include sidewalk-adjacent retail and restaurants, landscaping, and street furniture.	Within Lake Forest's residential neighborhoods, the primary amenity is street landscaping. Arterial roads offer few pedestrian-level amenities, especially given that retail in Lake Forest is generally not street-facing.

In addition to on-street facilities, Lake Forest residents enjoy several off-road hiking-only and multiuse trails. These include the Serrano Creek Trail and other trails in the Foothill area, as shown in Figure 4-1. In addition, pedestrians using these trails are supported by several bicycle/pedestrian bridges and underpasses across the City.

Bicycle Facilities

The City of Lake Forest has a bicycle facilities network that consists of both dedicated and shared street space for bicyclists. Figure 4-1 displays the existing designated bicycle facilities in the City.

Bicycle facilities are categorized into four types, as described and depicted in illustrations below. Note that while the graphics include typical widths for the various facilities, the exact configuration of a bike facility can vary depending on its location and the jurisdiction's preferences.

- Class I Bikeway (Bike Path). Also known as a shared path or multi-use path, a bike path is a paved right-of-way for bicycle travel that is completely separate from any street or highway.
- Class II Bikeway (Bike Lane). A striped and stenciled lane for one-way bicycle travel on a street or highway. This facility could include a buffered space between the bike lane and vehicle lane and the bike lane could be adjacent to on-street parking.
- Class III Bikeway (Bike Route). A signed route along a street where the bicyclist shares the right-of-way with motor vehicles. This
- Class IV Bikeway (Separated Bike Lane). A bikeway for the exclusive use of bicycles including a separation required between the separated bikeway and the through vehicular traffic. The separation may include, but is not limited to, grade separation, flexible posts, inflexible physical barriers, or on-street parking.

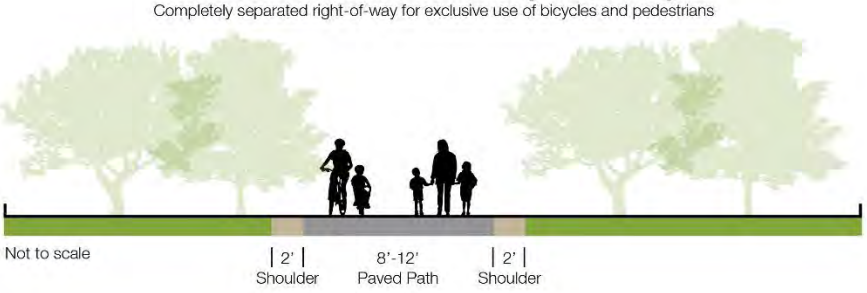
As shown in Figure 4-1, the existing bicycle facilities in Lake Forest include:

- A Class I facility running along Aliso Creek between Santiago Canyon Road and Laguna Niguel.
- Class II bicycle lanes on the City's arterial roadways including Portola Parkway, Alton Parkway, Bake Parkway, Ridge Route Drive, Trabuco Road, Jeronimo Road, Muirlands Boulevard, Los Alisos Boulevard, and Rancho Parkway.
- Class II bicycle lanes on portions of the City's arterial roadways including Lake Forest Drive (Muirlands Boulevard to Portola Parkway), Toledo Way (Bake Parkway to Lake Forest Drive), and Rockfield Boulevard (Ridge Route Drive to Cavanaugh Road and El Toro Road to Los Alisos Boulevard.
- The Serrano Creek Trail, an unpaved multiuse trail running from Bake Parkway to El Toro Road.
- Several unpaved multiuse trails in the Foothill area northeast of SR-241.
- Non-motorized bridges and underpasses along the Aliso Creek bikeway, Serrano Creek Trail, and other paths and trails.

Bicycle Facility Examples

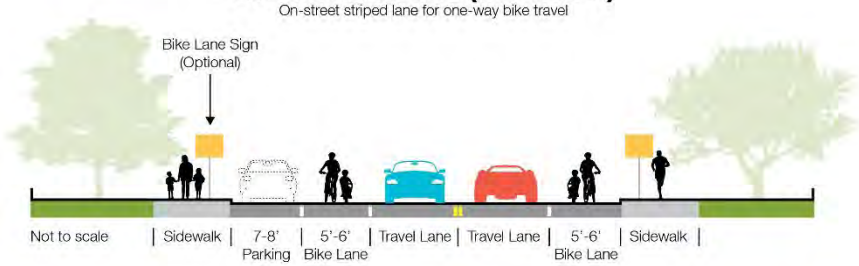
SHARED-USE PATH (CLASS I)

Completely separated right-of-way for exclusive use of bicycles and pedestrians



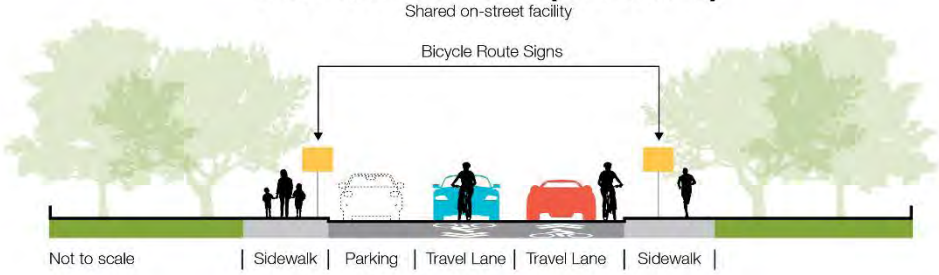
BICYCLE LANE (CLASS II)

On-street striped lane for one-way bike travel



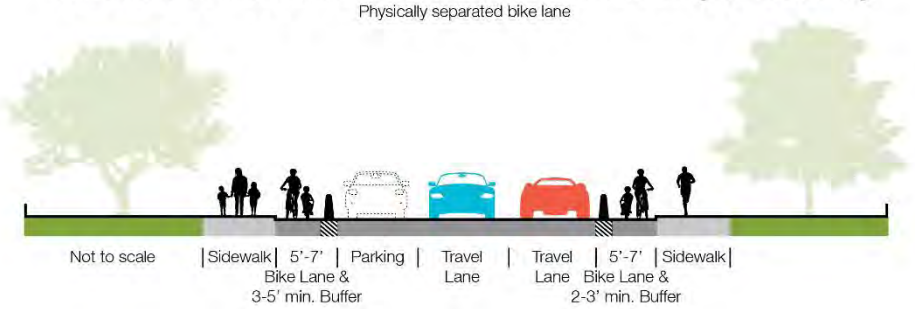
BICYCLE ROUTE (CLASS III)

Shared on-street facility



CYCLE TRACK/SEPARATED BIKEWAY (CLASS IV)

Physically separated bike lane



4.3 TRANSIT SERVICE

OCTA provides bus service and shared-ride paratransit service within Lake Forest and throughout Orange County. In addition, transit riders can access Metrolink and Amtrak commuter rail services in nearby Irvine and Mission Viejo. There are also a number of park and ride lots in and adjacent to Lake Forest, most of which provide access to OCTA bus routes. The various public transit services in and around Lake Forest are documented below.

ORANGE COUNTY TRANSPORTATION AUTHORITY (OCTA)

OCTA provides bus service in Orange County. It connects Lake Forest with several nearby cities (including Santa Ana, Mission Viejo, Irvine, and Laguna Hills) and several regional destinations such as John Wayne Airport and Irvine Station. OCTA also provides paratransit service through its ACCESS Service. This shared-ride paratransit serves areas with ¾ mile of an OCTA fixed route service. The fare is $3.60 per passenger, one-way, and reservations are required.

Bus routes in Lake Forest and annual stop-level ridership throughout the City are illustrated in Figures 4-2 and 4-3 (included at the end of this chapter). Table 4-5 presents the route information and average weekday daily ridership for all OCTA routes that serve Lake Forest.

Table 4-5 OCTA Transit Lines and Ridership (Fiscal Year 2016)

#	Lake Forest Streets Served	Destinations Served	Hours of Operation	Average Weekday Daily Ridership (Route)	Headways (minutes)	
					Peak	Off-Peak
82	Portola Parkway	Foothill Ranch Towne Center, Saddleback Church Park and Ride, Portola Plaza, Rancho Santa Margarita Towne Center	4:51 AM - 7:58 PM	605	70	70
86	Jeronimo Road	Mission Viejo, Norman Murray Community Center, Serrano Intermediate School, Heroes Park, Irvine Civic Center, Kaiser Permanente, Irvine Spectrum, Irvine Station Area, South Coast Plaza, Orange County Performing Arts Center, John Wayne Airport	5:42 AM - 8:53 PM	653	60	60
89	El Toro Road	Portola Plaza, El Toro High School, Serrano Intermediate School, The Arbor, Saddleback Memorial Medical Center, Laguna Hills Transportation Center, Laguna College of Art & Design, Laguna Beach Bus Station	4:57 AM - 10:15 PM	1,250	30	60
177	Lake Forest Drive	Foothill Ranch Towne Center, Saddleback Memorial Medical Center, and Laguna Hills Transportation Center	5:50 AM - 7:17 PM	350	45	90
206	Bake Parkway	Santa Ana Regional Transportation Center, Irvine Station, Irvine Spectrum, and Foothill Ranch Marketplace and Towne Center	5:44 AM - 5:41 PM	87	30	N/A
480	Bake Parkway	Irvine Station, Irvine Spectrum, and Commercentre	6:07 AM - 5:18 PM	78	25	N/A

Source: OCTA Bus Book (February 11, 2018), OC Transit Vision (January 2018)

METROLINK

Metrolink provides heavy-rail, regional transit service to the counties of Los Angeles, San Bernardino, Orange, Ventura, San Diego, and Riverside. The closest Metrolink station to Lake Forest is the Irvine Station, two miles northwest of Lake Forest. The Irvine Station provides 1,650 parking stalls, and parking is free. The Inland Empire-Orange County and Orange County lines serve the Irvine Station. The Inland Empire-Orange County line connects to Oceanside to the south and to San Bernardino to the North, via a connection in the City of Orange and Anaheim Canyon. The Orange County line also connects to downtown Los Angeles to the north, serving several cities in Orange County in between. An average of 1,367 passengers per day board at Irvine Station and an average of 346 passengers per day board at Laguna Niguel/Mission Viejo Station.6 Metrolink operates Sunday through Saturday with 15 to 30-minute headways during commute periods and provides service between 4:15 AM and 10:41 PM.

AMTRAK

Amtrak operates intercity and interstate rail service nationwide. Currently, there are no Amtrak stops located within the City of Lake Forest, but residents can access Amtrak Pacific Surfliner line at the Irvine Station, located in Irvine. The line travels along the California coast, connecting San Luis Obispo to San Diego, and serving destinations such as downtown Los Angeles along the way.

4.4 MOVEMENT SYSTEMS

Freight and Goods Movement

Accommodating freight and goods movement plays an important role in Lake Forest's circulation network, given the City's proximity to several freeways.

The Surface Transportation Assistance Act (STAA) of 1982 defines a network of state facilities as truck routes which accommodate large trucks. STAA-designated truck routes in Lake Forest consist of I-5 and SR-241. Other STAA-designated truck routes in proximity to Lake Forest include Interstate 405 (I-405), SR-133/Laguna Canyon Road, and SR-73. These truck routes are shown in Figure 4-4.

According to the current General Plan, trucks on local roads should be limited to arterial roadways. The City's Municipal Code prohibits vehicles exceeding a maximum gross weight of 14,000 pounds from using the following arterials and local roads in the City, displayed in Figure 4-4:7

- Canada Road from Dimension Drive to Lake Forest Drive
- Osterman Road from Pittsford Drive to Regency Lane
- Pittsford Drive from Northcrest Drive to Lake Forest Drive
- Regency Lane from Normandale Drive to Lake Forest Drive
- Normandale Drive from El Toro Road to Osterman Road
- Aliso Park Drive from El Toro Road to Midcrest Drive
- Northcrest Drive from Midcrest Drive to El Toro Road
- Serrano Road from Toledo Way to El Toro Road
- Toledo Way from Bake Parkway to Lake Forest Drive
- Jeronimo Road from Bake Parkway to Lake Forest Drive
- Muirlands Boulevard from north City limits to Lake Forest Drive

Additionally, goods movement in Lake Forest and the surrounding area is supported by the Topeka & Santa Fe Railroad which runs through the City between Muirlands Boulevard and Jeronimo Road. This is an important regional freight facility and is included in SCAG's main line rail network.8

6 *Southern California Regional Rail Authority Development of Strategic Plan, 2016.*
7 *City of Lake Forest Municipal Code, 12.26.030*
8 *Southern California Association of Governments, 2016-2040 RTP/SCS, June 2016.*

Aviation System

John Wayne Airport is a commercial airport serving passenger and cargo airplanes. The airport is located approximately 10 miles northwest of Lake Forest and surrounded by the cities of Irvine, Newport Beach, and Costa Mesa. With two runways and over 10 million passengers in the year 2016, it is the third busiest airport in Southern California. Lake Forest residents can directly access the airport using I-405, which connects to Lake Forest via I-5, SR-133, and SR-241. Other passenger airports in the region include Los Angeles International Airport, Long Beach Airport, Ontario International Airport, Hollywood Burbank Airport, and San Diego International Airport.

Roadway System

The roadway system in Lake Forest consists of arterial roadways as well as regional freeways and highways that serve local and regional traffic demand. The vehicular facilities in Lake Forest are discussed below.

Local Arterial Roadways

Roadways within Lake Forest are classified in the Circulation Element (revised 2008) of the 1994 Lake Forest General Plan as principal arterials, major arterials, primary arterials, secondary arterials, and commercial streets; these classifications are shown in Figure 4-5.

- Principal Arterials. According to the current Circulation Element, principal arterials generally have eight lanes and a raised median with a daily capacity of approximately 70,000 vehicles. On-street parking and left-turns at unsignalized minor street and driveway intersections are typically prohibited.
- Major Arterials. Major arterials generally have six lanes and a raised median with a daily capacity of approximately 56,000 vehicles. On-street parking is typically prohibited. In addition, signalized intersections are preferable to unsignalized intersections along major arterials.
- Primary Arterials. Primary arterials generally have four lanes and a painted or raised median with a daily capacity of approximately 36,000 vehicles. Similar to other arterial classifications in Lake Forest, on-street parking is typically prohibited.
- Secondary Arterials. Secondary arterials generally have four lanes without a painted or raised median. The daily capacity for a secondary arterial is approximately 25,000 vehicles. Unlike principal, major, and primary arterials, secondary arterials can provide on-street parking and access via unsignalized intersections at minor streets.
- Commercial Streets. The current Circulation Element recognizes that certain streets near commercial centers can have different daily traffic patterns compared to arterials in areas that are predominantly residential. For example, streets in commercial areas experience heavier traffic volumes after the morning peak hour and during non-peak hours compared to residential areas. Due to these unique characteristics, certain arterials in commercial areas are designated as commercial streets.

Individual arterials in Lake Forest and their current classifications are described below. In general, the east-west roadways provide connections to neighboring cities such as Mission Viejo and Irvine, and the north-south roadways connect Lake Forest to Laguna Woods, Cleveland National Park, SR-241, and I-5.

El Toro Road is a north-south road connecting I-5 to SR- 241. It serves commercial centers and provides access to several neighborhoods. There are four 11-foot travel lanes in each direction, between Interstate 5 and Muirlands Boulevard. North of Muirlands Boulevard, El Toro has three travel lanes in each direction. Opposing travel lanes are separated by a painted median and two-way left turn lane. There are sidewalks on both sides of the street, except between Creekside and Raintree Lane, where there is only a sidewalk on the west side. The Aliso Creek bikeway, a shared use path, runs along the west side of the street between Normandale Drive and Live Oak Canyon Road. The posted speed limit is 55 miles per hour (mph) north of North Crest, 50 mph between North Crest and Jeronimo Road, and 40 mph south of Jeronimo Road. On-street parking is not permitted. El Toro Road is classified as a major arterial north of Trabuco Road, a principal arterial between Trabuco Road and Muirlands Boulevard, and a commercial street between Muirlands Boulevard and I-5.

Lake Forest Drive is a north-south road connecting I-5 to SR-241. It serves commercial centers and provides access to several neighborhoods. There are three 11-foot travel lanes in each direction south of Trabuco Road and four travel lanes in each direction north of Trabuco Road. Opposing travel lanes are separated by a raised median. Sidewalks are present along both sides of the roadway throughout the City. On-street parking is not permitted. Lake Forest Drive has Class II bike lanes on both sides of the street, between Portola Parkway and Muirlands Boulevard. The posted speed limit varies between 40 mph and 55 mph. Lake Forest Drive is classified as a commercial street from Portola Parkway to Rancho Parkway, a primary arterial from Rancho Parkway to Trabuco Road, a major arterial from Trabuco Road to Muirlands Boulevard, and a commercial street from Muirlands Boulevard to I-5.

Alton Parkway is a north-south road traveling between Portola Parkway, SR-241, and the northwestern City limit, providing connectivity from Foothill Ranch to I-5 and I-405. There are three 11- to 12-foot travel lanes in each direction, separated by a raised median. There are sidewalks on both sides of the street and Class II bike lanes are provided south of Portola Parkway. The posted speed limit is 40 mph. Alton Parkway is classified as a major arterial.

Bake Parkway is a north-south road running between Portola Parkway and the City limits and providing connectivity from Foothill Ranch to I-5. There are two 11- to 12-foot travel lanes in each direction, separated by a raised median. Sidewalks and Class II bike lanes are provided on both sides of the street. The posted speed limit is 50 mph. Bake Parkway is classified as a commercial street north of Rancho Parkway, a primary arterial between Rancho Parkway and Pointe Drive, and a major arterial south of Pointe Drive.

Los Alisos Boulevard is a north-south roadway running along a portion of the southeastern City limits. Within Lake Forest, Los Alisos Boulevard mainly serves residential neighborhoods. There are three 11-foot travel lanes in each direction, separated by a raised median. Sidewalks and Class II bike lanes are provided along both sides of the roadway. On-street parking is not permitted. The posted speed limit is 45 mph. Los Alisos Boulevard is classified as a major arterial.

Portola Parkway is an east-west roadway traveling parallel to and across SR-241, between the City boundaries with Irvine and Mission Viejo. East of SR 241, there are two to three 11- to 12-foot travel lanes in each direction, separated by a raised median. West of SR 241, there are three 11 to 12-foot travel lanes. Sidewalks and Class II bike lanes are provided along both sides of the roadway. On-street parking is not permitted. The posted speed limit is 45 mph. Portola Parkway is classified as a primary arterial west of Alton Parkway, a major arterial between Alton Parkway and SR-241, a principal arterial between SR-241 and El Toro Road, and a major arterial south of El Toro Road. Portola Parkway presently terminates at the City's northwest limits (past Paloma) before resuming at the SR-241 diamond interchange in Irvine. The OCTA MPAH shows Portola Parkway's future alignment as continuous between these two segments.

Trabuco Road is an east-west roadway, bisecting Lake Forest. There are three 11- to 12-foot travel lanes in each direction west of El Toro Road and two travel lanes in each direction east of El Toro Road, separated by a raised median. Sidewalks are present on both sides of the road, except for a short extent on the Aliso Creek bridge. Class II bike lanes are provided along both sides of the roadway. On-street parking is not permitted. The posted speed limit is 45 mph. Trabuco Road is classified as a major arterial. West of Bake Parkway (in Irvine) this roadway is known as Irvine Boulevard.

Toledo Way is an east-west roadway, extending from Alton Parkway (in Irvine) to El Toro Road. There are two 10- to 12-foot travel lanes in each direction, separated by a two-way left turn lane. Sidewalks are present on both sides of the road. Class II bike lanes are available on both sides of the street west of Ridge Route Drive. On-street parking is permitted on the north side of Toledo Way between El Toro Road and El Toro High School. The posted speed limit varies between 45 and 50 mph; between Ridge Route Drive and El Toro Road (adjacent to El Toro High School) the speed limit is 25 mph when children are present. Toledo Way is classified as a Secondary Arterial.

Jeronimo Road is an east-west roadway, bisecting Lake Forest. There are two 10- to 12-foot travel lanes in each direction; opposing travel lanes are separated by a two-way left turn lane west of El Toro Road and by a raised median east of El Toro Road. Sidewalks and Class II bike lanes are provided on both sides of the road. On-street parking is not permitted. The posted speed limit varies between 40 and 45 mph; adjacent to Serrano Middle School, the speed limit is 25 mph when children are present. Jeronimo Road is classified as a primary arterial.

Muirlands Boulevard is an east-west roadway, providing access to residential and commercial uses in Lake Forest. There are two 11- to 14-foot travel lanes in each direction, separated by a two-way left turn lane. Sidewalks and Class II bike lanes are provided on both sides of the road. On-street parking is not permitted. The posted speed limit is 45 mph. Muirlands Boulevard is classified as a primary arterial.

Rockfield Boulevard is an east-west roadway, running parallel east of I-5 and providing access to residential and commercial uses. There are two 10- to 13-foot travel lanes in each direction, separated by either a raised median or a two-way left turn lane. Sidewalks are provided on both sides of the road. Class II bike lanes are available between the northwestern City limit and Lake Forest Drive, Ridge Route Drive and Cavanaugh Road, and El Toro Road and Los Alisos Boulevard. On-street parking is not permitted. The posted speed limit is 45 mph. Rockfield Boulevard is classified as a commercial street west of Ridge Route Drive and a primary arterial east of Ridge Route Drive.

Ridge Route Drive is a north-west road between Trabuco Road and a terminus point at I-5, providing connectivity to residential and retail uses. There are two 11- to 12-foot travel lanes in each direction, which is reduced to one lane in each direction at the railroad underpass between Muirlands Boulevard and Jeronimo Road. South of Costa Bella Drive, opposing travel lanes are separated by a raised median; north of Costa Bella Drive, opposing travel lanes are either undivided or separated by a two-way left turn lane. Sidewalks are provided on both sides of the street, except at the railroad underpass which only provides a sidewalk

on the western side. Class II bike lanes are provided north of Rockfield Boulevard except for a short gap at the railroad crossing. On-street parking is prohibited north of Rockfield Boulevard. The posted speed limit is 40 mph; between Serrano Road and Toledo Way (adjacent to El Toro High School and La Madera Elementary School) the speed limit is 25 mph when children are present. Ridge Route Drive is classified as a primary arterial.

Glenn Ranch Road is an east-west roadway between Portola Parkway and El Toro Road, providing access to residential neighborhoods and several recreational hiking trails. There are two 11- to 24-foot travel lanes in each direction, separated by a two-way left turn lane. Sidewalks are provided on both sides of the road west of Saddleback Ranch Road and on the north side of the road east of Saddleback Ranch Road. On-street parking is not permitted, and the posted speed limit is 50 mph. Glenn Ranch Road is classified as a primary arterial.

Rancho Parkway is an east-west roadway between Bake Parkway and Portola Parkway. There are two 12- to 14-foot lanes in each direction, separated by a raised median. Sidewalks are provided on both sides of the road east of Lake Forest drive and on the northern side of Rancho Parkway west of Lake Forest Drive. Class II bike lanes are provided in both directions. On-street parking is permitted east of Hermana Circle. The posted speed limit is 45 mph. Rancho Parkway is classified as a commercial street.

Rancho Parkway South is an east-west roadway between Alton Parkway and Bake Parkway; west of Alton Parkway, Rancho Parkway South continues as Towne Centre Drive South. There are two 13- to 14-foot lanes in each direction, separated by a raised median. Sidewalks and Class II bike lanes are provided on both sides of the road. On-street parking is not permitted. The posted speed limit is 40 mph. Rancho Parkway South is classified as a primary arterial.

Commercentre Drive is an east-west roadway connecting Alton Parkway, Bake Parkway, and Dimension Drive and provides access to office/industrial uses and Lake Forest City Hall. There are two 11- to 14-foot travel lanes in each direction, separated by a two-way left turn lane. Sidewalks are provided on both sides of the street. On-street parking is not permitted. The posted speed limit is 45 mph. Commercentre Drive is classified as a secondary arterial.

Freeways

Freeways are distinguished from other types of roadways in that abutting lands have no right or easement of access to or from the lands or abutting land-owners have only limited or restricted right or easement of access.9 Freeways that travel through or adjacent to Lake Forest are described below.

Interstate 5 (I-5) is a north-south freeway connecting the Mexican border to the Canadian border, running through California, Oregon, and Washington. I-5 runs along Lake Forest's southwestern City limit and provides connections to Los Angeles County, northern and southern Orange County, and San Diego County, as well as connections to I-405, SR-133, and other regional freeways. Access to and from I-5 is possible via on- and off-ramps at El Toro Road, Lake Forest Drive, Bake Parkway, and Alton Parkway. Adjacent to Lake Forest, the freeway has five 12-foot general purpose lanes in each direction; there are two high-occupancy vehicle (HOV) (2+ persons) lanes in each direction north of El Toro Road and one HOV lane in each direction south of El Toro Road. The posted speed limit is 65 mph.

State Route 241 (SR-241) is a north-south tolled state highway operated by TCA and traveling from Rancho Santa Margarita to its terminus at State Route 91 (SR-91) in Anaheim. SR-241 bisects Lake Forest and provides connectivity to other state highways consisting of SR-133, SR-261, and SR-91. Access to and from SR-241 is possible via ramps at Alton Parkway, Lake Forest Drive, and Portola Parkway. Within the City, SR-241 has three 12-foot travel lanes in the northbound direction and two to three travel lanes in the southbound direction. The posted speed limit is 65 mph.

Study Roadway Segments

Operations on 75 roadway segments in the City were determined on a daily traffic volume basis. Operations were assessed and assigned a level of service (LOS) letter grade ranging from LOS A to LOS F (from better to worse congestion), with LOS A signifying free-flow traffic and LOS F signifying operations that are over roadway capacity. The roadway segment LOS thresholds are shown in Table 4-6. These thresholds are based on representative roadway capacities in the current Lake Forest General Plan Circulation Element and are defined by the number of lanes and the presence of a median or divider. Daily capacities for roadways with asymmetric capacity (e.g., seven lanes) were interpolated based on the capacities displayed in Table 4-7. Please note that, as described at the beginning of this chapter, the role of LOS is evaluating project impacts is changing and the State of California is requiring cities to use the metric of Vehicle Miles Traveled (VMT) to determine potential impacts. However, because LOS is still a measurement cities and residents are familiar with, its analysis has been included in this Report and it may still continue to play a role in the future policy direction for the City of Lake Forest.

9 *California Department of Transportation, 2012, Highway Design Manual, Chapter 60 Nomenclature.*

Table 4-6 Daily Roadway Capacity Values for Arterial Level of Service

	A	B	C	D	E
8 Lane Divided	42,000	49,000	56,000	63,000	70,000
6 Lane Divided	33,600	39,200	44,800	50,400	56,000
4 Lane Divided	21,600	25,200	28,800	32,400	36,000
4 Lane Undivided	15,000	17,500	20,000	22,500	25,000

Source: Lake Forest Circulation Element 2008

All 24-hour vehicle volumes were collected at the study roadway segments in April 2018. Table 4-5 provides the study roadway segments, existing daily volumes, and the resulting levels of service. Data in bold indicate roadway segments that currently operate at unacceptable levels of service (LOS E or F), as defined the City's current General Plan. This data is also shown in Figure 4-6 (included at the end of this chapter).

Overall, the majority of the study roadway segments operate at LOS A on a daily basis. However, Lake Forest Drive (south of Rockfield Boulevard) operates (unacceptably) at LOS F.

Table 4-7 Existing (2018) Roadway Segment Level of Service

Roadway	Segment	Roadway Type[1]	ADT[2]	LOS
Trabuco Road	West of Lake Forest Drive	6D	21,535	A
	West of Ridge Route Drive	6D	22,336	A
	West of El Toro Road	6D	25,107	A
	East of El Toro Road	4D	21,730	A
Toledo Way	West of Lake Forest Drive	4D	6,063	A
	East of Lake Forest Drive	4U	5,812	A
	East of Ridge Route Drive	4D	5,985	A
Jeronimo Road	West of Lake Forest Drive	4D	13,482	A
	West of Ridge Route Drive	4U	13,349	A
	West of El Toro Road	4D	14,359	A
	East of El Toro Road	4D	21,648	A
Muirlands Boulevard	West of Lake Forest Drive	4D	13,936	A
	West of Ridge Route Drive	4D	17,180	A
	East of Ridge Route Drive	4D	19,578	A
	East of El Toro Road	4D	20,709	A

Roadway	Segment	Roadway Type[1]	ADT[2]	LOS
Rockfield Boulevard	West of Lake Forest Drive	4D	21,911	B
	West of Ridge Route Drive	4D	17,549	A
	West of El Toro Road	4D	18,642	A
	West of Los Alisos Boulevard	4D	13,707	A
Portola Parkway	West of Alton Parkway	4D	5,976	A
	West of Bake Parkway	5D	17,526	A
	West of Lake Forest Drive	5D	23,677	A
	West of Glenn Ranch Road	6D	32,283	A
	North of SR-241	6D	25,325	A
	South of SR-241	6D	27,477	A
	West of El Toro Road	6D	35,739	B
	East of El Toro Road	7D	37,996	A
Rancho Parkway South	West of Bake Parkway	4D	7,400	A
Rancho Parkway	East of Bake Parkway	4D	13,914	A
	East of Lake Forest Drive	4D	19,440	A
Glenn Ranch Road	Portola Parkway to Saddleback Ranch Road	4D	16,076	A
	Saddleback Ranch Road to El Toro Road	4D	6,849	A
Alton Parkway	South of Portola Parkway	6D	13,231	A
	South of SR-241	6D	19,122	A
	South of Rancho Parkway South	6D	23,261	A
	North of Trabuco Road	6D	24,382	A
Bake Parkway	South of Towne Center Drive	4D	26,318	C
	North of Commercentre Drive	4D	29,630	D
	South of Commercentre Drive	4D	32,335	D
	South of Trabuco Road	6D	46,162	D
	South of Toledo Way	6D	49,268	D
Lake Forest Drive	South of Portola Parkway	4D	9,502	A
	North of Rancho Parkway	4D	18,493	A
	South of Rancho Parkway	4D	20,894	A
	North of Trabuco Road	4D	31,667	D
	South of Trabuco Road	6D	31,178	A
	North of Jeronimo Road	6D	33,027	A
	North of Muirlands Boulevard	6D	32,627	A
	South of Muirlands Boulevard	6D	36,011	B
	South of Rockfield Boulevard	6D	59,276	F
Ridge Route Drive	North of Toledo Way	4D	6,666	A
	North of Jeronimo Road	4U	7,428	A
	South of Jeronimo Road	2D	7,689	A
	North of Muirlands Boulevard	4D	6,886	A
	North of Rockfield Boulevard	4D	6,811	A
	South of Rockfield Boulevard	4D	2,524	A

Roadway	Segment	Roadway Type[1]	ADT[2]	LOS
El Toro Road	North of Glenn Ranch Road	3D	13,969	A
	South of Glenn Ranch Road	3D	14,800	A
	North of Santa Margarita Parkway	5D	13,832	A
	South of Santa Margarita Parkway	6D	25,322	A
	North of Trabuco Road	5D	31,358	B
	South of Trabuco Road	6D	35,784	B
	North of Jeronimo Road	6D	38,539	B
	North of Muirlands Boulevard	6D	40,733	C
	South of Muirlands Boulevard	8D	44,716	B
	South of Rockfield Boulevard	9D	54,028	B
Los Alisos Boulevard	North of Jeronimo Road	6D	28,974	A
	North of Muirlands Boulevard	6D	30,001	A
	South of Muirlands Boulevard	6D	27,284	A
	South of Rockfield Boulevard	4D	25,047	B
Commercentre Drive	East of Alton Parkway	4D	7,546	A
	East of Bake Parkway	4D	11,085	A
	West of Dimension Drive	4D	7,896	A
Dimension Drive	North of Commercentre Drive	4D	5,963	A
	South of Commercentre Drive	4D	12,021	A

Notes: 1. Roadway type refers to number of lanes and divided (D) or undivided (U)
2. ADT denotes Average Daily Traffic

Study Intersections

Weekday AM and PM peak hour operations were assessed at 48 key intersections in and around the City, shown in Figure 4-7. Vehicle turning movement data was collected in April 2018 when schools were in session, during the weekday morning (7:00 AM to 9:00 AM) and evening (4:00 PM to 6:00 PM) peak periods and shown in Figure 4-8. The study locations, traffic control device, and governing jurisdictions are stated in Table 4-8.

Table 4-8 Study Intersections

Intersection Number	Intersection	Traffic Control	Jurisdiction
1	Alton Parkway & Portola Parkway	Signal	Lake Forest
2	Bake Parkway & Portola Parkway	Signal	Lake Forest
3	Lake Forest Drive & Portola Parkway	Signal	Lake Forest
4	Glenn Ranch Road & Portola Parkway	Signal	Lake Forest
5	Portola Parkway & SR-241 Ramps	Signal	Lake Forest / Caltrans
6	Alton Parkway & SR-241 Ramps	Signal	Lake Forest / Caltrans
7	Lake Forest Drive & SR-241 NB On-Ramp	Signal	Lake Forest / Caltrans
8	Lake Forest Drive & SR-241 SB Off-Ramp	Signal	Lake Forest / Caltrans
9	Bake Parkway & Rancho Parkway	Signal	Lake Forest
10	Lake Forest Drive & Rancho Parkway	Signal	Lake Forest
11	Bake Parkway & Rancho Parkway South	Signal	Lake Forest
12	El Toro Road & Portola Parkway/Santa Margarita Parkway	Signal	Lake Forest
13	Bake Parkway & Commercentre Drive	Signal	Lake Forest
14	Bake Parkway & Irvine Boulevard/Trabuco Road	Signal	Lake Forest
15	Lake Forest Drive & Trabuco Road	Signal	Lake Forest
16	Ridge Route Drive & Trabuco Road	Signal	Lake Forest
17	El Toro Road & Trabuco Road	Signal	Lake Forest
18	Bake Parkway & Toledo Way	Signal	Lake Forest
19	Lake Forest Drive & Toledo Way	Signal	Lake Forest
20	Ridge Route Drive & Toledo Way	Signal	Lake Forest
21	El Toro Road & Toledo Way	Signal	Lake Forest
22	Bake Parkway & Jeronimo Road	Signal	Lake Forest
23	Lake Forest Drive & Jeronimo Road	Signal	Lake Forest
24	Ridge Route Drive & Jeronimo Road	Signal	Lake Forest
25	El Toro Road & Jeronimo Road	Signal	Lake Forest
26	Los Alisos Boulevard & Jeronimo Road	Signal	Lake Forest
27	Lake Forest Drive & Muirlands Boulevard	Signal	Lake Forest
28	Ridge Route Drive & Muirlands Boulevard	Signal	Lake Forest
29	El Toro Road & Muirlands Boulevard	Signal	Lake Forest
30	Los Alisos Boulevard & Muirlands Boulevard	Signal	Lake Forest
31	Lake Forest Drive & Rockfield Boulevard	Signal	Lake Forest
32	Ridge Route Drive & Rockfield Boulevard	Signal	Lake Forest
33	El Toro Road & Rockfield Boulevard	Signal	Lake Forest

Intersection Number	Intersection	Traffic Control	Jurisdiction
34	Los Alisos Boulevard & Rockfield Boulevard	Signal	Lake Forest
35	Lake Forest Drive & I-5 NB Ramps	Signal	Lake Forest / Caltrans
36	Lake Forest Drive & I-5 SB Ramps/Avenida De La Carlota	Signal	Laguna Hills / Caltrans
37	Paseo De Valencia & Avenida De La Carlota	Signal	Laguna Hills / Caltrans
38	El Toro Road & Bridger Road/I-5 NB Ramps	Signal	Lake Forest / Caltrans
39	El Toro Road & Avenida De La Carlota	Signal	Laguna Hills
40	Portola Parkway & Rancho Parkway	Signal	Lake Forest
41	Alton Parkway & Rancho Parkway South	Signal	Lake Forest
42	Alton Parkway & Commercentre	Signal	Lake Forest
51	El Toro Road & Glenn Ranch Road	Signal	Lake Forest
56	Bake Parkway & Dimension Drive	Signal	Lake Forest
57	Lake Forest Drive & Dimension Drive	Signal	Lake Forest
60	Dimension Drive & Commercentre Drive	Signal	Lake Forest
101	Lake Forest Drive & Pittsford Drive	Signal	Lake Forest
102	El Toro Road & Northcrest Drive	Signal	Lake Forest

Study intersections, including locations in Laguna Hills, were analyzed using the Intersection Capacity Utilization (ICU) methodology, consistent with Lake Forest10 and Laguna Hills11 guidelines. Under the ICU methodology, the critical movement and critical movement capacity of an intersection are used to calculate a volume-to-capacity (V/C) ratio. After the V/C ratio is calculated, the ICU methodology assigns an LOS grade (A to F) representing the quality of intersection operations, with LOS F signifying volumes exceeding capacity. LOS grades and corresponding V/C ratios under the ICU methodology are provide in Table 4-9. The maximum acceptable level of service for intersections is LOS D.

Table 4-9 Intersection Level of Service and V/C Ratios (ICU Methodology)

Level of Service	Volume to Capacity Ratio
A	Less than 0.61
B	06.1 to 0.70
C	0.71 to 0.80
D	0.81 to 0.90
E	0.91 to 1.00
F	Greater than 1.00

10 *City of Lake Forest, CEQA Significance Thresholds Guide, November 2001.*
11 *City of Laguna Hills, Traffic Study Guidelines, August 2010.*

Caltrans freeway ramp intersections were also analyzed using the Highway Capacity (HCM) methodology. The HCM methodology assigns a level of service grade to an intersection based on the average control delay for vehicles at the intersection, ranging from LOS A to LOS F; LOS A signifies very slight delay with no approach phase fully utilized while LOS F signifies very high delays and congestion, frequent cycle failures, and long queues. LOS C is the maximum acceptable level of service for Caltrans intersections under the HCM methodology. LOS grades and corresponding delay values under the HCM methodology are provided in Table 4-10.

Table 4-10 Intersection Level of Service and Delay Thresholds (HCM Methodology)

Level of Service	Average Control Delay Per Vehicle (Seconds) Signalized	Unsignalized
A	< 10.0	< 10.0
B	> 10.0 to 20.0	> 10.0 to 15.0
C	> 20.0 to 35.0	> 15.0 to 25.0
D	> 35.0 to 55.0	> 25.0 to 35.0
E	> 55.0 to 80.0	> 35.0 to 50.0
F	> 80.0	> 50.0

Source: Highway Capacity Manual

Weekday AM and PM peak hour level of service for the 48 study intersections are shown in Table 4-11. Data in bold indicate unacceptable level of service (per each criteria). The ICU LOS is also shown in Figures 4-9 and 4-10. The following intersections currently operate with unacceptable LOS during the weekday AM and/or PM peak hour under the ICU methodology:

- Bake Parkway & Jeronimo Road (LOS E in the weekday AM peak hour)

In addition, under the HCM methodology, the following Caltrans freeway ramp intersections currently operate with unacceptable LOS during the weekday AM and/or PM peak hour:

- Lake Forest Drive & I-5 SB Ramps/Avenida De La Carlota (LOS D in the weekday AM peak hour and LOS F in the weekday PM peak hour)
- Paseo De Valencia & Avenida De La Carlota (LOS D in the weekday AM and PM peak hours)
- El Toro Road & Bridger Road/I-5 NB Ramps (LOS D in the weekday PM peak hour)

Please note that while most City intersections operate acceptably during the weekday AM and PM peak hours, some intersections (primarily those closest to I-5 on- and off-ramps) can experience periods of delay due to high traffic volumes entering and exiting the freeway.

Table 4-11 Existing (2018) Intersection Level of Service – Weekday AM/PM Peak Hours

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		V/C (Delay)	LOS	V/C (Delay)	LOS
1	Alton Parkway & Portola Parkway	0.43	A	0.31	A
2	Bake Parkway & Portola Parkway	0.47	A	0.51	A
3	Lake Forest Drive & Portola Parkway	0.47	A	0.46	A
4	Glenn Ranch Road & Portola Parkway	0.40	A	0.48	A
5	Portola Parkway & SR-241 Ramps	0.44 (23.8)	A (B	0.41 (21.5)	A (C)
6	Alton Parkway & SR-241 Ramps	0.45 (24.6)	A (C)	0.41 (21.6)	A (C)
7	Lake Forest Drive & SR-241 NB On-Ramp	0.26 (4.0)	A (A)	0.28 (3.7)	A (A)
8	Lake Forest Drive & SR-241 SB Off-Ramp	0.32 (7.9)	A (A)	0.31 (6.0)	A (A)
9	Bake Parkway & Rancho Parkway	0.49	A	0.63	B
10	Lake Forest Drive & Rancho Parkway	0.50	A	0.62	B
11	Bake Parkway & Rancho Parkway South	0.58	A	0.58	A
12	El Toro Road & Portola Parkway/Santa Margarita Parkway	0.67	B	0.76	C
13	Bake Parkway & Commercentre Drive	0.48	A	0.51	A
14	Bake Parkway & Irvine Boulevard/Trabuco Road	0.68	B	0.67	B
15	Lake Forest Drive & Trabuco Road	0.64	B	0.59	A
16	Ridge Route Drive & Trabuco Road	0.53	A	0.54	A
17	El Toro Road & Trabuco Road	0.71	C	0.59	A
18	Bake Parkway & Toledo Way	0.80	C	0.62	B
19	Lake Forest Drive & Toledo Way	0.59	A	0.54	A
20	Ridge Route Drive & Toledo Way	0.43	A	0.28	A
21	El Toro Road & Toledo Way	0.61	B	0.46	A
22	Bake Parkway & Jeronimo Road	0.95	E	0.79	C
23	Lake Forest Drive & Jeronimo Road	0.66	B	0.73	C
24	Ridge Route Drive & Jeronimo Road	0.56	A	0.50	A
25	El Toro Road & Jeronimo Road	0.69	B	0.80	C
26	Los Alisos Boulevard & Jeronimo Road	0.71	C	0.73	C
27	Lake Forest Drive & Muirlands Boulevard	0.52	A	0.71	C
28	Ridge Route Drive & Muirlands Boulevard	0.45	A	0.56	A
29	El Toro Road & Muirlands Boulevard	0.65	B	0.72	C
30	Los Alisos Boulevard & Muirlands Boulevard	0.72	C	0.71	C
31	Lake Forest Drive & Rockfield Boulevard	0.55	A	0.68	B
32	Ridge Route Drive & Rockfield Boulevard	0.31	A	0.48	A
33	El Toro Road & Rockfield Boulevard	0.58	A	0.62	B
34	Los Alisos Boulevard & Rockfield Boulevard	0.64	B	0.53	A
35	Lake Forest Drive & I-5 NB Ramps	0.42 (11.4)	A (B)	0.49 (31.0)	A (C)
36	Lake Forest Drive & I-5 SB Ramps/Avenida De La Carlota	0.47 (47.9)	A (D)	0.82 (>80.0)	D (F)
37	Paseo De Valencia & Avenida De La Carlota	0.50 (43.1)	A (D)	0.50 (41.3)	A (D)

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		V/C (Delay)	LOS	V/C (Delay)	LOS
38	El Toro Road & Bridger Road/I-5 NB Ramps	0.66 (21.4)	B (C)	0.68 (41.4)	B (D)
39	El Toro Road & Avenida De La Carlota	0.39	A	0.58	A
40	Portola Parkway & Rancho Parkway	0.53	A	0.61	B
41	Alton Parkway & Rancho Parkway South	0.51	A	0.43	A
42	Alton Parkway & Commercentre	0.45	A	0.55	A
51	El Toro Road & Glenn Ranch Road	0.51	A	0.59	A
56	Bake Parkway & Dimension Drive	0.47	A	0.62	B
57	Lake Forest Drive & Dimension Drive	0.36	A	0.54	A
60	Dimension Drive & Commercentre Drive	0.41	A	0.64	B
101	Lake Forest Drive & Pittsford Drive	0.66	B	0.42	A
102	El Toro Road & Northcrest Drive	0.46	A	0.46	A

4.5 COLLISION ANALYSIS

Analysis for vehicle, bicycle, and pedestrian collisions that occurred in Lake Forest was conducted using the most recently available data for a five-year period (2013-2017) from the Transportation Injury Mapping System (TIMS) and the Statewide Integrated Traffic Records System (SWITRS). Collisions that took place on I-5 and SR-241 were not included in the analysis as these facilities are not part of the City's roadway network. The data included information on the number, type, severity, and locations of collisions, plus possible contributing factors and the involvement of bicycles and pedestrians. Overall, there were 1,797 collisions that took place in Lake Forest between 2013 and 2017, an average of 359 collisions per year.

Collision Type and Severity

The number of total collisions has fluctuated over the years, with the fewest collisions occurring in the most recent year that data was available (2017). The proportion of collisions resulting in a fatality or injury have increased over this time period and the proportion of property damage only (PDO) collisions decreased.

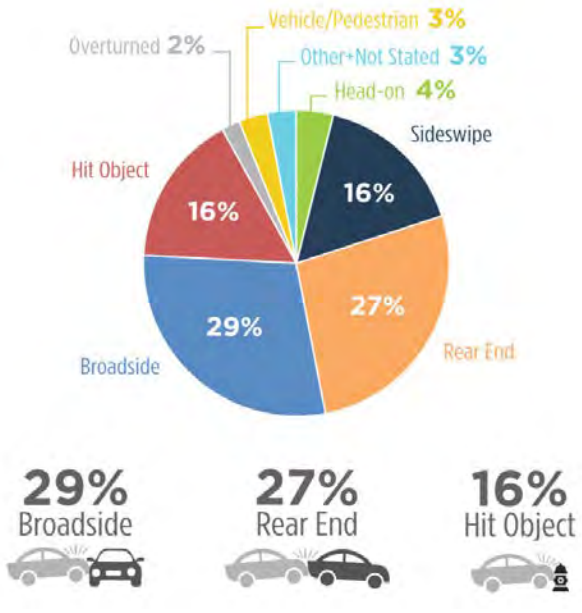
Table 4-12 Lake Forest Collision Severity by Year (2013-2017)

Year	Fatal/Severe Injury Crashes	Other Injury Crashes	Property Damage Only	Total Crashes
2013	4%	30%	66%	381
2014	8%	36%	56%	349
2015	8%	43%	49%	351
2016	7%	43%	50%	386
2017	6%	43%	51%	330

Source: SWITRS, 2018

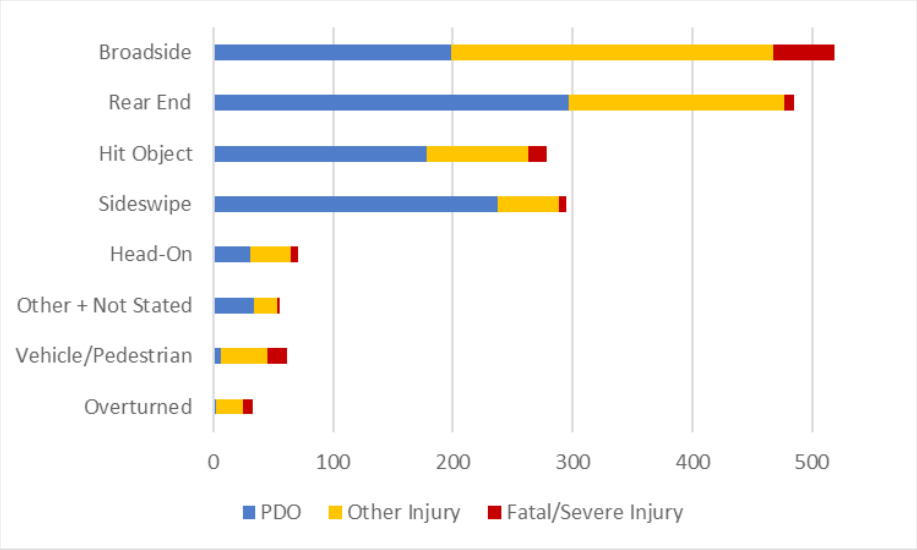
The most common collision types were broadside collisions (29 percent), rear end collisions (27 percent), sideswipe collisions (16 percent), and collisions with fixed objects (16 percent). Collisions that result in a fatality or severe injury made up a significant portion of vehicle-pedestrian collisions (26 percent), overturned vehicle collisions (24 percent), broadside collisions (10 percent) and head-on collisions (10 percent).

Table 4-13 Lake Forest Collisions by Type (2013-2017)



Source: SWITRS, 2018

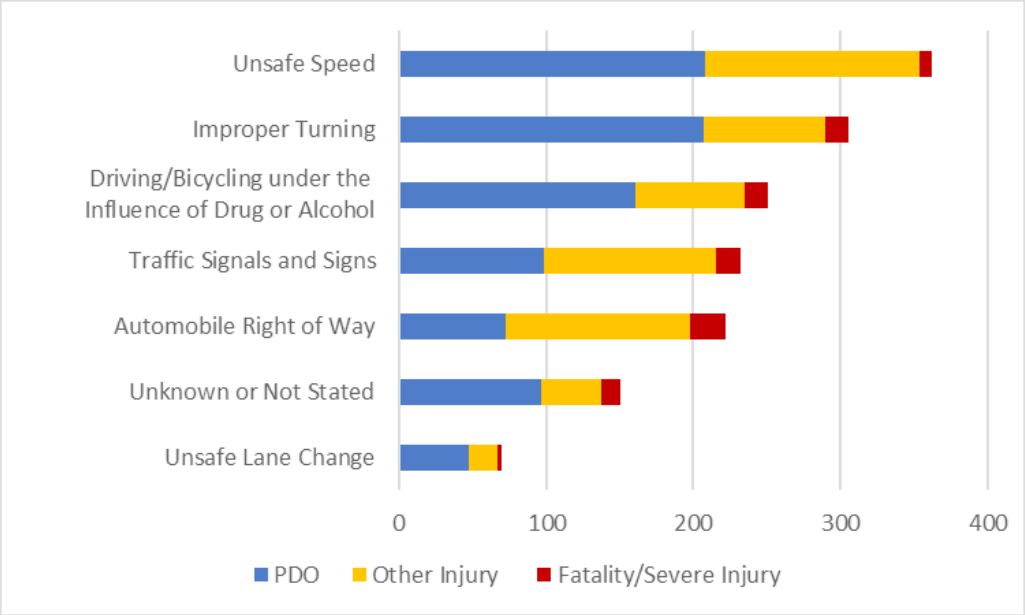
Table 4-14 Lake Forest Collisions by Type and Severity (2013-2017)



Source: SWITRS, 2018

The top five primary contributing factors to these collisions included unsafe speed (20 percent), improper turning (17 percent), drive/bicycling under the influence of drugs or alcohol (14 percent), traffic signals and signs12 (13 percent), and automobile right of way13 (12 percent). Driving on the wrong side of the road and pedestrian violations were two other primary contributing factors for fewer collisions, but these collisions had a larger portion of severe injury and fatal crashes. Table 4-15 includes the severity of the collisions by primary crash factor.

Table 4-15 Lake Forest Primary Collision Factors (2013-2017)

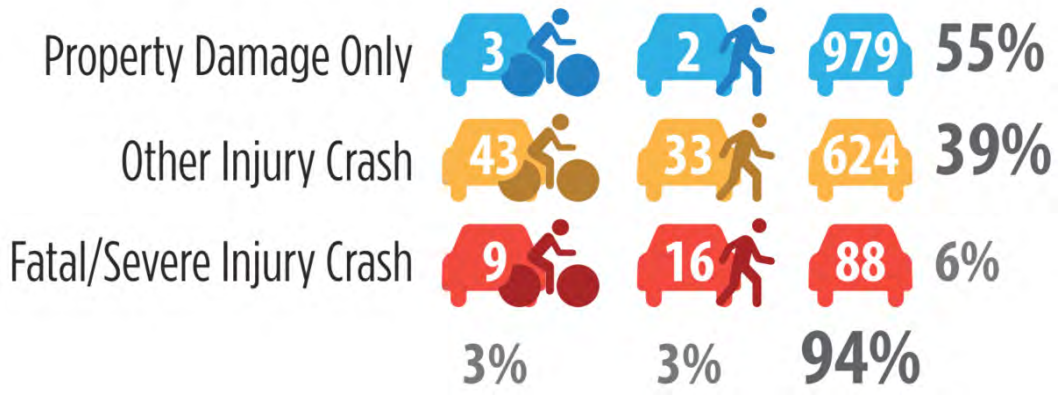


Source: SWITRS, 2018

Bicycle and Pedestrian Collisions

While bicycle and pedestrian collisions make up a small portion of the overall collisions (six percent), these collisions more often result in injuries and fatalities. Table 4-16 shows the severity by road user involved, as illustrated by the car, bicycle, and pedestrian icons.

Table 4-16 Lake Forest Road Users Involved and Crash Severity (2013-2017)



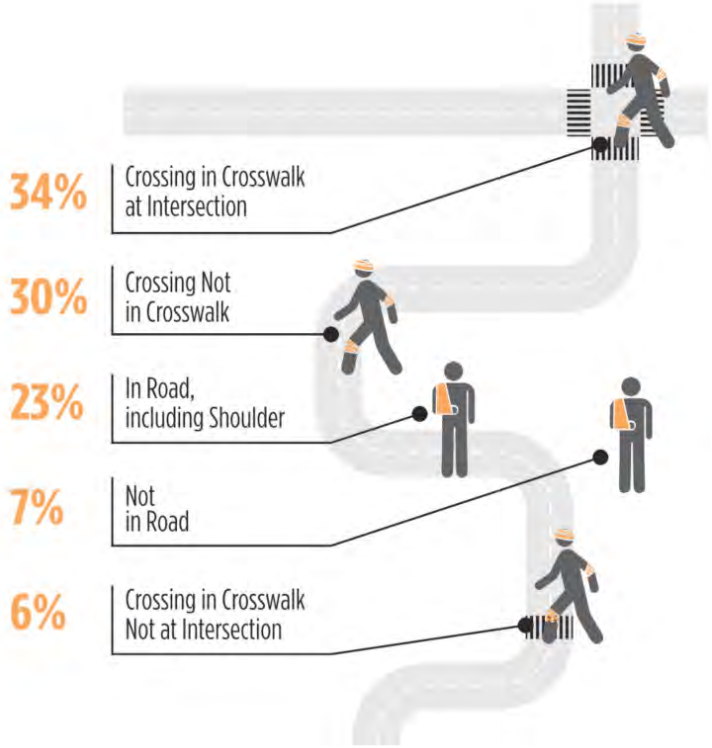
Source: SWITRS, 2018

12 *Traffic Signals and Signs refer to a crash resulting from a motorist's failure to comply with a traffic control device (traffic signal, yield sign, or stop sign).*

13 *Automobile right of way refers to a crash resulting from one motorist's failure to yield to another motorist who had the right of way.*

For pedestrian collisions, it is also important to note exactly where the pedestrians were walking when the collision occurred. Approximately one-third of collisions took place while the pedestrian was crossing in a crosswalk at an intersection, and 30 percent of pedestrian collisions occurred where the pedestrian was crossing the street at a non-intersection location and was not in a crosswalk. Approximately one quarter of pedestrian collisions occurred on the road (including the shoulder).

Table 4-17 Lake Forest Pedestrian Collisions by Pedestrian Action (2013-2017)



Source: SWITRS, 2018

Collision Locations

Collisions that resulted in an injury or fatality are shown in Figure 4-11. Collisions primarily occurred on Lake Forest's arterial roadways, with fewer collisions occurring on local residential streets. Three fatalities occurred in close proximity to each other on Santiago Canyon Road along the City's northeastern boundary, with another three fatalities on Lake Forest Drive. Other fatalities occurred on El Toro Road, Bake Parkway, Trabuco Road, Muirlands Boulevard, and Rockfield Boulevard. A noticeable concentration of collisions occurred on El Toro Road approaching I-5.

Bicycle and pedestrian collisions are shown in Figure 4-12. These collisions are primarily clustered in the City's southern portion, with several occurring along Lake Forest Drive, El Toro Road, Jeronimo Road, and Muirlands Boulevard.

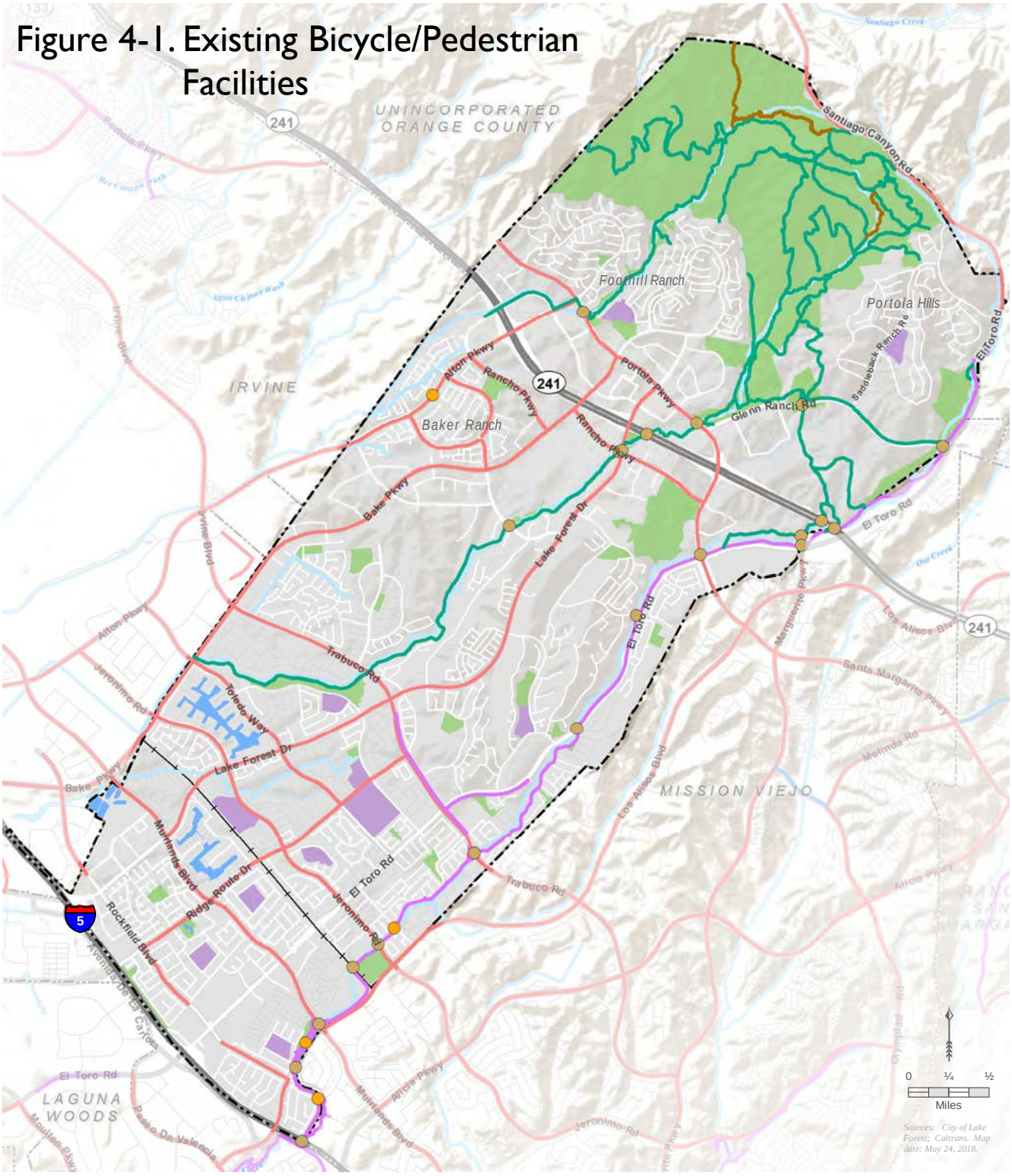
4.6 NEW TECHNOLOGIES

Transportation and mobility services are constantly evolving, with emerging technologies having the potential to significantly change travel behavior and the transportation system. While some new technologies are already being implemented and cities are beginning to understand their effects and implications, other technologies are pending future use and thus require regular monitoring and studying. The following are major recent and upcoming changes to the transportation system:

- Bicycle and Scooter Sharing Programs. Bike sharing services provide short-term bicycle rentals and are typically associated with bicycle travel in busy areas (such as downtowns and business districts) and improve access to transit stations. These services are becoming increasingly popular in Southern California; examples of local agencies with bike sharing services include LA Metro, City of Santa Monica, and City of West Hollywood. In Orange County, UC Irvine initiated its ZotWheels bike share program for students and faculty in 2009. In addition, scooter sharing programs have recently been implemented in various locations in Los Angeles County, such as the introduction of the Bird system in Venice and West Los Angeles.
- Transportation Network Companies (TNCs). TNCs, such as Uber and Lyft, provide easy door-to-door transportation services through the use of smartphone apps. While data on TNC use (especially for commute trips) is still limited, these services are becoming a significant part of the transportation system; some jurisdictions and agencies have begun incorporating TNCs into their transportation systems, such as including ample pick-up and drop-off areas at transit stations and mobility hubs. Lake Forest is currently within areas serviced by Uber and Lyft. In addition, OCTA has begun partnering with Lyft to provide rideshare subsidies to fill gaps in fixed-route service in locations such as South Orange County.
- Car Sharing Programs. These programs allow users to borrow a car for short periods of time (for example, to buy groceries for an hour) and provide increased mobility and flexibility for people who may not want to or cannot pay for vehicle ownership. Car sharing services are already successfully in place in several California cities.
- Microtransit. Microtransit services are privately-operated transit services that can often overlap with public transit routes. A relatively new form of transit, microtransit benefits from high flexibility in determining routes, fares, and making other service changes. Examples of microtransit services in cities include Leap in San Francisco, and Bridj in Boston and Washington, D.C.
- Autonomous Vehicles (AVs). AVs, or self-driving vehicles, are projected to be available on the consumer market in the next five to ten years. AVs will initially represent a small percentage of vehicles on the road due to normal fleet turnover rates, but are expected to represent 50 percent of the vehicle market within 25 years. Once driverless vehicles represent the majority of vehicles on the road, operational roadway efficiency is expected to improve since AVs are able to communicate with one another. This is likely to lead to improved LOS and higher VMT (anywhere from five percent to 35 percent14 depending on demographic trends, economic factors, and other technologies). AVs have the potential to improve roadway safety for vehicle passengers, bicyclists, pedestrians, and other users. AVs can also change land use patterns since parking needs may decrease. However, during the transition period when AVs are mixed with the standard vehicle fleet, jurisdictions need to carefully plan and design facilities to reduce conflicts and allow for flexibility in zoning designations.

14 *Public Square/Congress for New Urbanism, Autonomous vehicles: Hype and potential, September 2016.*

Figure 4-1. Existing Bicycle/Pedestrian Facilities



Legend

- City of Lake Forest
- Other City Boundaries
- Public School
- City or County Park
- Class I Bike Path
- Class II Bike Lanes
- Class III Bike Route
- Hiking-Only Trail
- Multi-Use Trail
- Bike/Pedestrian Bridge
- Bike/Pedestrian Underpass

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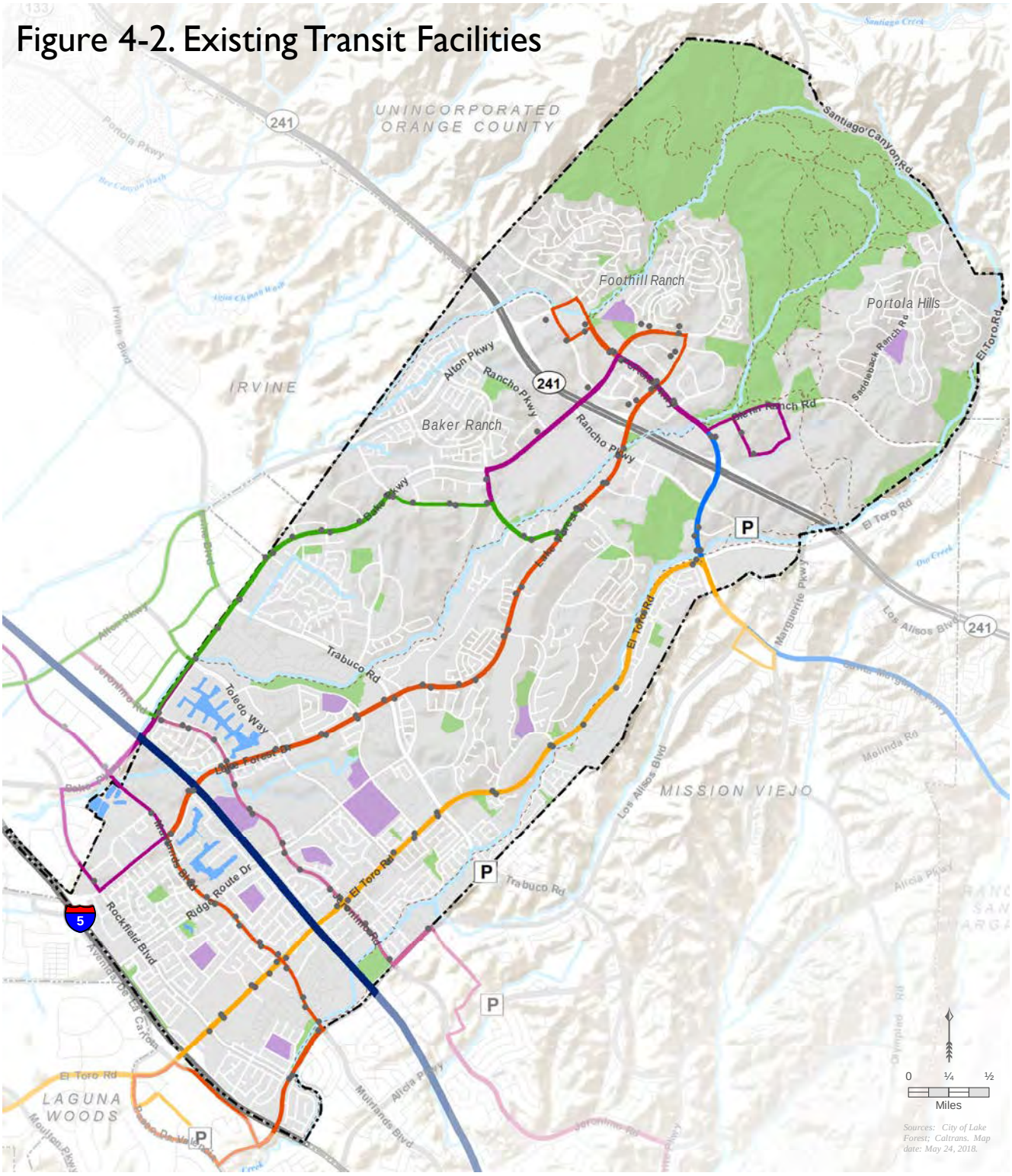
Figure 4-2. Existing Transit Facilities



Legend

- City of Lake Forest
- Other City Boundaries
- Public School
- City or County Park
- Riding & Hiking Trails

OCTA Bus Routes

- 82
- 86
- 89
- 177
- 206
- 480

- OCTA Bus Stops
- Metrolink/Amtrak
- P Park and Ride

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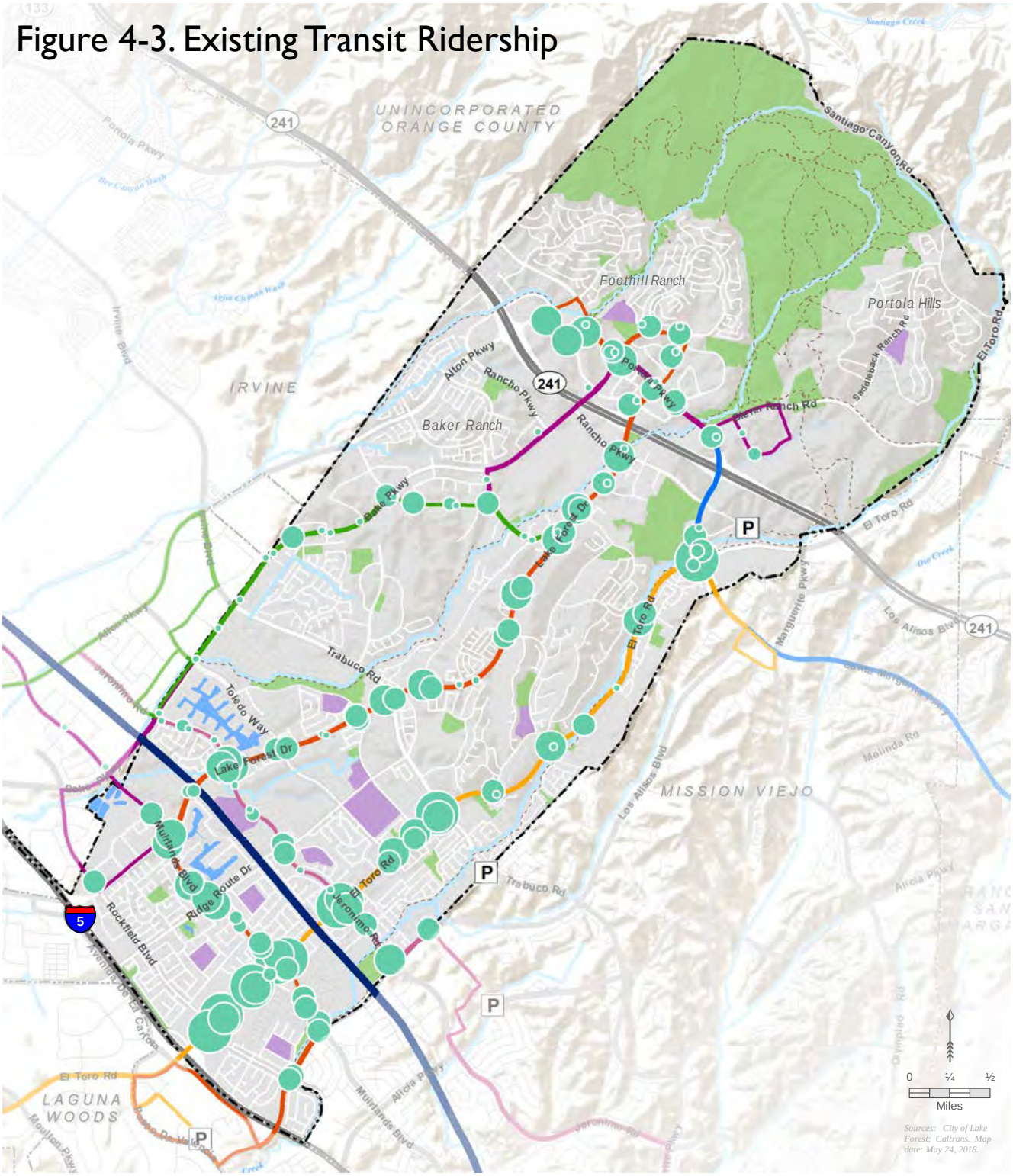
Figure 4-3. Existing Transit Ridership



Legend

- City of Lake Forest
- Other City Boundaries
- Public School
- City or County Park
- Riding & Hiking Trails

Total Annual Riders

- 150
- 250
- 1,500
- 5,000
- 15,000

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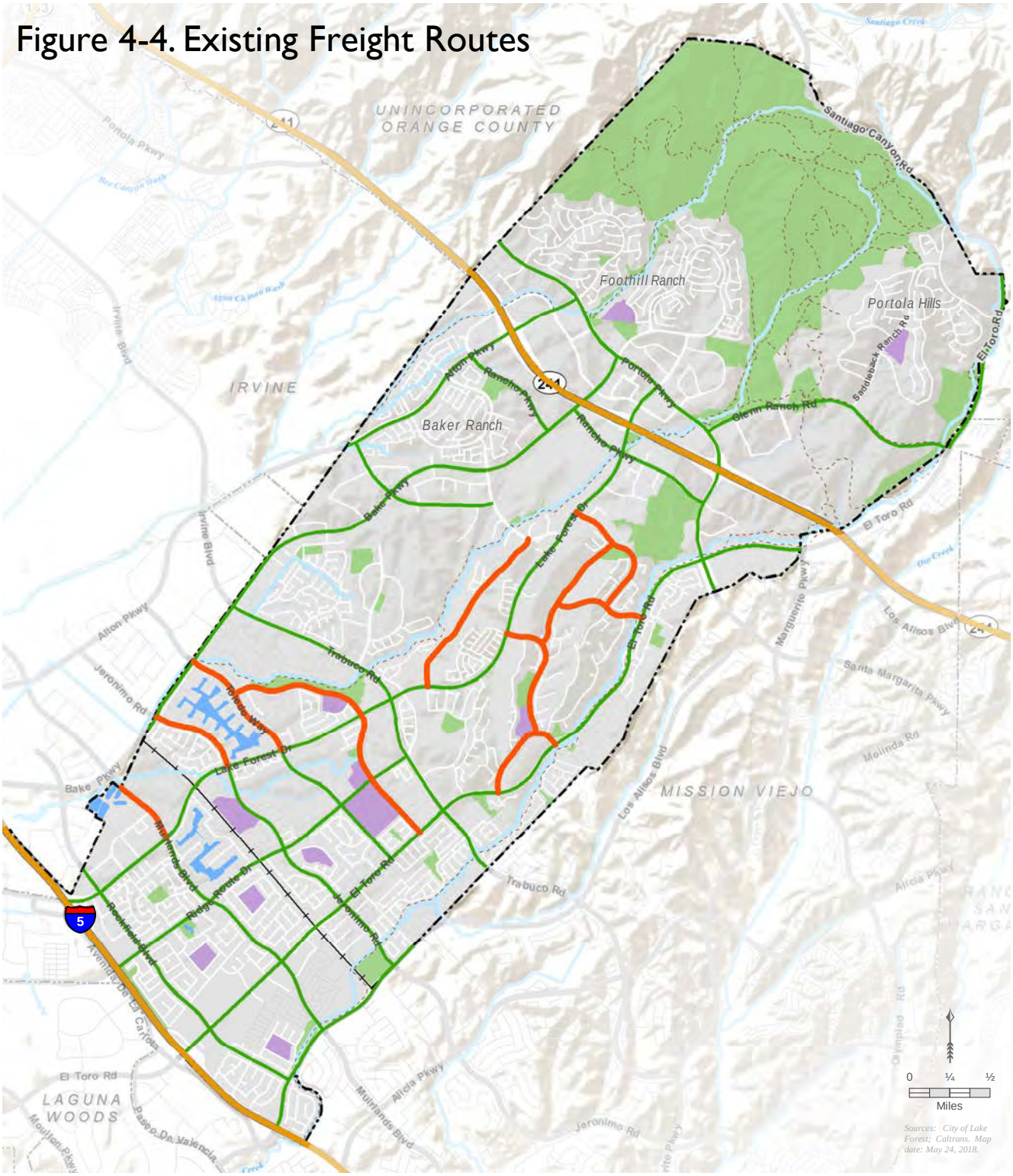
Figure 4-4. Existing Freight Routes



Legend

- City of Lake Forest
- Other City Boundaries
- Public School
- City or County Park
- Riding & Hiking Trails
- State Highway Truck Network
- Local Arterial Roadways
- Trucks Prohibited
- Rail

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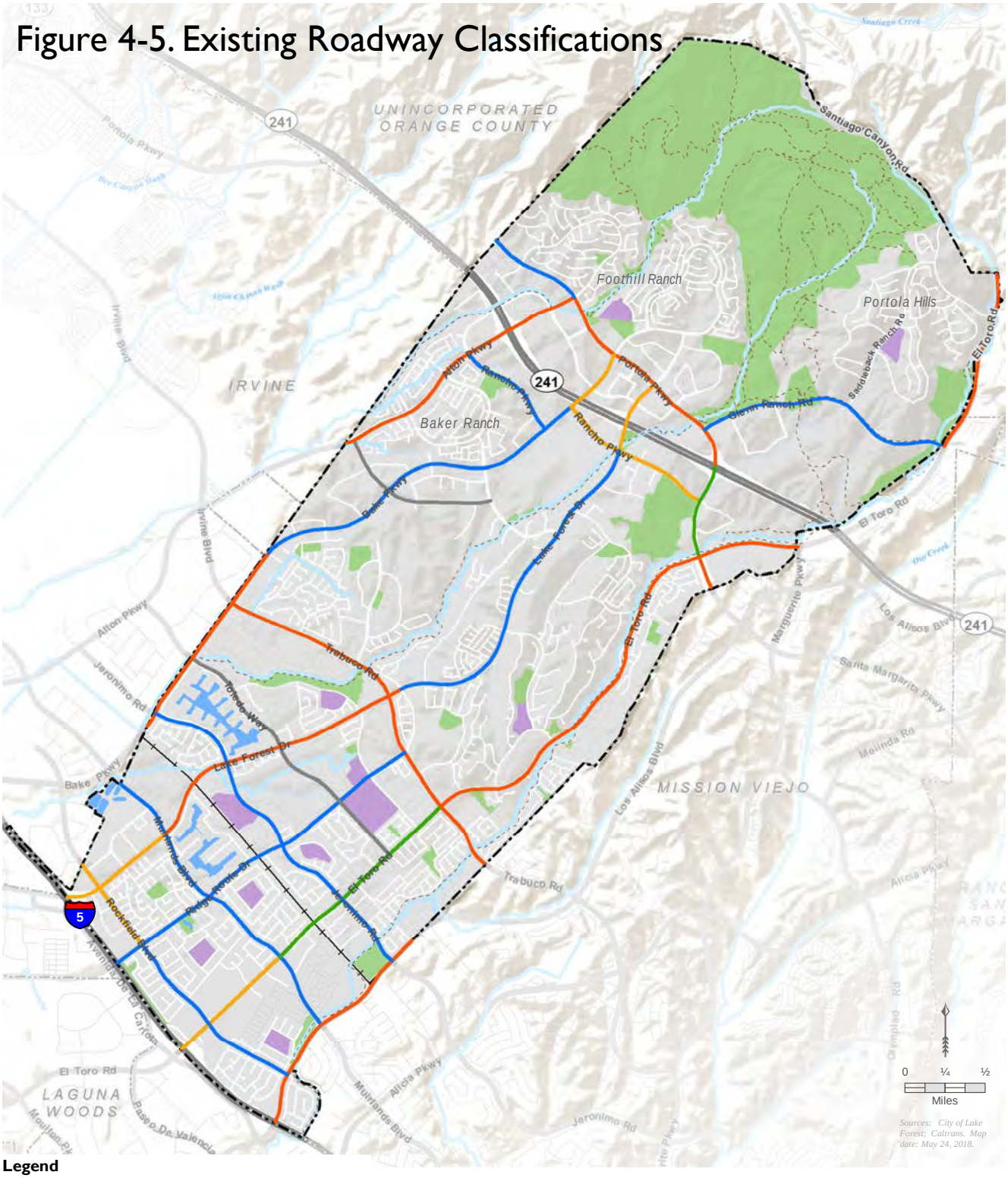
Figure 4-5. Existing Roadway Classifications



Legend

- City of Lake Forest
- Other City Boundaries
- Public School
- City or County Park
- Riding & Hiking Trails

Roadway Classifications

- Principal Arterial
- Major Arterial
- Primary Arterial
- Secondary Arterial
- Commercial Street

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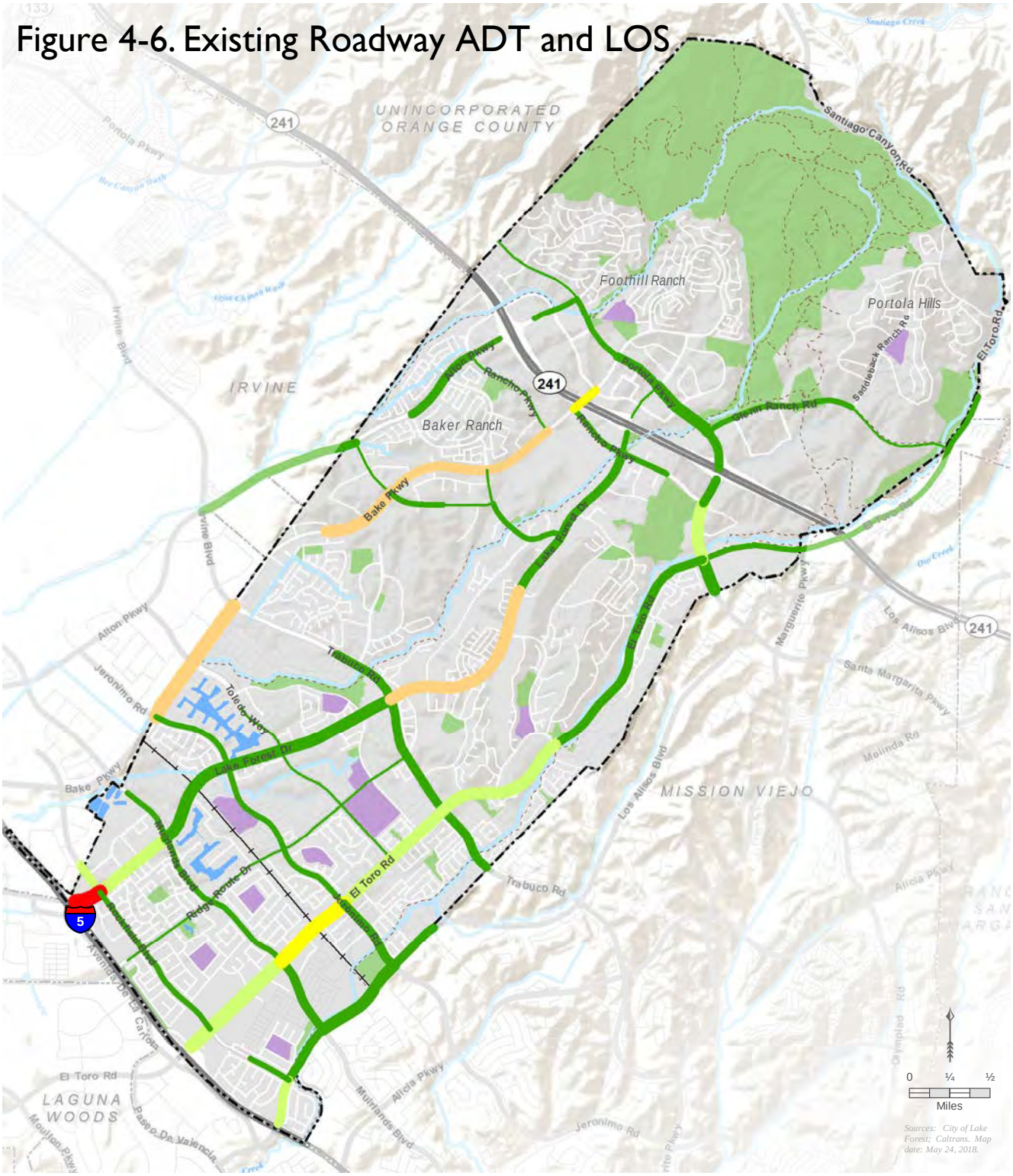
Figure 4-6. Existing Roadway ADT and LOS



Legend

- City of Lake Forest
- Other City Boundaries
- Public School
- City or County Park
- Riding & Hiking Trails
- LOS A
- LOS B
- LOS C
- LOS D
- LOS E
- LOS F
- Less than 10,000 ADT
- 10,000 to 20,000 ADT
- 20,000 to 30,000 ADT
- 30,000 to 40,000 ADT
- More than 40,000 ADT

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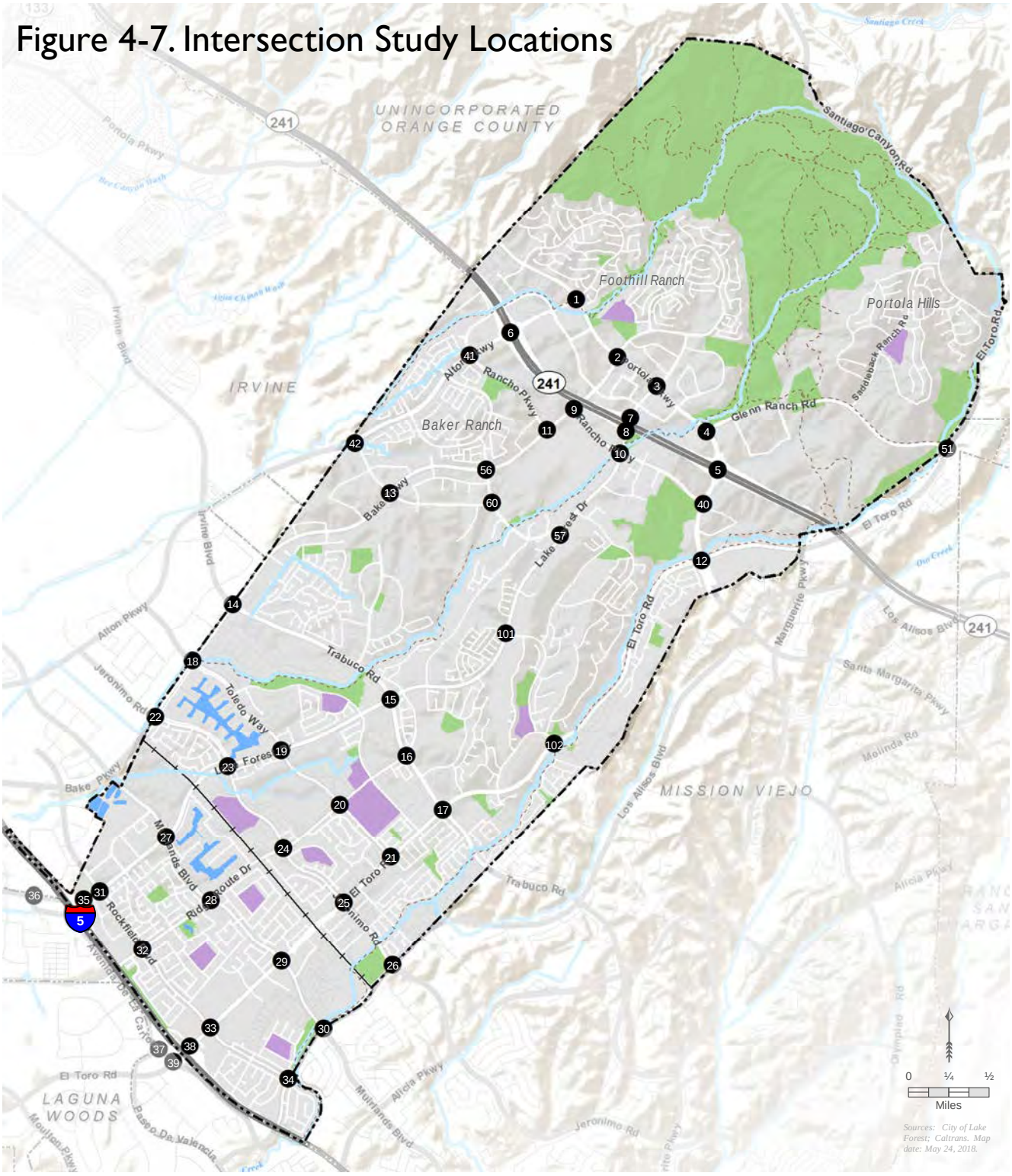
Figure 4-7. Intersection Study Locations



Legend

- City of Lake Forest
- Other City Boundaries
- Public School
- City or County Park
- Riding & Hiking Trails
- Study Intersections

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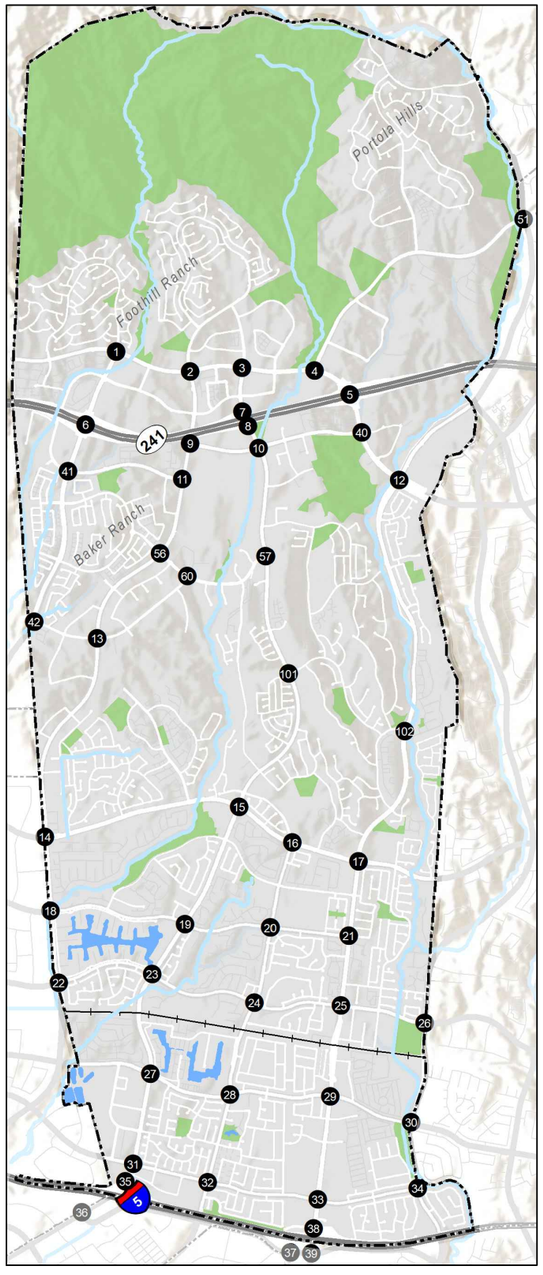
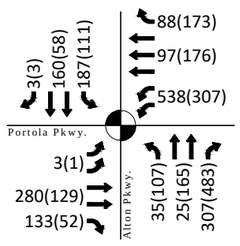
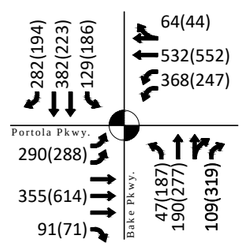


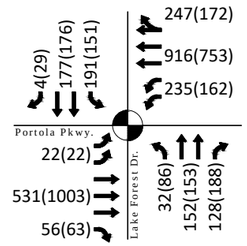
1 Alton Pkwy. & Portola Pkwy.



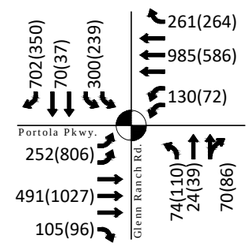
2 Bake Pkwy. & Portola Pkwy.



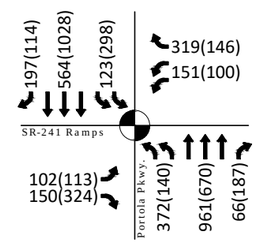
3 Lake Forest Dr. & Portola Pkwy.



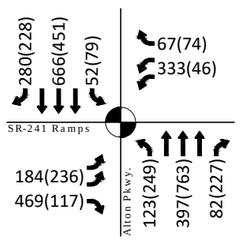
4 Glenn Ranch Rd. & Portola Pkwy.



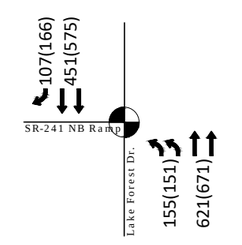
5 Portola Pkwy. & SR-241 Ramps



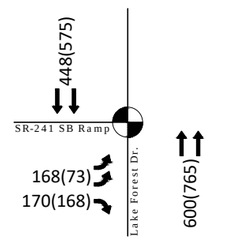
6 Alton Pkwy. & SR-241 Ramps



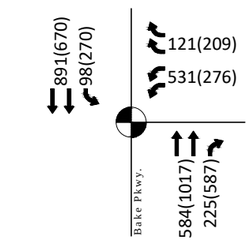
7 Lake Forest Dr. & SR-241 NB Ramp



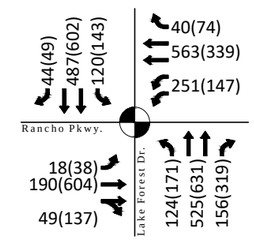
8 Lake Forest Dr. & SR-241 SB Ramp



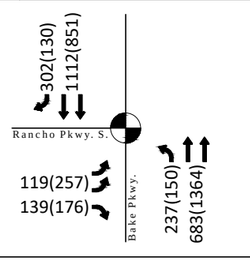
9 Bake Pkwy. & Rancho Pkwy.



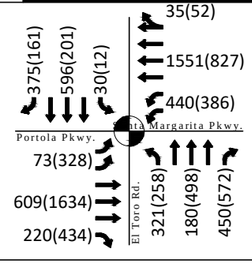
10 Lake Forest Dr. & Rancho Pkwy.



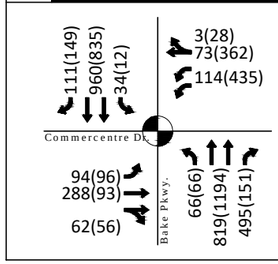
11 Bake Pkwy. & Rancho Pkwy. S.



12 El Toro Rd. & Portola Pkwy.



13 Bake Pkwy. & Commercentre Dr.



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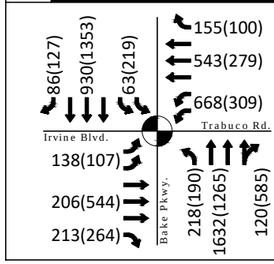

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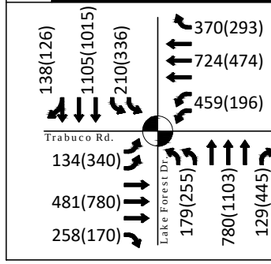

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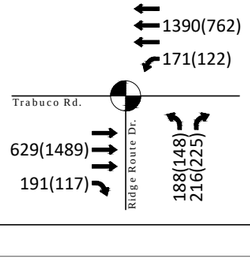
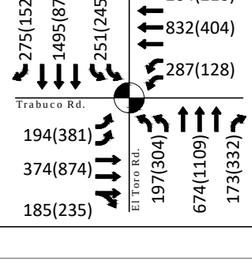


17 El Toro Rd. & Trabuco Rd.



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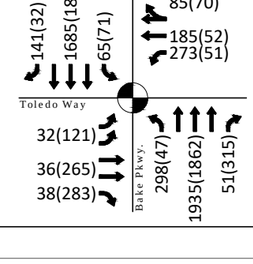
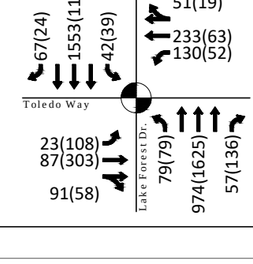
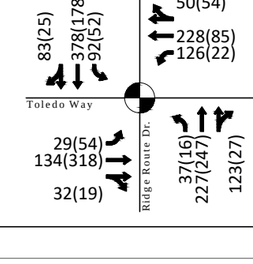


19 Lake Forest Dr. & Toledo Way



20 Ridge Route Dr. & Toledo Way

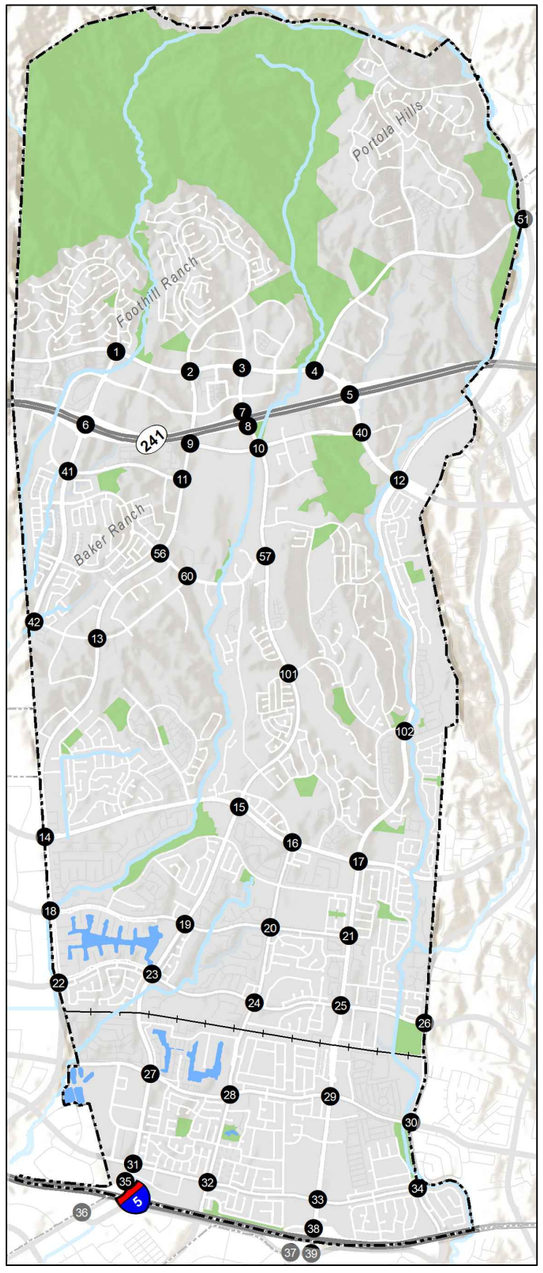


AM(PM) - Traffic Volume

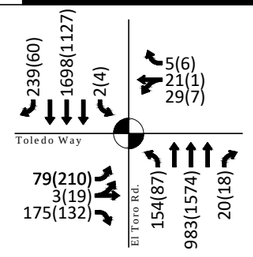
- Traffic Signal

Existing Intersection Volumes and Geometries
Lake Forest, CA

Figure
4-8



21 El Toro Rd. & Toledo Way



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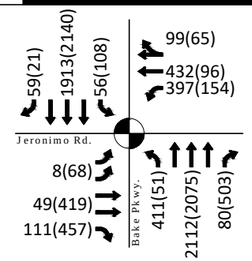

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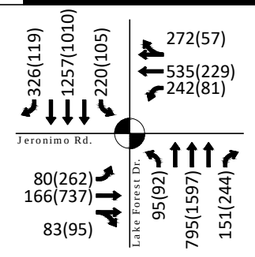

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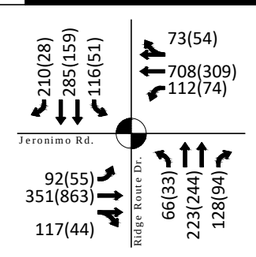

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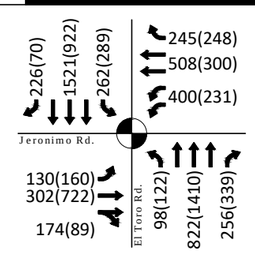

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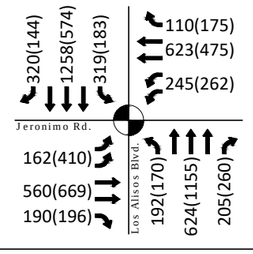
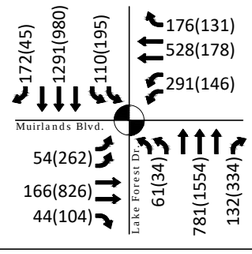


27 Lake Forest Dr. & Muirlands Blvd.



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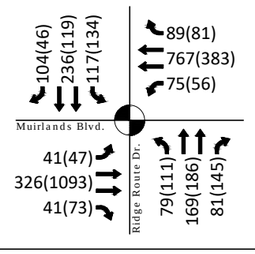

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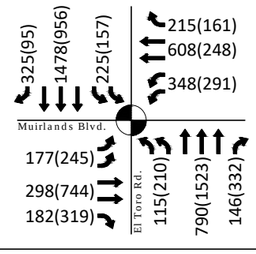

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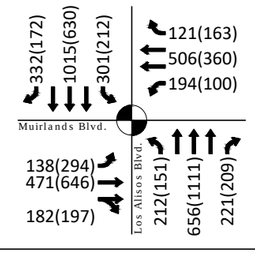
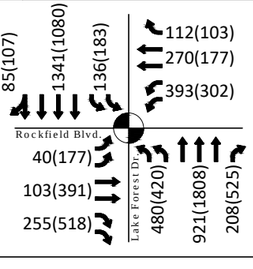


31 Lake Forest Dr. & Rockfield Blvd.



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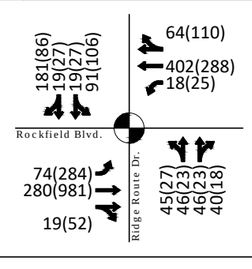

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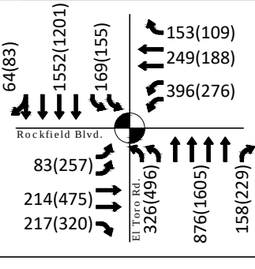

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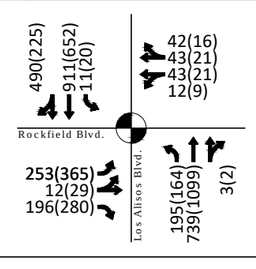
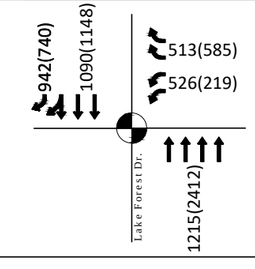


35 Lake Forest Dr. & I-5 NB Ramps



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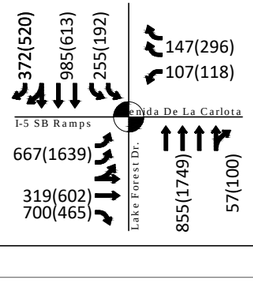
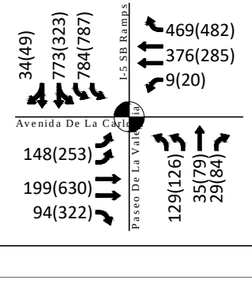


37 I-5 SB Ramps & Avenida De La Carlota



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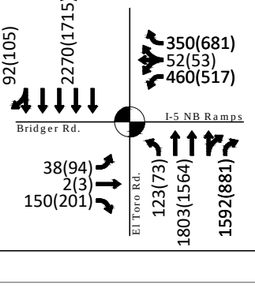

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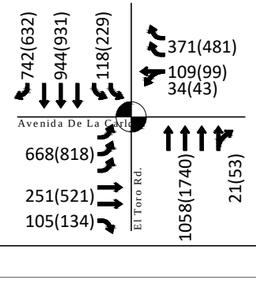
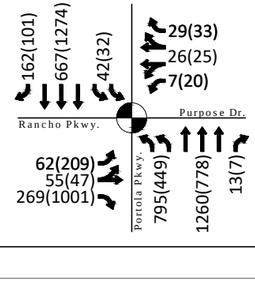


40 Portola Pkwy. & Rancho Pkwy.

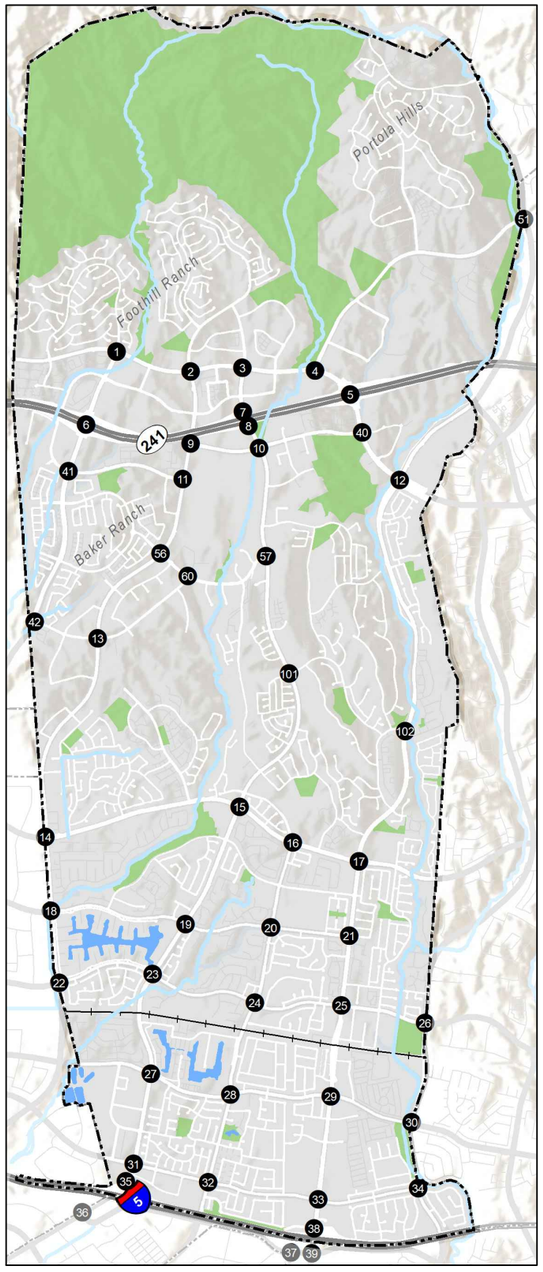


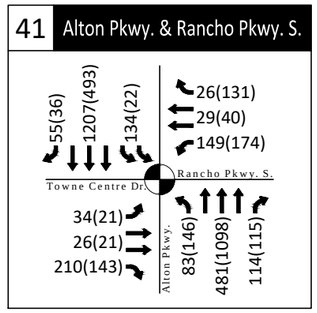
AM(PM) - Traffic Volume

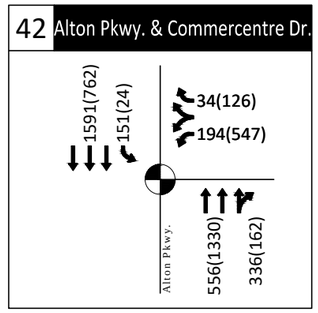
- Traffic Signal

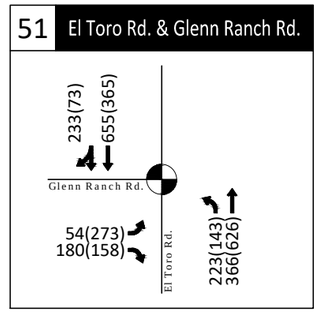
Existing Intersection Volumes and Geometries
Lake Forest, CA

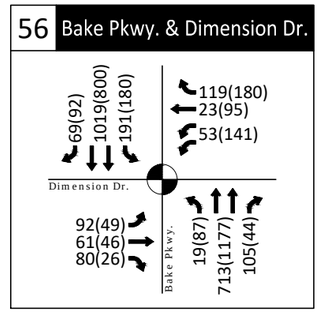
Figure 4-8

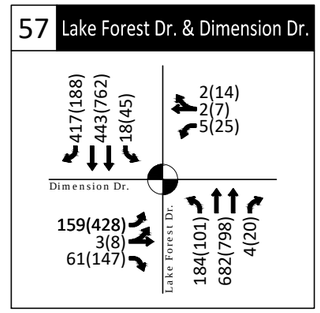


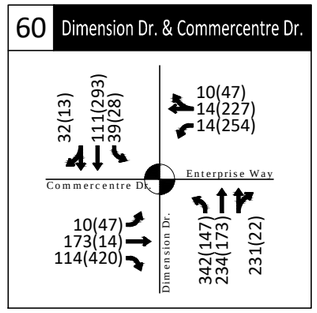


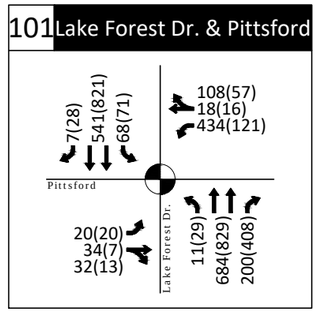


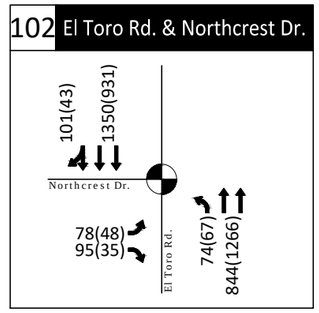












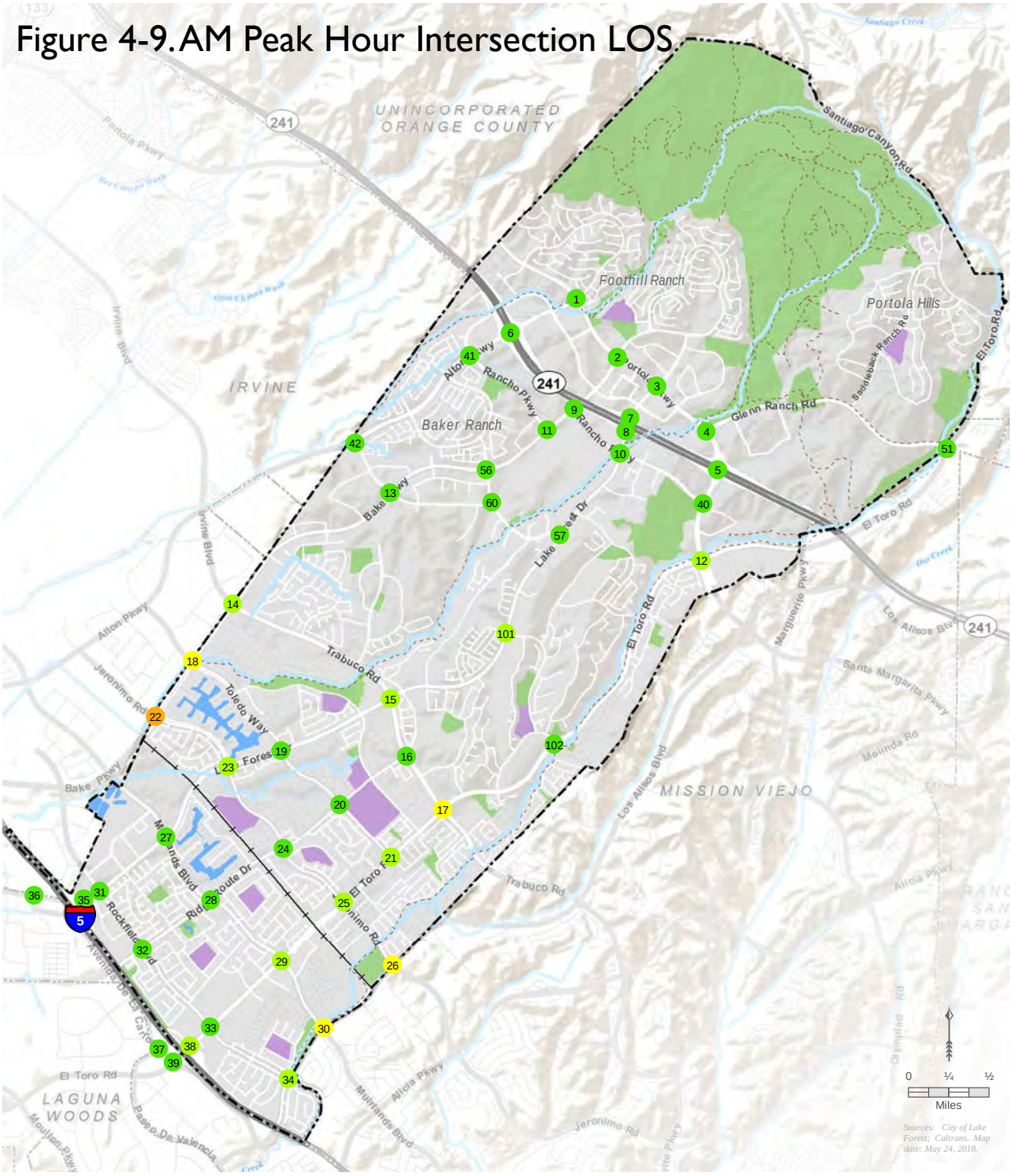
AM(PM) - Traffic Volume

- Traffic Signal

Existing Intersection Volumes and Geometries
Lake Forest, CA

Figure
4-8

Figure 4-9. AM Peak Hour Intersection LOS



Legend

- City of Lake Forest
- Other City Boundaries
- Public School
- City or County Park
- Riding & Hiking Trails

AM LOS

- A
- B
- C
- D
- E
- F

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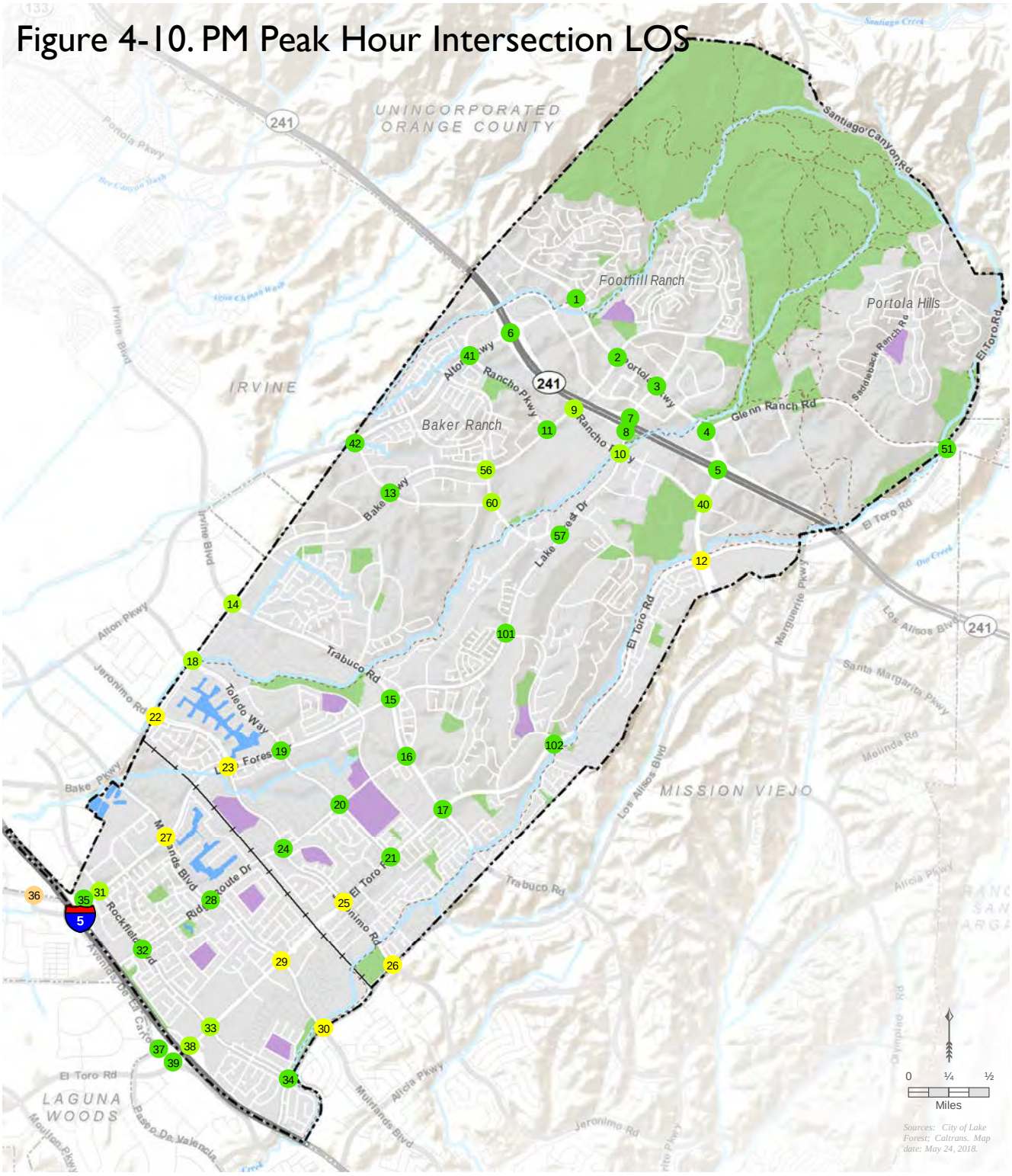
Figure 4-10. PM Peak Hour Intersection LOS



Legend

- City of Lake Forest
- Other City Boundaries
- Public School
- City or County Park
- Riding & Hiking Trails

PM LOS

- A
- B
- C
- D
- E
- F

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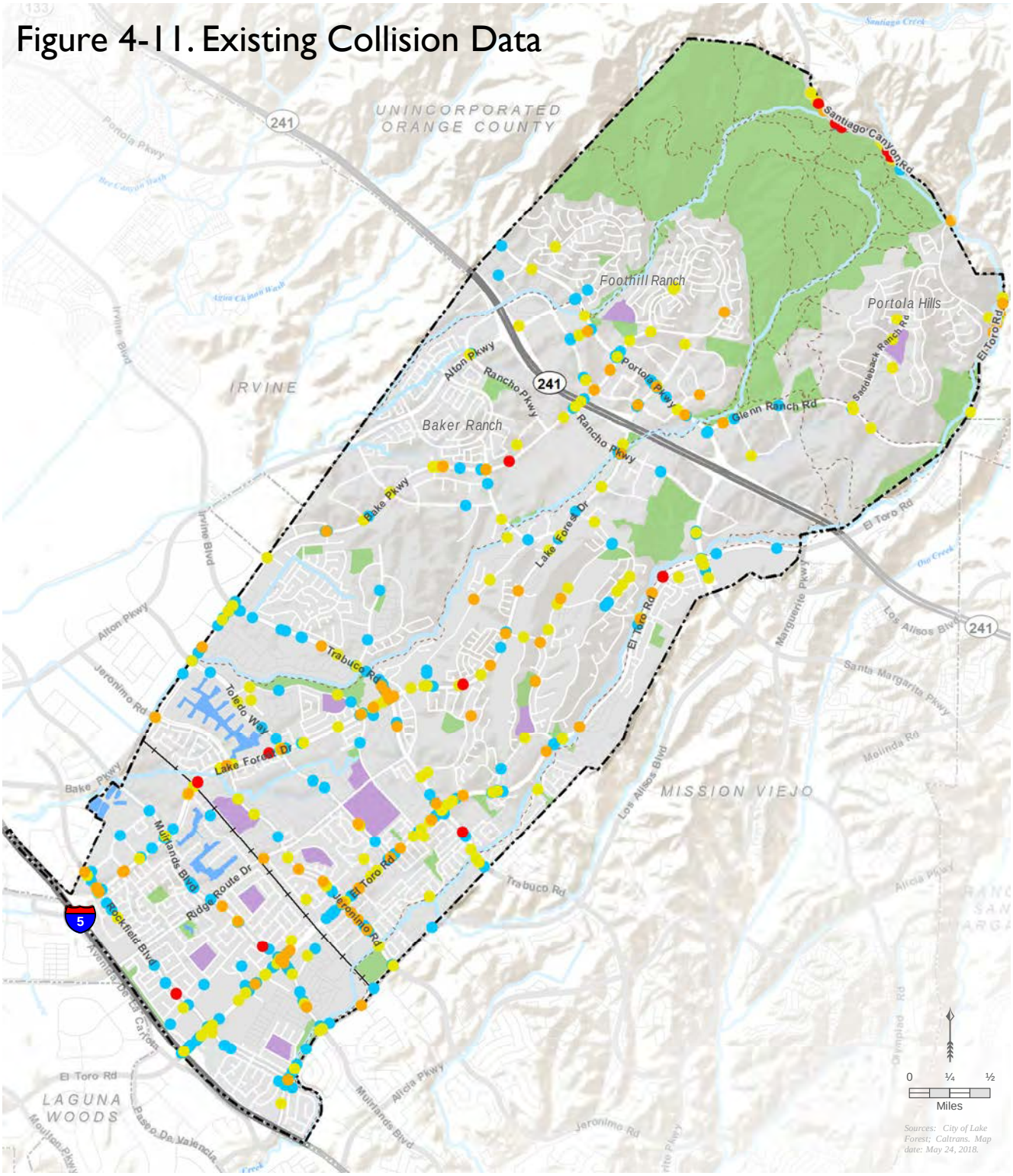
Figure 4-11. Existing Collision Data



Legend

- City of Lake Forest
- Other City Boundaries
- Public School
- City or County Park
- Riding & Hiking Trails

Collision Severity

- Fatal
- Injury (Severe)
- Injury (Other Visible)
- Injury (Complaint of Pain)

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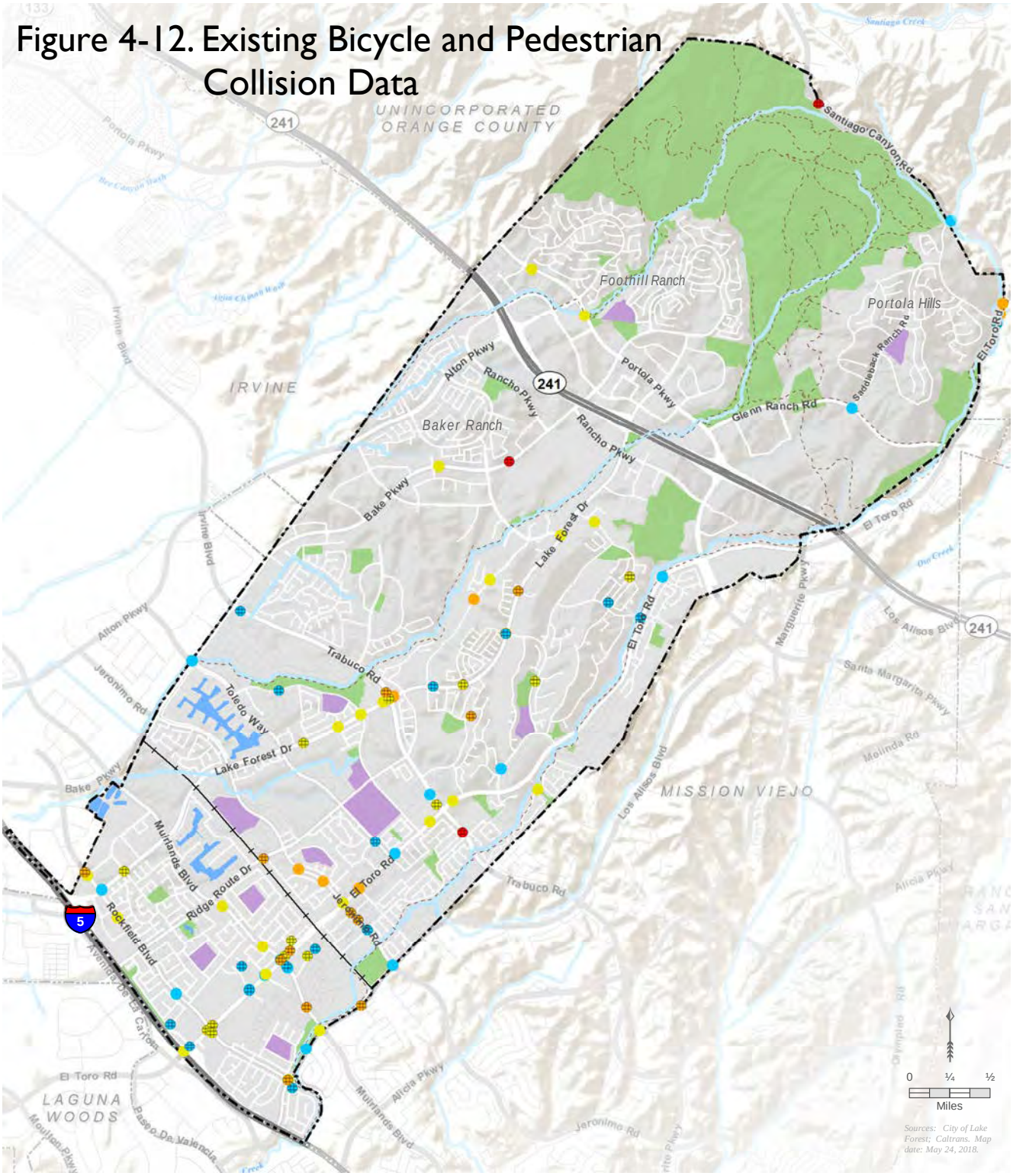
Figure 4-12. Existing Bicycle and Pedestrian Collision Data



Legend

- City of Lake Forest
- Other City Boundaries
- Public School
- City or County Park
- Riding & Hiking Trails

Collision Severity

- Fatal
- Injury (Severe)
- Injury (Other Visible)
- Injury (Complaint of Pain)

- Pedestrian Collision
- Bicycle Collision

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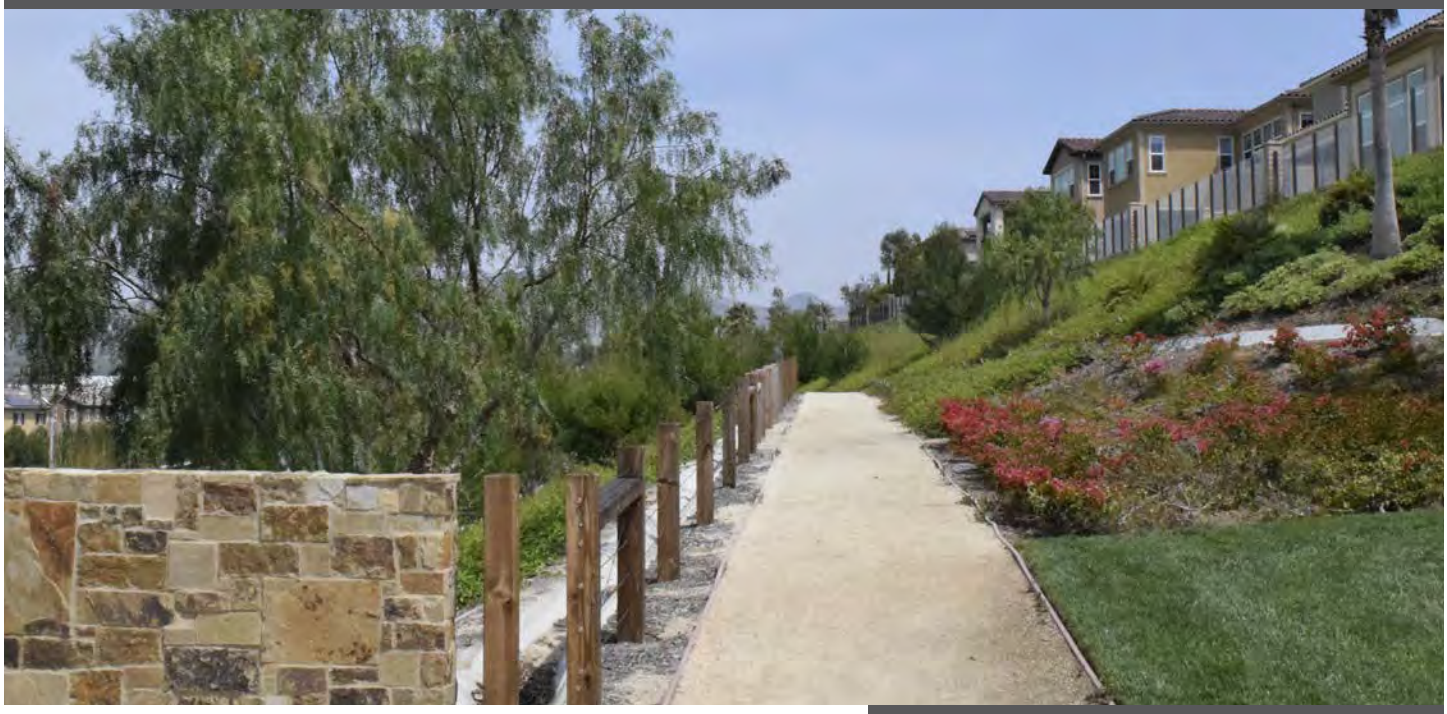
CHAPTER 5
GREENHOUSE GAS AND CLIMATE CHANGE



The City's natural resources form an important part of its unique character and quality of life. This chapter addresses the topics of air quality, greenhouses gases, and climate change.

This chapter includes the following topics:

5.1 AIR QUALITY

This section discusses the regulatory setting, regional climate, topography, air pollution potential, and existing ambient air quality for criteria air pollutants, toxic air contaminants, odors, and dust. This section also discusses the applicable federal and state ambient air quality standards and attainment statuses, recent trends in ambient air quality, and the nature and location of existing sensitive receptors. Information presented in this section is based in part on information gathered from the South Coast Air Quality Management District (SCAQMD) and the California Air Resources Board (CARB).

Federal Regulatory Setting

Air quality with respect to criteria air pollutants and toxic air contaminants (TACs) within the South Coast Air Basin (SCAB) is regulated by such agencies as the SCAQMD, CARB, and Federal EPA. Each of these agencies develops rules, regulations, policies, and/or goals to attain the goals or directives imposed through legislation. Although the EPA regulations may not be superseded, both State and local regulations may be more stringent.

U.S. Environmental Protection Agency

At the Federal level, EPA has been charged with implementing national air quality programs. EPA's air quality mandates are drawn primarily from the Federal Clean Air Act (FCAA), which was enacted in 1963. The FCAA was amended in 1970, 1977, and 1990.

The FCAA required EPA to establish primary and secondary national ambient air quality standards (NAAQS). The FCAA also required each state to prepare an air quality control plan referred to as a State Implementation Plan (SIP). The Federal Clean Air Act Amendments of 1990 (FCAAA) added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is periodically modified to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. EPA has responsibility to review all state SIPs to determine conformity to the mandates of the FCAAA and determine if implementation will achieve air quality goals. If the EPA determines a SIP to be inadequate, a Federal Implementation Plan (FIP) may be prepared for the nonattainment area that imposes additional control measures. Failure to submit an approvable SIP or to implement the plan within the mandated timeframe may result in sanctions being applied to transportation funding and stationary air pollution sources in the air basin.

Federal Hazardous Air Pollutant Program

Title III of the FCAA requires the EPA to promulgate national emissions standards for hazardous air pollutants (NESHAPs). The NESHAP may differ for major sources than for area sources of HAPs (major sources are defined as stationary sources with potential to emit more than 10 tons per year [TPY] of any HAP or more than 25 TPY of any combination of HAPs; all other sources are considered area sources). The emissions standards are to be promulgated in two phases. In the first phase (1992–2000), the EPA developed technology-based emission standards designed to produce the maximum emission reduction achievable. These standards are generally referred to as requiring maximum available control technology (MACT). These Federal rules are also commonly referred to as MACT standards, because they reflect the Maximum Achievable Control Technology. For area sources, the standards may be different, based on generally available control technology. In the second phase (2001–2008), the EPA is required to promulgate health risk–based emissions standards where deemed necessary to address risks remaining after implementation of the technology-based NESHAP standards. The FCAAA required the EPA to promulgate vehicle or fuel standards containing reasonable requirements that control toxic emissions, at a minimum to benzene and formaldehyde. Performance criteria were established to limit mobile-source emissions of toxics, including benzene, formaldehyde, and 1,3-butadiene. In addition, §219 required the use of reformulated gasoline in selected U.S. cities (those with the most severe ozone nonattainment conditions) to further reduce mobile-source emissions.

State Regulatory Setting

In 1992 and 1993, the California Air Resources Board (CARB) requested delegation of authority for the implementation and enforcement of specified New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAPS) to the following local agencies: Bay Area and South Coast Air Quality Management Districts (AQMDs). EPA's review of the State of California's laws, rules, and regulations showed them to be adequate for the implementation and enforcement of these Federal standards, and EPA granted the delegations as requested.

California Air Resources Board

CARB is the agency responsible for coordination and oversight of State and local air pollution control programs in California and for implementing the California Clean Air Act (CCAA), which was adopted in 1988. The CCAA requires that all air districts in the State endeavor to achieve and maintain the CAAQS by the earliest practical date. The act specifies that districts should focus particular attention on reducing the emissions from transportation and area-wide emission sources, and provides districts with the authority to regulate indirect sources.

CARB is primarily responsible for developing and implementing air pollution control plans to achieve and maintain the NAAQS. CARB is primarily responsible for statewide pollution sources and produces a major part of the SIP. Local air districts are still relied upon to provide additional strategies for sources under their jurisdiction. The CARB combines this data and submits the completed SIP to EPA.

Other CARB duties include monitoring air quality (in conjunction with air monitoring networks maintained by air pollution control and air quality management districts), establishing CAAQS (which in many cases are more stringent than the NAAQS), determining and updating area designations and maps, and setting emissions standards for new mobile sources, consumer products, small utility engines, and off-road vehicles.

Transport of Pollutants

The California Clean Air Act, Section 39610 (a), directs the CARB to "identify each district in which transported air pollutants from upwind areas outside the district cause or contribute to a violation of the ozone standard and to identify the district of origin of transported pollutants." The information regarding the transport of air pollutants from one basin to another was to be quantified to assist interrelated basins in the preparation of plans for the attainment of State ambient air quality standards. Numerous studies conducted by the CARB have identified air basins that are impacted by pollutants transported from other air basins (as of 1993). Among the air basins affected by air pollution transport from the SCAB are the South Central Coast Air Basin, the Mojave Desert Air Basin, the Salton Sea Air Basin, and the San Diego County Air Basin. The SCAB was also identified as an area impacted by the transport of air pollutants from the South Central Coast region (CARB, 2001).

State Toxic Air Contaminant Programs

California regulates TACs primarily through the Tanner Air Toxics Act (AB 1807) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588). The Tanner Act sets forth a formal procedure for CARB to designate substances as TACs. This includes research, public participation, and scientific peer review before CARB can designate a substance as a TAC. To date, CARB has identified over 21 TACs, and adopted the EPA's list of HAPs as TACs. Most recently, diesel exhaust particulate was added to the CARB list of TACs. Once a TAC is identified, CARB then adopts an Airborne Toxics Control Measure for sources that emit that particular TAC. If there is a safe threshold for a substance at which there is no toxic effect, the control measure must reduce exposure below that threshold. If there is no safe threshold, the measure must incorporate best available control technology (BACT) to minimize emissions. None of the TACs identified by CARB have a safe threshold.

The Hot Spots Act requires that existing facilities that emit toxic substances above a specified level:

1. Prepare a toxic emission inventory;
2. Prepare a risk assessment if emissions are significant;
3. Notify the public of significant risk levels; and
4. Prepare and implement risk reduction measures.

CARB has adopted diesel exhaust control measures and more stringent emission standards for various on-road mobile sources of emissions, including transit buses and off-road diesel equipment (e.g., tractors and generators). In February 2000, CARB adopted a new public transit bus fleet rule and emission standards for new urban buses. These new rules and standards provide for: 1) more stringent emission standards for some new urban bus engines beginning with 2002 model year engines, 2) zero-emission bus demonstration and purchase requirements applicable to transit agencies, and 3) reporting requirements with which transit agencies must demonstrate compliance with the urban transit bus fleet rule. Upcoming milestones include the low sulfur diesel fuel requirement, and tighter emission standards for heavy-duty diesel trucks (2007) and off-road diesel equipment (2011) nationwide. Over time, the replacement of older vehicles will result in a vehicle fleet that produces substantially less TACs than under current conditions. Mobile-source emissions of TACs (e.g., benzene, 1-3-butadiene, and diesel PM) have been reduced significantly since 2000, and is being reduced further in California through a progression of regulatory measures [e.g., Low Emission Vehicle/Clean Fuels and Phase II reformulated gasoline regulations) and control technologies. With implementation of CARB's Risk Reduction Plan, it is expected that diesel PM concentrations will be reduced by 85% in 2020 from the estimated year 2000 level. Adopted regulations are also expected to continue to reduce formaldehyde emissions from cars and light-duty trucks. As emissions are reduced, it is expected that risks associated with exposure to the emissions will also be reduced.

Local Regulatory Setting

South Coast Air Quality Management District

The SCAQMD shares responsibility with CARB for ensuring that all state and federal ambient air quality standards are achieved and maintained over an area of approximately 10,743 square miles. This area includes all of Orange County and Los Angeles County except for the Antelope Valley, the non-desert portion of western San Bernardino County, and the western and Coachella Valley portions of Riverside County.

The SCAQMD reviews projects to ensure that they do not (1) cause or contribute to any new violation of any air quality standard; (2) increase the frequency or severity of any existing violation of any air quality standard; or (3) delay the timely attainment of any air quality standard or any required interim emission reductions or other milestones of any federal attainment plan.

SCAQMD is responsible for controlling emissions primarily from stationary sources. SCAQMD maintains air quality monitoring stations throughout the South Coast Air Basin. In coordination with the Southern California Association of Governments (SCAG),

SCAQMD is also responsible for developing, updating, and implementing the Air Quality Management Plan (AQMP) for the South Coast Air Basin. An AQMP is a plan prepared and implemented by an air pollution district for a county or region designated as nonattainment of the national and/or California ambient air quality standards.

In 2003, an AQMP was prepared by SCAQMD to bring the South Coast Air Basin, as well as portions of the Salton Sea Air Basin under SCAQMD jurisdiction, into compliance with the 1-hour O_3 and PM_{10} national standards. The 2003 AQMP also replaced the 1997 attainment demonstration for the federal CO standard and provided a basis for a maintenance plan for CO for the future. It also updated the maintenance plan for the federal NO_2 standard, which the South Coast Air Basin has met since 1992.

A subsequent AQMP for the Basin was adopted by SCAQMD on June 1, 2007. The goal of the 2007 AQMP was to lead the South Coast Air Basin into compliance with the national 8-hour O_3 and $PM_{2.5}$ standards. The 2007 AQMP outlined a detailed strategy for meeting the national health-based standards for $PM_{2.5}$ by 2015 and 8-hour O_3 by 2024 while accounting for and accommodating future expected growth. The 2007 AQMP incorporated significant new emissions inventories, ambient measurements, scientific data, control strategies, and air quality modeling. Most of the reductions were to be from mobile sources, which are currently responsible for about 75 percent of all smog and particulate-forming emissions.

The SCAQMD approved the 2012 AQMP on December 7, 2012. The 2012 AQMP incorporated the latest scientific and technological information and planning assumptions, including the 2012–2035 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) and updated emission inventory methodologies for various source categories. The 2012 AQMP outlines a comprehensive control strategy that meets the requirement for expeditious progress toward attainment with the 24-hour $PM_{2.5}$ federal ambient air quality standard with all feasible control measures and demonstrates attainment of the standard by 2014. The 2012 AQMP also updates the 8-hour O_3 control plan with new emission reduction commitments from a set of new control measures that implement the 2007 AQMP's Section 182 (e)(5) commitments. The goal of the Final 2012 AQMP is to lead the Basin into compliance with the national 8-hour O_3 and $PM_{2.5}$ standards.

The SCAQMD approved the Final 2016 AQMP on March 3, 2017. The 2016 AQMP includes transportation control measures developed by SCAG from the 2016–2040 RTP/SCS, as well as the integrated strategies and measures needed to meet the NAAQS. The 2016 AQMP demonstrates attainment of the 1-hour and 8-hour O_3 NAAQS as well as the latest 24-hour and annual $PM_{2.5}$ standards.

The SCAQMD has also prepared the 2010 Clean Communities Plan (Formerly the Air Toxics Control Plan), the Air Quality Monitoring Network Plan, the Vision for Air: A Framework for Air Quality and Climate Plan.

The SCAQMD is responsible for limiting the amount of emissions that can be generated throughout the basin by various stationary, area, and mobile sources. Specific rules and regulations have been adopted by the SCAQMD Governing Board that (1) limit the emissions that can be generated by various uses and activities; and (2) identify specific pollution reduction measures, which must be implemented in association with various uses and activities. These rules regulate the emissions of not only the federal and state criteria pollutants, but also TACs and acutely hazardous materials. The rules are also subject to ongoing refinement by SCAQMD.

Among the SCAQMD rules applicable to the project are Rule 403 (Fugitive Dust), Rule 1113 (Architectural Coatings), and Rule 1403 (Asbestos Emissions from Demolition/Renovation Activities). Rule 403 requires the use of stringent best available control measures (BACMs) to minimize PM_{10} emissions during grading and construction activities. Rule 1113 requires reductions in the VOC content of coatings. Compliance with SCAQMD Rule 1403 requires the owner or operator of any demolition or renovation activity to have an asbestos survey performed prior to demolition and to provide notification to the SCAQMD prior to commencing demolition activities.

City of Lake Forest General Plan

The existing City of Lake Forest General Plan identifies multiple policies related to air quality. All current goals and policies can be accessed in the existing General Plan.

Environmental Setting

South Coast Air Basin

Lake Forest is located within the South Coast Air Basin (SCAB). The South Coast Air Basin is regulated by a single air quality management district: the Southern California Air Quality Management District (SCAQMD). The SCAQMD consists of Orange County, the western portion of Los Angeles County, the southwestern portion of San Bernardino County, and the western portion of Riverside County. Air quality in this area is determined by such natural factors as topography, meteorology, climate, as well as existing air pollution sources and ambient conditions. These factors along with applicable regulations are discussed below. The

combination of topography, low mixing height, abundant sunshine, and emissions from the second-largest urban area in the United States give the Basin the worst air pollution problem in the nation.

Climate, Topography, and Air Pollution Potential

The clean air challenge in the South Coast has always been formidable. Complex terrain and weather patterns make the region a natural sink for the accumulation of emissions and sustained high pollution levels. Along the coastal area, better air quality prevails because of the relatively mild climate, cooler temperatures, and a pattern of onshore airflow. However, in the inland portion of the air basin, a combination of abundant sunshine, warm temperatures, and poor vertical air mixing is conducive to the formation of ozone, commonly referred to as "smog." The problem is further aggravated by the surrounding mountains that act together with the weather and air pollutant emissions.

The accumulation of smog is further heightened by the extent of exposure to elevated pollution levels. The South Coast Air Basin is the nation's second largest urban area and California's largest metropolitan region. It includes the southern two-thirds of Los Angeles County, all of Orange County, and the western urbanized portions of Riverside and San Bernardino counties. The South Coast Air Basin is home to over 40 percent of the total State population, or about 16 million people, and over 10 million vehicles. Fifty thousand heavy duty diesel trucks travel nearly 10 million miles through the region annually, and well over 50,000 diesel engines are used to move goods and power construction and mining equipment.

Air quality for all pollutants in the Basin continues to improve, with recent years registering the lowest levels since measurements began over six decades ago. During the 1960s, maximum 1-hour concentrations were well above levels considered safe for public health -- more than four times the current health standard. In recent times, the maximum measured concentrations are less than one-third of those peak concentrations. Moreover, long-term ozone air quality trends continue to show an overall improvement. The number of days above both the one and eight-hour standards has also declined dramatically.

Because of weather patterns and geography, residual pollution from the South Coast Air Basin is transported to several downwind air basins -- the Mojave Desert, the Salton Sea, the South Central Coast, and San Diego. As ozone precursor emissions in the South Coast Air Basin decrease over time, the transport impact on the downwind areas will also decline.

The majority of annual rainfall in the South Coast Air Basin occurs between November and April. Summer rainfall is minimal and is generally limited to scattered thunder showers in coastal regions and slightly heavier showers in the eastern portion of the Basin and along the coastal side of the mountains. Lake Forest has a Mediterranean climate with moderate, dry summers. The average July high temperature in Lake Forest is 90 degrees Fahrenheit, and the average January low temperature is 44 degrees Fahrenheit. The City receives about 19 inches of rain per year.

The Basin experiences a persistent temperature inversion (increasing temperature with increasing altitude) as a result of the Pacific high. This inversion limits the vertical dispersion of air contaminants, holding them relatively near to the ground. As the sun warms the ground and the lower air layer, the temperature of the lower air layer approaches the temperature of the base of the inversion (upper) layer until the inversion layer finally breaks, allowing vertical mixing with the lower layer. This phenomenon is observed in mid to late afternoons on hot summer days. Winter inversions frequently break by midmorning.

The combination of stagnant wind conditions and low inversions produces the greatest pollutant concentrations. On days of no inversion or high wind speeds, ambient air pollutant concentrations are lowest. During periods of low inversions and low wind speeds, air pollutants generated in urbanized areas are transported predominantly onshore into Riverside and San Bernardino counties. In the winter, the greatest pollution problem is the accumulation of CO and nitrogen oxides (NOx) due to low inversions and air stagnation during the night and early morning hours. In the summer, the longer daylight hours and the brighter sunshine combine to cause a reaction between hydrocarbons and NOx to form photochemical smog.

Existing Ambient Air Quality: Criteria Air Pollutants

The California Air Resources Board (CARB) and the U.S. Environmental Protection Agency (EPA) currently focus on the following air pollutants as indicators of ambient air quality: ozone (O_3), particulate matter (PM), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and lead (Pb). Because these are the most prevalent air pollutants known to be deleterious to human health, they are commonly referred to as "criteria air pollutants." Sources and health effects of the criteria air pollutants are summarized in Table 5-1.

Table 5-1 Common Sources of Health Effects for Criteria Air Pollutants

Pollutants	Sources	Effects on Health and Environment
Ozone (O3)	Atmospheric reaction of organic gases with nitrogen oxides in sunlight	Health: Aggravation of respiratory and cardiovascular diseases; reduced lung function; increased cough and chest discomfort. Environment: Crop, forest and ecosystem damage; damage to materials, including rubber, plastics, fabrics, paint and metals.
Fine Particulate Matter (PM10 and PM2.5)	Stationary combustion of solid fuels; construction activities; industrial processes; atmospheric chemical reactions	Health: Reduced lung function; aggravation of respiratory and cardiovascular diseases; increases in mortality rate; reduced lung function growth in children; premature death.
Nitrogen Dioxide (NO2)	Motor vehicle exhaust; high temperature stationary combustion; atmospheric reactions	Health: Aggravation of respiratory illness (e.g. lung irritation; enhanced allergic responses).
Carbon Monoxide (CO)	Incomplete combustion of fuels and other carbon-containing substances, such as motor vehicle exhaust; natural events, such as decomposition of organic matter	Health: Aggravation of some heart diseases; reduced tolerance for exercise; impairment of mental function (e.g. light-headedness); headaches; birth defects; death at high levels of exposure.
Sulfur Dioxide (SO2)	Combination of sulfur-containing fossil fuels; smelting of sulfur-bearing metal ore; industrial processes	Health: Aggravation of respiratory diseases (including asthma); reduced lung function.
Lead (Pb)	Contaminated soil	Health: Learning disabilities in children; nervous system impairment; impaired mental functioning; brain and kidney damage.

Source: California Air Resources Board, 2017a

Ozone (O3), or smog, is not emitted directly into the environment, but is formed in the atmosphere by complex chemical reactions between reactive organic gases (ROG) and nitrous oxide (NOX) in the presence of sunlight. Ozone formation is greatest on warm, windless, sunny days. The main sources of NOX and ROG, often referred to as ozone precursors, are combustion processes (including motor vehicle engines), the evaporation of solvents, paints, and fuels, and biogenic sources. Automobiles are the single largest source of ozone precursors in the SCAB. Tailpipe emissions of ROG are highest during cold starts, hard acceleration, stop-and-go conditions, and slow speeds. They decline as speeds increase up to about 50 mph, then increase again at high speeds and high engine loads. ROG emissions associated with evaporation of unburned fuel depend on vehicle and ambient temperature cycles. Nitrogen oxide emissions exhibit a different curve; emissions decrease as the vehicle approaches 30 mph and then begin to increase with increasing speeds.

Ozone levels usually build up during the day and peak in the afternoon hours. Short-term exposure can irritate the eyes and cause constriction of the airways. Besides causing shortness of breath, it can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema. Chronic exposure to high ozone levels can permanently damage lung tissue. Ozone can also damage plants and trees, and materials such as rubber and fabrics.

Particulate Matter (PM) refers to a wide range of solid or liquid particles in the atmosphere, including smoke, dust, aerosols, and metallic oxides. Respirable particulate matter with an aerodynamic diameter of 10 micrometers or less is referred to as PM10. PM2.5 includes a subgroup of finer particles that have an aerodynamic diameter of 2.5 micrometers or less. Some particulate matter, such as pollen, is naturally occurring. In the SCAB, most particulate matter is caused by combustion, factories, construction, grading, demolition, agricultural activities, and motor vehicles. Extended exposure to particulate matter can increase the risk of chronic respiratory disease. PM10 is of concern because it bypasses the body's natural filtration system more easily than larger particles and can lodge deep in the lungs. The EPA and the State of California revised their PM standards several years ago to apply only to these fine particles. PM2.5 poses an increased health risk because the particles can deposit deep in the lungs and contain substances that are particularly harmful to human health. Motor vehicles are currently responsible for about half of

particulates in the SCAB. Wood burning in fireplaces and stoves is another large source of fine particulates.

Nitrogen Dioxide (NO2) is a reddish-brown gas that is a by-product of combustion processes. Automobiles and industrial operations are the main sources of NO2. Aside from its contribution to ozone formation, nitrogen dioxide can increase the risk of acute and chronic respiratory disease and reduce visibility. NO2 may be visible as a coloring component of a brown cloud on high pollution days, especially in conjunction with high ozone levels.

Carbon Monoxide (CO) is an odorless, colorless gas. It is formed by the incomplete combustion of fuels. The single largest source of CO in the SCAB is motor vehicles. Emissions are highest during cold starts, hard acceleration, stop-and-go driving, and when a vehicle is moving at low speeds. New findings indicate that CO emissions per mile are lowest at about 45 mph for the average light-duty motor vehicle and begin to increase again at higher speeds. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease or anemia, as well as fetuses. Even healthy people exposed to high CO concentrations can experience headaches, dizziness, fatigue, unconsciousness, and even death.

Sulfur Dioxide (SO2) is a colorless acid gas with a pungent odor. It has potential to damage materials and it can have health effects at high concentrations. It is produced by the combustion of sulfur-containing fuels, such as oil, coal, and diesel. SO2 can irritate lung tissue and increase the risk of acute and chronic respiratory disease.

Lead (Pb) is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been mobile and industrial sources. As a result of the phase-out of leaded gasoline, metal processing is currently the primary source of lead emissions. The highest levels of lead in air are generally found near lead smelters. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers.

Twenty years ago, mobile sources were the main contributor to ambient lead concentrations in the air. In the early 1970s, the EPA set national regulations to gradually reduce the lead content in gasoline. In 1975, unleaded gasoline was introduced for motor vehicles equipped with catalytic converters. The EPA banned the use of leaded gasoline in highway vehicles in December 1995. As a result of the EPA's regulatory efforts to remove lead from gasoline, emissions of lead from the transportation sector and levels of lead in the air decreased dramatically.

Ambient Air Quality Standards and Designations

The current Federal and State ambient air quality standards and attainment standards are presented in Table 5-2.

Table 5-2 Ambient Air Quality Standards and Designations

Pollutant	Averaging Time	California[1]		National Standards[2]		
		Standards[3]	Attainment Status	Primary[3,4]	Secondary[3,5]	Attainment Status
Ozone (O_3)[6]	1-hour	0.09 ppm (180 µg/m^3)	N	–	Same as Primary Standard	N (Extreme)
	8-hour	0.070 ppm (137 µg/m^3)	N	0.070 ppm (137 µg/m^3)		P
Carbon Monoxide (CO)	1-hour	20 ppm (23 mg/m^3)	A	35 ppm (40 mg/m^3)	–	A
	8-hour	9 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)		
Respirable Particulate Matter (PM_{10})[7]	Annual Arithmetic Mean	20 µg/m^3	N	–	Same as Primary Standard	A
	24-hour	50 µg/m^3		150 µg/m^3		
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 µg/m^3	N	15 µg/m^3	Same as Primary Standard	N
	24-hour	–	–	35 µg/m^3		
Sulfur Dioxide (SO_2)[9]	Annual Arithmetic Mean	–	–	0.030 ppm (for certain areas)[11]	–	U/A
	24-hour	0.04 ppm (105 µg/m^3)	–	0.14 ppm (for certain areas)[11]	–	
	3-hour	–	–	–	0.5 ppm (1300 µg/m^3)	
	1-hour	0.25 ppm (655 µg/m^3)	–	75 ppb (196 µg/m^3)	–	
Nitrogen Dioxide (NO_2)[10]	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)	A	0.053 ppm (100 µg/m^3)	Same as Primary Standard	A
	1-hour	0.18 ppm (339 µg/m^3)	A	100 ppb (188 µg/m^3)	–	U/A
Lead[10,11]	30-day Average	1.5 µg/m^3	–	–	–	–
	Calendar Quarter	–	–	1.5 µg/m^3	Same as Primary Standard	–
	Rolling 3-Month Average	–	–	0.15 µg/m^3	Same as Primary Standard	N (Partial)
Sulfates	24-hour	25 µg/m^3	A	No National Standards		
Hydrogen Sulfide	1-hour	0.03 ppm (42 µg/m^3)	A			
Vinyl Chloride[10]	24-hour	0.01 ppm (26 µg/m^3)	A			

Pollutant	Averaging Time	California[1]		National Standards[2]		
		Standards[3]	Attainment Status	Primary[3,4]	Secondary[3,5]	Attainment Status
Visibility-Reducing PM[12]	8-hour	See footnote 12	–			

A = Attainment; N = Nonattainment; P = Designation Pending; U = Unclassifiable; – = No Data.

1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM_{10}, $PM_{2.5}$, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m3 is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

5. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

6. On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.

7. On December 14, 2012, the national annual $PM_{2.5}$ primary standard was lowered from 15 µg/m^3 to 12.0 µg/m^3. The existing national 24-hour $PM_{2.5}$ standards (primary and secondary) were retained at 35 µg/m^3, as was the annual secondary standard of 15 µg/m^3. The existing 24-hour PM10 standards (primary and secondary) of 150 µg/m^3 also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.

8. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

9. On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

10. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

11. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 µg/m^3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

12. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

Sources: California Air Resources Board, 2016; SCAQMD, 2016.

Monitoring Data

The SCAQMD, together with CARB, operates a regional air quality monitoring network that regularly measures the concentrations of the major criteria air pollutants. Air pollutant monitoring data is available at https://arb.ca.gov/adam. The SCAB still has some of the worst air quality in the nation because of regionally specific characteristics, including: climate and topography, mobile sources like cars and trucks, a large industrial sector, and two major ports. Neither Federal nor State ambient air quality standards have been violated in recent decades for nitrogen dioxide, sulfur dioxide, sulfates, hydrogen sulfide, and vinyl chloride.

The closest air quality monitoring site to Lake Forest is located in Mission Viejo (at 26081 Via Pera), within ¼ mile southeast of Lake Forest. It is important to note that the Federal ozone 1-hour standard was revoked by the EPA and is no longer applicable for Federal standards. Data obtained from this monitoring site between 2014 and 2016 is shown in Table 5-3.

Table 5-3 Ambient Air Quality Monitoring Data (Mission Viejo – 26081 Via Pera)

Pollutant	Cal. Primary Standard	Fed. Primary Standard	Year	Days Exceeded State/Fed Standard
Ozone (O3) (1-hour)	0.09 ppm for 1 hour	NA	2016 2015 2014	5 / 0 2 / 0 4 / 0
Ozone (O3) (8-hour)	0.07 ppm for 8 hour	0.07 ppm for 8 hour	2016 2015 2014	13 / 13 8 / 8 10/ 10
Particulate Matter (PM10)	50 ug/m3 for 24 hours	150 ug/m3 for 24 hours	2016 2015 2014	* / 0 * / * 0 / 0
Particulate Matter (PM2.5)	No 24 hour State Standard	35 ug/m3 for 24 hours	2016 2015 2014	7.3 / 7.3 7.0 / 7.0 * / *

Sources: California Air Resources Board (ADAM) Air Pollution Summaries, 2014-2016.

ppm = parts per million.

Ug/m3 = microns per cubic meter.

** = There was insufficient (or no) data available to determine the value*

The SCAQMD and CARB also provide statistics from its air quality monitoring network for the SCAB as a whole. Data obtained for the SCAB between 2014 and 2016 is shown in Table 5-4.

Table 5-4 Ambient Air Quality Monitoring Data (in the South Coast Air Basin)

Pollutant	Cal. Primary Standard	Fed. Primary Standard	Year	Days Exceeded State/Fed Standard
Ozone (O3) (1-hour)	0.09 ppm for 1 hour	NA	2016 2015 2014	83 / 0 71 / 0 74 / 0
Ozone (O3) (8-hour)	0.07 ppm for 8 hour	0.07 ppm for 8 hour	2016 2015 2014	132 / 132 115 / 8 129 / 10
Particulate Matter (PM10)	50 ug/m3 for 24 hours	150 ug/m3 for 24 hours	2016 2015 2014	* / * 123.8 / 6.6 128.5 / 1.0
Particulate Matter (PM2.5)	No 24 hour State Standard	35 ug/m3 for 24 hours	2016 2015 2014	* / 7.3 * / 17.6 * / *

Sources: California Air Resources Board (ADAM) Air Pollution Summaries, 2014-2016.
ppm = parts per million.
Ug/m3 = microns per cubic meter.
** = There was insufficient (or no) data available to determine the value*

Emissions Inventory

CARB estimates emissions of criteria air pollutants for the entire South Coast Air Basin. The results of these emissions are provided

in Table 5-5, below. All emissions are represented in tons per day, and reflect the most current data provided to the ARB.

Table 5-5 2012 Estimated Annual Average Emissions (SCAB)

Stationary Sources	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5
Fuel Combustion	52.5	11.3	48.6	45.1	6.8	5.9	5.7	5.6
Waste Disposal	646.2	12.6	1.0	2.1	0.5	0.3	0.2	0.2
Cleaning and Surface Coatings	82.4	34.1	0.1	0.1	0.0	1.5	1.5	1.4
Petroleum Production and Marketing	79.9	29.0	5.1	1.3	2.1	2.6	1.7	1.5
Industrial Processes	11.9	10.1	0.5	0.4	0.3	15.9	10.8	6.3
Total Stationary Sources	872.9	97.2	55.2	49.1	9.7	26.2	19.9	15.1
Areawide Sources	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**
Solvent Evaporation	119.9	101.9	-	-	-	0.0	0.0	0.0
Miscellaneous Processes	53.3	13.3	54.0	20.6	0.5	174.9	92.6	28.4
Total Areawide Sources	173.2	115.1	54.0	20.6	0.5	174.9	92.6	28.4
Mobile Sources	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**
On-road Motor Vehicles	176.0	157.3	1323.8	318.7	2.0	28.1	27.5	14.5
Other Mobile Sources	111.1	98.4	680.1	125.9	4.6	8.8	8.4	7.1
Total Mobile Sources	287.0	255.7	2003.9	444.7	6.6	36.8	35.9	21.6
Total for South Coast Air Basin	1333.1	468.1	2113.1	514.3	16.8	238.0	148.4	65.1

Source: California Air Resources Board, 2016 SIP Emission Projection Data (accessed April 2018)

Existing Ambient Air Quality: Toxic Air Contaminants

In addition to the criteria air pollutants listed above, another group of pollutants, commonly referred to as toxic air contaminants (TACs) or hazardous air pollutants can result in health effects that can be quite severe. Many TACs are confirmed or suspected carcinogens, or are known or suspected to cause birth defects or neurological damage. Additionally, many TACs can be toxic at very low concentrations. For some chemicals, such as carcinogens, there are no thresholds below which exposure can be considered risk-free.

It is important to understand that TACs are not considered criteria air pollutants and thus are not specifically addressed through the setting of ambient air quality standards. Instead, the EPA and CARB regulate hazardous air pollutants (HAPs) and TACs through statutes and regulations that generally require the use of the maximum or best available control technology (MACT and BACT) to limit emissions. MACT and BACT standards, in conjunction with additional rules set forth by the SCAQMD, establish the regulatory framework for regulating TACs. The SCAQMD maintains approximately 23 rules regulating toxics and other non-criteria pollutants.

Industrial facilities and mobile sources are significant sources of TACs. Sources of TACs go beyond industry. Various common urban facilities also produce TAC emissions, such as gasoline stations (benzene), hospitals (ethylene oxide), and dry cleaners (perchloroethylene). Automobile exhaust also contains TACs such as benzene and 1,3-butadiene. Diesel particulate matter has also been identified as a TAC by the CARB. Diesel PM differs from other TACs in that it is not a single substance but rather a complex mixture of hundreds of substances. SCAQMD research indicates that mobile-source emissions of diesel PM, benzene, and 1,3-butadiene represent a substantial portion of the ambient background risk from TACs in the SCAB.

Sensitive receptors, which include children, the sick, and the elderly, may be especially impacted by TACs. Sensitive receptors located within Lake Forest include: residences, schools, and senior care facilities. However, sources of TACs (such as industrial facilities and gasoline stations) are generally located at a sufficient distance from sensitive receptors that the potential for substantial deleterious health effects to these sensitive receptors from TACs is minimized.

Examples of current SCAQMD Rules relating to TACs are as follows: SCAQMD Rule 1401 requires a new source review of TACs from new permit units, relocations, or modifications to existing permit units which emit TACs. Rule 1401.1 provides requirements for new and relocated TAC-emitting facilities near schools. Rule 1403 provides work practice requirements to limit asbestos emissions

from building demolition and renovation activities. Rule 1404 reduces the level of hexavalent chromium emissions allowed from cooling towers. Rule 1469-1 provides limitations on spraying operations using coatings containing chromium. Additionally, Rule 1472 provides requirements for facilities with multiple stationary emergency standby diesel-fueled internal combustion engines.

Existing Ambient Air Quality: Odors and Dust

Other areas of concern related to air quality in the SCAB include the nuisance impacts of odors and dust. Objectionable odors may be associated with a variety of pollutants. Common sources of odors include wastewater treatment plants, landfills, composting facilities, refineries and chemical plants. Similarly, nuisance dust may be generated by a variety of sources including quarries, agriculture, grading and construction. Odors rarely have direct health impacts, but they can be very unpleasant and can lead to anger and concern over possible health effects among the public. Dust emissions can contribute to increased ambient concentrations of PM10, and can also contribute to reduced visibility and soiling of exposed surfaces.

Each year the SCAB receives thousands of citizen complaints about objectionable odors. One particularly large source of numerous odor complaints from 1995 through 2017 has been the Sunshine Canyon Landfill. SCAQMD inspectors must confirm odors in the presence of sufficient numbers of public complainants, then trace the odors to the operation of a unique source before enforcement action can be taken against the verified source of odors. Based on this evidence, a SCAQMD inspector may issue a Notice of Violation (NOV) against the source of nuisance odors for creating a public nuisance, in violation of SCAQMD Rule 402 and California Health and Safety Code Section 41700.

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5.2 GREENHOUSE GASES

Various gases in the Earth's atmosphere, classified as atmospheric GHGs, play a critical role in determining the Earth's surface temperature. Solar radiation enters Earth's atmosphere from space, and a portion of the radiation is absorbed by the Earth's surface. The Earth emits this radiation back toward space, but the properties of the radiation change from high-frequency solar radiation to lower-frequency infrared radiation.

Naturally occurring greenhouse gases include water vapor (H2O), carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and ozone (O3). Several classes of halogenated substances that contain fluorine, chlorine, or bromine are also greenhouse gases, but they are, for the most part, solely a product of industrial activities. Although the direct greenhouse gases CO2, CH4, and N2O occur naturally in the atmosphere, human activities have changed their atmospheric concentrations. From the pre-industrial era (i.e., ending about 1750) to 2011, concentrations of these three greenhouse gases have increased globally by 40, 150, and 20 percent, respectively (IPCC, 2013).

This section addresses greenhouse gases and sets the framework for analysis of this important topic in the General Plan.

Greenhouse Gases and Climate Change Linkages

Greenhouse gases, which are transparent to solar radiation, are effective in absorbing infrared radiation. As a result, this radiation that otherwise would have escaped back into space is now retained, resulting in a warming of the atmosphere. This phenomenon is known as the greenhouse effect. Among the prominent GHGs contributing to the greenhouse effect are carbon dioxide (CO2), methane (CH4), ozone (O3), water vapor, nitrous oxide (N2O), and chlorofluorocarbons (CFCs).

Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the industrial/manufacturing, utility, transportation, residential, and agricultural sectors. In California, the transportation sector is the largest emitter of GHGs, followed by the industrial sector (California Air Resources Board, 2017b).

As the name implies, global climate change is a global problem. Unlike criteria air pollutants and toxic air contaminants, which are pollutants of regional and local concern,GHGs are global pollutants. Global pollutants are pollutants that have international impacts and affect the ecosystem on a world-wide scale. In regard to global pollutants, California produced approximately 440 million gross metric tons of carbon dioxide equivalents (MMTCO2e) in 2015 (California Air Resources Board, 2017b). By 2020, California is projected to produce 509 MMTCO2e per year (California Air Resources Board, 2014).

Carbon dioxide equivalents are a measurement used to account for the fact that different GHGs have different potential to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. This potential, known as the global warming potential of a GHG, is also dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. Expressing GHG emissions in carbon dioxide equivalents takes the contribution of all GHG emissions to the greenhouse effect and converts them to a single unit equivalent to the effect that would occur if only CO2 were being emitted.

Consumption of fossil fuels in the transportation sector was the single largest source of California's GHG emissions in 2015, accounting for 39% of total GHG emissions in the state. This category was followed by the industrial sector (23%), the electricity generation sector (including both in-state and out of-state sources) (29%) and the agriculture sector (8%), the residential sector (6%), and the commercial sector (5%) (California Air Resources Board, 2017b).

Effects of Global Climate Change

The effects of increasing global temperature are far-reaching and extremely difficult to quantify. The scientific community continues to study the effects of global climate change. In general, increases in the ambient global temperature as a result of increased GHGs are anticipated to result in rising sea levels; which could threaten coastal areas through accelerated coastal erosion, threats to levees and inland water systems and disruption to coastal wetlands and habitat.

If the temperature of the ocean warms, it is anticipated that the winter snow season would be shortened. Snowpack in the Sierra Nevada provides both water supply (runoff) and storage (within the snowpack before melting), which is a major source of water supply for the state. The snowpack portion of the supply could potentially decline by 70% to 90% by the end of the 21st century (Cal EPA, 2006). This phenomenon could lead to significant challenges securing an adequate water supply for a growing state population. Further, the increased ocean temperature could result in increased moisture flux into the state. However, any additional moisture flux would likely increasingly come in the form of rain rather than snow in the high elevations. The possible increased precipitation could lead to increased potential and severity of flood events, placing more pressure on California's levee/flood control system.

Sea level has risen approximately seven inches during the last century and it is predicted to rise an additional 22 to 35 inches by 2100, depending on the future GHG emissions levels (Cal EPA, 2006). If this occurs, resultant effects could include increased

coastal flooding, saltwater intrusion and disruption of wetlands (Cal EPA, 2006). As the existing climate throughout California changes over time, mass migration of species, or failure of species to migrate in time to adapt to the perturbations in climate, could also result. Under the emissions scenarios of the Climate Scenarios report (Cal EPA, 2006), the impacts of global warming in California are anticipated to include, but are not limited to, the following.

Public Health

Higher temperatures are expected to increase the frequency, duration, and intensity of conditions conducive to air pollution formation. For example, days with weather conducive to ozone formation are projected to increase from 25 to 35 percent - under the lower warming range, to 75 to 85 percent- under the medium warming range. In addition, if global background ozone levels increase as predicted in some scenarios, it may become impossible to meet local air quality standards. Air quality could be further compromised by increases in wildfires, which emit fine particulate matter that can travel long distances depending on wind conditions. The Climate Scenarios report indicates that large wildfires could become up to 55 percent more frequent if GHG emissions are not significantly reduced.

In addition, under the higher warming scenario, there could be up to 100 more days per year with temperatures above 90oF in Los Angeles and 95oF in Sacramento by 2100. This is a large increase over historical patterns and approximately twice the increase projected if temperatures remain within or below the lower warming range. Rising temperatures will increase the risk of death from dehydration, heat stroke/exhaustion, heart attack, stroke, and respiratory distress caused by extreme heat.

Water Resources

A vast network of man-made reservoirs and aqueducts capture and transport water throughout the State from northern California rivers and the Colorado River. The current water distribution system relies on Sierra Nevada snow pack to supply water during the dry spring and summer months. Rising temperatures, compounded by potential decreases in precipitation, could severely reduce spring snow pack, increasing the risk of summer water shortages.

The State's water supplies are also at risk from rising sea levels. An influx of saltwater would degrade California's estuaries, wetlands, and groundwater aquifers. Saltwater intrusion caused by rising sea levels is a major threat to the quality and reliability of water within the southern edge of the Sacramento/San Joaquin River Delta, a major state fresh water supply. Global warming is also projected to negatively impact other spheres of the California economy, especially agriculture. California farmers are projected to lose as much as 25 percent of the water supply they need, negatively impacting agricultural production. Global warming may also decrease the potential for hydropower production within the state (although the effects on hydropower are uncertain) and seriously harm winter tourism. Under the lower warming range, the ski season at lower elevations could be reduced by as much as 1 month. If temperatures reach the higher warming range and precipitation declines, there might be many years with insufficient snow for skiing and snowboarding.

If GHG emissions continue unabated, more precipitation will fall as rain instead of snow, and the snow that does fall will melt earlier, reducing the Sierra Nevada spring snow pack by as much as 70 to 90 percent. Under the lower warming scenario, snow pack losses are expected to be only half as large as those expected if temperatures were to rise to the higher warming range. How much snow pack will be lost depends in part on future precipitation patterns, the projections for which remain uncertain. However, even under the wetter climate projections, the loss of snow pack would pose challenges to water managers, hamper hydropower generation, and nearly eliminate all skiing and other snow-related recreational activities.

Agriculture

Increased GHG emissions are expected to cause widespread changes to the agriculture industry, reducing the quantity and quality of agricultural products statewide. Although higher carbon dioxide levels can stimulate plant production and increase plant water-use efficiency, California's farmers will face greater water demand for crops and a less reliable water supply as temperatures rise. Crop growth and development will change, as will the intensity and frequency of pest and disease outbreaks. Rising temperatures will likely aggravate ozone pollution, which makes plants more susceptible to disease and pests and interferes with plant growth.

Plant growth tends to be slow at low temperatures, increasing with rising temperatures up to a threshold. However, faster growth can result in less-than optimal development for many crops, so rising temperatures are likely to worsen the quantity and quality of yield for a number of California's agricultural products. Products likely to be most affected include wine grapes, fruits and nuts, and milk.

In addition, continued global warming will likely shift the ranges of existing invasive plants and weeds and alter competition patterns with native plants. Range expansion is expected in many species while range contractions are less likely in rapidly evolving species with significant populations already established. Should range contractions occur, it is likely that new or different

weed species will fill the emerging gaps. Continued global warming is also likely to alter the abundance and types of many pests, lengthen pests' breeding seasons, and increase pathogen growth rates.

Forests and Landscapes

Global warming is expected to intensify this threat by increasing the risk of wildfire and altering the distribution and character of natural vegetation. If temperatures rise into the medium warming range, the risk of large wildfires in California could increase by as much as 55 percent, which is almost twice the increase expected if temperatures stay in the lower warming range. However, since wildfire risk is determined by a combination of factors, including precipitation, winds, temperature, and landscape and vegetation conditions, future risks will not be uniform throughout the state. For example, if precipitation increases as temperatures rise, wildfires in Southern California are expected to increase by approximately 30 percent toward the end of the century. In contrast, precipitation decreases could increase wildfires in northern California by up to 90 percent.

Moreover, continued global warming will alter natural ecosystems and biological diversity within the state. For example, alpine and sub-alpine ecosystems are expected to decline by as much as 60 to 80 percent by the end of the century as a result of increasing temperatures. The productivity of the state's forests is also expected to decrease as a result of global warming.

Rising Sea Levels

Rising sea levels, more intense coastal storms, and warmer water temperatures will increasingly threaten the state's coastal regions. Under the higher warming scenario, sea level is anticipated to rise 22 to 35 inches by 2100. Elevations of this magnitude would inundate coastal areas with saltwater, accelerate coastal erosion, threaten vital levees and inland water systems, and disrupt wetlands and natural habitats.

Federal Regulatory Setting

Clean Air Act

The Federal Clean Air Act (FCAA) was first signed into law in 1970. The law was substantially amended In 1977, and again in 1990. The FCAA is the foundation for a national air pollution control effort, and it is composed of the following basic elements: National ambient air quality standards (NAAQS) for criteria air pollutants, hazardous air pollutant standards, state attainment plans, motor vehicle emissions standards, stationary source emissions standards and permits, acid rain control measures, stratospheric ozone protection, and enforcement provisions.

The EPA is responsible for administering the FCAA. The FCAA requires the EPA to set standards (NAAQS) for several problem air pollutants based on human health and welfare criteria. Two types of NAAQS were established: primary standards and secondary standards. Primary standards under the NAAQS protect public healthsecondary standards protect the public welfare from non-health-related adverse effects such as visibility reduction.

Energy Policy and Conservation Act

The Energy Policy and Conservation Act of 1975 sought to ensure that all vehicles sold in the U.S. would meet certain fuel economy goals. Through this Act, Congress established the first fuel economy standards for on-road motor vehicles in the United States. Pursuant to the Act, the National Highway Traffic and Safety Administration, which is part of the U.S. Department of Transportation (USDOT), is responsible for establishing additional vehicle standards and for revising existing standards.

Since 1990, the fuel economy standard for new passenger cars has been 27.5 mpg. Since 1996, the fuel economy standard for new light trucks (gross vehicle weight of 8,500 pounds or less) has been 20.7 mpg. Heavy-duty vehicles (i.e., vehicles and trucks over 8,500 pounds gross vehicle weight) are not currently subject to fuel economy standards. Compliance with federal fuel economy standards is determined on the basis of each manufacturer's average fuel economy for the portion of its vehicles produced for sale in the U.S. The Corporate Average Fuel Economy (CAFE) program, which is administered by the EPA, was created to determine vehicle manufacturers' compliance with the fuel economy standards. The EPA calculates a CAFE value for each manufacturer based on city and highway fuel economy test results and vehicle sales. Based on the information generated under the CAFE program, the USDOT is authorized to assess penalties for noncompliance.

Energy Policy Act of 1992 (EPAct)

The Energy Policy Act of 1992 (EPAct) was passed to reduce the country's dependence on foreign petroleum and improve air quality. EPAct includes several parts intended to build an inventory of alternative fuel vehicles (AFVs) in large, centrally fueled fleets in metropolitan areas. EPAct requires certain federal, state, and local government and private fleets to purchase a percentage of light duty AFVs capable of running on alternative fuels each year. In addition, financial incentives are included in EPAct. Federal

tax deductions will be allowed for businesses and individuals to cover the incremental cost of AFVs. States are also required by the act to consider a variety of incentive programs to help promote AFVs.

Energy Policy Act of 2005

The Energy Policy Act of 2005 was signed into law on August 8, 2005. Generally, the act provides for renewed and expanded tax credits for electricity generated by qualified energy sources, such as landfill gas; provides bond financing, tax incentives, grants, and loan guarantees for a clean renewable energy and rural community electrification; and establishes a federal purchase requirement for renewable energy.

Intermodal Surface Transportation Efficiency Act (ISTEA)

ISTEA (49 U.S.C. § 101 et seq.) promoted the development of intermodal transportation systems to maximize mobility as well as address national and local interests in air quality and energy. ISTEA contained factors that metropolitan planning organizations (MPOs), such as SACOG, were to address in developing transportation plans and programs, including some energy-related factors. To meet the ISTEA requirements, MPOs adopted explicit policies defining the social, economic, energy, and environmental values that were to guide transportation decisions in that metropolitan area. The planning process was then to address these policies. Another requirement was to consider the consistency of transportation planning with federal, state, and local energy goals. Through this requirement, energy consumption was expected to become a criterion, along with cost and other values that determine the best transportation solution.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)

SAFETEA-LU (23 U.S.C. § 507), renewed the Transportation Equity Act for the 21st Century (TEA-21) of 1998 (23 U.S.C.; 49 U.S.C.) through FY 2009. SAFETEA-LU authorized the federal surface transportation programs for highways, highway safety, and transit. SAFETEA-LU addressed the many challenges facing our transportation system today—such as improving safety, reducing traffic congestion, improving efficiency in freight movement, increasing intermodal connectivity, and protecting the environment—as well as laying the groundwork for addressing future challenges. SAFETEA-LU promoted more efficient and effective federal surface transportation programs by focusing on transportation issues of national significance, while giving state and local transportation decision makers more flexibility to solve transportation problems in their communities. SAFETEA-LU was extended in March of 2010 for nine months, and expired in December of the same year. In June 2012, SAFETEA-LU was replaced by the Moving Ahead for Progress in the 21st Century Act (MAP-21), which will take effect October 1, 2012.

U.S. Federal Climate Change Policy

The U.S. EPA published the latest version of the Climate Change Indicators report in 2016, in collaboration with more than 40 government agencies, academic institutions, and other organizations, to compile a key set of indicators related to the causes and effects of climate change. The U.S. EPA also currently administers multiple programs that encourage voluntary GHG reductions, including "ENERGY STAR", "Climate Leaders", and Methane Voluntary Programs. However, as of this writing, there are no adopted federal plans, policies, regulations, or laws directly regulating GHG emissions.

State Regulatory Setting

Assembly Bill 1493

In response to AB 1493, CARB approved amendments to the California Code of Regulations (CCR) adding GHG emission standards to California's existing motor vehicle emission standards. Amendments to CCR Title 13 Sections 1900 (CCR 13 1900) and 1961 (CCR 13 1961), and adoption of Section 1961.1 (CCR 13 1961.1), require automobile manufacturers to meet fleet average GHG emission limits for all passenger cars, light-duty trucks within various weight criteria, and medium-duty passenger vehicle weight classes beginning with the 2009 model year. Emission limits are further reduced each model year through 2016. For passenger cars and light-duty trucks 3,750 pounds or less loaded vehicle weight (LVW), the 2016 GHG emission limits are approximately 37 percent lower than during the first year of the regulations in 2009. For medium-duty passenger vehicles and light-duty trucks 3,751 LVW to 8,500 pounds gross vehicle weight (GVW), GHG emissions are reduced approximately 24 percent between 2009 and 2016.

CARB requested a waiver of Federal preemption of California's Greenhouse Gas Emissions Standards. The intent of the waiver is to allow California to enact emissions standards to reduce carbon dioxide and other greenhouse gas emissions from automobiles in accordance with the regulation amendments to the CCRs that fulfill the requirements of AB 1493. The EPA granted a waiver to California to implement its greenhouse gas emissions standards for cars.

California Executive Orders S-3-05 and S-20-06, and Assembly Bill 32

On June 1, 2005, Governor Arnold Schwarzenegger signed Executive Order S-3-05. The goal of this Executive Order is to reduce

California's GHG emissions to: 1) 2000 levels by 2010, 2) 1990 levels by 2020 and 3) 80% below 1990 levels by 2050.

In 2006, this goal was further reinforced with the passage of Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006. AB 32 sets the same overall GHG emissions reduction goals while further mandating that CARB create a plan, which includes market mechanisms, and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." Executive Order S-20-06 further directs State agencies to begin implementing AB 32, including the recommendations made by the State's Climate Action Team.

Assembly Bill 1007

Assembly Bill 1007 (Pavley, Chapter 371, Statutes of 2005) directed the CEC to prepare a plan to increase the use of alternative fuels in California. As a result, the CEC prepared the State Alternative Fuels Plan in consultation with State, Federal, and local agencies. The plan presents strategies and actions California must take to increase the use of alternative non-petroleum fuels in a manner that minimizes costs to California and maximizes the economic benefits of in-state production. The Plan assessed various alternative fuels and developed fuel portfolios to meet California's goals to reduce petroleum consumption, increase alternative fuels use, reduce greenhouse gas emissions, and increase in-state production of biofuels without causing a significant degradation of public health and environmental quality.

Assembly Bill 2140

Under the Federal Disaster Mitigation Act of 2000, each municipality must develop a Local Hazard Mitigation Plan (LHMP) or participate in a multi-jurisdictional LHMP in order to be eligible for pre- disaster mitigation grants or post-disaster recovery assistance from the federal government. AB 2140 authorizes local governments to adopt their LHMP's with the safety elements of their General Plans. Integration or incorporation by reference is encouraged through a post-disaster financial incentive which authorizes the state to use available California Disaster Assistance Act funds to cover local shares of the 25% non-federal portion of grant-funded post-disaster projects.

Bioenergy Action Plan – Executive Order #S-06-06

Executive Order #S-06-06 establishes targets for the use and production of biofuels and biopower and directs state agencies to work together to advance biomass programs in California while providing environmental protection and mitigation. The executive order establishes the following target to increase the production and use of bioenergy, including ethanol and biodiesel fuels made from renewable resources: produce a minimum of 20 percent of its biofuels within California by 2010, 40 percent by 2020, and 75 percent by 2050. The executive order also calls for the state to meet a target for use of biomass electricity.

Governor's Low Carbon Fuel Standard (Executive Order S-01-07)

Executive Order (EO) S-01-07 establishes a statewide goal to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020 through establishment of a Low Carbon Fuel Standard. The Low Carbon Fuel Standard is incorporated into the State Alternative Fuels Plan and is one of the proposed discrete early action GHG reduction measures identified by CARB pursuant to AB 32.

Executive Order B-30-15

On April 29, 2015, Governor Jerry Brown issued Executive Order (EO) B-30-15, which establishes a State GHG reduction target of 40 percent below 1990 levels by 2030. The new emission reduction target provides for a mid-term goal that would help the State to continue on course from reducing GHG emissions to 1990 levels by 2020 (per AB 32) to the ultimate goal of reducing emissions 80 percent under 1990 levels by 2050 (per EO S-03-05). This is in line with the scientifically established levels needed in the U.S. to limit global warming below 2 degrees Celsius – the warming threshold at which scientists say there will likely be major climate disruptions. EO B-30-15 also addresses the need for climate adaptation and directs State government to:

Incorporate climate change impacts into the State's Five-Year Infrastructure Plan;

Update the Safeguarding California Plan, the State climate adaptation strategy, to identify how climate change will affect California infrastructure and industry and what actions the State can take to reduce the risks posed by climate change;

Factor climate change into State agencies' planning and investment decisions; and

Implement measures under existing agency and departmental authority to reduce GHG emissions.

Climate Action Program at Caltrans

Caltrans prepared a Climate Action Program in response to new regulatory directives. The goal of the Climate Action Program is

to promote clean and energy efficient transportation, and provide guidance for mainstreaming energy and climate change issues into business operations. The overall approach to lower fuel consumption and CO2 from transportation is twofold: (1) reduce congestion and improve efficiency of transportation systems through smart land use, operational improvements, and Intelligent Transportation Systems; and (2) institutionalize energy efficiency and GHG emission reduction measures and technology into planning, project development, operations, and maintenance of transportation facilities, fleets, buildings, and equipment.

The reasoning underlying the Climate Action Program is the conclusion that "the most effective approach to addressing GHG reduction, in the short-to-medium term, is strong technology policy and market mechanisms to encourage innovations. Rapid development and availability of alternative fuels and vehicles, increased efficiency in new cars and trucks (light and heavy duty), and super clean fuels are the most direct approach to reducing GHG emissions from motor vehicles (emission performance standards and fuel or carbon performance standards)."

Senate Bill 97

Senate Bill 97 (Chapter 185, 2007) required the Governor's Office of Planning and Research (OPR) to develop recommended amendments to the State CEQA Guidelines for addressing greenhouse gas emissions. OPR prepared its recommended amendments to the State CEQA Guidelines to provide guidance to public agencies regarding the analysis and mitigation of greenhouse gas emissions and the effects of greenhouse gas emissions in draft CEQA documents. The Amendments became effective on March 18, 2010.

Senate Bill 375

SB 375 requires CARB to develop regional greenhouse gas emission reduction targets to be achieved from the automobile and light truck sectors for 2020 and 2035. The 18 metropolitan planning organizations (MPO) in California will prepare a "sustainable communities strategy" to reduce the amount of greenhouse gas emission in their respective regions and demonstrate the ability for the region to attain CARB's reduction targets. CARB would later determine if each region is on track to meet their reduction targets. In addition, cities would have extra time -- eight years instead of five -- to update housing plans required by the State.

Senate Bill 32

An update to Assembly Bill 32 was passed in August 2016, which extends the state's targets for reducing greenhouse gases from 2020 to 2030. Under Senate Bill (SB) 32, the state would reduce its greenhouse gas emissions to 40 percent below 1990 levels by 2030.

Senate Bill 379

As California confronts climate change impacts, local governments are now required, in accordance with Senate Bill 379, to include a climate change vulnerability assessment, measures to address vulnerabilities, and comprehensive hazard mitigation and emergency response strategy within their Land Use and Safety Elements. Communities may use the safety element as a vehicle for defining "acceptable risk" and the basis for determining the level of necessary mitigation. Policies may include methods of minimizing risks, as well as ways to minimize economic disruption and expedite recovery following disasters.

Regional Regulatory Setting

South Coast Air Quality Management District (SCAQMD)

SCAQMD adopted a "Policy on Global Warming and Stratospheric Ozone Depletion" on April 6, 1990. The policy commits the SCAQMD to consider global impacts in rulemaking and in drafting revisions to the Air Quality Management Plan. In March 1992, the SCAQMD Governing Board reaffirmed this policy and adopted amendments to the policy to include the following directives:

> Phase out the use and corresponding emissions of chlorofluorocarbons, methyl chloroform (1,1,1- trichloroethane or TCA), carbon tetrachloride, and halons by December 1995.
>
> Phase out the large quantity use and corresponding emissions of hydrochlorofluorocarbons by the year 2000.
>
> Develop recycling regulations for hydrochlorofluorocarbons (e.g., SCAQMD Rules 1411 and 1415).
>
> Develop an emissions inventory and control strategy for methyl bromide
>
> Support the adoption of a California GHG emission reduction goal.

SCAQMD released draft guidance regarding interim CEQA GHG significance thresholds in 2008. Within its October 2008 document, SCAQMD proposed the use of a percent emission reduction target to determine significance for commercial/residential projects that emit greater than 3,000 MT CO2e per year. On December 5, 2008, the SCAQMD Governing Board adopted the staff proposal

for an interim GHG significance threshold for stationary source/industrial projects where SCAQMD is the lead agency.

Existing Greenhouse Gas Emissions in Lake Forest

The City of Lake Forest does not have any plans, policies, regulations, significance thresholds, or laws addressing climate change at this time. Additionally, the City has not calculated a greenhouse gas emissions baseline for the community or for City government operations, nor has the City developed a Climate Action Plan or other planning document regulation GHGs.

Development of GHG emissions inventories for the City of Lake Forest are expected to occur in future years. GHG emissions within the City of Lake Forest are closely tied to trends within the region of Orange County and the State of California. In general, the biggest GHG emissions sectors (e.g. building energy and on-road transportation) tend to be affected most heavily by State and regional-level regulations and initiatives (as opposed to local policies). This means that the local government has limited control over the magnitude of local-level GHG emissions. Nevertheless, the City of Lake Forest has control over policy decisions that can substantially reduce the community's overall GHG emissions. For example, the local government has substantial control over current and future land uses, parking policies, building energy efficiency and renewable energy requirements, recycling initiatives, and water and wastewater reduction plans and policies. The City of Lake Forest also has substantial control over its own government operations, including energy usage within County-operated buildings, County vehicle fleet usage, and street lighting. The City of Lake Forest will continue to work closely with neighboring jurisdictions and Orange County to reduce community-wide and municipal-level GHG emissions under its control.

Qualified Greenhouse Gas Analysis

The City of Lake Forest's General Plan Update will include preparation of a qualified Greenhouse Gas Analysis which will be used to evaluate potential impacts associated with buildout of the preferred plan and identification of appropriate mitigation strategies. This analysis will be prepared as part of the Land Use Alternatives Report and Environmental Impact Report associated with Phase 2 and Phase 3 of the General Plan Update project, respectively. The intent of this section is to record applicable federal, state, regional requirements related to greenhouse gas and climate change planning and set the stage for the quantified assessment to be completed in these subsequent tasks.

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5.3 CLIMATE CHANGE AND RESILIENCY PLANNING

This section addresses hazards associated with climate change as well as resiliency planning and adaptation strategies. Information in this section is primarily from the Los Angeles County Department of Public Health Framework for Addressing Climate Change in Los Angeles County, the California State Legislature's Senate Environmental Quality Committee Report on Southern California Regional Adaptation Efforts to Climate Change Impacts, and the University of California Los Angeles (UCLA) Institute of the Environment and Sustainability Climate Change in the Los Angeles Region Project.

Climate change is currently having global and local impacts that are occurring in response to greenhouse gas (GHG) emissions from human activities, as noted in the 5th assessment of the Intergovernmental Panel on Climate Change (IPCC). These global changes are manifesting in varied environmental health and infrastructure consequences for different countries, regions, and states, necessitating a change in public policy decision making in order to adapt to a new environment.

Over the next century, increasing atmospheric greenhouse gas (GHG) concentrations are expected to cause a variety of changes to global climate conditions, including sea level rise (SLR) and storm surge in coastal areas, increased riverine flooding, and higher temperatures more frequently (leading to extreme heat events and wildfires), particularly in inland areas. Local impacts stemming from climate related conditions range from impacts to water quality and supply, public health, air quality, wildfires and infrastructure.

Because local governments largely determine the shape of development through land-use plans, regulations, and implementing decisions, local governments play an important role in developing climate change strategies including resiliency planning and adaptation. Inasmuch as local governments play an important role in adaptation strategies through local land use plans and policies, many climate adaptation strategies will need to be coordinated as part of a larger regional, or statewide strategy requiring cooperation by many local governments, and decision making and regulatory bodies.

Environmental Setting

Until recently, the most robust climate change research has focused on large regions and global conditions, and information about climate change and how if effects regional areas has been less well known. While global climate models are incredibly useful for understanding climate change on global and continental scales, they are too low in spatial resolution to help understand climate impacts on smaller scales, particularly in areas like the Los Angeles region, whose complex topography creates microclimates that a global climate model cannot account for.

The most comprehensive study of climate change in the Los Angeles area to date, the Climate Change in the Los Angeles Region Project was conducted by Center for Climate Science Faculty Director Alex Hall and his research group at UCLA between 2010 and 2015. Researchers at UCLA used a technique to downscale approximately three dozen latest-generation global climate models at 1.2-mile resolution over the greater Los Angeles region. Focusing on two future periods, 2041–2060 and 2081–2100, researchers analyzed changes in various aspects of climate—temperature, extreme heat, precipitation, snowfall, and runoff from precipitation in the region's mountains—under two different scenarios of greenhouse gas emissions. The "business as usual" scenario represents a continued rise in emissions of heat-trapping greenhouse gases, and the "mitigation" scenario represents aggressive action to curb emissions over the coming decades. Key Findings from this research include:

At mid-century under the Business As Usual scenario, average temperatures over the region's land areas rise by 4.3°F, compared with a reference period of 1981–2000.

Warming is not uniform across the LA region. Valleys and inland areas warm more than areas near the coast.

The number of days hotter than 95°F increases across the region, but to a greater extent in the interior compared with coastal areas.

At mid-century, temperature changes in the Mitigation scenario are 70% of those in Business As Usual scenario. That warming doesn't differ greatly between the two scenarios means significant effects of climate change are inevitable.

At the end of the century, there's a much larger difference between the two scenarios. In the Mitigation scenario, temperatures level off, and by end-century, average temperatures are about 3°F warmer than in 1981–2000. Under Business As Usual, end-century average temperatures will be 8.2°F warmer than they were in 1981–2000. This stark difference indicates that global action to reduce greenhouse gas emissions would have significant benefits.

Average annual precipitation totals do not change significantly in either time period or scenario. (Note: Further studies are required for a holistic analysis of precipitation changes. In California, precipitation varies greatly from year to year, so changes to the average are just one part of the story. Other projects by the Center for Climate Science are assessing changes to the distribution of precipitation events and the effects of climate change on drought.)

Because temperature increases cause a greater share of winter precipitation to fall as rain instead of snow, snowfall in the region's mountains will be reduced. At mid-century under Business As Usual, elevations below about 6,500 feet lose half their snowfall compared with 1981–2000, while higher elevations lose up to 30%. At the end of the century under Business As Usual, lower elevations stand to lose 80% of the snowfall they received in 1981–2000.

Other studies have indicated a variety of changes to local climate conditions as a result of climate change are expected to occur leading to several local conditions that may affect southern California including the City of Lake Forest including: increased urban flooding, higher temperatures, more frequent heat waves (leading to extreme heat events), increased risk of wildfire, water quality and water supply impacts, impacts to regional air quality, and other public health Impacts.

Flooding

Precipitation change is a climate variable that is directly affected by changes in global atmospheric and oceanic temperatures. Projected changes in precipitation include annual trend changes as well as extreme precipitation events.

Riverine and local flooding is influenced by precipitation and local conditions, such as ground cover and soil conditions. Riverine flooding occurs when heavy rainfall causes rivers or creeks to overtop their banks and inundate surrounding areas during extreme weather events. Urban flooding commonly occurs when local stormwater infrastructure is overwhelmed during extreme precipitation events. As described previously, , rainfall averages are expected to vary only slightly from current conditions in the

Los Angeles Region, however, local model predictions include more extreme precipitation events, which in turn cause flood risks to worsen, increasing the likelihood of damaging infrastructure, increasing erosion, and overwhelming sewage treatment systems, which may reduce water quality and impact public health.

Water Supply and Quality

According to the Los Angeles Regional Water Quality Control Board's Los Angeles Region Framework for Climate Change Adaptation and Mitigation, overall mean precipitation amounts are expected to change very little, however it is expected that climate change will likely impact water demand, supply, and quality of both surface and ground water.

The Los Angeles Region Framework notes that mountains around Los Angeles are expected to lose at least 31% of snowfall, which will melt faster with increasing temperatures and begin melting 16 days earlier on average. With decreased stream flows and higher temperatures, impacts could include a reduction of fish habitat, increased surface water temperatures, pollutant levels, and sedimentation, intensified algal growth, and subsequently, more harmful algal blooms. For groundwater, the potential for salt water intrusion into aquifers with sea level rise could be worsened by overpumping. The decreased water quality could further deteriorate as pollutant concentrations increase due to reduced water levels and recharge from drought and diminished snowpack.

Wildfires

Wildfire occurs as a result of conditions affected by complex interactions between primary variables (including precipitation, and temperature) and other factors (including changes in cover type). Wildfires are unplanned, natural occurring fires and may be caused by lightning, accidental human ignitions, arson, or escaped prescribed fires. Weather is one of the most significant factors in determining the severity of wildfires; natural fire patterns are driven by conditions such as drought, temperature, precipitation, and wind, and also by changes to vegetation structure and fuel (i.e., biomass) availability. Wildfires pose a great threat to life and property, particularly when they move from forest or rangeland into developed areas.

Climate change is projected to increase the frequency of wildfire events, the extent of burned areas across California, and the duration of wildfire seasons. Wildfire seasons are projected to begin earlier in the spring due to drier and warmer spring conditions on average, potentially requiring longer periods for firefighting services. Greater inter-annual variability in temperature and precipitation may also affect wildfire intensity. For example, multiple wet years can result in larger fuel buildup in landscapes. This may result in increasingly intense and frequent wildfires, if followed by drought years. Wildfire risk will also vary depending on population growth and land use characteristics, including rates of residential expansion and infrastructure into fire prone areas over the next century.

In recent decades, Southern California has experienced an increase in the area burned by wildfires. According to the Southern California Fires Interdisciplinary Project, the southern California fires in 2003, were widely considered a 100-year event, and the 2007 fires, were responsible for billions of dollars in costs from firefighting, property damage, environmental erosion, ecosystem services, and human health impacts. By 2050, the region's fire season is projected to last three weeks longer with an increase of 20-30% in the annual amount of acreage burned (Yue et al. 2013).

Wildfires also contribute to reduced air quality, through the elevated levels of particulate matter and ozone pollution, with implications for public health. Wildfire smoke can result in both short-term and long-term health impacts, from minor lung and eye irritation to premature death. Research on health impacts from the 2003 Southern California wildfires showed an increase in hospital admissions for respiratory problems during the fires, including asthma attacks, acute bronchitis, and chronic obstructive pulmonary disorder (COPD), with small increases in cardiovascular admissions. The research further suggested that improved prevention measures are needed to reduce illness in vulnerable populations (Finlay, Elise et al 2012).

Extreme Heat

Temperature is a climate variable, and is directly affected by changes in global atmospheric and oceanic temperatures. While trends in average annual temperature are an important indicator of climate change, extreme temperature events have greater impacts on society due to their episodic nature. Therefore, vulnerability and risk assessment tends to specifically focus on extreme heat events and not on average temperature changes. The IPCC defines extreme heat events as a period of abnormally hot weather. While extreme heat events can have various durations, CalAdapt defines an extreme heat event as a period of five or more consecutive extreme heat days. CalAdapt defines an extreme heat day in a given region as a day in April through October where the maximum temperature exceeds the 98th historical percentile of maximum temperatures for that region based on daily temperature data from 1961 to 1990. The 98th historical percentile of maximum temperatures varies by locality and inland areas tend to be at a greater risk of extreme heat events when compared to areas near the coast.

Increasing numbers of extreme heat days are projected in the coming decades. The Public Health-Related Impacts of Climate Change in California report points out that increasing high heat days from climate change have a number of impacts on communities, including direct heat-related mortalities and worsening of chronic health conditions (Drechsler et al. 2006). Southern California already experiences energy shortages, and higher demand from more frequent and intense high heat days could further impact health.

As noted by the Union of Concerned Scientists (UCS) in the 2012 report Preparing for Climate Change Impacts in Los Angeles: Strategies and Solutions for Protecting Local Communities, extreme heat days can lead to dehydration, heat exhaustion, and fatal heat stroke, in addition to worsening existing medical conditions, including respiratory disease, diabetes, kidney and heart disease. They report that recent research has shown that Los Angeles County has the largest number of residents in California who will be exposed to extreme heat days and at greatest risk for related health problems. Reasons for this high amount of risk include a combination of lack of air conditioning or shaded areas, outdoor work exposure to air pollutants, and preexisting health conditions.

Additionally, a 2011 report by the UCS discusses the climate penalty on ozone, demonstrating how increasing temperatures could increase ozone pollution. In 2020 alone, impacts from ozone formation associated with this penalty could result in nearly 443,000 additional cases of serious respiratory illness and cost over $729 million.

Increased Risk and Spread of Diseases

In addition to the health impacts related to air and water quality, warmer temperatures and drought conditions can contribute to the spread of diseases by aiding development and spread of the vectors that transmit them (Drechsler et al. 2006). A vector-borne disease (VBD) is one caused by a virus, bacteria, or protozoan that spends part of its life cycle in a host species (e.g. mosquitoes, ticks, fleas, rodents), which subsequently spreads the disease to other animals and people.

Regional research assessments have previously concluded that climate change and variability are highly likely to influence current VBD spread, including both short-term outbreaks and shifts in long-term disease trends. For example, as temperatures rise, mosquito reproductive cycles are shortened, allowing more breeding cycles each season, and viral transmission rates rise sharply (Githeko et al. 2000). Mosquitoes are an increasing vector of concern, particularly those species that have been introduced from other countries because changes in temperature and precipitation conditions can allow exotic species to become established in places where they could not previously survive year-round.

In Los Angeles County, there are three invasive mosquito species including the Asian tiger mosquito, which has been identified in the San Gabriel Valley. These invasive mosquitoes bite aggressively during the day and can spread a variety of disease, including chikungunya, yellow fever, and dengue, as seen with recent outbreaks in Florida and Texas. As noted in a recent Special Report on invasive mosquitoes in Los Angeles County by the San Gabriel Valley and Los Angeles Mosquito and Vector Control Districts, once established, the mosquitoes can reproduce in extremely small amounts of water and are very difficult to control.

The California Department of Public Health further notes three vector-borne diseases that climate change may impact in the state: Hantavirus, Lyme disease, and West Nile Virus (WNV). As the ecology of vectors changes with climate, exposure to disease in people may increase significantly.

Climate Change and Resiliency Planning Efforts

State

Key documents that summarize climate impacts in sectors and regions and provide adaptation guidance include the 2014 Safeguarding California report, focused at the state level, and the 2012 Adaptation Planning Guide to support local governments and regional collaboratives. Additionally, Cal-Adapt was designed to be a web-based climate adaptation planning tool for local planning efforts with downscaled climate change scenarios and research for regions within California.

Local and Regional Efforts in Climate Adaptation

In Southern California, there are a number of regional collaboratives, agencies, academic institutions, and local governments engaged in climate change mitigation, adaptation, and research. A subset of the work from these many stakeholder groups is highlighted here.

The Alliance of Regional Collaboratives for Climate Adaptation (ARCCA), a network of regional collaboratives across the state, includes two in Southern California: the Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC) and the San Diego Regional Climate Collaborative.

LARC, with support from the UCLA Institute of the Environment and Sustainability (IoES), fosters a network of local and regional decision-makers in the Los Angeles County region for both climate mitigation and adaptation work across sectors and locally focused research on impacts. Members include groups from academia, cities, Los Angeles County, regional agencies, nonprofits, and businesses. Part of LARC's goals includes serving as a convening body to ensure consistency in performance, collaboration, and coordination of climate actions to maximize limited resources. They also facilitate the exchange of the latest scientific research, best practices for policy development, information systems, and education efforts. One example of this is LARC's ongoing development of the Framework, a resource to support local development of climate actions by providing regional information synthesis across sectors on vulnerabilities, adaptation strategies, and applicable federal, state, and local mandates.

Additionally, the state and regional water boards have been working to coordinate climate action planning. The Los Angeles Regional Water Quality Control Board's document, Los Angeles Region Framework for Climate Change Adaptation and Mitigation, notes that the regional board has been engaging in a dialogue with state and federal colleagues to develop a framework for adaptation within their programs. The framework is a living document meant to be updated and expanded, in addition to serving as the first step in developing a regional climate action plan for the Board.

The Los Angeles County Department of Public Health (DPH) has a focus on inter-departmental collaboration, which has led to the development of a "Five-Point Plan to Reduce the Health Impacts of Climate Change." The Plan includes the following goals to:

- Inform and engage the public.
- Promote local policies that support the design of healthy and sustainable communities.
- Provide guidance on local climate preparedness.
- Build the capacity of departmental staff and programs.
- Adopt best management practices within departments.

An example of the DPH's work includes their Los Angeles Climate & Health Workshop Series to build healthier and more resilient communities. This series was developed in collaboration with LARC and materials are provided as a template for other public health departments to train their staff. For the public, the DPH has developed reports to inform residents about specific, local-level health impacts of climate change and how they can reduce their contributions to climate change. As noted in these reports, addressing climate change requires "the foresight, commitment, and creativity of a host of agencies" working together.

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CHAPTER 6
ENVIRONMENTAL JUSTICE

The Environmental Justice chapter addresses a wide range of topics related to the health and well-being of City residents and workers. The negative effects of environmental degradation and pollution are well-documented and include severe impacts to human health and longevity, depending on the level of exposure. Within the United States, certain communities have historically been disproportionately disadvantaged by environmental threats and the negative health impacts of environmental degradation. These disproportionately disadvantaged communities include, but are not limited to: communities of color, low-income communities, members of tribal nations, and immigrant communities within the country. Increased exposure to environmental pollutants, unsafe drinking water, and contaminated facilities/structures have contributed to poorer health outcomes for these identified communities. Local and regional policies, intersectional structural inequalities, land-use planning, enforcement deficiencies, and lack of community agency are all critical facets of the disproportionate layout of negative environmental externalities. The field of environmental justice is focused on addressing these disproportionate impacts and improving the wellness of all communities by bolstering community agency and promoting the fair treatment of all people regardless of their race, color, national origin, or income.

Environmental justice practices across the United States have worked to improve the status of numerous communities and have lead to landmark policy

This chapter includes the following topics:

decisions, including California Senate Bill 1000 (described in detail in the following section) which requires cities and counties across California to consider Environmental Justice in their General Plans. These policy decisions have effectively restricted new sources of pollution, removed existing harmful sources of pollution, and created safer spaces for all members of the community to engage with. Appropriate and effective urban and regional planning is a critical component of achieving environmental justice goals. Effective planning can ensure that equal protection from environmental hazards is prioritized for all people.

A community's overall health depends on many factors, including the environment in which people live and work. A healthy living environment reduces risks and facilitates healthy lifestyles. Environmental justice looks holistically at a number of these factors in order to determine which areas have ready access to healthy lifestyle choices and which areas are currently being undeserved. Critical determinants of healthy living environments, which will be used to develop a community health baseline, include: public health indicators, active lifestyle opportunities, community design, and healthy lifestyle determinants. Based on available information and reports, this section will explore the relationship between each listed determinant and the promotion of environmental justice for all residents of Lake Forest. The existing conditions for health in the City of Lake Forest are provided in order to understand the context of healthy living environments within the City.

6.1 ENVIRONMENTAL JUSTICE AND SB 1000

Senate Bill 1000, also known as The Planning for Healthy Communities Act, is a comprehensive state legislation that requires California cities to include an Environmental Justice element or a set of environmental justice policies into their General Plans. The Bill was established as a state regulation on September 24, 2016, with the goal of improving the health of California cities and addressing pertinent issues of environmental justice related to community wellness. SB 1000 outlines strategies to promote the protection of sensitive land uses within the state, and simultaneously mandates that cities address the needs of disadvantaged communities. Through this bill, environmental justice is a mandated consideration in all City's local land-use planning. SB 1000 was authored by Senator Connie Leyva and co-sponsored by the California Environmental Justice Alliance (CEJA) and the Center for Community Action and Environmental Justice (CCAEJ).

To effectively meet the mandates of the bill, cities must formally identify disadvantaged communities (DACs) and work to reduce health risks specific to these communities by outlining methods and programs within their plan that address the needs of DACs. Each General Plan must address the following topics in order to meet the requirements of SB 1000:

- Pollution Exposure and Air Quality
- Public Facilities
- Food Access
- Safe and Sanitary Homes
- Physical Activity
- "Civil" or Community Engagement
- Improvement and Programs That Address the Needs of Disadvantaged Communities

What are Disadvantaged Communities?

The term 'Disadvantaged Community' is a broad designation that may include any community that lacks appropriate resources or is confronted with any exceptional economic, health, or environmental burden. In relation to environmental justice, disadvantaged communities are typically those communities that disproportionately face the burdens of environmental hazards. The Planning for Healthy Communities Act establishes a set criterion for identifying a Disadvantaged Community (DAC). The definition of a DAC for the purposes of the bill is as follows:

"An area identified by the California Environmental Protection Agency (CalEPA) pursuant to Section 39711 of the Health and Safety Code or an area that is a low-income area that is disproportionately affected by environmental pollution and other hazards that can lead to negative health effects, exposure, or environmental degradation." (CalEPA)

Localities must make an environmental justice element of their General Plan when one or more disadvantaged communities is identified within their General Plan planning area. Using the CalEPA definition of a disadvantaged community, SB 1000 provides stakeholders with the CalEnviroScreen 3.0 map to identify communities that are disproportionately disadvantaged by environmental hazards. The CalEnviroScreen 3.0 map is a science-based tool developed by the Office of Environmental Health Hazards Assessment on behalf of CalEPA that uses existing environmental, health, and socioeconomic data to rank all census tracts in California with a CalEnivroScreen score. Based on this score, the map identifies where DACs are located within each city.

Disadvantaged Communities in Lake Forest

The City of Lake Forest is committed to prioritizing the health and wellness of all community-members. The City has actively worked to ensure that the community is equitably engaged and that all individuals are afforded a hospitable environment in which to live. Lake Forest has utilized the optimal standard practice of identifying local disadvantaged communities using the CalEnviroScreen 3.0 map tool. The City of Lake Forest does not contain any disadvantaged communities (DAC) as defined by the map tool.

Although the City of Lake Forest does not have any DACs s identified by the CalEnviroScreen methodology, the City values the role of planning for environmental justice and community health and wellness in its General Plan for all community members. The City has used a framework for community planning that considers strategies for promoting environmental justice as it relates to all residents. In this section we have identified and evaluated a number of indicators that deal with these issues so the City can be better prepared to address issues related to environmental justice and community health and wellness through the goals, policies, and actions of its new General Plan.

6.2 HEALTH AND THE BUILT ENVIRONMENT

The field of city planning and the role of city planners grew out of concerns for public health and welfare during the periods of rapid industrialization and urban growth in American cities in the early 20th century. These concerns were related to pollution and unsanitary conditions in cities where industrial operations such as tanneries and slaughter houses abutted homes and schools, and tall skyscrapers blocked light and air from streets. Poor living conditions for city residents often resulted in infectious disease outbreaks and public health emergencies. Early planners worked to organize city infrastructure and rectify issues within the built environment in order to develop a safer city. Early improvements included the development of a sanitary sewer system to prevent cholera epidemics and establishment of zoned city blocks to buffer residential neighborhoods from polluting industries, often resulting in a strict separation of uses that is still common today.

These land use restrictions, infrastructure requirements, and development regulations went far beyond the 19th Century Common Law Theory of Nuisance that addressed public health and safety by prohibiting 'unreasonable' uses of land to prevent similar outbreaks of infectious diseases.

By 1926, the U.S. Supreme Court's decision on Village of Euclid vs. Ambler Realty Co. established the right of local governments to control land use through zoning laws and introduced the concept of 'Euclidean' Zoning that segregated land uses to minimize conflicts. While these laws and trends prevented factories from locating close to neighborhoods and offered centralized wastewater and waste disposal services which decreased instances of disease and epidemics, they also resulted in a shift in the built environment.

Strong zoning regulations that separated industrial and residential uses gave rise to the rapid expansion of suburbs and the "suburban lifestyle" during the 1950s. Increased U.S. investments in the national highway system, and the increased accessibility of the automobile to average American families resulted in people living further and further away from their place of work, schools, shopping centers, and recreational centers. Improvements in the transportation system, including the construction of freeways, further weakened the connection between work, home, retail, and other daily services, isolating them from one another and making them accessible only by car.

While these laws and trends prevented factories from locating close to neighborhoods and offered a means to escape from the polluted city center, they also provided local governments the power to exclude and segregate communities and supported the growth of suburbs. People were protected from infectious diseases such as tuberculosis and cholera, but they now faced new epidemics such as obesity, asthma, heart disease, and diabetes, all related to the design of the built environment.

As primary public health issues related to the built-environment became increasingly resolved through 19th and early 20th century planning practices, the scope of planning became more broad. Public health professionals began to focus on disease treatment, education, and discouraging unhealthy behaviors, while planning professionals shifted their attention to such issues as economic development and transportation. In particular, planners focused on how to accommodate rapid population growth and the desire for unlimited personal mobility through driving. Zoning increasingly became a means to protect property values and bolster the tax base, and infrastructure projects more often served to provide for efficient movement of vehicles.

In recent decades, however, there has been a rediscovery and professional shift in city planning that recognizes the role our built and natural environments play in public health and wellbeing. The environmental movement in the 1970s gave rise to the environmental review process, including the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). Other urban planning concepts such as new urbanism and smart growth are attempting to reverse the impacts of urban development policies of the previous decades. All these efforts attempted to return to the traditional neighborhoods and urban form that valued a mix of uses, pedestrian and transit amenities and compact development.

6.3 CURRENT HEALTH AND WELLNESS TRENDS

The places where people live, work, and play profoundly shape the health of a community. Transportation options, accessible parks, presence of crosswalks, the availability of grocery stores, the prevalence of fast food restaurants, and levels of crime and safety are a few examples of physical indicators that can impact community health. These physical indicators provide a framework for a community, sculpt the daily routines of residents, impact lifestyle choices, and ultimately affect public health and longevity. Collaborative work between city planners and public health professionals can help strategically develop spaces and systems that address these physical indicators to promote safe and healthy human activity.

A growing body of evidence supports the idea that the built environment (urban form, design, and street configurations) has a strong impact on the public's health. Between 1995 and 2010, the number of Americans who were overweight or obese (as measured by body mass index, or BMI) increased from 15.9 percent to 27.6 percent.[1] Additionally, between 2004 and 2010, the percentage of Americans diagnosed with diabetes increased from 7 percent to 8.7 percent.

Based on current obesity trends, for the first time in American history, children are not predicted to live as long as their parents.[2] Increasing rates of these chronic conditions in the US have paralleled higher levels of physical inactivity, auto-dependence, and consumption of foods high in calories and low in nutrients. There is a growing movement to better understand the impacts of our decisions about the way we structure our community. Walkable urban form, more compact development, mix of land uses, transportation choices, and access to recreation spaces all increase physical activity, which can improve health outcomes.[3]

California is among a select few states that have reported modest decreases in childhood obesity rates. Although California is meeting the Healthy People 2020 State targets, a significant percentage (25.4%) of California adults and adolescents (15.8%) are obese, and obesity rates among low-income children 2 to 4 years old (17.2%) and 5 to 19 years old (23.3%) exceed the State targets.[4]

Land use and planning decisions play a role in determining community members' behavioral and lifestyle choices that ultimately impact their physical health and mental wellbeing. The quality, safety, location, and convenience of the pedestrian and bicycle environment, such as; sidewalks, bicycle lanes, signals, and crosswalks, may impact a resident's decision to use these facilities. Therefore, the conditions of the pedestrian and bicycle environment influence physical activity levels. Similarly, the presence of neighborhood parks and open space provide an avenue for increased physical activity. Infrastructure and zoning to support local food processing and distribution enables local food to be used in the community where it was grown. Access to full-service grocery stores and farmers' markets is also correlated with increased consumption of fruits and vegetables. The physical presence and distribution of health care providers and facilities influence how easily people can access health care.

Furthermore, urban design and maintenance can contribute to or decrease levels of crime and perceptions of pedestrian comfort and safety. Poor mental health is associated, in part, with a number of factors related to planning, including; long commute times, exposure to crime, lack of transportation choice, driving related stress, lack of access to public spaces, and lack of opportunities for recreation and physical activity. Emissions from transportation sources are strongly linked with respiratory diseases, and various toxic air contaminants are known or suspected to cause asthma and cancer. Driving carries with it the risk of accidents that are fatal and or cause injuries for drivers, cyclists, or pedestrians. Automobile accidents alone kill roughly 30,000 Americans each year. Additionally, in 2014, 4,884 pedestrians were killed in auto related accidents.5 Crash data trends and analysis for the City is provided in Chapter 4, Mobility of this Background Report.

Addressing public health and wellness in the Lake Forest General Plan Update involves acknowledging the profound effects of the built environment on travel choices, access to food, levels of physical activity, and exposure to risk from accidents or pollution. Each of these has a health impact, and the General Plan provides an opportunity to prevent further disease and injury and sustain healthy lifestyle choices for Lake Forest residents. Though the creation of a healthy General Plan, Lake Forest can focus on opportunities to affect changes in the overall health and wellbeing of the community.

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6.4 COMMUNITY HEALTH INDICATORS IN LAKE FOREST

This section discusses key health indicators as they relate to the City of Lake Forest. For each indicator, the best available information has been included, which means that in some cases the sample years vary by indicator. If new data becomes available during the course of the City's General Plan Update, that updated data will be considered as appropriate.

Leading Causes of Death

The California Department of Public Health provides detailed statistics on deaths throughout California. Table 6-1 shows total deaths by age in the City of Lake Forest for the year 2010.

Table 6-1 Deaths by Age in Lake Forest

Year	Total Deaths	Sex		Age										
		M	F	<1	1-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85+
2010	338	165	173	5	-	1	5	5	6	16	33	46	75	146

Source: California Department of Health, Death Profiles by Zip Code (92630). Data files from 2010. Available at: www.cdph.ca.gov/data/statistics/Pages/DeathProfilesbyZIPCode.aspx. Accessed May 24, 2016. Note: Data is only available by zip code, and zip code 92630 includes the majority of the City.

As shown in Table 6-2, there have been very few deaths in Lake Forest associated with persons under 45 years of age during the sample year shown. In 2010, approximately 40 percent of total deaths in Lake Forest were of persons over 85 years old, and over 65 percent of total deaths in Lake Forest were of persons 75 years and older.

Table 6-2 shows the percentage of deaths by age for Lake Forest and California in 2013, while Table 6-3 shows the causes of death, by percentage, in 2015 for Lake Forest compared to statewide California figures.

Table 6-2 Percentage of Deaths by Age (2013)

Age	Lake Forest	California
<1	0.27%	0.95%
1-4	-	0.15%
5-14	0.27%	0.23%
15-24	1.08%	1.20%
25-34	0.27%	1.75%
35-44	2.71%	2.72%
45-54	5.69%	6.77%
55-64	10.84%	12.79%
65-74	20.59%	16.26%
75-84	24.93%	23.32%
85+	33.33%	33.86%

Source: California Department of Health, Death Profiles by Zip Code (92630). Data files from 2013. Data originally downloaded at: www.cdph.ca.gov/data/statistics/Pages/DeathProfilesbyZIPCode.aspx on May 2016. Accessed Feb 1, 2018.

As shown in Table 6-2, the percentages of deaths by age in Lake Forest are generally similar to statewide statistics in California.

Table 6-3 shows the causes of death by percentage in the City of Lake Forest, and the entire State of California in 2012, as reported by the California Department of Health.

Table 6-3 Causes of Death by Percentage (2015)

Cause	Lake Forest	California
Heart Disease	23.0%	23.6%
Cancer	22.8%	23.1%
Stroke	6.1%	5.8%
Lower Respiratory Disease	4.8%	5.3%
Alzheimer's	7.1%	5.8%
Injury (Unintentional)	4.0%	4.8%
Diabetes	3.2%	3.4%
Pneumonia or Influenza	2.9%	2.4%
Liver Disease or Cirrhosis	1.9%	2.1%
Hypertension and Renal Disease	1.6%	2.0%
Suicide	1.9%	1.6%
Kidney Disease, Nephritis, and Nephrosis	2.4%	1.3%
Other/Unknown	18.5%	18.8%

Source: California Department of Health and human services, Leading Causes of Death by Zip Code (92630). Data files from 2015. Available at: https://data.chhs.ca.gov/dataset/leading-causes-of-death-by-zip-code-1999-current. *Accessed March 30, 2018.*

Table 6-3 shows that the leading cause of death in Lake Forest in 2015 was heart disease, which was also the leading cause of death Statewide. The second leading cause of death in Lake Forest in 2015 was cancer, which accounted for approximately 23 percent of all deaths. Generally, Lake Forest death rates are similar to statewide averages with only small variations.

Obesity and Overweight Trends

Evidence demonstrates that remaining within a healthy weight range and avoiding obesity can decrease the risk of cancer, heart disease, stroke, Alzheimer's, and diabetes. Lifestyle choices and behavioral changes; such as increased physical activity[6] and reduced consumption of foods high in calories, sugar and fat[7], are all components of remaining in a healthy weight range and reducing these disease risks.[6] As shown above, heart disease and cancer are the two most prevalent causes of death in Lake Forest, and Alzheimer's related deaths within the City also exceed the statewide averages.

The California Health Interview Survey (CHIS) is the nation's largest state health survey. Using a random-dial telephone survey conducted every two years on a wide range of health topics, CHIS data gives a detailed picture of the health and health care needs of California's large and diverse population. Data regarding obesity is available from CHIS for the City of Lake Forest and the entire State. While data specific to the City of Lake Forest is not available, the Santa Clara County data provides the City with useful insight into obesity and overweight status for adults and teens living throughout the County, including the City of Lake Forest. Adult obesity trends are shown in Table 6-4 and child and teen obesity trends are shown in Table 6-5.

6 Morland, K., Roux, A., & Wing, S. (2006). "Supermarkets, Other Food Stores, and Obesity: The Atherosclerosis Risk in Communities Study". American Journal of Preventive Medicine 30(4):333-339.

Table 6-4 Obesity Trends- Adults (18+)

Region	Obese (BMI 30.0 or higher)	
	2012	2014
Lake Forest	22.8%	17.7%
Region[1]	20.4%*	16.2%
Orange County	22.9%	18.4%
California	24.8%	25.8%

Source: California Health Interview Survey. CHIS 2012, and 2014 Adult Source File. Los Angeles, CA: UCLA Center for Health Policy Research. Available at: www.chis.ucla.edu/ Accessed April 2, 2018. *indicates statistically unstable values due to sample size. 1For the purposes of this report this 'Region' refers to the following cities: Irvine, Laguna Hills, Laguna Niguel, Aliso Viejo, Mission Viejo, Rancho Santa Margarita, Costa Mesa, Tustin, and San Juan Capistrano.

As shown in table 6-4 above, obesity status in adults (a body mass index (BMI) of 30.0 or higher) are comparable in Lake Forest to the county and regional rates, but lower than the state average.

Table 6-5 Obesity and Overweight Trends- Children & Teens (Age 12-17)

Region	Children- Overweight for Age (Age 2-11) Weight ≥ 95th percentile)		Overweight Teens (Age 12-17) BMI ≥ 85th percentile)	
	2012	2014	2012	2014
Lake Forest	11.3%	10.9%	24.4%	19.2%
Region[1]	10.5%	9.9%*	22.7%*	18.0%
Orange County	12.9%	12.3%	27.3%	20.9%
California	13.6%	13.3%	32.4%	33.1%

*Source: California Health Interview Survey. CHIS 2012, and 2014. Teen Source File. Los Angeles, CA: UCLA Center for Health Policy Research. Available at: www.chis.ucla.edu/ Accessed February 15, 2018. *indicates statistically unstable values due to sample size. 1For the purposes of this report this 'Region' refers to the following cities: Irvine, Laguna Hills, Laguna Niguel, Aliso Viejo, Mission Viejo, Rancho Santa Margarita, Costa Mesa, Tustin, and San Juan Capistrano.*

As shown in Table 6-5 above, overweight status for children and teens is higher in Lake Forest than the region, although it is lower than the county or state average.

Physical Activity and Fitness

Lack of physical activity is a major risk factor for many chronic diseases and leading causes of death, including: cancer, heart disease, diabetes, stroke, and Alzheimer's. The California Health Interview Survey includes data regarding activity levels for children and teens in Orange County. As shown in Table 6-6 below, in 2014 roughly 18% of Lake Forest children ages 5-17 identified being physically active for at least one hour a week, which is less than the Statewide average for children. Although activity among children is around the same as the state average, the physical activity for adults in Lake Forest is below county and state averages.

Table 6-6 Children and Teens (5-17) who engaged in at least 60 minutes of physical activity in the past week

Year	Lake Forest	Region[1]	Orange County	California
2012	17.3%	17.6%	17.1%	20.8%
2014	18.0%	18.5%*	16.9%	20.7%

Table 6-7 Adults (18+) who walked for at least 150 minutes in the past week

Year	Lake Forest	Region [1]	Orange County	California
2012	33.8%	34.7%*	34.1%	33.3%
2014	30.4%	31.2%	31.3%	33.0%

*Source: California Health Interview Survey. CHIS 2012, and 2014 Physical Activity Source File. Los Angeles, CA: UCLA Center for Health Policy Research. Available at: www.chis.ucla.edu/ Accessed April 2, 2018. *indicates statistically unstable values due to sample size. 1For the purposes of this report this 'Region' refers to the following cities: Irvine, Laguna Hills, Laguna Niguel, Aliso Viejo, Mission Viejo, Rancho Santa Margarita, Costa Mesa, Tustin, and San Juan Capistrano.*

In addition to CHIS data, another indicator of physical activity and fitness for children and teens is the California Department of Education's Physical Fitness Testing (PFT) Program. The PFTis administered by local school districts to all fifth, seventh, and ninth graders annually.[7] The test assesses six major fitness areas, including aerobic capacity (cardiovascular endurance), body composition (percentage of body fat), abdominal strength and endurance, trunk strength and flexibility, upper body strength and endurance, and overall flexibility. The PFT Program provides a statewide snapshot of physical fitness. However, data from the PFT is collected at the local school district level by people who are not certified health professionals, and tests for each of the fitness areas are difficult to administer consistently. Consequently, its results are prone to some margin of error over time and from place to place.

PFT results from Saddleback Valley Unified School District, and statewide results for the 2016-17 academic year are shown in Table 6-7.

7 *California Department of Education. Physical Fitness Testing Results, Accessed on April 2, 2018. Accessible at: http://www.cde.ca.gov*

Table 6-8 Student Physical Fitness Testing (PFT) Results (2016-2017)

# of Physical Areas Meeting the HFZ	Needs Improvement (%)					
	Aerobic Capacity	Body Comp.	Abdominal Strength	Trunk Extension Strength	Upper Body Strength	Flexibility
5th Grade Saddleback Valley Unified	24.2%	15.6%	30.9%	5.7%	23.5%	12.2%
7th Grade Saddleback Valley Unified	13.6%	16.1%	13.8%	6.7%	21.1%	15.6%
9th Grade Saddleback Valley Unified	12.6%	15.1%	7.1%	5.1%	9.5%	5.6%
5th Grade California	31.3%	19.2%	29.1%	15.5%	36.4%	28.1%
7th Grade California	25.3%	19.1%	20.4%	12.7%	33.4%	20.2%
9th Grade California	24.5%	19.2%	17.4%	10.3%	29.1%	15.8%
Needs Improvement (%) By School						
Foothill Ranch Elementary (5th Grade)	9.8%	19.0%	35.6%	1.8%	22.1%	12.9%
La Madera Elementary (5th Grade)	14.2%	13.2%	21.7%	0%	0.9%	5.7%
Lake Forest Elementary (5th Grade)	23.6%	12.2%	39.0%	8.9%	28.5%	13.0%
Olivewood Elementary (5th Grade)	61.2%	23.9%	50.7%	3.0%	11.9%	17.9%
Ralph A. Gates Elementary (5th Grade)	27.3%	21.0%	24.5%	2.8%	21.7%	9.1%
Rancho Canada Elementary (5th Grade)	30.3%	17.1%	25.0%	2.6%	32.9%	30.3%
Santiago Elementary (5th Grade)	30.6%	12.9%	38.7%	12.9%	32.3%	25.8%
Serrano Intermediate School (7th Grade)	18.0%	18.5%	15.5%	12.0%	27.1%	15.0%
El Toro High School (9th Grade)	14.3%	15.8%	7.1%	7.5%	9.7%	6.0%

Source: California Department of Education, Physical Fitness Testing Results (2014-2015). Available at: https://www.cde.ca.gov/ta/tg/pf/ *Accessed February 20, 2018.*

As shown in Table 6-7 above, 5th graders at the Saddleback Valley Unified School District struggle with abdominal strength compared to 5th graders statewide. Otherwise, the Saddleback Valley Unified School District has a lower percentage of students that need improvement in the 6 various categories of the physical fitness exam.

Asthma and Heart Disease

Local air quality conditions can be a strong indicator of asthma rates within a community. Table 6-8 includes data from CHIS for asthma rates for Lake Forest. The local region, Orange County and California were included in this table to provide additional comparisons between local asthma rates, asthma rates in neighboring cities, and regional rates. Detailed data on local air quality conditions is contained in Chapter 5 (Greenhouse Gases and Climate Change) of this report.

Table 6-9 Asthma Rates (2014)

Region	Ever Diagnosed with Asthma (Age 1-17)	Ever Diagnosed with Asthma (Age 18+)
Lake Forest	11.0%	14.4%
Region [1]	10.8%	14.7%*
Orange County	10.6%	14.3%
California	14.6%	13.9%

*Source: California Health Interview Survey. CHIS 2014 Asthma Source File. Los Angeles, CA: UCLA Center for Health Policy Research. Available at: www.chis.ucla.edu/ Accessed April 4, 2018. *indicates statistically unstable values due to sample size. 1For the purposes of this report this 'Region' refers to the following cities: Irvine, Laguna Hills, Laguna Niguel, Aliso Viejo, Mission Viejo, Rancho Santa Margarita, Costa Mesa, Tustin, and San Juan Capistrano.*

As shown in Table 6-8 above, 11 percent of Lake Forest children and 14 percent of Lake Forest adults have been diagnosed with asthma at some point in their lives. The percentage of people diagnosed with asthma in Lake Forest is similar to the rates in both the region and Orange County.

Alcohol, Drug and Tobacco Use

In 2014, approximately 11 percent of adults in Lake Forest reported to the CHIS that they were currently tobacco smokers. This percentage closely mirrors the statewide average smoking rate of 12 percent.

According to the Centers for Disease Control and Prevention (CDC), e-cigarette use among both high school and middle school students tripled in one year. Among high school students, e-cigarette use increased from 4.5 percent in 2013 to 13.4 percent in 2014. Similarly, use among middle school students increased from 1.1 percent in 2013 to 3.9 percent in 2014 Youth use of e-cigarettes has now surpassed youth cigarette smoking. [8]

The American Medical Association (AMA) reports that approximately 11 million American youth under the age of 21 drink alcohol. Nearly half of them drink to excess, consuming five or more drinks in a row, one or more times in a two-week period. Alcohol is the most frequently used drug by high school seniors, and its use is increasing. Boys usually try alcohol for the first time at just 11 years old, while the average age for American girls' first drink is 13. The AMA reports the following facts for teen-related drinking[9]:

- Underage drinking is a factor in nearly half of all teen automobile crashes, the leading cause of death among teenagers.
- Alcohol use contributes to youth suicides, homicides and fatal injuries – the leading cause of death among youth after auto crashes.
- Alcohol abuse is linked to as many as two-thirds of all sexual assaults and date rapes of teens and college students.
- Alcohol is a major factor in unprotected sex among youth, increasing their risk of contracting HIV or other transmitted diseases.

Research indicates that the density of alcohol outlets may be correlated to the level of crime, domestic violence, and sexual assault in a community. Areas with a higher density of alcohol outlets also tend to have higher rates of vehicular accidents and fatalities, underage drinking, and adult alcohol and drug use.[10] In Lake Forest, there is one retail license for alcohol sales per 425 persons. This is a density roughly the same as Irvine, greater than the neighboring cities of Aliso Viejo, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, and lower than Costa Mesa, Laguna Hills, San Juan Capistrano, and Tustin. Table 6-9 summarizes retail liquor licenses per capita in Lake Forest, and its neighbors in Orange County.

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8 Centers for Disease Control and Prevention. Tobacco Use Among Middle and High School Students - United States, 2011–2014. Morbidity and Mortality Weekly Report April 17, 2015; 64(14):381-5

9 American Medical Association, Facts About Youth and Alcohol (Published 2011). Available at: http://www.ama-assn.org/ama/pub/physician-resources/public-health/promoting-healthy-lifestyles/alcohol-other-drug-abuse/facts-about-youth-alcohol.page*. Accessed July 7, 2016.*

10 Community Health Needs Assessment 2011-2014. Babs Kavanaugh, BK Consulting Services. No date.

Table 6-10 Retail Liquor Licenses per Capita (2018)

City	Active Retail Licenses	Density per Capita
Lake Forest	196	1/425
Aliso Viejo	69	1/745
Costa Mesa	518	1/218
Irvine	576	1/462
Laguna Hills	80	1/394
Laguna Niguel	107	1/611
Mission Viejo	146	1/660
Rancho Santa Margarita	73	1/671
San Juan Capistrano	116	1/313
Tustin	221	1/364

Source: Department of Alcoholic Beverage Control, Alcoholic Beverage Licenses, Active liquor licenses, April, 2018. Available at: http://www.abc.ca.gov *accessed April 2018. *Population data from the 2016 Census,* https://www.census.gov/quickfacts/fact/table.

6.5 OPPORTUNITIES FOR PHYSICAL ACTIVITY

This section focuses on levels of neighborhood walkability and existing commercial services (and other destinations) that enable or encourage physical activity. Other chapters of this General Plan Existing Conditions Report address topics that also impact physical activity and health – these include Community Services and Facilities (Chapter 7), Conservation (Chpater 9), and Mobility (Chapter 4).

Neighborhood Walkability

One factor that determines individual physical activity levels is the distance between the home and other neighborhood amenities, including shopping centers, parks, transit, and places of work. If this distance is perceived as "walkable" (safe, pleasant, and distance-appropriate), residents may be more likely and willing to walk to those amenities. A distance of 1/4 mile is a commonly cited threshold for how far most people are willing to walk for neighborhood services. For comparison, many people are willing to walk up to ½ mile for work or access to regional transit. Many factors contribute to a neighborhood's real or perceived walkability. Land uses, pedestrian facilities such as lighting and benches, commercial services, urban design, and residents' perceptions of safety, distance, and relative need for goods and services are some indicators that may promote or impede the decision to walk, rather than drive. Residents of higher-density, mixed-use areas make fewer vehicle trips and drive fewer miles than residents of lower-density, more single-use areas.[11]

Within Lake Forest, different areas of the City have different levels of walkability. One way of measuring walkability is with Walkscore™, which is based on access and proximity to various destinations and amenities from a selected location within a community.[12] Walkscore™ provides numerical rankings of an area's walkability on a scale of 0-100. A description of the numerical ranking system is provided below.

90-100: Daily errands do not require a car.

70-89: Most errands can be accomplished on foot.

50-69: Some amenities within walking distance.

25-49: A few amenities within walking distance.

0-24: Almost all errands require a car.

11 *Crane, R. (2000). The Influence of Urban Form on Travel: An Interpretive Review. Journal of Planning Literature; 15(1), 3-23.*

12 *Walkscore assessments and methodology are available at www.walkscore.com. Accessed May 9, 2016*

Table 6-11 shows the Walkscore™ calculated for various areas within Lake Forest. A map of these locations is shown on Figure 6-1, Lake Forest Walkscores™.

As described above, a Walkscore™ above 70 indicates that most daily errands can be accomplished on foot, while a Walkscore™ below 50 indicates that few amenities are within walking distance. The overall Walkscore™ for the City of Lake Forest is 39, which indicates that Lake Forest is a predominantly car-dependent place to live. Individual areas of Lake Forest are listed below.

Table 6-11 Walkability Scores in Lake Forest

(Map Code)-City Points of Interest	Street Address	Walk Score
(1)- City Hall	25550 Commercentre Drive	30
(2)- El Toro High School	25255 Toledo Way	55
(3)- Heritage Hill Historical Park	25151 Serrano Road	61
(4)- Rancho Serrano Park	20842 Paseo Sombra	31
(5)- Pebble Creek Park	26441 Pebble Creek Road	30
City Areas intersections	Intersection	Walk Score
(6)-Central City	Lake Forest Drive / Pittsford Drive	24
(7)-Northwest City	Alton Parkway / Portola Parkway	39
(8)-Southwest City	Muirlands / Lake Forest Drive	71
(9)-Southeast City	Los Alisos Boulevard	50
(10)-Northeast City	Saddleback Ranch Road	8
(11)- Northern City	20028 Lake Forest Drive	38

Source: www.walkscore.com. Accessed April 10, 2018.

The results in Table 6-11 show that neighborhoods that are located near major commercial centers score higher on the walkability scale than most of the other residential neighborhoods. However, most of Lake Forest has a relatively low Walkscore™ which means that only a few amenities are within walking distance.

These findings complement empirical evidence: in a comprehensive study of transportation, land use, air quality, and health, researchers found that when many destinations are near the home and there is a direct path to get there, people are more likely to engage in active transportation for at least 30 minutes on any given day.[13] These results highlight the importance of urban form and of a comfortable, safe, and inviting pedestrian environment. They suggest that a mix of land uses and development densities, a connected and well-maintained pedestrian network, and traffic calming measures can increase physical activity and health.

13 Frank, L. D., Schmid, T. L., Sallis, J. F., Chapman, J., and Saelens, B. E. (2005). "Linking Objectively Measured Physical Activity with Objectively Measured Urban Form: Findings from SMARTRAQ". American Journal of Preventive Medicine, 28 (2, Supplement 2), 117-125.

Activity-related Commercial Services

Another proxy measure for physical activity is the availability of activity-related commercial services.[14] Currently, there are many private health clubs, gyms, or personal training facilities within the City of Lake Forest. The facilities location, and Walkscore™ are listed in Table 6-12 below and shown on Figure 6-1. Locations in major commercial centers offer easy accessibility, and a high Walkscore™ (many over 60).

Table 6-12 Activity-Related Commercial Services

(Map Code) Name	Address	Walk Score
(1) LA Fitness	29400 Portola Pkwy	29
(2) Crunch- Lake Forest	23633 El Toro Rd	85
(3) OrangeTheory Fitness	27482 Portola Pkwy	32
(4) UFC Gym Lake Forest	24320 Swartz Dr	84
(5) The 1-2 Punch: Family Martial Arts & Fitness Center	22421 El Toro Rd # L	67
(6) Lake Forest Golf and Practice Center	23308 Cherry Ave	42
(7) Top Notch Fitness	23788 Mercury Rd, #2810	52
(8) Hardcore Fitness Studio	23600 Rockfield Blvd #2A	61
(9) BodyForge Fitness	22821 Lake Forest Dr #113	74
(10) Elite Generation Training	22762 Aspan St, STE 207	68
(11) Level Method Gym	22661 Lambert St Suite 206	69
(12) Corenetic Gym	22600 C Lambert Street # 909	62
(13) Undisputed Performance	22600 G Lambert Street #1403	62
(14) TOCA Academy - Soccer Training & Futsal Center	22600-F Lambert St #1205	62
(15) Trim Fitness Studio	22421 El Toro Rd	67
(16) Driven Fitness	24752 Toledo Way	29
(17) CrossFit Forest	26981 Vista Terrace F	34
(18) Wildfire Gymnastics	25 Spectrum Pointe Dr # 405	43
(19) 24 Hour Fitness	26781 Rancho Pkwy	42
(20) Aesthetic Climbing Gym	26794 Vista Terrace	35

Sources: http://www.google.com/, www.walkscore.com, Accessed April 10, 2018.

Research suggests that formal spaces for physical activity, such as gyms and health clubs, may not be enough to increase overall individual physical activity levels, even if it's easily accessible.[15] This demonstrates the importance of providing an environment where residents can easily incorporate physical activity into their everyday routines. This can be accomplished through improvements to the physical environment such as: the addition of bicycle lanes, sharrows, and convenient bicycle parking near shops and restaurants, or improving the pedestrian realm with wider sidewalks and count-down signals.

14 *Assessed using http://www.google.com. Accessed April 10, 2018.*

15 *Giles-Corti, B., & Donovan, R. J. (2002). "The Relative Influence of Individual, Social and Physical Environment Determinants of Physical Activity". Social Science & Medicine, 54(12): 1793-1812.*

6.6 FOOD ACCESS

Residents of neighborhoods with higher concentrations of "unhealthy" food outlets – such as fast food and liquor stores,have more health problems and higher mortality rates than residents of neighborhoods with more full-service grocery stores and other vendors selling fruits and vegetables, even when other factors are held constant.[16] The presence of a grocery store in a neighborhood is linked to higher fruit and vegetable consumption and reduced prevalence of overweight and obesity.[17] Fresh, minimally processed, local food is generally the most nutritionally valuable and the least detrimental to the environment. Access to affordable specialty grocery stores and farmers markets increases the likelihood that people will eat healthy, locally sourced food.

The concentration of food outlets is important, but it is more significant to concentrate on the impacts of the system as a whole. In response to the environmental and health implications of food systems, the popularity of local food is on the rise. The proliferation of the term "food miles" to measure the impact of the food system on the environment reinforces the logic of local production. Locally sourced food can address the negative externalities associated with packaging, preparing, and shipping food. These negative externalities are higher for fresh food that is grown at long distances; because many foods do not travel a single or logical route, but take many steps along the supply chain from "field to plate".

Retail Food Environment

Lake Forest's retail food environment includes non-restaurant shopping options that are located within the City. Table 6-13 provides examples of retail food options within the City limits.

Table 6-13 Retail Food Environment Summary

Retail Food Type	Examples	Quantity
Non-restaurant Food Vendors		
Grocery Stores	Sprouts, Ralph's Walmart, etc.	7
Small and/or Specialty Markets	Delis, etc.	5
Convenience Stores	7 Eleven, Circle K etc.	16
Liquor Stores	Lake Forest Liquor, etc.	7

Sources: google.com, Accessed April 10, 2018. Note: Table 6-13 does not provide an exhaustive list of all food retailers.

As shown in Table 6-13, there are many food options within the City which provide residents with a full range of grocery options and also provide a wide variety of healthy, and organic grocery options.

With respect to restaurants, there are a mix of dining options in Lake Forest including major chain restaurants, and locally owned, non-chain restaurants. Many of the City's restaurants are located along the main thoroughfares such as Lake Forest Drive, El Toro Road, and Trabuco Road. Lake Forest offers a wide array of dining options covering a broad range of food types (Mexican, Greek, Italian etc.). The City of Lake Forest has taken an active role in promoting Lake Forest businesses; including the development of a City app called "Shop and Dine Lake Forest", which provides daily updates and useful information from the Lake Forest community.

Eating Habits

A person's overall health and wellbeing is strongly correlated to food choices. Fast foods tend to be high in saturated fats, high in simple sugars, and low in fiber and nutritional value. Recent studies suggest that junk food consumption alters brain activity in a manner similar to addictive drugs.[18] After many weeks on a junk food diet, the pleasure centers of rat brains became desensitized, requiring more food for pleasure. After the junk food was taken away and replaced with a healthy diet, the rats starved for two weeks instead of eating nutritious fare. This study underlines the potentially negative impacts of fast food consumption on brain chemistry and behavior.

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16 Mari Gallagher Research and Consulting Group. (July 2006). "Examining the impact of food deserts on public health in Chicago". Accessed July 8, 2014. Available at: http://www.marigallagher.com/site_media/dynamic/project_files/Chicago_Food_Desert_Report.pdf.

17 S. Inagami et al. (2006). "You Are Where You Shop: Grocery Store Locations, Weight, and Neighborhoods". American Journal of Preventive Medicine; 31(1): 10-17.; K. Morland et al. (2006). "Supermarkets, Other Food Stores, and Obesity: The Atherosclerosis Risk in Communities Study". American Journal of Preventive Medicine; 30(4): 333-339.

18 Johnson, Paul M.; Kenny, Paul J. (2010). "Dopamine D2 receptors in addiction-like reward dysfunction and compulsive eating in obese rats". Nature Neuroscience 13 (5): 635.

More than 80 percent of people with Type 2 diabetes, the most common form of the disease, are obese or overweight. Data from the Centers for Disease Control and Prevention (CDC) National Health and Nutrition Examination Survey III shows that two-thirds of adult men and women in the U.S. diagnosed with Type 2 diabetes have a body mass index (BMI) of 27 or greater, which is classified as overweight and unhealthy.

According to the California Center for Public Health Advocacy, scientific evidence also suggests that sugar-sweetened beverages and sodas are contributing to the obesity epidemic. One 20 ounce bottle of soda has almost 17 teaspoons of sugar and contains 250 calories. Drinking a sugar-sweetened soda daily can increase a child's risk for obesity by 60 percent.[19]

Table 6-14 below, shows the percentage of adults (18+) that drink at least one sugary drink (soda or sweet beverages) a day. Lake Forest residents were compared to residents throughout California (from the time the 2014 CHIS survey was conducted). According to CHIS data from 2014, approximately 12 percent of Lake Forest residents drink one or more 12oz sodas daily.

Table 6-14 Percentage of Adults that Consume 1+ Sugary Drinks a Day (2014)

Location	Percentage of Adults 18+
Lake Forest	11.9%
Region[1]	11.2%*
Orange County	13.1%
California	17.4%

*Source: California Health Interview Survey. CHIS 2014 Sugar Drinks Source File. Los Angeles, CA: UCLA Center for Health Policy Research. Available at: www.chis.ucla.edu/ Accessed April 10, 2018. *indicates statistically unstable values due to sample size. 1For the purposes of this report this 'Region' refers to the following cities: Irvine, Laguna Hills, Laguna Niguel, Aliso Viejo, Mission Viejo, Rancho Santa Margarita, Costa Mesa, Tustin, and San Juan Capistrano.*

6.7 ACCESS TO HEALTH CARE AND HEALTH FACILITIES

Access to health care and mental health services is an important determinant of health and disease prevention, and increased access is very likely to improve public health. Preventive measures, such as screening for common health problems like diabetes and respiratory illnesses, dental care, and vaccinations have been shown to reduce the incidence and severity of illnesses,[20] and are often less expensive than care once someone has become sick.

Lake Forest has a number of health care providers. The Camino Health Center is affiliated with Mission Hospital, St. Joseph Health Group and is located at 22481 Aspan St., Suite A, Lake Forest. Services offered at the clinic include:

- Acute and chronic care
- Cancer screenings
- Comprehensive prenatal services
- General medicine and primary care
- General health screenings for adults and children
- Health education
- Immunizations for adults and children
- Laboratory and pharmacy services on-site

19 *California Center for Public Health Advocacy, Resources: Soda Consumption. Accessed on July 7, 2014. Accessible at* http://www.publichealthadvocacy.org/resources_soda.html.

20 *U.S. Department of Health and Human Services Agency for Healthcare Research and Quality, National Healthcare Disparities Report, pg. 112, Rockville, Maryland. July 2003.*

Lake Forest is also home to the U.S. HealthWorks Urgent Care run by U.S. HealthWorks Medical Group. It is located at 22741 Lambert Street, Suite 1608, Lake Forest. Services offered at the clinic include:

- Occupational Medicine
- Urgent Care
- Therapy Services
- Specialty Care
- Acupuncture

The two urgent care centers in northern Lake Forest include: The OC Urgent Care Center is located at 26781 Portola Pkwy #4E, Lake Forest, and The Clineva Urgent Care center 29100 Portola Parkway.

The nearest hospital is the Saddleback Memorial Med Center located at 24451 Health Center Drive, Laguna Hills.

According to 2014 CHIS data, 24.8 percent of Lake Forest adults and 7.0 percent of Lake Forest children experienced delayed prescriptions of delayed medical services. As of 2014, 84.1 percent of Lake Forest adults reported having some type of health insurance. Additionally, it should be noted that the most current data does not take into account the full effects of the Affordable Care Act and current rates of insured individuals in Lake Forest.

6.8 MENTAL HEALTH AND SOCIAL CAPITAL

Poor social networks and weak mental health is associated with a number of factors related to city planning. These factors that may impact social ties and mental health include long commute times, exposure to crime, lack of transportation choice, and lack of access to public spaces. Increased social capital — often characterized by levels of neighborhood trust and community participation — within a neighborhood is associated with many health benefits, such as increased physical activity.

Based on 2014 CHIS results, over 92.4 percent of Lake Forest adults reported having no significant psychological distress during the past year, which is slightly higher than the statewide rate of 91.9 percent. Additionally, approximately 16.8 percent of adult residents reported needing help for emotional, mental and/or alcohol or drug related issues in the past year (from the time the 2014 survey was conducted), which is close to the Statewide rate of 16.3 percent.

The City of Lake Forest offers numerous programs to foster community activities and volunteering opportunities. The Lake Forest Parks and Recreation Department hosts many popular festivities year-round, and hosts special programs for youth, teens, families, and seniors.

6.9 LOCAL POLICIES PROGRAMS AND AMENITIES RELATED TO ENVIRONMENTAL JUSTICE

Lake Forest has taken many steps to ensure the health and wellness of the community. This section describes some of the steps the City has taken that aid in the development of a healthy community.

Parks, Open Space and Street Trees

One of the elements of a sustainable and healthy city is adequate urban parks, open space, and street trees, which contribute to a local healthy environment.

Lake Forest is known for its Eucalyptus groves and tree cover. Trees provide the community with many benefits including: improved air quality, increased shade, assistance in calming traffic, and reduced urban heat island effects. The City of Lake Forest strongly supports the preservation of street trees. Trees beautify and enhance Lake Forest neighborhoods, help to conserve energy, clean the air, and provide a home for wildlife.

Since incorporation 1991, the City Council has supported a landscape improvement program called Expand the Forest. This program encourages citizen participation in tree planting and provides an opportunity for urban forest enhancement while minimizing the financial responsibility of the City.

Lake Forest has a variety of parkland and open space amenities. The Lake Forest Parks and Recreation Department is in charge of the maintenance of 32 city parks, including a variety of active and passive recreation amenities including walking trails, outdoor exercise equipment, picnic areas, sports fields and courts, and playgrounds. Additionally, Lake Forest is currently in the process of constructing a new Civic Center, which will increase the range of programs and activities offered to the community. The new Civic Center will include amenities such as a Senior Center, Community and Conference Center, Council Chambers/Performing Arts Hall, Administrative Buildings, Community Policing Center, Emergency Operations Center, connections to Serrano Creek Trail, and an outdoor Civic Plaza. For additional information on parks, recreation facilities, and open space see Chapter 7 (Community Services) and Chapter 9 (Conservation).

Lake Forest General Plan

A variety of policies contained in the existing Lake Forest General Plan support community health including: policies aimed at improving the transportation network to accommodate bicycle and pedestrian travel, supplying the City residents with high quality parks, recreation opportunities, community services and facilities, and promoting air and water quality throughout the planning area.

Lake Forest Municipal Code

A variety of Ordinances contained in the Lake Forest Municipal Code support community health. For example, Chapter 9.08 of the Lake Forest Municipal Code restricts where people can drink alcohol. This policy recognizes the health and safety implications of public alcohol consumption and seeks to limit the drinking of alcohol in public throughout the City.

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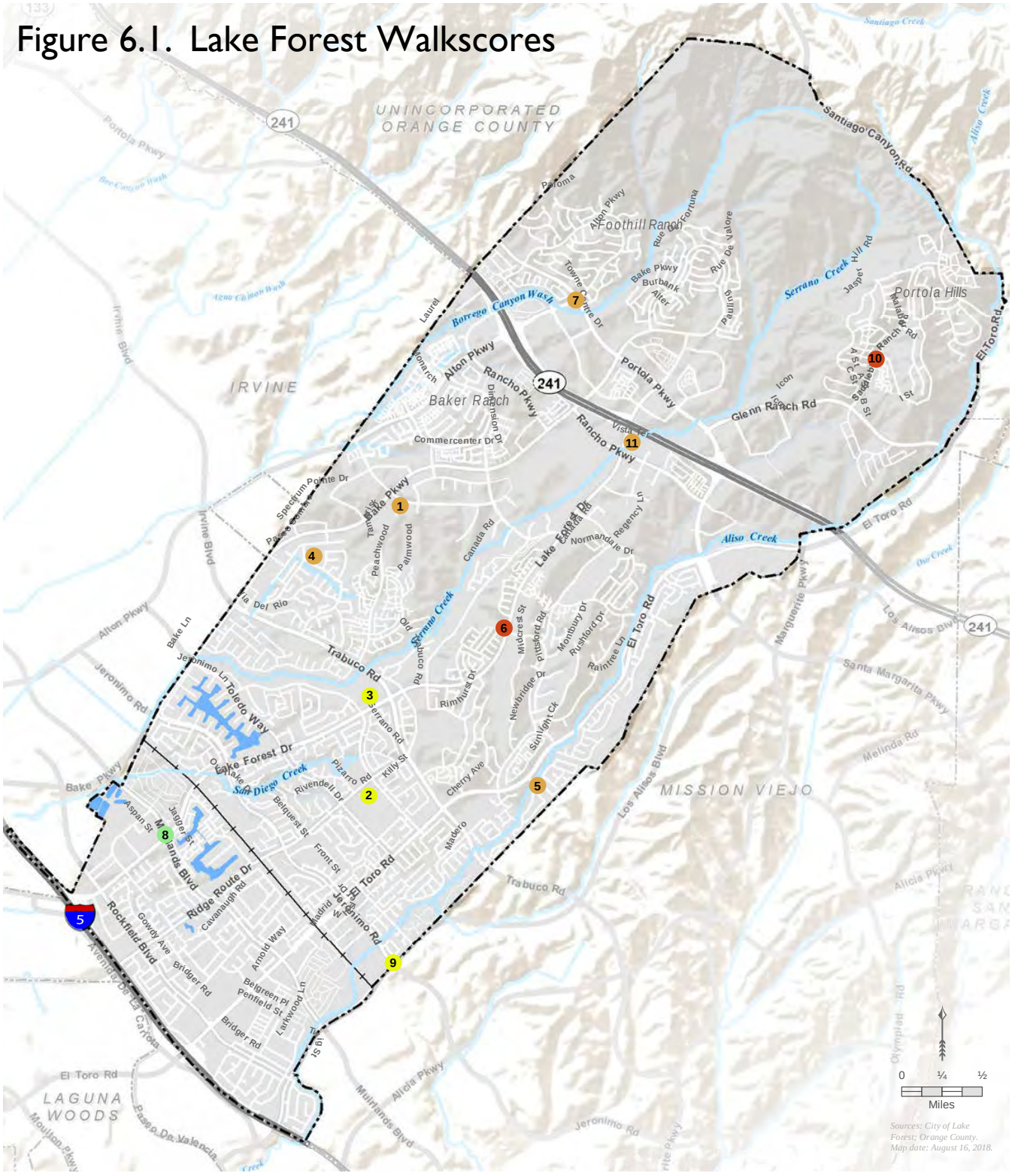
Figure 6.1. Lake Forest Walkscores



Legend

- City of Lake Forest
- Other City Boundaries

- Daily errands do not require a car
- Most errands can be accomplished on foot
- Some errands can be accomplished on foot
- Most errands require a car
- Almost all errands require a car

Our Vision. Our Plan. Lake Forest 2040

De Novo Planning Group
A Land Use Planning, Design, and Environmental Firm

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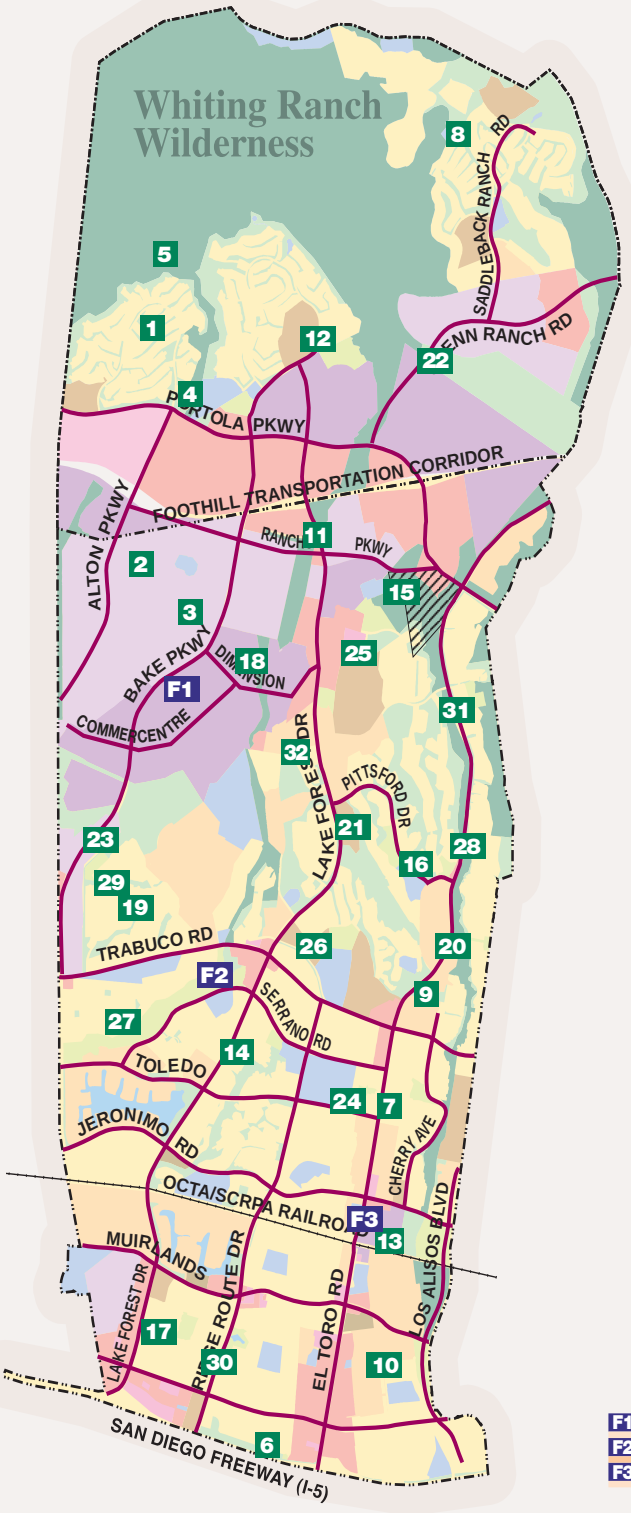
City Of Lake Forest Park Guide

Parks Make Life Better!



CITY PARKS

		Acres	Barbecues	Baseball	Basketball	Multi-Use Fields	Outdoor Exercise Equipment	Picnic	Playground	Restrooms	Soccer	Tennis Court	Walking Path
1	Alton Park 18992 Alton Parkway	2.3	4		1 hc			9 1 s	1				
2	Baker Ranch Community Park 26380 Rancho Parkway	8	2	1	1	1		2	1	1	1		
3	Barker Ranch Dog Park 26500 Baffin Bay Drive	0.5											
4	Borrego Park 26982 Cabriole	11	5		1 fc			11	1	1	1		1
5	Borrego Overlook Park 21 Viaggio Lane	1.6	3					5	1				
6	Cavanaugh Mini Park 23782 Cavanaugh Road	0.2			1 hc			1	1				
7	Cherry Park 22651 Cherry Avenue	4.5	3		1 hc			9 1 s	1				
8	Concourse Park 18931 Saddleback Ranch Road	7	2		1 hc		1	4 2 s	2	1			1
9	Darrin Park 22461 Cherry Avenue	3.1	6		1 hc			11 1 s	1				
10	El Toro Park 23701 Los Alisos Boulevard	10	2				1	7 1 s	1	1		2 L	
11	Etnies Skatepark of Lake Forest 20028 Lake Forest Drive	5.3						3		1			
12	Foothill Ranch Community Park 19422 Rue De Valore	15.5		2	1 fc			9	2	1	1	2	1
13	Heroes Park 25420 Jeronimo Road	12.4	1	4 L		1 L		2		1			
14	Lake Forest Park 24000 Serrano Road	2.3							1				
15	Lake Forest Sports Park/ Recreation Center 28000 Rancho Parkway	86	8	5 L	2 L fc	3 L	1	8 s	2	2	5 L		1
16	Montbury Park 21962 Montbury Drive	3.5	1					2					
17	Mountain View Park 24061 Dylan Street	5.3	2	1	1 fc 1 hc		1	9 1 s	2	1		2 L	
18	Nature Park 26215 Dimension Drive	4.5						7 1 s					1
19	Peachwood Park 21132 Peachwood	2.7						5 1 s	1				
20	Pebble Creek Park 26441 Pebble Creek Road	1.9						1	1				
21	Pittsford Park 21701 Pittsford Drive	10	2					8 1 s	2	1		2	1
22	Portola Hills Park (Future Site)	5											
23	Rancho Serrano Park 20842 Paseo Sombra	5.1	3					7			1		
24	Ranchwood Park 22500 Killy Street	1.9			1 hc				1				
25	Regency Park Regency Lane & Osterman Road	5									1		
26	Rimgate Park 29772 Rimgate	5	1		1 fc			7 1 s	3	1		1	
27	Serrano Creek Park 25101 Serrano Road	44	3					13 1 s	1	1			1
28	Sundowner Park 22041 Sundowners Lane	0.8	1					2	1				
29	Tamarisk Park 22001 Tamarisk	11.2		1	1 fc			11	1	1			
30	Village Pond Park 23102 Ridge Route Drive	4.7						3					
31	Vintage Park 21000 Vintage Street	4.8	5		1 fc 1 hc			11	1				
32	Whispering Hills Park (Future Site)												

park shelter available for reservation

gymnasium

roller rinks

- fc full court
- hc half court
- L lights
- s shelter

OTHER FACILITIES

F1	City Hall /Community Center	25550 Commercentre #100	461-3400
F2	Heritage Hill Historical Park	25151 Serrano Road	923-2230
F3	Lake Forest Golf	23308 Cherry Avenue	859-1455

Sources: City of Lake Forest Park Guide. https://www.lakeforestca.gov/DocumentCenter/View/1451

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CHAPTER 7
COMMUNITY SERVICES AND FACILITIES

This Chapter addresses utilities and community services within the City of Lake Forest. Utility services include the provision of water services, wastewater (sewer) services, stormwater and drainage, solid waste disposal, electricity, and natural gas. Community services include fire protection, law enforcement, parks and recreation, schools, libraries, and other public facilities.

A technical memorandum provided by West Yost Associates serves as the primary source for the information provided within Section 7.1 (Water), Section 7.2 (Wastewater), and Section 7.3 (Stormwater and flood control); the California Department of Resources Recycling and Recovery (CalRecycle) was the main source for the information for Section 7.4 (Solid Waste); and Southern California Edison (SCE) and Southern California Gas Company (SoCal Gas) were the main sources of information within Section 7.5 (Electricity and Natural Gas).

The majority of the City of Lake Forest's residents are provided water, wastewater collection, and wastewater treatment services by the Irvine Ranch Water District (IRWD), whose boundaries cover 8,300 acres in the City, or approximately 83 percent of the total area of the City. However, residents located along the southwest edge of the City are provided these utility services by El Toro Water District (ETWD). ETWD serves approximately 1,421 acres or 13 percent of the total area of the City. Finally, a small portion of residents in

This Chapter includes the following topics:

Figures are located at the end of the Chapter.

the northeastern section of the City are serviced by Trabuco Canyon Water District (TCWD). Figure 7-1 provides the utility district boundaries overlaid with the City's boundary.

West Yost Associates reviewed the most recent versions of the three utility districts' Master Plans to evaluate how the water and wastewater utility services are provided within the City. IRWD's latest update to its Sewer Collection System Master Plan occurred in 2016, with its Water Resources Master Plan updated in 2017; ETWD's Water and Sewer Master Plan was most recently updated in 2004; and TCWD's latest Water, Wastewater and Reclaimed Water Master Plan was most recently updated in 1999. West Yost Associates also reviewed the most recent versions of ETWD's and IRWD's Urban Water Management Plan (UWMP) and Sewer System Management Plan (SSMP) to more accurately determine projected water demands and supply and projected sewer flows and treatment capacity of each utility district. Flood control facilities and maintenance information were provided to West Yost Associates by the City of Lake Forest.

7.1 WATER

The City of Lake Forest does not directly provide water service to its residents. Rather, three separate, independent utility districts provide this service to residents within the City. Figure 7-1 provides the utility district boundaries overlaid with the City's boundary.

State Regulatory Framework

California Department of Health Services

The Department of Health Services, Division of Drinking Water and Environmental Management, oversees the Drinking Water Program. The Drinking Water Program regulates public water systems and certifies drinking water treatment and distribution operators. It provides support for small water systems and for improving their technical, managerial, and financial capacity. It provides subsidized funding for water system improvements under the State Revolving Fund ("SRF") and Proposition 50 programs. The Drinking Water Program also oversees water recycling projects, permits water treatment devices, supports and promotes water system security, and oversees the Drinking Water Treatment and Research Fund for MTBE and other oxygenates.

Consumer Confidence Report Requirements

California Code of Regulations (CCR) Title 22, Chapter 15, Article 20 requires all public water systems to prepare a Consumer Confidence Report for distribution to its customers and to the Department of Health Services. The Consumer Confidence Report provides information regarding the quality of potable water provided by the water system. It includes information on the sources of the water, any detected contaminants in the water, the maximum contaminant levels set by regulation, violations and actions taken to correct them, and opportunities for public participation in decisions that may affect the quality of the water provided.

Urban Water Management Planning Act

The Urban Water Management Planning Act has as its objectives the management of urban water demands and the efficient use of urban water. Under its provisions, every urban water supplier is required to prepare and adopt an urban water management plan. An "urban water supplier" is a public or private water supplier that provides water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. The plan must identify and quantify the existing and planned sources of water available to the supplier, quantify the projected water use for a period of 20 years, and describe the supplier's water demand management measures. The urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry years. The Department of Water Resources (DWR) must receive a copy of an adopted urban water management plan.

Senate Bill (SB) 610 and Assembly Bill (AB) 901

The State Legislature passed SB 610 and AB 901 in 2001. Both measures modified the Urban Water Management Planning Act.

SB 610 requires additional information in an urban water management plan if groundwater is identified as a source of water available to an urban water supplier. It also requires that the plan include a description of all water supply projects and programs that may be undertaken to meet total projected water use. SB 610 requires a city or county that determines a project is subject to CEQA to identify any public water system that may supply water to the project and to request identified public water systems to prepare a specified water supply assessment. The assessment must include, among other information, an identification of existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, and water received in prior years pursuant to these entitlements, rights, and contracts.

AB 901 requires an urban water management plan to include information, to the extent practicable, relating to the quality of existing sources of water available to an urban water supplier over given time periods. AB 901 also requires information on the manner in which water quality affects water management strategies and supply reliability. The bill requires a plan to describe plans to supplement a water source that may not be available at a consistent level of use, to the extent practicable. Additional findings and declarations relating to water quality are required.

Senate Bill (SB) 221

SB 221 adds Government Code Section 66455.3, requiring that the local water agency be sent a copy of any proposed residential subdivision of more than 500 dwelling units within five days of the subdivision application being accepted as complete for processing by the City or county. It also adds Government Code Section 66473.7, establishing detailed requirements for establishing whether a "sufficient water supply" exists to support any proposed residential subdivisions of more than 500 dwellings, including any such subdivision involving a development agreement. When approving a qualifying subdivision tentative map, the City or county must include a condition requiring availability of a sufficient water supply. The applicable public water system must provide proof of availability. If there is no public water system, the City or county must undertake the analysis described in Government Code Section 66473.7. The analysis must include consideration of effects on other users of water and groundwater.

Local Regulatory Framework

Irvine Ranch Water District (IRWD)

IRWD is a California Special District formed in 1961 and incorporated under the California Water Code. IRWD offers potable water sales, sewer service and sale of reclaimed (or recycled) water, and has approximately 300,000 customers spanning over 180 square miles of service area in Orange County. IRWD serves approximately 83 percent of the total area of the City of Lake Forest.

IRWD 2015 Urban Water Management Plan

IRWD's Urban Water Management Plan (UWMP) looks at IRWD's historic and current water use projections and compares water supplies with demands over the next 20 years. The UWMP serves as a long-range planning document for water supply and demand and provides an overview of IRWD's water supply and usage, recycled water and conservation programs.

The UWMP identifies the imported and local water supplies that will meet future demands including groundwater recovery and water recycling, as well as IRWD's current and planned conservation measures. This helps to ensure that IRWD can provide our service area with a reliable supply of high-quality water and meet current and future demand. The plan is updated every five years and submitted to the California Department of Water Resources. At its June 27, 2016, meeting IRWD's Board of Directors conducted a public hearing and approved the 2015 UWMP.

El Toro Water District (ETWD)

ETWD is California Special District formed in 1960 and receives its water from two main sources: recycled water, and imported water from the Municipal Water District of Orange County (MWDOC). The district serves over 50,000 people in southern Orange County. ETWD maintains a 275-million-gallon water storage facility. ETWD serves approximately 13 percent of the total area of the City of Lake Forest.

ETWD 2015 Urban Water Management Plan

ETWD's UWMP provides a detailed summary of ETWD's present and future water resources and demands and assess the ETWD's water resource needs. The UWMP provides water supply planning for a 25-year planning period in five-year increments and identifies water supplies needed to meet existing and future demands. The demand analysis identifies supply reliability under three hydrologic conditions: a normal year, a single-dry year, and multiple-dry years.

Trabuco Canyon Water District (TCWD)

TCWD is California Special District incorporated under the California Water Code. TCWD provides water service to customers and properties located within its boundaries. The district's primary facilities include a water treatment plant located in the City of Lake Forest, a wastewater treatment plant, and the Trabuco Creek Wells facility located in Trabuco Canyon. A small number of residents in the northeastern section of the City are served by TCWD.

City of Lake Forest General Plan

The existing Lake Forest General Plan includes goals and policies related to water services and supplies. For a full list of the City's goals and policies, please see the City's Current General Plan.

Water Distribution System

The water systems and water services provided by each utility district within Lake Forest are summarized below. The water utility infrastructure that serves the City is provided in Figure 7-2.

Water System Description by Utility District

Irvine Ranch Water District

The majority of the City is provided water service by IRWD. Prior to 2001, water service was provided by Los Alisos Water District (LAWD). In 2001, IRWD annexed LAWD's service area inside the City's boundaries. IRWD is one of the largest water districts in Orange County, serving the entire City of Irvine and portions of Tustin, Santa Ana, Costa Mesa, Newport Beach, and Lake Forest; an area of approximately 132 square miles. IRWD is a member agency of the Municipal Water District of Orange County (MWDOC), which is a wholesale importer and member agency of the Metropolitan Water District (MWD). As such, MWDOC is entitled to receive water from the available sources of MWD. IRWD receives its imported water supplies through MWDOC.

A small portion of the City, the Portola Hills community, is located within the TCWD service area boundary, yet is provided water by IRWD. For this area, TCWD reads the meters and bills the residents, then IRWD bills TCWD for the total amount of water consumed by residents within the TCWD boundary.

Water Infrastructure

IRWD's potable water supply inside the borders of the City consists of almost 250 miles of potable water lines. Due to the major elevation changes within the district, IRWD uses 15 pressure zones to deliver water to customers within a reasonable pressure. Five (5) of these pressure zones fall within the borders of the City; Lake Forest Zones 4, 5, and 6, Foothill Ranch Zone, and Portola Hills Zone.

Potable Water Supply

According to the most recent IRWD Water Master Plan update, groundwater makes up about 53 percent of the total water supply, recycled water makes up 24 percent, imported (treated and untreated) makes up 20 percent, and native surface water makes up around 3 percent. In the FY 2014/2015, about 20 percent of IRWD's potable water needs were met through water purchased and supplied by MWD through MWDOC. The majority of IRWD's potable water is a blend of Colorado River water and State Water Project water that is treated at the MWD Diemer Filtration Plant (DFP) located north of Yorba Linda. Two (2) major transmission lines deliver water from the DFP to IRWD, the Allen McColloch Pipeline (AMP) and East Orange County Feeder No. 2 (EOCF#2). IRWD owns 64.7 cubic feet per second (cfs) capacity in the AMP and 41.4 cfs capacity in the EOCF#2.

Groundwater currently makes up about 78 percent of the potable water supply in the district, and approximately 53 percent of all water supplies including non-potable. Water is pumped from the Orange County Groundwater Basin through seven potable production wells. The Orange County Groundwater Basin is managed by Orange County Water District (OCWD) who has the authority to impose replenishment assessments and basin equity assessments on production. The primary mechanism used by OCWD to manage pumping from the basin is the Basin Production Percentage (BPP). The BPP is the percentage of each producer's water supply that is allowed from groundwater pumped from the basin without incurring a financial penalty. The BPP is set on an annual basis and is uniform for all producers within the groundwater basin's watershed. Groundwater pumping above the BPP is assessed an additional charge that creates a disincentive for over-producing. Currently, and for the foreseeable future, the BPP will be limited to 75 percent. The 2014 IRWD Water Resources Master Plan Update states IRWD is looking to expand groundwater production in the future to max out their groundwater production to the max BPP of 75 percent.

Non-potable Water Supply

Non-potable water meets a large portion of the landscape irrigation demands within IRWD's service area. The non-potable supply consists primarily of recycled water that has been treated at IRWD's Michelson Water Recycling Plan (MWRP) and Los Alisos Water Recycling Plan (LAWRP). Untreated water supplements the recycled water supply through native runoff and the untreated imported water purchased and delivered to Irvine Lake.

Only the section of the City northeast of Trabuco Road and southwest of Highway 241 are currently served with non-potable water. The area of City south of Trabuco Road and the area north of Highway 241 are currently being provided a potable water supply for demands that could be served by non-potable water.

El Toro Water District

ETWD provides service to residents in the southeast corner of the City. The district area is almost entirely built out with residential communities and serves the entire City of Laguna Woods as well as portions of Aliso Viejo, Laguna Hills, Laguna Woods, Lake Forest, and Mission Viejo. The Lake Forest and Mission Viejo sections of ETWD, which are the only sections east of U.S Interstate 5 (the I-5 highway), contain the highest elevations in the district and require pump stations to deliver water.

Like IRWD, ETWD is a member agency of the MWDOC. ETWD receives all its imported water supply through MWDOC.

Water Infrastructure

ETWD supplies water through approximately 50 miles of potable water lines within the City boundary. ETWD has a total of 13 pressure zones, however only four of these zones serve the City: Shenandoah Zone, Cherry Zone, R-6 Zone, and Gravity Zone. The Shenandoah, Cherry, and R-6 Zones exclusively serve the City and are referred to by ETWD as the "Panhandle". These zones are the highest zones in elevation in the district and require pump stations to serve them directly. Gravity Zone is ETWD's largest pressure zone by area, serving parts of Lake Forest, Mission Viejo, Laguna Hills, Laguna Woods, and Aliso Viejo.

Potable Water Supply

ETWD relies completely on imported treated water from MWDOC to meet 100 percent of potable water demands. In general, imported water from MWDOC fills the District's 275 million gallon El Toro Reservoir (R-6), located just outside of ETWD in Mission Viejo, or directly feeds the distribution system. The majority of imported water is delivered to ETWD through the MWDOC owned Allen-McColloch Pipeline (AMP) where ETWD owns the right to 26.3cfs of capacity.

ETWD also owns 2.0 cfs (1.29 million gallons per day, or mgd) capacity in the Joint Regional Water Supply System (JRWSS), which transports MWD treated water as well. The JRWSS is a take-off from MWD's EOCF#2. The JRWSS is managed, operated and maintained by the South Coast Water District (SCWD). Both the AMP and EOCF#2 originate at MWD's DFP located in Yorba Linda.

ETWD has an emergency supply source available to them through the Aufdenkamp Connection Transmission Main (ATCM), which is owned and operated by the Santa Margarita Water District (SMWD). ETWD does not own any capacity in the ATCM but may receive permission from SMWD to take water from the pipeline in an emergency situation.

Non-potable Water Supply

At the time the ETWD master plan was completed, the District was recycling approximately 10 percent of the wastewater treated at the ETWD Water Recycling Plant, which amounts to approximately 0.5 mgd. The recycled water is primarily used for irrigation of the Leisure World Golf Course, which is located in the City of Laguna Woods. None of the recycled water is used in the City of Lake Forest.

Trabuco Canyon Water District

A portion of the City of Lake Forest's Portola Hills community is the only area that lies within TCWD boundaries. However, under terms of an agreement with IRWD, IRWD supplies water to the 532 connections. TCWD reads the meters and bills the customers for water service then IRWD bills TCWD for the water supplied to these customers. The evaluation of water demands indicates these customers have an average demand of 0.24 mgd and a maximum day demand of 0.48 mgd.

Projected Potable Water Demands and Supply

Irvine Ranch Water District

The 2015 IRWD UWMP developed future water demand projections and future water supply projections for the entire utility district. These projections were used to analyze if IRWD had enough supply to meet the projected water demand. The projections can be found in Table 7-1. As shown in Table 7-1, IRWD is projected to have significantly more supply than demand in 2035.

El Toro Water District

Since ETWD is mostly built out, increases in future water demand would be through redevelopment of existing land uses. The 2004 ETWD Master Plan identifies a range of potential development scenarios that may create new water demands, however, given its age these projects will be reassessed and updated based on the results of the General Plan Update process. For reference, is estimated that these projects will increase the average day domestic water demand by 239 gpm, or 0.344 mgd, or 0.532 cfs.

The 2004 ETWD Master Plan states that the District's capacity in the AMP is equivalent to the maximum day demand, therefore the current supply is deemed adequate. Estimated future demands increase only slightly, therefore additional turnout capacity is not anticipated. Projected potable water demand and supply values from the 2015 ETWD UMWP are presented in Table 7-1. Since ETWD relies completely on imported water from MWDOC, the available supply presented is equal to the demand.

Trabuco Canyon Water District

As previously stated, customers within the Portola Hills community are served potable water by IRWD. The community has an average day demand of 0.24 mgd and a maximum day demand of 0.48 mgd. The community is already built out and no redevelopment has been planned. Therefore, future flows are expected to remain the same. These demand values are included in the projected demand for IRWD in Table 7-1.

Table 7-1 Projected Potable Water Demand vs. Supply (acre-feet)

Utility District	Projected 2035 Demand	Projected 2035 Supply
IRWD	81,996	111,277
ETWD	7,315	7,315

Source: West Yost Associates, 2018

Note: Water demands generated by the Portola Hills Community are included in the IRWD demands. IRWD demands and supply based on 2015 IRWD UMWP. ETWD demands and supply based on 2015 ETWD UMWP.

Water System Issues and Opportunities

Irvine Ranch Water District

The latest IRWD potable and non-potable water system analysis was developed and run for the 1999 IRWD Master Plan. Most of the Lake Forest service area belonged to LAWD at the time and was not included in the analysis. The only parts of the City that were included in the potable system analysis were the Foothill Ranch community and the Portola Hills community, northeast of Freeway 241. No section of Lake Forest was included in the non-potable system analysis.

IRWD relies on Sub-Area Master Plans (SAMPs) to determine infrastructure needs throughout its service area. A SAMP provides a focused evaluation of infrastructure requirements in a specific area of the IRWD service area, based upon the general evaluations performed for the master plan. It is likely that a SAMP would be developed in response to land use changes proposed by the City of Lake Forest General Plan Update.

El Toro Water District

For the 2004 ETWD Master Plan, a hydraulic model of the ETWD Water Distribution System was developed to identify any deficiencies in the system. The system was analyzed under the maximum day extended period simulation scenario for existing and anticipated future flows to identify deficiencies in the system like areas that exceed either the high or low-pressure criteria, areas that cannot provide fire flows, or pipes with velocities that exceed the criteria.

The only deficiencies identified by the model within the Lake Forest City boundary involved several areas in the R-6 Zone that could not provide adequate fire flows of 1,500 gpm at 20 psi. These areas are located near the intersection of Brookhaven and Alderwood or on Fallbrook (just across Trabuco). However, the model was used to verify that in an emergency situation, the nearby pressure reducing valve PR-20, which provides back-up supply from the Cherry Zone to the R-6 Zone, will open to assist in meeting fire flow demands.

Trabuco Canyon Water District

As discussed previously, IRWD provides water to residents in the Lake Forest Portola Hills community who are within the TCWD boundaries. Hydraulic analysis of the Portola Hills community was included in the IRWD hydraulic Analysis. There are no discrepancies in the Portola Hills community.

7.2 WASTEWATER

The City of Lake Forest does not directly provide wastewater collection or wastewater treatment to its residents. Rather, three separate, independent utility districts provide these services to residents within the City. As previously provided, Figure 7-1 shows the utility district boundaries overlaid with the City's boundary.

State Regulatory Framework

State Water Resources Control Board/Regional Water Quality Control Board

In California, all wastewater treatment and disposal systems fall under the overall regulatory authority of the State Water Resources Control Board (SWRCB) and the nine California Regional Water Quality Control Boards (RWQCBs), who are charged with the responsibility of protecting beneficial uses of State waters (ground and surface) from a variety of waste discharges, including wastewater from individual and municipal systems. The City of Lake Forest falls within the jurisdiction of two Regional Water Quality Control Boards (RWQCBs): the Santa Ana RWQCB and the San Diego RWQCB.

The RWQCB's regulatory role often involves the formation and implementation of basic water protection policies. These are reflected in the individual RWQCB's Basin Plan, generally in the form of guidelines, criteria and/or prohibitions related to the siting, design, construction, and maintenance of on-site sewage disposal systems. The SWRCB's role has historically been one of providing overall direction, organizational and technical assistance, and a communications link to the State legislature.

The RWQCBs may waive or delegate regulatory authority for on-site sewage disposal systems to counties, cities or special districts. Although not mandatory, it is commonly done and has proven to be administratively efficient. In some cases, this is accomplished through a Memorandum of Understanding (MOU), whereby the local agency commits to enforcing the Basin Plan requirements or other specified standards that may be more restrictive. The RWQCBs generally elect to retain permitting authority over large and/or commercial or industrial on-site sewage disposal systems, depending on the volume and character of the wastewater.

Local Regulatory Framework

Irvine Ranch Water District (IRWD)

IRWD is a California Special District formed in 1961 and incorporated under the California Water Code. IRWD offers potable water sales, sewer service and sale of reclaimed (or recycled) water, and has approximately 300,000 customers spanning over 180 square miles of service area in Orange County. IRWD serves approximately 83 percent of the total area of the City of Lake Forest. IRWD provides wastewater collection and wastewater treatment to the majority of residents in the City. IRWD maintains approximately 175 miles of sewer mains within the City of Lake Forest.

El Toro Water District (ETWD)

ETWD is California Special District formed in 1960 and incorporated under the California Water Code. ETWD maintains 34 miles of sewer mains within the City of Lake Forest. The majority of the flow in the area within Lake Forest served by ETWD is conveyed by gravity and eventually flows across the I-5 highway via an 18-inch main southwest into Laguna Woods where the ETWD Water Recycling Plant is located.

Trabuco Canyon Water District (TCWD)

TCWD is California Special District incorporated under the California Water Code. TCWD's wastewater collection system consists of three zones that are served by gravity sewers and lift stations; Robinson Ranch Zone, Dove Canyon Zone, and El Toro Road Zone. The portion of Lake Forest served by TCWD for sewer service is located within the El Toro Road Zone and consists of approximately 8 miles of sewer mains.

City of Lake Forest General Plan

The existing Lake Forest General Plan includes goals and policies related to wastewater. For a full list of the City's goals and policies, please see the City's Current General Plan.

Sewer Collection System and Wastewater Treatment

Sewer collection and wastewater treatment for the City of Lake Forest are described below. The wastewater infrastructure that serves the City is laid out in Figure 7-2.

Wastewater System Description by Utility District

As with the water system, the City's sewer services are divided up by three utility districts, IRWD, ETWD, and TCWD. Among the three agencies, there are approximately 215 miles of sewer main within the borders of Lake Forest.

Irvine Ranch Water District

IRWD wastewater collection and treatment facilities are discussed below.

Sewer Collection System Infrastructure

IRWD provides wastewater collection and wastewater treatment to the majority of residents in the City of Lake Forest. IRWD maintains approximately 175 miles of sewer mains within the City of Lake Forest. Wastewater flow originating within Lake Forest northeast of Highway 241 flows across the IRWD collection system to the MWRP. All other flow originating in Lake Forest is directed to the LAWRP. Recycled water is produced at both plants, and recycled water makes up about 20 percent of IRWD's current water supply.

The 2014 IRWD Master Plan Update identifies five sewer sheds for the City of Lake Forest including Alton-Bake, Bake, El Toro; Muirlands Cherry, Lake Forest, and Portola. The Alton-Bake shed, located northeast of Highway 241 flows to MWRP, while the Bake, El Toro; Muirlands Cherry, and Lake Forest sheds flow to LAWRP. The Portola shed flows into the sewer system owned by TCWD.

Wastewater Treatment Capacity

The MWRP is located on Riparian Way south of Michelson Drive, on the northwest side of the San Diego Creek in the City of Irvine. As of 2008, the MWRP had a plant capacity of 18 mgd but it was recently expanded to a capacity of 28 mgd.

The LAWRP is located on the corner of Muirlands Boulevard and Aspen Street in the City of Lake Forest. As of 2014, the LAWRP had a plant capacity of 7.5 mgd but only approximately 3.43 mgd was being conveyed to the LAWRP for treatment.

El Toro Water District

ETWD wastewater collection and treatment facilities are discussed below.

Sewer Collection System Infrastructure

The southeast portion of the City is served by El Toro Water District. ETWD's most recent Water and Sewer Master Plan was published in 2004. ETWD maintains approximately 34 miles of sewer mains within the City of Lake Forest. The majority of the flow in the City's ETWD area is conveyed by gravity and eventually flows across the I-5 highway via an 18-inch trunk main southwest into Laguna Woods where the ETWD Water Recycling Plant (WRP) is located.

Flow originating from the community located just south of Ralph A. Gates Elementary School flows across the I-5 highway and into Laguna Woods south of the 18-inch trunk main. The flow then is directed to the Aliso Viejo Pump Station where it is pumped to the ETWD WRP. Wastewater from a few small residential streets at the far south end of the City flows southeast into Mission Viejo to Freeway Lift Station where it joins flow from Mission Viejo and is pumped to the ETWD collection system west of the I-5 highway.

Wastewater Treatment Capacity

The current ETWD WRP has an average flow capacity of 5.4 mgd but has the ability to accommodate up to 6 mgd during max month conditions. The ETWD WRP recycles about 10 percent of the water it treats.

Trabuco Canyon Water District

TCWD wastewater collection and treatment facilities are discussed below.

Sewer Collection System Infrastructure

Residents who live in part of the Portola Hills community in the northeast section of the City are serviced by TCWD. TCWD's most recent Master Plan was created in 1999. TCWD's collection system consists of three zones that are served by gravity sewers and lift stations; Robinson Ranch Zone, Dove Canyon Zone, and El Toro Road Zone. The Portola Hills community falls within the El Toro Road Zone and consists of approximately eight miles of sewer mains. Flow from this community is directed into the El Toro Road Sewage Collection System, which is jointly-owned by TCWD, IRWD, and Santa Margarita Water District (SMWD). All flow from the El Toro Road Sewage Collection System is pumped into SMWD's wastewater collection system and is eventually treated at the Chiquita Water Reclamation Plant then disposed of.

Wastewater Treatment Capacity

As discussed above, the only section of Lake Forest which TCWD provides wastewater services for is a portion of the Portola Hills community. The amount of flow capacity available to the Portola Hills Community is limited by the total capacity that TCWD owns in SMWD's wastewater collection system and the Chiquita Water Reclamation Plant. The District owns 0.558 mgd of capacity in SMWD's wastewater collection system and Chiquita Water Reclamation Plant. 0.428 mgd is reserved specifically for TCWD's El Toro Road Zone. Of the 0.428 mgd reserved for the El Toro Road Zone, 0.158 mgd is reserved for its Portola Hills customers.

Projected Wastewater Flows

Projected wastewater flows for the three districts serving the City are discussed below.

Irvine Ranch Water District

The projected future wastewater flows for each wastewater treatment facility are presented in Table 7-2 along with the treatment capacity discussed above. It should be noted that IRWD is currently performing a treatment master plan to evaluate alternatives for supplying adequate treatment capacity for its service area in the future.

El Toro Water District

The ETWD 2004 Master Plan identified yearly average flow through the WRP for years 2001-2003 based on monthly influent flow data. The results show a slight decrease in average influent flow for this period. Average daily flow was 5.29 mgd in 2001, 4.82 mgd in 2002, and 4.94 mgd in 2003. The Master Plan does not break down the existing flow for wastewater generated inside the City of Lake Forest, however it does break down increased projected flow specifically for the City of Lake Forest.

The ETWD 2004 Master Plan identified four possible areas of redevelopment within the borders of Lake Forest that will impact wastewater generation. The Arbor/El Toro Road redevelopment project is a landscape project and will not generate any additional sewage. An existing light industrial area along El Toro Road is proposed to be redeveloped with a rail station, commercial property and multi-family residential. An additional 244 units are proposed to be added to the Saddleback Ranch Apartments located on Los Alisos Boulevard. The City also anticipates redeveloping the mobile home parks, approximately 120 aces, into master planned communities in the future. It is estimated that these projects will increase the average daily wastewater generation by 146.6 gpm, or 0.211 mgd.

The projected wastewater flows that are directed to the ETWD WRP are presented in Table 7-2 along with the treatment capacity.

Trabuco Canyon Water District

The 1999 TCWD Master Plan does not specifically identify any possible development inside the borders of Lake Forest. It is assumed the projected flows for the Portola Hills Community will stay below 0.158 mgd. The Portola Hills community is not included in Table 7-2.

Table 7-2 Projected Sewer Flow vs. Treatment Capacity (Million Gallons Per Day, MGD)

Utility District	Projected Build-out Flow	Current Total Treatment Capacity
IRWD MWRP	32.6	28.0
IRWD LAWRP	5.0	7.5
ETWD WRP	6.9	6.0

Source: West Yost Associates, 2018

Sewer Collection System and Wastewater Treatment Issues and Opportunities

Collection system and treatment issues and opportunities are discussed below

Irvine Ranch Water District

For the Existing System Analysis completed as part of the IRWD Master Plan, a model of the system was constructed in 1999 using Innovyze's InfoSWMM. This model was updated in 2014. The hydraulic analysis indicates that the trunk main in the Alton Parkway, which conveys flows from portions of the City, has future potential capacity deficiencies.

IRWD relies on Sub-Area Master Plans (SAMPs) to determine infrastructure needs throughout its service area. A SAMP provides a focused evaluation of infrastructure requirements in a specific area of the IRWD service area, based upon the general evaluations performed for the master plan. It is likely that a SAMP would be developed in response to land use changes proposed by the City of Lake Forest General Plan Update (West Yost, 2018).

El Toro Water District

As of the 2004 El Toro Water District Master Plan, there were no deficient pipes in the existing collection system according to the model. The 2004 El Toro Water District Master Plan identified possible development in four areas within their system inside the borders of Lake Forest. The projects were estimated to increase average daily wastewater generation created by the City by 146 gpm. The model was run again with the projected increased wastewater generation values from the four possible development areas along with a 20 percent increase due to inflow and infiltration (I&I). The results were analyzed for the WRP and the existing sewer mains and are summarized by West Yost below.

The ETWD WRP was analyzed to determine if it had sufficient capacity to accommodate the projected development. The WRP was completely reconstructed in 1998 to accommodate the increased demands from heavy commercial and residential development during the 1990's and now has a capacity under an average flow condition of 5.4 mgd. The WRP also has the ability to accommodate maximum month flows up to 6 mgd. After a capacity analysis was completed, it was found that the WRP capacity was adequate to treat flows after construction of all proposed developments within the entire ETWD identified in the Master Plan.

Pipelines were analyzed to determine if there would be any deficiencies as wastewater flow increased due to the proposed developments. After the model was run under the future loading condition with I&I, a total of 56 pipes exceeded the criteria for d/D (flow depth/pipe diameter) of 75 percent, with 40 of those pipes having a d/D value of 100 percent (indicating surcharging). Many of the deficient pipes identified are within the City of Lake Forests borders.

Trabuco Canyon Water District

There are currently no deficient pipes in the Portola Hills community, the only community in the City that is being serviced by TCWD. As stated above, the amount of flow capacity is limited by the total capacity that TCWD owns in SMWD's wastewater collection system and the Chiquita Water Reclamation Plant. However, due to its small area of influence inside the City of Lake Forest, TCWD is not expected to have any significant issues in terms of capacity in the City and development in the future will not be an issue.

7.3 STORMWATER AND FLOOD CONTROL

Lake Forest's stormwater control systems are currently owned and operated by the City.

Federal Regulatory Framework

Clean Water Act (CWA)

The CWA, initially passed in 1972, regulates the discharge of pollutants into watersheds throughout the nation. Section 402(p) of the act establishes a framework for regulating municipal and industrial stormwater discharges under the NPDES Program. Section 402(p) requires that stormwater associated with industrial activity that discharges either directly to surface waters or indirectly through municipal separate storm sewers must be regulated by an NPDES permit.

The SWRCB is responsible for implementing the Clean Water Act and does so through issuing NPDES permits to cities and counties through regional water quality control boards. Federal regulations allow two permitting options for storm water discharges (individual permits and general permits). Pursuant to Section 402 of the CWA and the Porter-Cologne Water Quality Control Act, municipal stormwater discharge in the City of Lake Forest is subject to the Waste Discharge Requirements (WDRs) of the MS4 Permit (Order Number R8-2016-0001) and NPDES Permit No. CAS618030.

National Pollutant Discharge Elimination System (NPDES)

National Pollutant Discharge Elimination System (NPDES) permits are required for discharges to navigable waters of the United States, which includes any discharge to surface waters, including lakes, rivers, streams, bays, oceans, dry stream beds, wetlands, and storm sewers that are tributary to any surface water body. NPDES permits are issued under the Federal Clean Water Act, Title IV, Permits and Licenses, Section 402 (33 USC 466 et seq.).

The RWQCB issues these permits in lieu of direct issuance by the Environmental Protection Agency, subject to review and approval by the EPA Regional Administrator (EPA Region 9). The terms of these NPDES permits implement pertinent provisions of the Federal Clean Water Act and the Act's implementing regulations, including pre-treatment, sludge management, effluent limitations for specific industries, and anti-degradation. In general, the discharge of pollutants is to be eliminated or reduced as much as practicable so as to achieve the Clean Water Act's goal of "fishable and swimmable" navigable (surface) waters. Technically, all NPDES permits issued by the RWQCB are also Waste Discharge Requirements issued under the authority of the CWA.

These NPDES permits regulate discharges from publicly owned treatment works, industrial discharges, stormwater runoff, dewatering operations, and groundwater cleanup discharges. NPDES permits are issued for five years or less, and therefore must be updated regularly. To expedite the permit issuance process, the RWQCB has adopted several general NPDES permits, each of which regulates numerous discharges of similar types of wastes. The SWRCB has issued general permits for stormwater runoff from construction sites statewide. Stormwater discharges from industrial and construction activities in Lake Forest can be covered under these general permits, which are administered jointly by the SWRCB and RWQCB.

Construction associated throughout the City of Lake Forest could disturb more than one acre of land surface for centralized and regional structural Best Management Practices (BMPs) (and possibly for those distributed structural BMPs larger than one acre), affecting the quality of stormwater discharges into waters of the United States. The City would therefore be subject to the National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Order 2009-0009-DWQ, NPDES No. CAS000002, Construction General Permit [CGP]), as amended by Order 2010-0014-DWQ and Order 2012-0006-DWQ). The CGP regulates discharges of pollutants in stormwater associated with construction activity to waters of the United States from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface.

The CGP requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that includes specific BMPs designed to prevent pollutants from contacting stormwater and keep all products of erosion from moving off-site into receiving waters. The SWPPP BMPs are intended to protect surface water quality by preventing the off-site migration of eroded soil and construction-related pollutants from the construction area.

State Regulatory Framework

California Water Code

California's primary statute governing water quality and water pollution issues with respect to both surface waters and groundwater is the Porter-Cologne Water Quality Control Act of 1970 (Division 7 of the California Water Code) (Porter-Cologne Act). The Porter-Cologne Act grants the SWRCB and each of the RWQCBs power to protect water quality, and is the primary vehicle for implementation of California's responsibilities under the Federal Clean Water Act. The Porter-Cologne Act grants the SWRCB and the RWQCBs authority and responsibility to adopt plans and policies, to regulate discharges to surface and groundwater, to regulate waste disposal sites, and to require cleanup of discharges of hazardous materials and other pollutants. The Porter-Cologne Act also establishes reporting requirements for unintended discharges of any hazardous substance, sewage, or oil or petroleum product.

Each RWQCB must formulate and adopt a Water Quality Control Plan (Basin Plan) for its region. The regional plans are to conform to the policies set forth in the Porter-Cologne Act and established by the SWRCB in its State water policy. The Porter-Cologne Act also provides that a RWQCB may include within its regional plan water discharge prohibitions applicable to particular conditions, areas, or types of waste.

Water Quality Control Plan (Basin Plan)

A Basin Plan is designed to preserve and enhance water quality and protect the beneficial uses of all regional waters. The Basin Plan is a resource for the Regional Board and others who use water and/or discharge wastewater in the region that the Basin Plan is designed to cover. Other agencies and organizations involved in environmental permitting and resource management activities also use the Basin Plan. Finally, the Basin Plan provides valuable information to the public about local water quality issues. The City of Lake Forest is split between two regions – the Santa Ana River Basin and the San Diego River Basin, approximately delineated by El Toro Road.

Water Quality Control Plan (Basin Plan) for the Santa Ana River Basin

The Santa Ana Region (Region 8) includes the upper and lower Santa Ana River watersheds, the San Jacinto River watershed, and several other small drainage areas. The Santa Ana Region covers parts of southwestern San Bernardino County, western Riverside County, and northwestern Orange County. The northwestern portion of the City of Lake Forest, approximately north of El Toro Road, is located within this region.

Water Quality Control Plan (Basin Plan) for the San Diego Basin

The San Diego Region (Region 9) occurs within the Peninsula Range Physiographic Province of California. One of the most prominent physical features in the region is the northwest-trending Peninsula Range which includes from the north to south, the Santa Ana, Agua Tibia, Palomar, Volcan, Cuyamaca and Laguna Mountains. The southeastern portions of the City fall under the requirements of the San Diego Regional Water Quality Control Board. The San Diego Region is divided into a coastal plain area, a central mountain-valley area, and an eastern mountain valley area. The southern portion of the City of Lake Forest is located within this region.

State Water Resources Control Board (State Water Board) Storm Water Strategy

The Storm Water Strategy is founded on the results of the Storm Water Strategic Initiative, which served to direct the State Water Board's role in storm water resources management and evolve the Storm Water Program by a) developing guiding principles to serve as the foundation of the storm water program, b) identifying issues that support or inhibit the program from aligning with the guiding principles, and c) proposing and prioritizing projects that the Water Boards could implement to address those issues. The State Water Board staff created a strategy-based document called the Strategy to Optimize Management of Storm Water (STORMS). STORMS includes a program vision, missions, goals, objectives, projects, timelines, and consideration of the most effective integration of project outcomes into the Water Board's Storm Water Program.

Local Regulatory Framework

Orange County Drainage Area Management Plan

The specific water pollutant control elements of the Orange County Stormwater Program are documented in the 2003 Drainage Area Management Plan (DAMP) which is the County's primary policy, planning and implementation document for municipal NPDES Stormwater Permit compliance. The DAMP was prepared and is periodically updated using a consensus building process that involving public and private sector input and public review through the California Environmental Quality Act (CEQA) process. The DAMP is the principal guidance and compliance document for the county-wide implementation of the stormwater program and provides a foundation for the Orange County Stormwater Permittees to implement model programs designed to prevent pollutants from entering receiving waters to the maximum extent practicable. Review the Orange County DAMP.

City of Lake Forest Local Implementation Plan

The City Local Implementation Plan (LIP) is the principal guidance and compliance document specific to the City of Lake Forest's jurisdiction. The LIP provides description and detail of the City's water quality program implementation activities. The LIP is designed to work in conjunction with the Orange County DAMP.

Orange County Stormwater Resource Plan

The Orange County Stormwater Resource Plan (OC SWRP) was prepared by Orange County per the requirements of SB 985. SB 985 requires the preparation of a Storm Water Resource Plan as an eligibility requirement for an entity to receive grant funding from a voter-approved bond initiative for a storm water and/or urban runoff project. Four primary significant planning efforts referenced throughout this OC SWRP are used for functional equivalency to meet the SWRP guidelines. These include (1) the 2013/2014 Reports of Waste Discharge (ROWDs), (2) Integrated Regional Watershed Management Plans for North, Central and South Orange County, (3) Watershed Infiltration and Hydromodification Management Plan (WIHMP) mapping tools, and (4) the South Orange County Water Quality Improvement Plan (WQIP).

Municipal NPDES Permit Waste Discharge Requirements

On May 19, 2009, the Santa Ana Regional Water Quality Control Board adopted Order No. R8-2009-0030, NPDES No. CAS618030. On December 16, 2009, the San Diego Regional Water Quality Control Board adopted Order No. R9-200-0002, NPDES No. CAS018740. These Municipal NPDES Permits require the permittees to continue to implement stormwater quality management programs and develop additional programs in order to control pollutants in stormwater discharges.

The City of Lake Forest is split by the jurisdictional boundaries of two California Regional Water Quality Control Boards. The northwestern portions of the City fall under the requirements of the Santa Ana Regional Water Quality Control Board, and the southeastern portions of the City fall under the requirements of the San Diego Regional Water Quality Control Board. The jurisdictional boundaries are defined by the geographic division of watersheds; however, the boundary line can roughly be delineated by El Toro Road.

City of Lake Forest Regional Water Management Plan (IRWMP)

Within Orange County, water resource management has been structured into three primary Watershed Management Areas (WMA):

- North Orange County Watershed Management Area
- Central Orange County WMA
- South Orange County WMA

The 11 watersheds in Orange County were grouped by similar characteristics into these three WMAs. The City of Lake Forest is an active participating member of the Central and South Orange County WMAs.

At its essence, the Watershed Management Area is a collaborative framework for municipalities and special purpose agencies to work collaboratively and find synergies across water resource disciplines. Its purpose is to bring together a wide variety of water resource managers in order to achieve more comprehensive and cost-effective solutions to Orange County's water resources needs. Member agencies voluntarily enter into a cooperative agreement that forms the WMA.

Governance includes a policy committee of elected officials, the Executive Committee, to oversee each Watershed Management Area. Senior staff from each member organization form a Management Committee to develop a joint work plan and oversee its implementation. Regular stakeholder forums are held to involve the public and share information across organizations within each Watershed Management Area.

These WMA groups and respective committees meet together on a regular basis to collaborate on water resource issues, including water supply, surface water quality, flood management, wastewater, and natural resource protection. Integrated Regional Water Management Plans (IRWMPs) have been completed for each WMA. Goals and solutions specific to each Watershed Management Area are formulated through consensus with participating stakeholders. Likewise, a custom slate of projects and programs is developed to address the water resource needs of each WMA. The Central and South Orange County WMAs have existing cooperative agreements in place.

City of Lake Forest General Plan

The existing City of Lake Forest General Plan identifies policies related to stormwater and/or flood control. For a full list of the City's goals and policies, please see the City's Current General Plan.

General Description of the Storm Drainage System

The City's stormwater control systems are currently owned and operated by the City of Lake Forest. Until recently, the Orange County Flood Control District owned and operated the stormwater control system within the City. The City took over control of all facilities recently and is currently in the process of tracking, mapping, and analyzing the facilities.

Description of Infrastructure

At this time, the City does not have its own mapping of the stormwater facilities; however, these are currently mapped by the Orange County Flood Control District. The Drainage Facilities Basemap Index and the maps specific to Lake Forest that describe the existing stormwater structures are included in he Appendix of this report (as shown in Appendix A of the West Yost Technical Memorandum). These maps have dates ranging from 2000 to 2007.

7.4 SOLID WASTE

Provided below is a discussion of the solid wastes services that serve the City of Lake Forest.

Key Terms

Class I landfill: A landfill that accepts for disposal 20 tons or more of municipal solid waste daily (based on an annual average); or one that does not qualify as a Class II or Class III municipal solid waste landfill.

Class II landfill: A landfill that (1) accepts less than 20 tons daily of municipal solid waste (based on an annual average); (2) is located on a site where there is no evidence of groundwater pollution caused or contributed by the landfill; (3) is not connected by road to a Class I municipal solid waste landfill, or, if connected by road, is located more than 50 miles from a Class I municipal solid waste landfill; and (4) serves a community that experiences (for at least three months each year) an interruption in access to surface transportation, preventing access to a Class I landfill, or a community with no practicable waste management alternative.

Class III landfill: A landfill that is not connected by road to a Class I landfill or a landfill that is located at least 50 miles from a Class I landfill. Class III landfills can accept no more than an average of one ton daily of ash from incinerated municipal solid waste or less than five tons daily of municipal solid waste.

Federal Regulatory Framework

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) was enacted in 1976 to address the huge volumes of municipal and industrial solid waste generated nationwide. After several amendments, the current Act governs the management of solid and hazardous waste and underground storage tanks (USTs). RCRA was an amendment to the Solid Waste Disposal Act of 1965. RCRA has been amended several times, most significantly by the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRA is a combination of the first solid waste statutes and all subsequent amendments. RCRA authorizes the Environmental Protection Agency (EPA) to regulate waste management activities. RCRA authorizes states to develop and enforce their own waste management programs, in lieu of the Federal program, if a state's waste management program is substantially equivalent to, consistent with, and no less stringent than the Federal program.

State Regulatory Framework

California Integrated Waste Management Act (AB 939 and SB 1322)

The California Integrated Waste Management Act of 1989 (AB 939 and SB 1322) requires every city and county in the state to prepare a Source Reduction and Recycling Element to its Solid Waste Management Plan that identifies how each jurisdiction will meet the mandatory state waste diversion goals of 25% by 1995 and 50% by 2000. The purpose of AB 939 and SB 1322 is to "reduce, recycle, and re-use solid waste generated in the state to the maximum extent feasible." The term "integrated waste management" refers to the use of a variety of waste management practices to safely and effectively handle the municipal solid waste stream with the least adverse impact on human health and the environment. The Act has established a waste management hierarchy, as follows: Source Reduction; Recycling; Composting; Transformation; and Disposal.

California Integrated Waste Management Board Model Ordinance

Subsequent to the Integrated Waste Management Act, additional legislation was passed to assist local jurisdictions in accomplishing the goals of AB 939. The California Solid Waste Re-use and Recycling Access Act of 1991 (§42900-42911 of the Public Resources Code) directs the California Integrated Waste Management Board (CIWMB) to draft a "model ordinance" relating to adequate areas for collecting and loading recyclable materials in development projects. The model ordinance requires that any new development project, for which an application is submitted on or after September 1, 1994, include "adequate, accessible, and convenient areas for collecting and loading recyclable materials." For subdivisions of single family detached homes, recycling areas are required to serve only the needs of the homes within that subdivision.

California's Mandatory Commercial Recycling Law (AB 341)

Assembly Bill (AB) 341 directed CalRecycle to develop and adopt regulations for mandatory commercial recycling. CalRecycle initiated formal rulemaking with a 45-day comment period beginning Oct. 28, 2011. The final regulation was approved by the Office of Administrative Law on May 7, 2012. The purpose of AB 341 is to reduce GHG emissions by diverting commercial solid waste to recycling efforts and to expand the opportunity for additional recycling services and recycling manufacturing facilities in California.

Beginning on July 1, 2012, businesses have been required to recycle, and each jurisdiction has implemented programs that include education, outreach, and monitoring. Jurisdictions were required to start reporting on their 2012 Electronic Annual Report (due August 1, 2013) on their initial education, outreach, and monitoring efforts, and, if applicable, on any enforcement activities or exemptions implemented by the jurisdiction.

In addition to Mandatory Commercial Recycling, AB 341 sets a statewide goal for 75 percent disposal reduction by the year 2020. This is not written as a 75 percent diversion mandate for each jurisdiction. The 50 percent disposal reduction mandate still stands for cities, counties, and State agencies (including community colleges) under AB 939. CalRecycle continues to evaluate program implementation as it has in the past through the Annual Report review process for entities subject to either AB 939.

Assembly Bill 1826 Mandatory Commercial Organics Recycling

In October 2014 Governor Brown signed AB 1826, requiring businesses to recycle their organic waste on and after April 1, 2016, depending on the amount of waste they generate per week. This law also requires that on and after January 1, 2016, local jurisdictions across the state implement an organic waste recycling program to divert organic waste generated by businesses, including multifamily residential dwellings that consist of five or more units (please note, however, that multi-family dwellings are not required to have a food waste diversion program). Organic waste (also referred to as organics) means food waste, green waste, landscape and pruning waste, nonhazardous wood waste, and food-soiled paper waste that is mixed in with food waste. This law phases in the mandatory recycling of commercial organics over time, while also offering an exemption process for rural counties. In particular, the minimum threshold of organic waste generation by businesses decreases over time, which means an increasingly greater proportion of the commercial sector will be required to comply.

Starting on January 1, 2019, businesses that generate 4 cubic yards or more of commercial solid waste per week shall arrange for organic waste recycling services. By Summer/Fall 2021, if CalRecycle determines that the statewide disposal of organic waste in 2020 has not been reduced by 50 percent of the level of disposal during 2014, the organic recycling requirements on businesses will expand to cover businesses that generate 2 cubic yards or more of commercial solid waste per week. Additionally, certain exemptions may no longer be available if this target is not met.

Senate Bill 1383 Short-Lived Climate Pollutants: Organic Waste Methane Emissions Reductions

In September 2016, Governor Brown signed SB 1383, establishing methane emissions reduction targets in a statewide effort to reduce emissions of short-lived climate pollutants (SLCP) in various sectors of California's economy. The bill codifies the California Air Resources Board's Short-Lived Climate Pollutant Reduction Strategy, established pursuant to SB 605, in order to achieve reductions in the statewide emissions of short-lived climate pollutants. Actions to reduce short-lived climate pollutants are essential to address the many impacts of climate change on human health, especially in California's most at-risk communities, and on the environment.

As it pertains to solid waste, SB 1383 establishes targets to achieve a 50 percent reduction in the level of the statewide disposal of organic waste from the 2014 level by 2020 and a 75 percent reduction by 2025. The law grants CalRecycle the regulatory authority required to achieve the organic waste disposal reduction targets and establishes an additional target that not less than 20 percent of currently disposed edible food is recovered for human consumption by 2025.

Local Regulatory Framework

City of Lake Forest General Plan

The existing Lake Forest General Plan includes goals and policies related to solid waste. For a full list of the City's goals and policies, please see the City's Current General Plan.

Waste Collection Services

The City of Lake Forest has a sole-source contract with CR&R Incorporated Environmental Services to collect solid waste, recycling, and green waste from the residential and commercial sectors. CR&R Incorporated Environmental Services serves more than 3 million people and over 25,000 businesses throughout Orange, Los Angeles, San Bernardino, Imperial and Riverside Counties. The CR&R vehicle fleet in Lake Forest uses natural gas vehicles and pick-up services usually occur weekly.

Waste Disposal Facilities

The vast majority (90%) of landfill disposed from the City of Lake Forest in 2017 (the latest year of information available) went to Frank R. Bowerman Sanitary Landfill1. The City of Lake Forest disposed of approximately 56,548 tons at this landfill. Other landfills

1 *Note: data provided by Calrecycle, based on information provided by County disposal reports.*

that received relatively small amounts of waste from the City of Lake Forest in 2017 include:

- Antelope Valley Public Landfill (1 ton);
- Azusa Land Reclamation Co. Landfill (184 tons);
- El Sobrante Landfill (161 tons)
- McKittrick Waste Treatment Site (25 tons)
- Mid-Valley Sanitary Landfill (241 tons);
- Olinda Alpha Sanitary Landfill (223 tons);
- Prima Deshecha Sanitary Landfill (5,408 tons); and
- Simi Valley Landfill & Recycling Center (95 tons);

Frank R. Bowerman Sanitary Landfill has a remaining capacity of 87,384,799 cubic yards, and has a current maximum permitted throughput of 4,000 tons per day. The City of Lake Forest contributed a total of 62,887 tons of waste in 2017, well below the remaining capacity of the landfill. In 2017, the City of Lake Forest disposed of a total of approximately 172 tons of waste per day, with approximately 155 tons per day of this total disposed at Frank R. Bowerman Sanitary Landfill. This is well below the maximum permitted throughput of 4,000 tons per day at this landfill.

Frank R. Bowerman Sanitary Landfill

The Frank R. Bowerman Sanitary landfill is a Class III, municipal solid waste landfill. Opened in 1990 near Irvine, CA, it is one of the largest landfills in the state and the ninth largest in the United States. The property spans approximately 725 acres of Irvine hillside with 534 acres allocated for waste disposal. It is permitted for 11,500 tons per day (TPD) maximum with an 8,500 TPD annual average. The landfill has enough projected capacity to serve residents and businesses until approximately 2053.

The landfill is also the site for the world's first landfill gas to liquid natural gas project. Opened in 2016, the Bowerman Power Plant is an award-winning, public-private partnership producing electricity to 14,700 homes, as of March 2018. It generates electric power by capturing landfill gas created by the millions of tons of waste buried at the landfill. A natural byproduct of solid waste decomposition, the gas contains high amounts of methane, a prevalent greenhouse gas and source of energy. Annual energy production at this site is approximately 154,500 megawatt-hours (MWH). The Power Plant has won awards from the Association of Energy Engineers (AEE), the American Society of Civil Engineers (ASCE), and the Solid Waste Association of North America (SWANA).

Solid Waste Generation Rates and Volumes

The California Integrated Waste Management Act of 1989 (AB 939), requires each city or county's source reduction and recycling element to include an implementation schedule showing that a city or county must divert 50 percent of solid waste from landfill disposal or transformation on and after January 1, 2000. SB 1016, passed in 2008, required the 50 percent diversion requirement to be calculated in a per capita disposal rate equivalent. AB 341, passed in 2012, requires that California increase its diversion rate to 75% by 2020.

The California Department of Resources Recycling and Recovery (CalRecycle) tracks and monitors solid waste generation rates on a per capita basis. Per capita solid waste generation rates and total annual solid waste disposal volumes for the City of Lake Forest between 2011 and 2016 are shown in Table 7-3 below.

Table 7-3 Solid Waste Generation Rates in the City of Lake Forest

Year	Waste Generation Rates (pounds/person/day)		Total Disposal Tonnage (tons/year)
	Per Resident	Per Employee	
2011	4.6	10.3	65,028
2012	4.5	9.9	64,184
2013	4.4	9.6	64,771
2014	4.5	9.3	65,081
2015	4.4	9.1	64,856
2016	4.2	8.9	63,663

Source: Calrecycle. 2018. Jurisdiction Per Capita Disposal Trends. Available: http://www.calrecycle.ca.gov/LGCentral/Reports/Jurisdiction/ReviewReports.aspx Accessed July 2018.

The City of Lake Forest has complied with State requirements to reduce the volume of solid waste through recycling and reuse of solid waste. As shown in Table 7-3, both the per capita waste generation rates and the total annual disposal tonnage in Lake Forest were at their lowest levels (during this period) in 2016 (the latest year of information available). The City's per capita disposal rates in 2016 were 4.2 and 8.3 pounds per person per day for residents and employees, respectively. The City's per capita disposal rate satisfies the target rate established by CalRecycle (of 10.6 pounds/person/day for residents and 24.2 pounds/person/day for employees).

Hazardous Waste Disposal

Household hazardous waste are products that are flammable, corrosive, reactive or toxic. Examples of household hazardous waste include: automotive fluids, propane, paint and solvents, medical sharps, fertilizers, pool chemicals, cleaning products, pesticides, herbicides, and non-empty aerosol cans. Orange County operates year-round drop-off centers to collect household hazardous waste. The closest center to Lake Forest is in Irvine.

Separately, as of October 19, 2012, Assembly bill 1343 established the PaintCare Inc. program. The programs makes proper paint disposal more convenient for the public by setting up hundreds of new paint drop-off sites at retailers throughout the state. The closest drop-off location is currently located in Lake Forest at Sherwin-Williams (22500 Muirlands Boulevard).

Electronic waste (e-Waste) is anything with a circuit board or battery. It is illegal to dispose of e-Waste in any of the regular carts. CR&R will legally dispose of these items for a nominal fee.

Universal wastes are hazardous wastes that contain mercury, lead, cadmium, copper, and other substances hazardous to human and environment health. In general, universal waste may not be discarded in solid waste landfills or placed in any of your automated carts. Residents and businesses within Lake Forest can contact CC&R customer services to arrange a pick-up of E-waste or universal waste.

7.5 ELECTRICITY AND NATURAL GAS

Provided below is a discussion of the electricity and natural gas services that serve the City of Lake Forest.

State Regulatory Framework

Public Utilities Commission

The California Public Utilities Commission (PUC) is the primary State agency that regulates privately owned public utilities in California. These utilities include telecommunications, electricity, natural gas, water, railroad, rail transit, and passenger transportation companies. A primary role of the PUC is to authorize utility rate changes. It also establishes service standards and safety rules, monitors the safety of utility and transportation operations, prosecutes unlawful marketing and billing activities, and oversees the merger and restructure of utility corporations.

Bioenergy Action Plan – Executive Order #S-06-06

Executive Order #S-06-06 establishes targets for the use and production of biofuels and biopower, and directs State agencies to work together to advance biomass programs in California while providing environmental protection and mitigation. The executive order establishes the following target to increase the production and use of bioenergy, including ethanol and biodiesel fuels made from renewable resources: produce a minimum of 20% of its biofuels within California by 2010, 40% by 2020, and 75% by 2050. The executive order also calls for the State to meet a target for use of biomass electricity, including biomass cogeneration facilities.

Senate Bill 14 and Assembly Bill 64

Prior to the passage of SB 14 and AB 64 in 2009, California law required investor-owned utilities (IOUs) and energy service providers (ESPs) to increase their existing purchases of renewable energy by 1% of sales per year such that 20% of their retail sales, as measured by usage, are procured from eligible renewable resources (including biomass cogeneration) by December 31, 2010. This is known as the Renewable Portfolio Standard (RPS).

SB 14 and AB 64 require IOUs, POUs, and ESPs to increase their purchases of renewable energy such that at least 33% of retail sales are procured from renewable energy resources by December 31, 2020. For IOUs and ESPs, this is required only if the PUC determines that achieving these targets will result in just and reasonable rates.

Title 24

Title 24, Part 6, of the California Code of Regulations is also known as California's Energy Efficiency Standards for Residential and Nonresidential Buildings. Title 24 was established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. The 2008 Energy Efficiency Standards went into effect on January 1, 2010. Title 24, Part 11, of the California Code of Regulations establishes the California Green Building Standards Code (CalGreen). Initially, the code requirements were voluntary; however, CalGreen became mandatory in 2011. CalGreen addresses five areas of green building: 1) planning and design, 2) energy efficiency, 3) water efficiency and conservation, 4) material conservation and resources efficiency, and 5) environmental quality. The mandatory requirements are separated into non-residential and residential projects. CalGreen also includes two optional tiers: Tier 1 and Tier 2. The tiers employ higher thresholds that jurisdictions may adopt or that projects may meet voluntarily.

Southern California Edison and Southern California Gas Company

Southern California Edison (SCE) provides electrical service and Southern California Gas Company (SoCalGas) provides natural gas services to residences and businesses throughout the City of Lake Forest. SCE provides electricity service to 15 million people over an approximately 50,000 square mile area throughout southern California. SoCalGas provides natural gas service to approximately 21.6 million customers, spanning roughly 20,000 miles.

SCE generates electric power from many sources, including renewable, coal, hydroelectric powerhouses, natural gas, and nuclear sources. SCE also purchases power from independent power producers; generation sources from these producers can range from large fossil power plants to smaller renewable and cogeneration plants. After the power is produced or bought, it goes into SCE's electric transmission and distribution systems to get to the homes and businesses of SCE's customers. The electricity power mix for SCE in 2016 (for SCE as a whole, and for the portion sold to California customers only) is shown in the following table. As shown, approximately 25% of all electricity sold to California customers in 2016 were from eligible renewable energy resources.

Table 7-4 Southern California Edison – 2016 Power Content Label

SCE Energy Resources	SCE Power Mix	California Power Mix**
Eligible Renewable	28%	25%
Biomass & biowaste	1%	2%
Geothermal	7%	4%
Eligible hydroelectric	0%	2%
Solar	10%	8%
Wind	10%	9%
Coal	0%	4%
Large Hydroelectric	6%	10%
Natural Gas	19%	37%
Nuclear	6%	9%
Other	0%	0%
Unspecified sources*	41%	15%
TOTAL	100%	100%

Source: http://www.energy.ca.gov/pcl/labels/2016_labels/Southern_California_Edison-Default.pdf

** "Unspecified sources of power" means electricity from transactions that are not traceable to specific generation sources.*

*** Percentages are estimated annually by the California Energy Commission based on the electricity sold to California consumers during the identified year.*

SoCalGas provides natural gas to more than 21 million consumers through nearly 5.9 million meters in more than 500 communities. Most of the natural gas used in California comes from out-of-state natural gas basins. In 2012, California customers received 35% of their natural gas supply from basins located in the Southwest, 16% from Canada, 40% from the Rocky Mountains, and 9% from basins located within California. The vast majority of California's natural gas customers are residential and small commercial customers, referred to as "core" customers, who accounted for approximately 32% of the natural gas delivered by California utilities in 2012. SoCalGas is currently working on new ways to provide natural gas supplies to the growing number of automobiles in the Santa Ana region that rely on natural gas as a primary source of fuel.

Infrastructure to deliver electricity and natural gas throughout Lake Forest is currently in place. SCE and SoCalGas can generally can provide these services to newer development on request.

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7.6 FIRE PROTECTION AND EMERGENCY MEDICAL

Fire services in the City of Lake Forest are provided by the Orange County Fire Authority (OCFA). OCFA provides fire protection and suppression, inspection services, paramedic emergency medical services and hazardous material response.

Emergency medical transportation services in the City and the adjacent unincorporated Modjeska Canyon Area and Upper Trabuco/Cook Canyon Areas are provided by Care Ambulance Service.

State Regulatory Framework

California Occupational Safety and Health Administration

In accordance with California Code of Regulations Title 8 Sections 1270 "Fire Prevention" and 6773 "Fire Protection and Fire Equipment," the California Occupational Safety and Health Administration (Cal/OSHA) has established minimum standards for fire suppression and emergency medical services. The standards include, but are not limited to, guidelines on the handling of highly combustible materials, fire hose sizing requirements, restrictions on the use of compressed air, access roads, and the testing, maintenance, and use of all firefighting and emergency medical equipment.

Office of Emergency Services

The State of California passed legislation authorizing the Office of Emergency Services (OES) to prepare a Standard Emergency Management System (SEMS) program, which sets forth measures by which a jurisdiction should handle emergency disasters. Non-compliance with SEMS could result in the State withholding disaster relief from the non-complying jurisdiction in the event of an emergency disaster.

Local Regulatory Framework

City of Lake Forest General Plan

The existing City of Lake Forest General Plan identifies goals and policies related to fire protection services. For a full list of the City's goals and policies, please see the City's Current General Plan.

Fire Protection Services

The Orange County Fire Authority (OCFA) is a regional fire service agency that serves the City of Lake Forest as well as a total of 23 cities and all unincorporated areas in Orange County. The OCFA protects over 1,790,000 residents from its 72 fire stations located throughout Orange County. OCFA Reserve Firefighters work 10 stations throughout Orange County.

The mission of the OCFA is to "enhance public safety and meet the evolving needs of our communities through education, prevention, and emergency response."

Prior to the 1980s fire services for many of the cities of Orange County and unincorporated areas were provided by the California Department of Forestry. However, in 1980, the Orange County Fire Department (OCFD) was formed to take over firefighting responsibilities for the area. Since that time the organization has continued to grow and develop. In 1995 the Orange County Fire Authority (OCFA) was formed at which time the City of Lake Forest joined the OCFA's service area.

The OCFA now serves Orange County's 1.8 million residents, protecting 23 cities and unincorporated areas of Orange County which amounts to 571 square miles including 175,000 acres of wildland. The OCFA has a 97.3% service approval rating for its work in educating, preventing, and responding to emergency situations. Lake Forest is currently served by Division 5, Battalion 4 of the OCFA.

In 2017, the OCFA responded to a total of 5,514 incidents. Of these calls, the vast majority were associated with provision of emergency medical services.

Table 7-5 Fire Department Incident Type Report by Type

	2011	2012	2013	2014	2015	2016	2017
Population*	78,391	78,877	79,278	79,852	82,147	83,240	84,931
Square Miles	16.79	16.79	16.79	16.79	16.79	16.79	16.79
Fire Stations	3	3	3	3	3	3	3
Unit Responses	6,900	7,464	7,580	7,183	7,763	6,837	7,150
Fire Incidents	92	76	69	78	80	98	90
EMS Incidents	3,063	3,272	3,297	3,384	3,792	4,013	4,325
Other Incidents	1,014	1,028	1,074	936	1,002	1,083	1,099
Difference from Previous Year	-	5%	1%	-1%	11%	7%	6%
Total Incidents	**4,169**	**4,376**	**4,440**	**4,398**	**4,874**	**5,194**	**5,514**

*Source: Orange County Fire Association, Annual Report, http://www.ocfa.org/Transparency/Transparency.aspx#governance (2011, 2012, 2013, 2014, 2015, 2016, and 2017). *Population data from Census.*

Fire Stations

The Orange County Fire Department (OCFD) operates three fire stations within the City of Lake Forest, as shown on Figure 7-4.

- Fire Station 19 is located at 23022 El Toro Road.
- Fire Station 42, located at 19159 Ridgeline Road.
- Fire Station 54 is located at 19811 Pauling Avenue.

Fire Department Programs

The Orange County Fire Authority provides more than fire and emergency medical services. It operates a number of programs that include information on cooking fires, disaster preparedness, drowning prevention, fire safety, smoke alarm and home escape plans, the Ready, Set, Go! Wildfire Emergency Preparedness Action Plan, the Fire FRIENDS program, and information current wildfire danger. In 2017, the OCFA participated in a total of 107 community outreach and educational events as part of its mission to enhance the public safety through education.

Fire FRIENDS

Fire FRIENDS is a collaboration of community-based partners joining together with the common goal of reducing the number of deaths, burn injuries and property destruction caused by juvenile firesetting. The OCFA provides fire safety education and intervention to children with an interest in fire or explosives, and to those who have been involved in a firesetting incident. In situations where the behaviors or concerns appear to be more serious, the Fire FRIENDS program offers a referral for a free confidential behavioral health evaluation with an experienced behavioral health professional.

Ready, Set, Go! Wildfire Emergency Preparedness

The "Ready, Set, Go!" Action Plan, available to all City of Lake Forest residents on the Fire Department's website, is an easy to understand guide for how to make your home resistant to wildfires as well as preparing your family to leave early and safely. This process is called "Ready, Set, Go!" (RSG). The publication was prepared by the International Association of Fire Chief's RSG! Program and the U.S.D.A Forest Service, U.S. Department of the Interior, and the U.S. Fire Administration, in collaboration with the Lake Forest Fire Department.

The Action Plan describes the risks and responsibilities associated with living in a Wildland Urban Interface and Ember Zone, which is generally the area where residential development meets natural open space. Residents in these areas and on the wildland boundary should assist firefighters by providing "defensible space" around their home, effectively creating a buffer zone by removing weeds, brush, and other vegetation. The Action Plan also provides direction on how to make your home more fire resistant by selecting certain materials and design features that protect the home against fire and assist firefighters with defending the structure. Information is included to help people prepare their own Action Guide, including a checklist for getting ready, a checklist to ensure you're prepared to leave, and a checklist of how you should respond when it's time to leave.

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7.7 LAW ENFORCEMENT

Police Services for the City of Lake Forest are provided by contract with the Orange County Sheriff's Department (OCSD). The Sheriff's Department is responsible for providing the protection of citizens, the enforcement of laws, and crime prevention. Law enforcement services include patrol, traffic enforcement, accident analysis and investigation, parking enforcement, general and special investigations, and the Community Support Unit.

Local Regulatory Framework

City of Lake Forest General Plan

The existing City of Lake Forest General Plan identifies goals and policies related to law enforcement and police protection services. For a full list of the City's goals and policies, please see the City's Current General Plan.

Police Protection Services

The City of Lake Forest contracts with the Orange County Sheriff's Department for law enforcement. Lake Forest enjoys relatively low crime rate and was recognized in 2010 by a national firm as the 7th safest City in the United States (of cities with populations between 75,000 and 100,000).

The mission of the Orange County Sheriff's Department states: "The men and women of the Orange County Sheriff's Department are dedicated to the protection of all we serve. We provide exceptional law enforcement services free from prejudice or favor, with leadership, integrity, and respect."

The Orange County Sheriff's Department Staff include: five Sergeants, three Investigators, 38 Deputies, an Investigative Assistant, five Community Services Officers, and a Crime Prevention Specialist.

Services provided through the City include direct and preventative patrol, a Special Enforcement Team, Traffic Enforcement (motorcycle and commercial), a Homeless Liaison Officer, a deputy assigned to the regional Directed Enforcement Team, School Resource Officers, Bike Patrol, Neighborhood and Business Watch programs, as well as emergency preparedness classes for the community. In addition to these services, the sheriff's department also provides street and regional narcotics suppression programs, a Gang Enforcement Team, Mounted Unit, Special Weapons and Tactics Team (SWAT), Hostage Negotiations, the Drug Use is Life Abuse drug prevention program, and a complement of patrol-trained Reserve Deputy Sheriffs, many of whom volunteer their time for City events such as the Annual 4th of July Parade.

In addition to being responsible for the protection of citizens, the enforcement of laws, and crime prevention, the Orange County Sheriff's Department runs a number of programs including:

- The Orange County Sheriff's Department Citizen's Academy
- Stay Safe OC

The Citizen's Academy

The Citizens' Academy is a 9-week informational series designed to give citizens a view into the daily operations of the Orange County Sheriff's Department. It is an interactive course that includes instruction and field trips.

Stay Safe OC

Stay Safe OC is a partnership between the OC Sheriff's Department and the various communities it serves. It involves educational programs and resources that focus on reducing and preventing crime.

Other community policing and educational programs or services offered by the City of Lake Forest include:

- Alert OC
- Don't Make It Easy
- Homeless Program
- Neighborhood Watch
- Business Watch
- Crime Information
- Fingerprinting
- Shredding Program
- Vacation Home Checks

Nearby Jail Facility

The James A. Musick Facility is a one-hundred-acre minimum security facility known as "The Farm." The facility is located in an unincorporated area of the county near the cities of Irvine and Lake Forest. The inmates housed at the facility are considered to be a low security risk and most are in jail for crimes such as driving under the influence, minor drug possession, burglary, failure to pay child support, and or prostitution. Inmates and ICE detainees who have committed violent crimes, sex crimes or mayhem are not eligible for transfer to the facility.

The James A. Musick Facility provides custodial and rehabilitative programs for 1,322 adult male and female inmates and ICE detainees. Educational programs are available which enable the inmates to receive a G.E.D. while incarcerated. In addition, educational classes are offered in subjects such as; parenting, substance abuse, HiSET, and English as a Second Language (ESL). Vocational Classes that are offered at the facility includes; Cabinetry, Welding, and Workforce Readiness. The laundry facility at Musick also serves the Theo Lacy facility as well as Orange County Juvenile Hall in addition to the laundry needs for the Musick facility.

Crimes by Category in Lake Forest

Statistics on the number of crimes by category of crime in Lake Forest during each year from 2010 to 2015, as reported by the Federal Bureau of Investigation (FBI) Criminal Justice Information Services Division, are shown in Table 7-6 below.

Table 7-6 Crimes by Category

Category	2010	2011	2012	2013	2014	2015	2016
Population	75,780	78,172	79,166	79,336	79,748	80,798	83,511
Violent Crime	92	89	107	105	104	109	105
Homicide	0	2	0	2	0	0	0
Rape	8	1	8	12	19	15	17
Robbery	32	22	20	23	18	23	13
Aggravated Assault	52	64	79	68	67	71	75
Violent Crime Rate Per 100,000 Population	121.4	113.9	135.2	132.3	130.1	134.9	125.7
Property Crimes	959	947	1,088	813	682	908	746
Burglary	161	140	227	150	127	134	135
Larceny-Theft	736	763	798	620	493	684	533
Vehicle Theft	62	44	63	43	62	90	78
Arson	5	8	4	1	2	2	7
Property Crime Rate Per 100,000 Population	1,265.5	1,211.4	1,374.3	1,024.8	855.2	1,123.8	893.3

Source: Federal Bureau of Investigation, Criminal Justice Information Services Division, Offenses Known to Law Enforcement Tables, https://ucr.fbi.gov/crime-in-the-u.s/ *(2010, 2011, 2012, 2013, 2014, 2015, and 2016).*

As shown in the table, the majority of crimes committed in Lake Forest consist of non-violent property crimes, primarily larceny-theft.

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7.8 PARKS AND RECREATION

The City of Lake Forest's Community Services Department provides planning and coordination for City-wide events, recreation activities for youth, teen, adults, and seniors, and programming for the Sports Park and Skatepark. The City's Public Works Maintenance Division maintains the City's lakes, creeks, forests, parks, and open space. The City maintains 30 parks with the development of additional parks planned in the future. The City is currently updating 10 smaller City parks.

State Regulatory Framework

Quimby Act

The Quimby Act (California Government Code Section 66477) states that "the legislative body of a city or county may, by ordinance, require the dedication of land or impose a requirement of the payment of fees in lieu thereof, or a combination of both, for park or recreational purposes as a condition to the approval of a tentative or parcel map." Requirements of the Quimby Act apply only to the acquisition of new parkland and do not apply to the physical development of new park facilities or associated operations and maintenance costs. The Quimby Act seeks to preserve open space needed to develop parkland and recreational facilities; however, the actual development of parks and other recreational facilities is subject to discretionary approval and is evaluated on a case-by-case basis with new residential development. The City has adopted park fees as allowed by the Quimby Act, as described in greater detail below.

Local Regulatory Framework

City of Lake Forest Municipal Code

Title 13, Parks and Recreational Facilities, of the Lake Forest Municipal Code addresses the Parks and Recreation Commission, Operational Policies, Facilities, Skatepark Regulation, User Fees, Camping and Storage of Personal Property on Public Property, and the Naming of City Property.

City of Lake Forest General Plan

The existing Lake Forest General Plan includes goals and policies related to parks and recreation. For a full list of the City's goals and policies, please see the City's Current General Plan.

Types of Parks

The National Recreation and Parks Association (NRPA) has created a set of standards for classification of park and recreation facilities to help serve as a guide to planning. This classification system is to be used as a boilerplate set of standards to be modified to fit the individual municipality's needs. According to the NRPA classification system, parks are usually categorized according to their service area, size, function, and acres/1,000 population. The Recreation and Resources Element of the General Plan was updated by the City of Lake Forest in 2015. Below are descriptions of the three categories of parks as defined by the NRPA, as well as the standards created by the City of Lake Forest:

Mini Parks

These parks serve the recreational needs of a specific user group such as small children or senior citizens. These parks should be located within high density neighborhoods (condominium/apartment complexes, townhouse developments, or senior developments) in close proximity to the intended users and often serve as a substitute for backyards.

City standards:

- Desirable Size: 0.5 to 1.0 acre
- Service Area: < 0.25-mile radius
- Acres/Population: 0.25 to 0.5 acres/1,000 pop.

Neighborhood Parks

Neighborhood parks are designed for intense recreational activities such as: field games, court games, crafts, playground areas, picnicking, etc. These parks should be easily accessible to the neighboring population and geographically centered with safe bicycling or walking access.

City standards:

- Desirable Size: 1.0 to 10.0 acres

- Service Area: 0.25- to 0.5-mile radius
- Acres/Population: 1.0 to 2.0 acres/1,000 pop.

Community parks: This category of park generally offers a wide range of recreational amenities and facilities including: athletic complexes, swimming pools, arenas, sheltered picnic areas, playground facilities, and/or areas of natural quality for outdoor recreation. Amenities in community parks may vary depending on the park setting and the needs of the surrounding community.

City standards:

- Desirable Size: 10.0 to 25.0 acres
- Service Area: 1.0- to 2.0-mile radius
- Acres/Population: 5.0 to 8.0 acres/1,000 pop.

Within the City of Lake Forest, strict adherence to the NRPA classification system for park facilities is difficult because there are instances where parks may function as both neighborhood and community parks.

Regional Parks

This category of park generally offers a wide range of recreational amenities or allows access to open space. It attracts and serves people from all over the community as well as surrounding areas. The County of Orange owns and operates a number of regional parks including: Limestone/Whiting Wilderness Park, Heritage Hill Historical Park, and the O'Neill Regional Park. The Cleveland National Forest, located just east of the City, also offers recreational opportunities. The Lake Forest Sports Park is approximately 86 acres and attracts visitors from all over.

City Parks

A summary of existing City parks with notable amenities and locations is provided in Table 7-7 (opposite page), prepared by the City of Lake Forest. The location of these parks is also shown on Figure 7-5, which includes all public parks as well as private parks that are open to the public.

The City adopted standard for park space acreage is 5.0 acres for every 1,000 people. The City's 2017 population was approximately 84,931. With 294 acres of parkland, the City currently provides 3.5 acres of parkland for every 1,000 people, which is below the City's standard of 5.0 acres for every 1,000 people. The deficit in park land is currently being offset with the recreational opportunities available in the Limestone/Whiting Wilderness Park, private parks, and other nearby regional parks.

Trails

Lake Forest's trail system includes pedestrian and bike trails within open space corridors and along regional trails. The County maintains a coordinated system of trails, including bikeways, equestrian trails and hiking trails within the City. There are a number of proposed improvments including: off-street bike trail connecting Aliso Creek Trail with Serrano Creek in the northern portion of the City and Foothill Transportation Corridor; a riding and hiking trail that would follow the Borrego Wash; a connection between the Aliso Creek Trail and the Serrano Creek Trail; and a realignment of portions of Aliso Creek Riding and Hiking Trail. The location of the hiking trails, equestrian trails, and bicycle paths are shown on Figure 7-6.

References

City of Lake Forest. 2018. Parks and Recreation. Available at: https://www.lakeforestca.gov/159/Parks-Recreation.

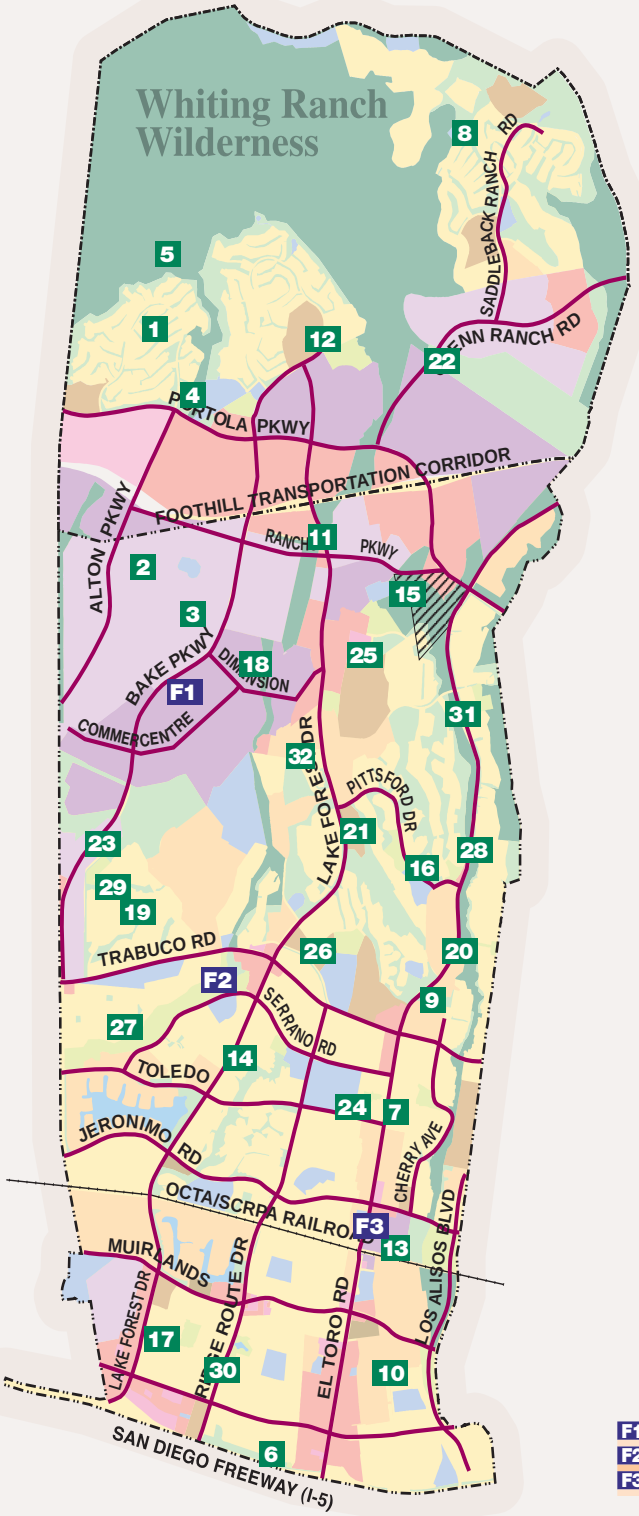
City of Lake Forest. 2018. Public Works Maintenance. Available at: https://www.lakeforestca.gov/250/Maintenance.

City of Lake Forest General Plan. 2018. Adopted 1994. Available at: https://www.lakeforestca.gov/292/Planning-Documents.

Table 7-7 Existing Park Facilities

City Of Lake Forest Park Guide

Parks Make Life Better!



CITY PARKS

		Acres	Barbecues	Baseball	Basketball	Multi-Use Fields	Outdoor Exercise Equipment	Picnic	Playground	Restrooms	Soccer	Tennis Court	Walking Path
1	Alton Park 18992 Alton Parkway	2.3	4		1 hc			9 1 s	1				
2	Baker Ranch Community Park 26380 Rancho Parkway	8	2	1	1	1		2	1	1	1		
3	Barker Ranch Dog Park 26500 Baffin Bay Drive	0.5											
4	Borrego Park 26982 Cabriole	11	5		1 fc			11	1	1	1		1
5	Borrego Overlook Park 21 Viaggio Lane	1.6	3					5	1				
6	Cavanaugh Mini Park 23782 Cavanaugh Road	0.2			1 hc			1	1				
7	Cherry Park 22651 Cherry Avenue	4.5	3		1 hc			9 1 s	1				
8	Concourse Park 18931 Saddleback Ranch Road	7	2		1 hc		1	4 2 s	2	1			1
9	Darrin Park 22461 Cherry Avenue	3.1	6		1 hc			11 1 s	1				
10	El Toro Park 23701 Los Alisos Boulevard	10	2				1	7 1 s	1	1		2 L	
11	Etnies Skatepark of Lake Forest 20028 Lake Forest Drive	5.3						3		1			
12	Foothill Ranch Community Park 19422 Rue De Valore	15.5		2	1 fc			9	2	1	1	2	1
13	Heroes Park 25420 Jeronimo Road	12.4	1	4 L		1 L		2		1			
14	Lake Forest Park 24000 Serrano Road	2.3							1				
15	Lake Forest Sports Park/ Recreation Center 28000 Rancho Parkway	86	8	5 L	2 L fc	3 L	1	8 s	2	2	5 L		1
16	Montbury Park 21962 Montbury Drive	3.5	1					2					
17	Mountain View Park 24061 Dylan Street	5.3	2	1	1 fc 1 hc		1	9 1 s	2	1		2 L	
18	Nature Park 26215 Dimension Drive	4.5						7 1 s					1
19	Peachwood Park 21132 Peachwood	2.7						5 1 s	1				
20	Pebble Creek Park 26441 Pebble Creek Road	1.9						1	1				
21	Pittsford Park 21701 Pittsford Drive	10	2					8 1 s	2	1		2	1
22	Portola Hills Park (Future Site)	5											
23	Rancho Serrano Park 20842 Paseo Sombra	5.1	3					7			1		
24	Ranchwood Park 22500 Killy Street	1.9			1 hc				1				
25	Regency Park Regency Lane & Osterman Road	5									1		
26	Rimgate Park 29772 Rimgate	5	1		1 fc			7 1 s	3	1		1	
27	Serrano Creek Park 25101 Serrano Road	44	3					13 1 s	1	1			1
28	Sundowner Park 22041 Sundowners Lane	0.8	1					2	1				
29	Tamarisk Park 22001 Tamarisk	11.2		1	1 fc			11	1	1			
30	Village Pond Park 23102 Ridge Route Drive	4.7						3					
31	Vintage Park 21000 Vintage Street	4.8	5		1 fc 1 hc			11	1				
32	Whispering Hills Park (Future Site)												

park shelter available for reservation

gymnasium

roller rinks

• fc full court • hc half court • L lights • s shelter

OTHER FACILITIES

F1	City Hall /Community Center	25550 Commercentre #100	461-3400
F2	Heritage Hill Historical Park	25151 Serrano Road	923-2230
F3	Lake Forest Golf	23308 Cherry Avenue	859-1455

7.9 COMMUNITY FACILITIES

Lake Forest is a proud community with strong support for public schools. There are nine public schools, which form a part of the Saddleback Valley Unified District as well as a number of parochial schools.

State Regulatory Framework

Leroy F. Greene School Facilities Act of 1998 (SB 50)

The "Leroy F. Greene School Facilities Act of 1998," also known as Senate Bill No. 50 or SB 50 (Chapter 407, Statutes of 1998), governs a school district's authority to levy school impact fees. This comprehensive legislation, together with the $9.2 billion education bond act approved by the voters in November 1998 known as "Proposition 1A," reformed methods of school construction financing in California. SB 50 instituted a new school facility program by which school districts can apply for State construction and modernization funds. It imposed limitations on the power of cities and counties to require mitigation of school facilities impacts as a condition of approving new development and provided the authority for school districts to levy fees at three different levels:

Level I fees are the current statutory fees allowed under Education Code 17620. This code section provides the basic authority for school districts to levy a fee against residential and commercial construction for the purpose of funding school construction or reconstruction of facilities. These fees vary by district for residential construction and commercial construction and are increased biannually.

Level II fees are outlined in Government Code Section 65995.5, allowing school districts to impose a higher fee on residential construction if certain conditions are met. These conditions include having a substantial percentage of students on multi-track year-round scheduling, having an assumed debt equal to 15–30% of the district's bonding capacity (percentage is based on revenue sources for repayment), having at least 20% of the district's teaching stations housed in relocatable classrooms, and having placed a local bond on the ballot in the past four years which received at least 50% plus one of the votes cast. A Facility Needs Assessment must demonstrate the need for new school facilities for unhoused pupils is attributable to projected enrollment growth from the construction of new residential units over the next five years.

Level III fees are outlined in Government Code Section 65995.7. If State funding becomes unavailable, this code section authorizes a school district that has been approved to collect Level II fees to collect a higher fee on residential construction. This fee is equal to twice the amount of Level II fees. However, if a district eventually receives State funding, this excess fee may be reimbursed to the developers or subtracted from the amount of State funding.

The Kindergarten-University Public Education Facilities Bond Act of 2002 (Prop 47)

This act was approved by California voters in November 2002 and provides for a bond issue of $13.05 billion to fund necessary education facilities to relieve overcrowding and to repair older schools. Funds will be targeted at areas of greatest need and must be spent according to strict accountability measures. Funds will also be used to upgrade and build new classrooms in the California Community Colleges, the California State University, and the University of California in order to provide adequate higher education facilities to accommodate growing student enrollment.

California Department of Education

The California Department of Education (CDE) School Facilities Planning Division (SFPD) prepared a School Site Selection and Approval Guide that provides criteria for locating appropriate school sites in the State of California. School site and size recommendations were changed by the CDE in 2000 to reflect various changes in educational conditions, such as lowering of class sizes and use of advanced technology. The expanded use of school buildings and grounds for community and agency joint use and concern for the safety of the students and staff members also influenced the modification of the CDE recommendations.

Specific recommendations for school size are provided in the School Site Analysis and Development Guide. This document suggests a ratio of 1:2 between buildings and land. CDE is aware that in a number of cases, primarily in urban settings, smaller sites cannot accommodate this ratio. In such cases, the SFPD may approve an amount of acreage less than the recommended gross site size and building-to-ground ratio.

- Certain health and safety requirements for school site selection are governed by State regulations and the policies of the SFPD relating to:
- Proximity to airports, high-voltage power transmission lines, railroads, and major roadways;
- Presence of toxic and hazardous substances;
- Hazardous facilities and hazardous air emissions within one-quarter mile;
- Proximity to high-pressure natural gas lines, propane storage facilities, gasoline lines, pressurized sewer lines, or high-pressure

water pipelines;

- Noise;
- Results of geological studies or soil analyses; and
- Traffic and school bus safety issues.

Local Regulatory Framework

City of Lake Forest General Plan

The City of Lake Forest General Plan contains goals and policies related to parks and recreation. For a full list of the City's goals and policies, please see the City's Current General Plan.

Public and Parochial Schools

The City of Lake Forest is served by the Saddleback Valley Unified School District as well as several parochial schools. Table 7-8 provides a summary of the schools serving the City's population.

Table 7-8 Schools Serving Lake Forest

School	Grades Served	Address	Enrollment (2016-2017)	Average Class Size
Public Elementary Schools				
Foothill Ranch Elementary	K-6	1 Torino Drive	1,133	29.15
La Madera	K-6	25350 Serrano Road	626	27.26
Lake Forest	K-6	21801 Pittsford Drive	894	25
Olivewood Elementary		23391 Dune Mear Road	490	28.28
Ralph A. Gates Elementary	K-6	23882 Landisview Avenue	1,059	30.21
Rancho Canada Elementary	K-6	21801 Winding Way	696	26.81
Santiago Elementary	K-6	24982 Rivendell Drive	414	26.43
Public Middle Schools				
Serrano Intermediate School	7-8	24642 Jeronimo Road	1,233	30.38[1]
Public High Schools				
El Toro High School	9-12	25255 Toledo Way	2,548	29.29[1]
Parochial Schools				
Grace Christian	PK-6	26052 Trabuco Road	480	Pre-K: <12 Elem: <20
Heritage Christian	7-12	23302 El Toro Road	196	22[2]
Lake Forest Montessori	PK-1	2535 Trabuco Rd Ste 5	87	13
Arbor Christian	PK-6	23302 El Toro Road	81	<12
Abiding Savior Lutheran	PK-8	23262 El Toro Road	360	<25

Sources: GreatSchools, School Profiles, August 2018, GreatSchools.org. Private School Review. https://www.privateschoolreview.com/ .

1. Average taken excluding class sizes for the following subject areas: self-contained classes & other instruction related assignments

2. For First through Sixth grade students only

Library System

Lake Forest is part of the Orange County Public Library system. The Orange County Public Library has a network of 33 libraries of which two are in Lake Forest: Foothill Ranch Library, and the El Toro Library.

The El Toro Library is located at 24672 Raymond Way. The library is open from 10 am to 7 pm Monday through Thursday, and 9 am to 5 pm Friday through Sunday.

The Foothill Ranch Library is located at 27002 Cabriole Way. The library is open The library is open from 10 am to 7 pm Monday through Thursday, and 9 am to 5 pm on Saturday. The library is closed on Friday and Sunday.

Lake Forest City Hall

Lake Forest City Hall is currently located at 25550 Commercentre Drive. A new Civic Center is under construction that once complete will house not only City Hall, but a range of community services. The new facility will be 12.5 acres and is envisioned as a gathering place with public facilities to meet some of the community's current unmet needs. It will include a Senior Center, City Hall, Council Chambers, Performing Arts Center, Community Policing Center, and Community Center.

The new Civic Center was designed along the following planning principles:

- Reflect Lake Forest. Emphasize the pastoral landscape, natural topography, and unique history that set Lake Forest apart from its neighbors.
- Be a destination. Develop the Civic Center complex as a destination through site location, architecture, and landscaping.
- Provide new amenities. Prioritize services at the Civic Center currently unavailable to the community.
- Accommodate multiple uses. Design the Civic Center buildings and amenities to accommodate multiple uses whenever possible.

Lake Forest Sports Park

The City of Lake Forest hosts a range of events and services at the Lake Forest Sports Park. The Sports Park includes a 27,000 square foot Recreation Center with a gymnasium, classrooms, and activity rooms. The City hosts a range of classes, youth and teen camps, special events, the preschool program, and youth and adult sports at this facility.

The 57 acre Sports Park opened in November 2014, and is one of the largest sports parks in Orange County. It includes a variety of amenities including:

- 5 Baseball/Softball Diamonds
- 3-Acre Common Lawns
- 27,000 Square Foot Recreation Center/Gymnasium
- Outdoor Exercise Equipment
- 2 Restroom and Concession Buildings
- 2 Synthetic Turf Soccer Fields with spectator seating areas
- 2 Outdoor Basketball Courts
- 8 Gazebo Picnic Structures
- 2 Playgrounds/Tot Lots
- Pet Friendly Park
- Free Wifi

References

City of Lake Forest. 2018. Public Libraries. Available at: https://www.lakeforestca.gov/441/Public-Libraries.

City of Lake Forest General Plan. 2018. Adopted 1994. Available at: https://www.lakeforestca.gov/292/Planning-Documents.

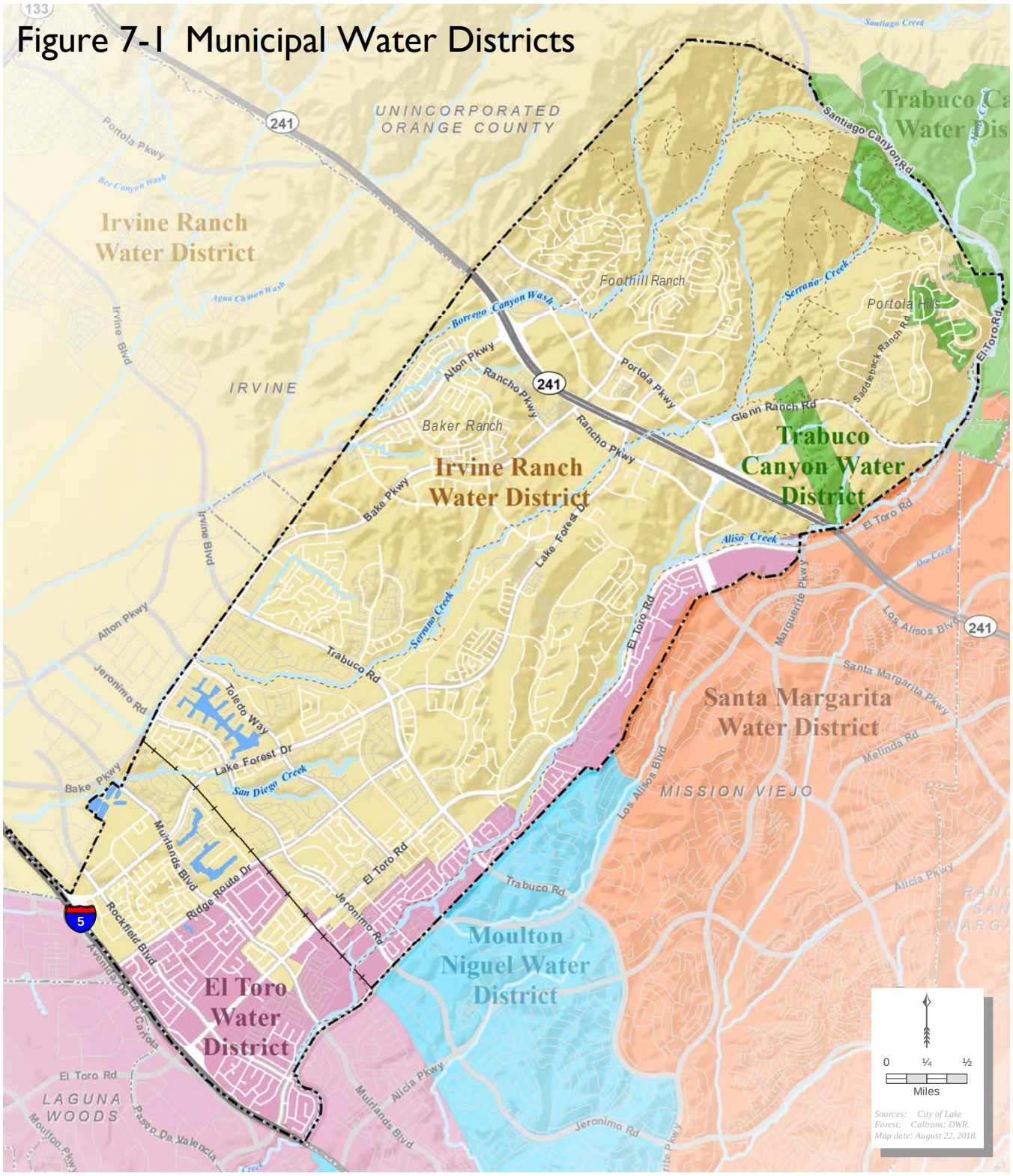
City of Lake Forest Sports Park and Recreation Center. Available at: http://lfsportspark.com/.

GreatSchools, School Profiles, August 2018, GreatSchools.org. Private School Review. https://www.privateschoolreview.com/.

Orange County, CA Public Libraries. 2018. Available at: http://www.ocpl.org/.

Saddleback Valley Unified School District. 2018. Available at: https://www.svusd.org/.

Figure 7-1 Municipal Water Districts



Legend

- El Toro Water District
- Irvine Ranch Water District
- Moulton Niguel Water District
- Santa Margarita Water District
- Trabuco Canyon Water District

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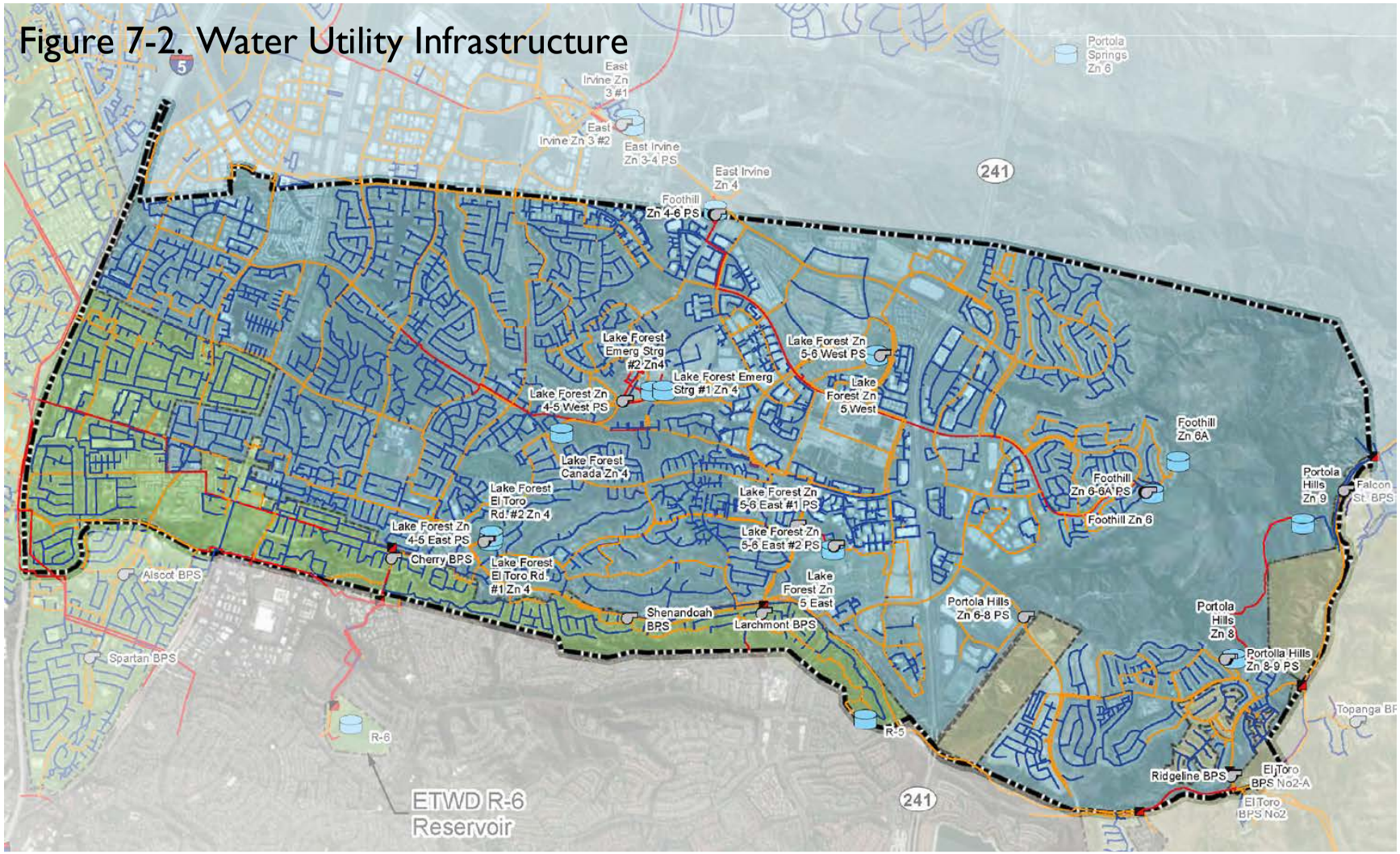
Figure 7-2. Water Utility Infrastructure



Legend

Water Infrastructure

Water Mains by Diameter

- No Data
- 2-8 inches
- 10-20 inches
- 21+ inches

- Pump Station
- Interconnection
- Reservoir

Boundaries

- City of Lake Forest
- El Toro Water District Boundary
- Irvine Ranch Water District Boundary
- Trabuco Canyon Water District Boundary

0 ¼ ½ Miles

Sources: West Yost Associates 6/26/2018. Map date: August 22, 2018.

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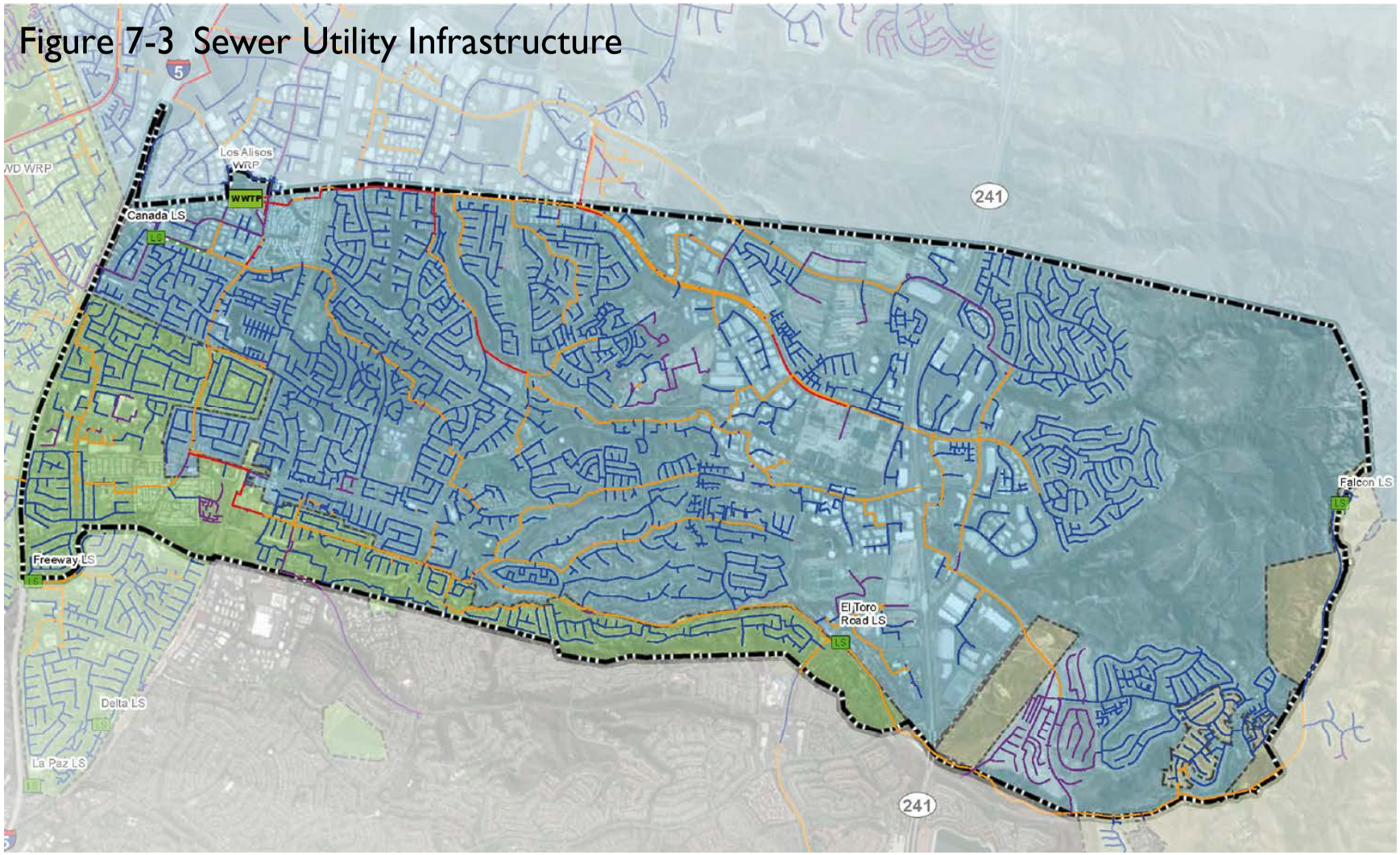
Figure 7-3 Sewer Utility Infrastructure



Legend

Sewer Infrastructure

Sewer Mains by Diameter

- No Data
- 2-8 inches
- 10-18 inches
- 21+ inches

- LS — Sewer Lift Station
- WWTP — Wastewater Treatment Plant

Boundaries

- City of Lake Forest
- El Toro Water District Boundary
- Irvine Ranch Water District Boundary
- Trabuco Canyon Water District Boundary

0 ¼ ½ Miles

Sources: West Yost Associates 6/26/2018. Map date: August 22, 2018.

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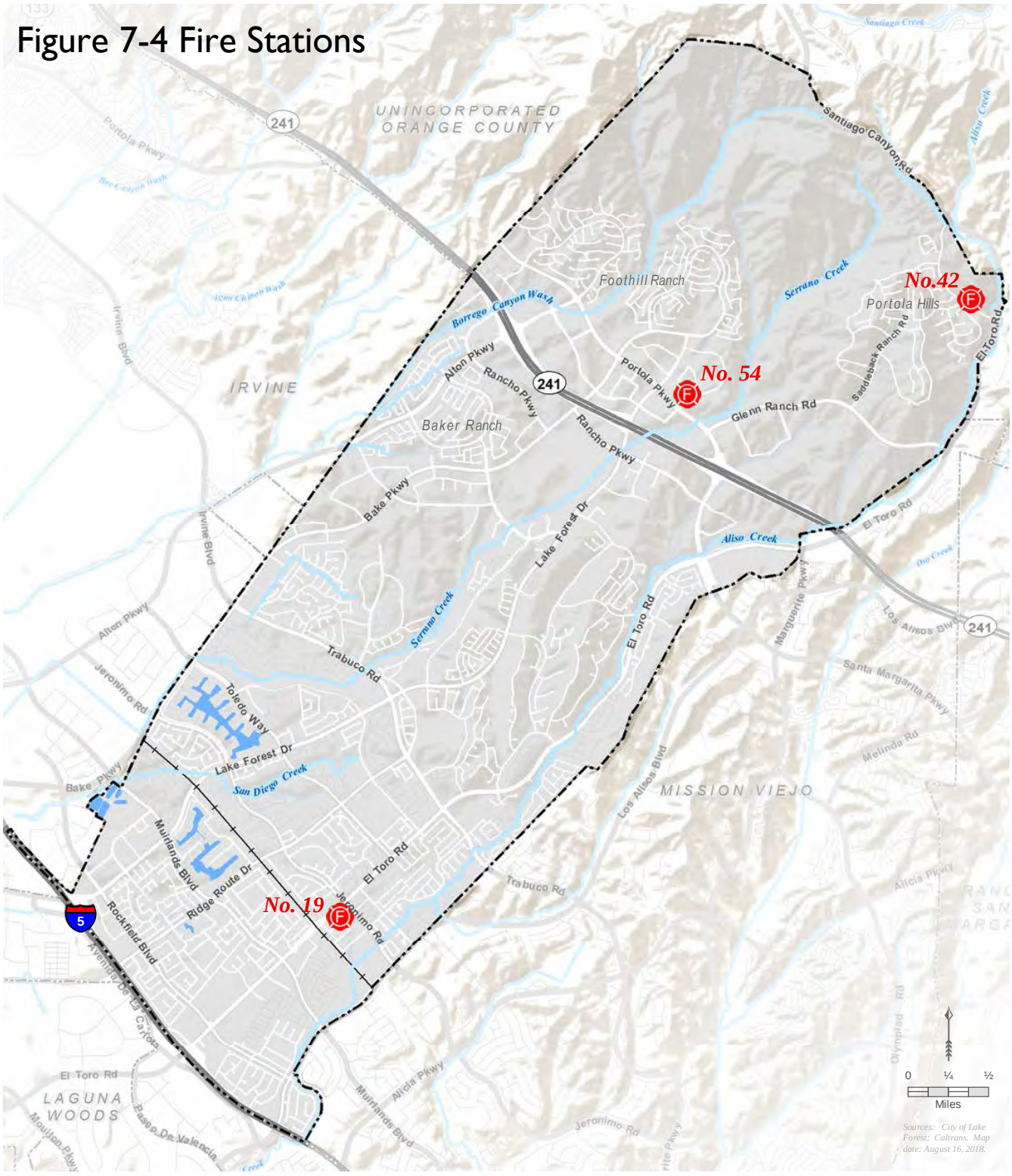
Figure 7-4 Fire Stations



Legend

- City of Lake Forest
- Other City Boundaries
- Orange County Fire Authority (OCFA) Station

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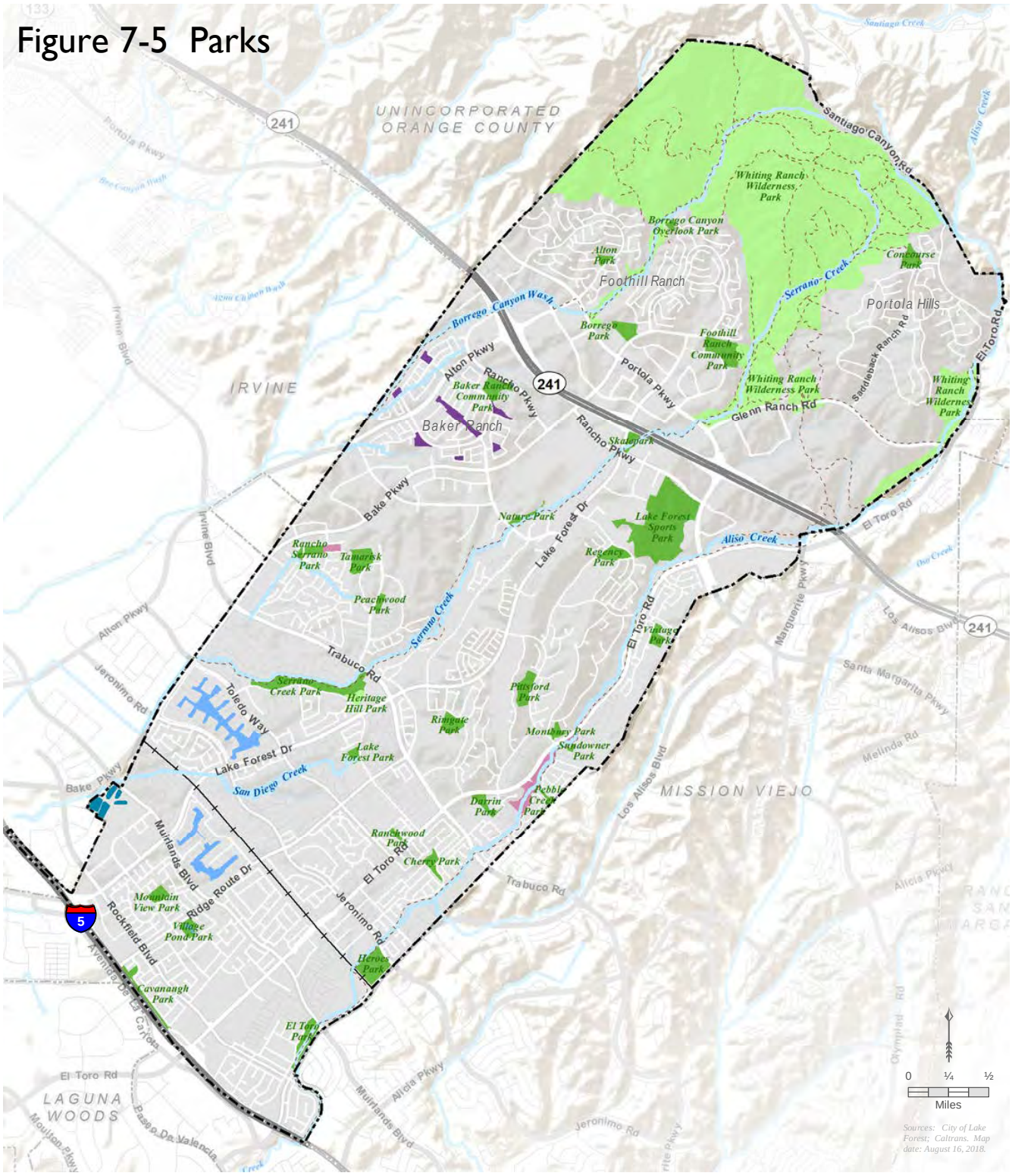
Figure 7-5 Parks



Legend

- City of Lake Forest
- Other City Boundaries
- Riding & Hiking Trails
- City Park
- County Park
- Private Park
- Private Park (Proposed)

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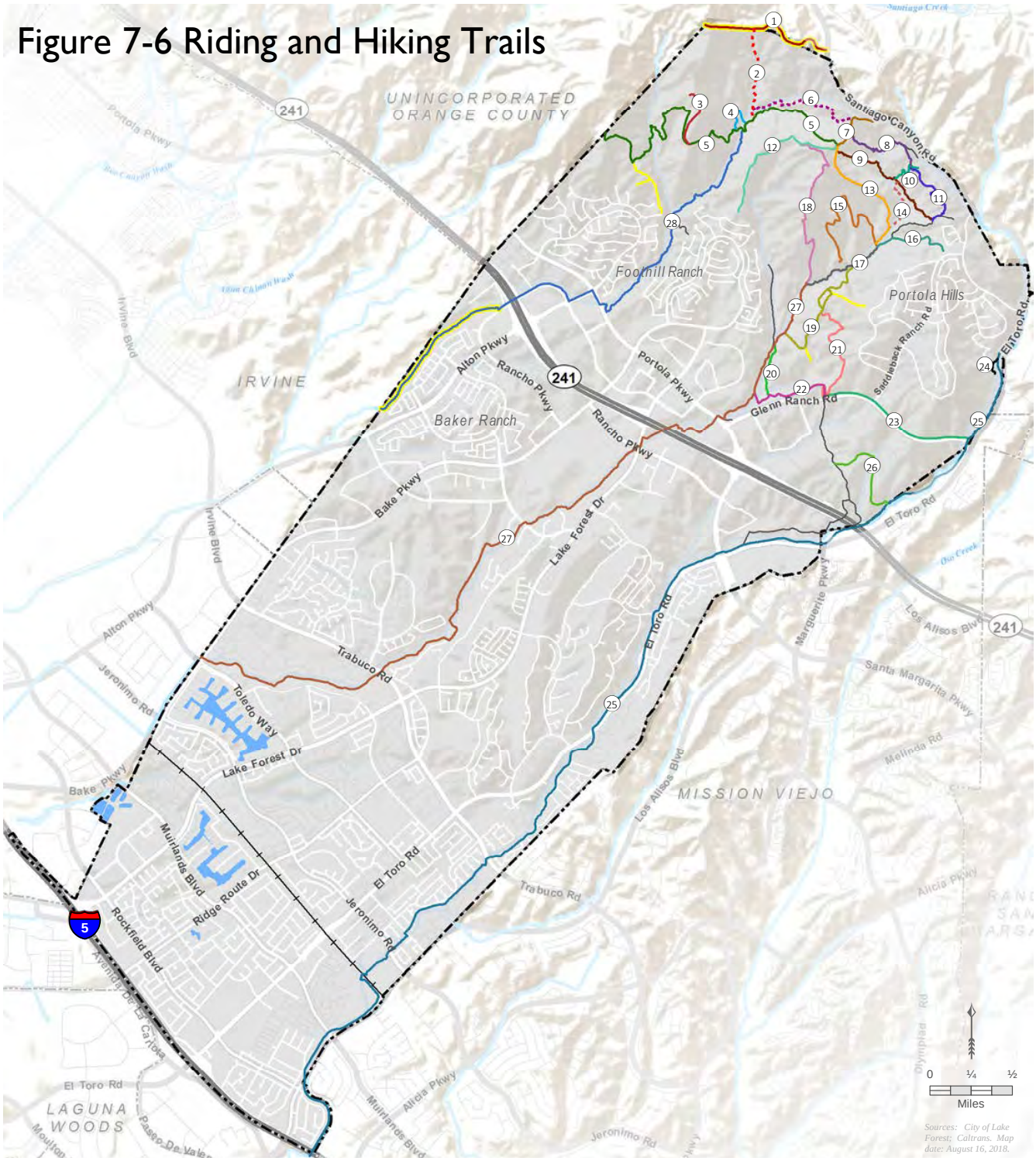
Figure 7-6 Riding and Hiking Trails



Legend

- Closed Trail
- Unnamed Trail
- 1-Bolero Lookout Road
- 2-Red Rock Trail (Hiking Only)
- 3-Vista Lookout Trail
- 4-Cattle Pond Loop
- 5-Mustard Road
- 6-Billy Goat Trail (Hiking Only)
- 7-Whiting Spur Road
- 8-Upper Pond Trail
- 9-Cactus Hill Trail
- 10-Santiago Ranch Road
- 11-Sage Scrub Trail
- 12-Water Tank Road
- 13-Whiting Road
- 14-Sleepy Hollow Trail (Hiking Only)
- 15-Edison Road
- 16-Whiting Access
- 17-Serrano Cow Trail
- 18-Dreaded Hill Road
- 19-Line Shack Road
- 20-Live Oak Trail
- 21-Coyote Brush Road
- 22-Raptor Road
- 23-Aliso-Serrano Trail
- 24-Mcfadden Ranch House Access
- 25-Aliso Creek Trail
- 26-Edison Riding & Hiking Trail
- 27-Serrano Creek Trail
- 28-Borrego Trail

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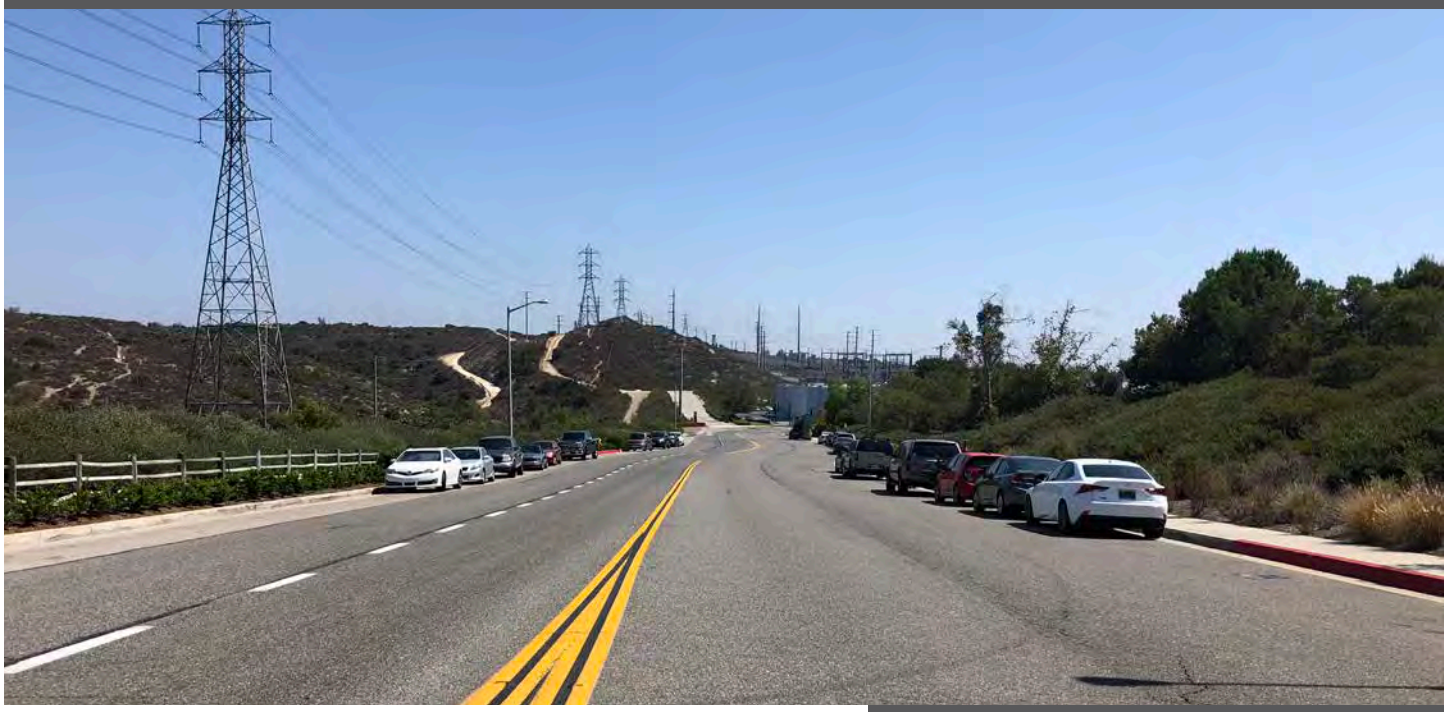
CHAPTER 8
HAZARDS, SAFETY AND NOISE



Issues and topics related to hazards, safety and noise within the Planning Area are addressed in this chapter. Some of these hazards may be naturally induced, such as wildfire hazards. Other health and safety hazards may be the result of natural hazards, which are exacerbated by human activity, such as development in areas prone to flooding. Additional hazards are entirely human-made, including airport crash hazards, exposure to hazardous materials, and noise.

This chapter includes the following topics:

Figures are located at the end of the chapter.

8.1 HAZARDOUS MATERIALS AND WASTE

A hazardous material is a substance or combination of substances which, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may either (1) cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating irreversible illness; or (2) pose a substantial present or potential hazard to human health and safety, or the environment when improperly treated, stored, transported, or disposed of. Hazardous materials are mainly present because of industries involving chemical byproducts from manufacturing, petrochemicals, and hazardous building materials.

Hazardous waste is the subset of hazardous materials that has been abandoned, discarded, or recycled and is not properly contained, including contaminated soil or groundwater with concentrations of chemicals, infectious agents, or toxic elements sufficiently high to increase human mortality or to destroy

the ecological environment. If a hazardous material is spilled and cannot be effectively picked up and used as a product, it is considered to be hazardous waste. If a hazardous material site is unused, and it is obvious there is no realistic intent to use the material, it is also considered to be a hazardous waste. Examples of hazardous materials include flammable and combustible materials, corrosives, explosives, oxidizers, poisons, materials that react violently with water, radioactive materials, and chemicals.

Federal Regulatory Framework

Comprehensive Environmental Response, Compensation & Liability Act (CERCLA)

This act, commonly associated with the term "Superfund," established:

Regulations concerning closed and abandoned hazardous waste sites

Liability of parties responsible for any releases of hazardous waste at these sites

Funding for cleanup when responsible parties cannot be identified

Resource Conservation and Recovery Act (RCRA)

This act established EPA's "cradle to grave" control (generation, transportation, treatment, storage and disposal) over hazardous materials and wastes. In California, the Department of Toxic Substances Control (DTSC) has RCRA authorization.

Clean Air Act

According to the Clean Air Act, the EPA has established National Emissions Standards for Hazardous Air Pollutants. Exceeding the emissions standard for a given air pollutant may cause an increase in illnesses and/or fatalities.

Clean Water Act

The CWA, which amended the WPCA of 1972, sets forth the §404 program to regulate the discharge of dredged and fill material into Waters of the U.S. and the §402 National Pollutant Discharge Elimination System (NPDES) to regulate the discharge of pollutants into Waters of the U.S. The §401 Water Quality Certification program establishes a framework of water quality protection for activities requiring a variety of Federal permits and approvals (including CWA §404, CWA §402, FERC Hydropower and §10 Rivers and Harbors).

State Regulatory Framework

California Health & Safety Code

Division 20 of the Health and Safety Code establishes DTSC authority and sets forth hazardous waste and underground storage tank regulations. In addition, the division creates a State superfund framework that mirrors the Federal program.

Division 26 of the Health and Safety Code establishes California Air Resources Board (CARB) authority. The division designates CARB as the air pollution control agency per Federal regulations and charges the Board with meeting Clean Air Act requirements.

Food and Agriculture Code

Division 6 of the California Food and Agricultural Code (FAC) establishes pesticide application regulations. The division establishes training standards for pilots conducting aerial applications as well as permitting and certification requirements.

Water Code

Division 7 of the California Water Code, commonly referred to as the Porter-Cologne Water Quality Control Act, created the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCB). In addition, water quality responsibilities are established for the SWRCB and RWQCBs.

California Code of Regulations

Title 3 of the California Code of Regulations (CCR) pertains to the application of pesticides and related chemicals. Parties applying regulated substances must continuously evaluate application equipment, the weather, the treated lands and all surrounding properties. Title 3 prohibits any application that would:

- Contaminate persons not involved in the application
- Damage non-target crops or animals or any other public or private property
- Contaminate public or private property or create health hazards on said property

Title 8 of the CCR establishes California Occupational Safety and Health Administration (Cal OSHA) requirements related to public and worker protection. Topics addressed in Title 8 include materials exposure limits, equipment requirements, protective clothing, hazardous materials, and accident prevention. Construction safety and exposure standards for lead and asbestos are set forth in Title 8.

Title 14 of the CCR establishes minimum standards for solid waste handling and disposal.

Title 17 of the CCR establishes regulations relating to the use and disturbance of materials containing naturally occurring asbestos.

Title 22 of the CCR sets forth definitions of hazardous waste and special waste. The section also identifies hazardous waste criteria and establishes regulations pertaining to the storage, transport, and disposal of hazardous waste.

Title 26 of the CCR is a medley of State regulations pertaining to hazardous materials and waste that are presented in other regulatory sections. Title 26 mandates specific management criteria related to hazardous materials identification, packaging, and disposal. In addition, Title 26 establishes requirements for hazardous materials transport, containment, treatment, and disposal. Finally, staff training standards are set forth in Title 26.

Title 27 of the CCR sets forth a variety of regulations relating to the construction, operation and maintenance of the State's landfills. The title establishes a landfill classification system and categories of waste. Each class of landfill is constructed to contain specific types of waste (household, inert, special, and hazardous).

Local Regulatory Framework

City of Lake Forest General Plan

The existing City of Lake Forest General Plan identifies Goals and Policies related to hazardous materials and waste. For a full list of the City's goals and policies, please see the City's Current General Plan.

City of Lake Forest Municipal Code

The City of Lake Forest Municipal Code is a primary tool that guides development in the City. Section 2.20.080 describes the responsibilities of the Lake Forest Disaster Council, including for the development of the City of Lake Forest Emergency Plan. Additionally, Chapter 6 of the Municipal Code provides requirements for dealing with hazardous materials, including hazardous waste. Provisions for protection from fire and flood hazards with the Lake Forest Municipal Code are provided elsewhere within this chapter.

Environmental Setting

Envirostor Data Management System

The DTSC maintains the Envirostor Data Management System, which provides information on hazardous waste facilities (both permitted and corrective action) as well as any available site cleanup information. This site cleanup information includes: Federal Superfund Sites (NPL), State Response Sites, Voluntary Cleanup Sites, School Cleanup Sites, Corrective Action Sites, Tiered Permit Sites, Military Evaluation Sites, and Evaluation/Investigation Sites. The hazardous waste facilities include: Permitted–Operating, Post-Closure Permitted, and Historical Non-Operating.

There are three locations with a Lake Forest address that are listed in the Envirostor database. The first location is located at 23512-23532 El Toro Road. The site was the historical location of Prothero Enterprises, a dry-cleaning facility (since 1979). The potential contaminants of concern include tetrachloroethylene (PCE) and trichloroethylene (TCE); the cleanup status states to "refer to local agency" (as of 2/27/2013). This is a voluntary cleanup site and Orange County is currently responsible for oversight of this investigation. Indoor air and soil vapor are potentially affected.

The second location within Lake Forest listed in the Envirostor database is located at 22641 Lake Forest Drive. The site was also the historical location of a dry cleaner. The potential contaminants of concern include tetrachloroethylene (PCE) and trichloroethylene (TCE); the cleanup status is active as of June 14, 2016. This is a voluntary cleanup site. Soil, soil vapor, and groundwater are potentially affected. A Voluntary Cleanup Agreement (VCA) to investigate and remediate the Site under DTSC oversight was fully executed on August 17, 2016. On June 30, 2017, DTSC approved a workplan for investigation activities which, focusing on the dry-cleaning facility, proposed soil and soil vapor sampling and a vapor intrusion assessment (sub-slab and indoor air sampling). Fieldwork activities were completed in early April 2018.

The third location within Lake Forest listed in the Envirostor database is 25255 Toledo Way. The site contains El Toro High School since 1974. The site was the historical location of agriculture with row crops. The potential contaminants of concern include polychlorinated biphenyls (PCBS) and TPH-Diesel; the cleanup status is "no further action" as of November 20, 2000.

Cortese List

The Hazardous Waste and Substances Sites (Cortese) List is a planning document used by the State, local agencies, and developers to comply with the California Environmental Quality Act requirements in providing information about the location of hazardous materials release sites. Government Code Section 65962.5 requires the California Environmental Protection Agency to develop at least annually an updated Cortese List. California Department of Toxic Substances Control (DTSC) is responsible for a portion of the information contained in the Cortese List. Other State and local government agencies are required to provide additional hazardous material release information for the Cortese List. There are no hazardous materials release sites located in the City of Lake Forest listed on the Cortese List.

GeoTracker

GeoTracker is the California Water Resource Control Board's data management system for managing sites that impact groundwater, especially those that require groundwater cleanup (Underground Storage Tanks, Department of Defense, Site Cleanup Program).

There are 52 locations within Lake Forest (i.e. with a Lake Forest address) that are listed in the GeoTracker database. Several locations have open cases. Table 8-1 lists the name, location, and status of each Geotracker cleanup site in Lake Forest.

Table 8-1 Geotracker Database Sites in Lake Forest

Site Name	*Site Type*	*Status*
ARCO (20572 Lake Forest)	LUST	Completed – Case Closed
ARCO #3013 (23742 El Toro)	LUST	Open – Site Assessment
Ascension Cemetery (24754 Trabuco)	LUST	Completed – Case Closed
Aspen Cleaners (22851 Lake Forest, Suite B)	Cleanup Program	Completed – Case Closed
Beacon Bay Auto Wash #06 (23602 El Toro)	LUST	Open - Remediation
Because Bay Auto Wash #12 (23581 Rockfield)	LUST	Open – Site Assessment
Because Bay Car Wash (20602 Lake Forest)	LUST	Completed – Case Closed
Cameo Homes (19812 El Toro)	Cleanup Program	Completed – Case Closed
Cameo Homes (19812 El Toro)	LUST	Completed – Case Closed
Chevron USA (23891 Bridger)	LUST	Completed – Case Closed
Chevron (22942 Ridge Route)	LUST	Completed – Case Closed
Chevron (23631 Rockfield)	LUST	Completed – Case Closed
Chevron (20731 Lake Forest)	LUST	Completed – Case Closed
Chevron #9-0884 (22942 Ridge Route)	LUST	Completed – Case Closed
Chevron Service Station #9-0141 (23891 Bridger)	LUST	Completed – Case Closed
Econo Lube N Tune (22861 Lake Forest)	LUST	Completed – Case Closed
El Toro High School (25255 Toledo)	LUST	Completed – Case Closed
El Toro High School (25255 Toledo)	School Site	No Further Action
El Toro Water District (24251 Los Alisos)	LUST	Completed – Case Closed
EXXON (23852 El Toro)	LUST	Completed – Case Closed
EXXON #7-6113 (21762 Lake Forest)	LUST	Completed – Case Closed
Former Crown Cleaners (24601 Raymond Way)	Cleanup Program	OPEN - ACTIVE
J & E Welding (23222 Olive)	LUST	Completed – Case Closed
Kenita Enterprises (24961 Whisler)	LUST	Completed – Case Closed
Lake Forest Town Center/Dry Cleaner (22641 Lake Forest)	Voluntary Cleanup	Active

Site Name	Site Type	Status
Los Alisos Water District (22312 Muirlands)	LUST	Completed – Case Closed
Los Alisos Water District (21802 Wisteria)	LUST	Completed – Case Closed
Mercury Cleaners (23804 Mercury)	Cleanup Program	Open - Remediation
MOBIL (21721 Lake Forest)	LUST	Completed – Case Closed
MOBIL #18-170 (22381 El Toro)	LUST	Completed – Case Closed
MOBIL #18-378 (23771 El Toro)	LUST	Open – Site Assessment
MOBIL OIL (23771 El Toro)	LUST	Completed – Case Closed
OC Fire Station #19 (23022 El Toro)	LUST	Completed – Case Closed
Orange County Fire Station #54 (19811 Pauling)	LUST	Completed – Case Closed
Prothero Enterprises Inc. (23512-23532 El Toro)	Voluntary Cleanup	Refer: Local Agency
Shell Oil (23842 El Toro)	LUST	Completed – Case Closed
Shell Oil (23751 El Toro)	LUST	Completed – Case Closed
Shell Oil (23652 Rockfield)	LUST	Completed – Case Closed
Shell Oil (21762 Lake Forest)	LUST	Completed – Case Closed
Southern California Edison (22641 Lake Forest)	LUST	Completed – Case Closed
Standard Concrete (20851 El Toro)	LUST	Completed – Case Closed
Texaco (23751 El Toro)	LUST	Completed – Case Closed
Texaco (23652 Rockfield)	LUST	Completed – Case Closed
Texaco (23652 Rockfield)	LUST	Completed – Case Closed
The Former Orange Tree Plaza Dry Cleaners (23532 El Toro)	Cleanup Program	Open - Active
The Orchard Shopping Center, Former Silver Cleaners (23684 El Toro)	Cleanup Program	Open – Site Assessment
The Shops at Lake Forest Shopping Center (24312-24422 Rockfield)	Cleanup Program	Open - Remediation – Land Use Restrictions
Unocal (22391 El Toro)	LUST	Completed – Case Closed
Unocal (24201 El Toro)	LUST	Completed – Case Closed
Unocal #6186 (24382 Muirlands)	LUST	Completed – Case Closed
USA Petroleum #825 (23852 El Toro)	LUST	Completed – Case Closed
USA Station #824 (26731 Portola)	LUST	Open – Site Assessment

Source: California Open Data Portal, 2018.

Solid Waste Information System (SWIS) Facility/Site Listing

The Solid Waste Information System (SWIS) is a database of solid waste facilities that is maintained by the California Integrated Waste Management Board (CIWMB). The SWIS data identifies active, planned and closed sites. There are two facilities listed in the SWIS database located in the City of Lake Forest. The first facility is the Serrano Creek Ranch Composting Operation (30-AB-0405), an active composting operation located at 25201 Trabuco Road. The second facility is the OC Public Works Portola Yard LVTO (30-AB-0450), an active 'Limited Volume Transfer Operation' facility, located at 20791 El Toro Road. There are no other SWIS solid waste facilities located in Lake Forest.

References

Data and Information found in this section primarily came from the following sources:

California Department of Resources Recycling and Recovery. 2018. http://www.calrecycle.ca.gov/SWFacilities/Directory/Search.aspx

California Department of Toxic Substances Control. 2018. Envirostor Database. http://www.envirostor.dtsc.ca.gov/public/

California Open Data Portal. 2018. Geotracker. https://data.ca.gov/dataset/geotracker

California Water Resources Control Board. 2018. https://geotracker.waterboards.ca.gov/

CalRecycle. 2018. SWIS Facility/Site Search. http://www.calrecycle.ca.gov/SWFacilities/Directory/Search.aspx

City of Lake Forest General Plan. 1994. http://www.lakeforestca.gov/292/Planning-Documents

City of Lake Forest Municipal Code. March 2018. https://qcode.us/codes/lakeforest/

8.2 AIR TRAFFIC

The State Division of Aeronautics has compiled extensive data regarding aircraft accidents around airports in California. This data is much more detailed and specific than data currently available from the FAA and the National Transportation Safety Board (NTSB). According to the California Airport Land Use Planning Handbook (2002), prepared by the State Division of Aeronautics, 18.2% of general aviation accidents occur during takeoff and initial climb and 44.2% of general aviation accidents occur during approach and landing. The State Division of Aeronautics has plotted accidents during these phases at airports across the country and has determined certain theoretical areas of high accident probability.

Approach and Landing Accidents

As nearly half of all general aviation accidents occur in the approach and landing phases of flight, considerable work has been done to determine the approximate probability of such accidents. Nearly 77% of accidents during this phase of flight occur during touchdown onto the runway or during the roll-out. These accidents typically consist of hard or long landings, ground loops (where the aircraft spins out on the ground), departures from the runway surface, etc. These types of accidents are rarely fatal and often do not involve other aircraft or structures. Commonly these accidents occur due to loss of control on the part of the pilot and, to some extent, weather conditions (California Division of Aeronautics, 2001).

The remaining 23% of accidents during the approach and landing phase of flight occur as the aircraft is maneuvered towards the runway for landing, in a portion of the airspace around the airport commonly called the traffic pattern. Common causes of approach accidents include the pilot's misjudging of the rate of descent, poor visibility, unexpected downdrafts, or tall objects beneath the final approach course. Improper use of rudder on an aircraft during the last turn toward the runway can sometimes result in a stall (a cross-control stall) and resultant spin, causing the aircraft to strike the ground directly below the aircraft. The types of events that lead to approach accidents tend to place the accident site fairly close to the extended runway centerline. The probability of accidents increases as the flight path nears the approach end of the runway (California Division of Aeronautics, 2001).

According to aircraft accident plotting provided by the State Division of Aeronautics, most accidents that occur during the approach and landing phase of flight occur on the airport surface itself. The remainder of accidents that occur during this phase of flight are generally clustered along the extended centerline of the runway, where the aircraft is flying closest to the ground and with the lowest airspeed (California Division of Aeronautics, 2001).

Takeoff and Departure Accidents

According to data collected by the State Division of Aeronautics, nearly 65% of all accidents during the takeoff and departure phase of flight occur during the initial climb phase, immediately after takeoff. This data is correlated by two physical constraints of general aviation aircraft:

- The takeoff and initial climb phase are times when the aircraft engine(s) is under maximum stress and is thus more susceptible to mechanical problems than at other phases of flight; and
- Average general aviation runways are not typically long enough to allow an aircraft that experiences a loss of power shortly after takeoff to land again and stop before the end of the runway.

While the majority of approach and landing accidents occur on or near to the centerline of the runway, accidents that occur during initial climb are more dispersed in their location as pilots are not attempting to get to any one specific point (such as a runway). Additionally, aircraft vary widely in payload, engine power, glide ratio, and several other factors that affect glide distance, handling characteristics after engine loss, and general response to engine failure. This further disperses the accident pattern. However, while the pattern is more dispersed than that seen for approach and landing accidents, the departure pattern is still generally localized in the direction of departure and within proximity of the centerline. This is partially due to the fact that pilots are trained to fly straight ahead and avoid turns when experiencing a loss of power or engine failure. Turning flight causes the aircraft to sink faster and flying straight allows for more time to attempt to fix the problem (California Division of Aeronautics, 2001).

Federal Regulatory Framework

Aviation Act of 1958

The Federal Aviation Act resulted in the creation of the Federal Aviation Administration (FAA). The FAA was charged with the creation and maintenance of a National Airspace System.

Federal Aviation Regulations (CFR, Title 14)

The Federal Aviation Regulations (FAR) establish regulations related to aircraft, aeronautics, and inspections and permitting.

State Regulatory Framework

Aeronautics Act (Public Utilities Code §21001)

The Caltrans Division of Aeronautics bases the majority of its aviation policies on the Aeronautics Act. Policies include permits and annual inspections for public airports and hospital heliports and recommendations for schools proposed within two miles of airport runways.

Airport Land Use Commission Law (Public Utilities Code §21670 et seq.)

The law, passed in 1967, authorized the creation of Airport Land Use Commissions (ALUC) in California. Per the Public Utilities Code, the purpose of an ALUC is to protect public health, safety, and welfare by encouraging orderly expansion of airports and the adoption of land use measures that minimizes exposure to excessive noise and safety hazards within areas around public airports to the extent that these areas are not already devoted to incompatible uses (§21670). Furthermore, each ALUC must prepare an Airport Land Use Compatibility Plan (ALUCP). Each ALUCP, which must be based on a twenty-year planning horizon, should focus on broadly defined noise and safety impacts.

Local Regulatory Framework

City of Lake Forest General Plan

The existing City of Lake Forest General Plan identifies policies related to airport facilities. For a full list of the City's goals and policies, please see the City's Current General Plan.

El Toro Marine Corps Air Station

Established in 1942, the El Toro Marine Corps Air Station occupied 4,700 acres of land adjacent to what would later become the City of Lake Forest. Until its decommissioning in 1999, the base was the largest Marine air station on the West Coast, channeling hundreds of aircraft through a flight path directly over the City. In the shadow of the flight path and exposed to safety hazards and noise, more than 800 acres of City land was restricted to industrial development. Then in 1993, the closure of the base was announced by the Federal Government, and a debate ensued over how the site should be repurposed. In the end, voters turned down the idea of building an international airport on the site which led the way to the City being able to discuss new ideas, including building housing. The City conducted a comprehensive "Opportunities Study" and rezoned of a number of parcels to allow for a broader range of uses. Although the El Toro Marine Corps Air Station is now closed, its impact continues to be felt on the development and history of the City of Lake Forest.

Environmental Setting

Major Regional Airport Facilities

John Wayne Airport (SNA): SNA is located to the west of the City, in the City of Santa Ana, in the northern part of Orange County. It offers limited international service. The National Plan of Integrated Airport Systems categorizes this airport as a primary commercial service airport, since it has over 10,000 passenger boardings per year.

Long Beach Airport (LGB): LGB is located to the north of the City, in the City of Long Beach. This airport is categorized as a primary commercial service airport by the National Plan of Integrated Airport Systems. FAA records show that the airport had 1,451,404 passengers in 2010.

Los Angeles International Airport (LAX): LAX is owned by the City of Los Angeles. The airport is located in the west of Los Angeles and is, by far, the busiest airport serving the Los Angeles region. It is the sixth busiest commercial airport in the world and the third busiest in the United States; in 2006, LAX handled over 61 million passengers and 2 million tons of cargo.

Ontario International Airport (ONT): ONT is owned by the City of Ontario and the county of San Bernardino, under a Joint Powers Agreement, as of November 1, 2016. This airport primarily serves the Inland Empire. This airport is located to the east, in the bedroom community of Ontario, California and is the next most prominent airport after LAX.

San Bernardino International Airport (SBD): SBD is in San Bernardino. It is the former Norton Air Force Base. The airport serves the inland empire and is in close proximity to both the Interstate 210 and Interstate 10, and is also in the proximity of historic Route 66.

Bob Hope Airport/Burbank Airport (BUR): BUR is located in Burbank, California, north of downtown. It is limited to a small number of passenger airlines and serves the San Fernando and San Gabriel Valleys. Burbank Airport is the only airport in the Los Angeles area to have a direct rail connection to Downtown Los Angeles. This airport serves the greater Los Angeles area. The FAA shows

that this airport had 2,239,804 passenger boardings in 2010.

Other Nearby Airport Facilities

Agua Dulce Airport: A public-use airport located 2 miles east of the central business district of Agua Dulce, Los Angeles County. This airport covers an area of 108 acres and contains one paved runway.

Catalina Airport: A privately owned airport located six miles northwest of the central business district of Avalon, California in the middle of Catalina Island. The airport is open to the public and allows general aviation aircraft to land there.

Compton/Woodley Airport: A Los Angeles County-owned public-use airport located two miles southwest of downtown Compton, in the southern portion of the County. The FAA's National Plan of Integrated Airport Systems has categorized this airport as a reliever airport.

San Gabriel Valley Airport/El Monte Airport: A public airport one mile north of El Monte, in Los Angeles County. This airport has one runway. In November 2014, the airport's name was officially changed from El Monte Airport to San Gabriel Valley Airport.

General William J. Fox Airfield: a Los Angeles County-owned, public airport in Los Angeles County, five miles northwest of Lancaster. Locally known as Fox Field, this airport primarily serves the Antelope Valley. It is categorized by the National Plan of Integrated Airport Systems as a general aviation facility.

Hawthorne Airport: A one-runway airport located one mile east of Hawthorne, Los Angeles County. This airport has one runway.

Palmdale Airport: An airport owned by the City of Palmdale, located in Palmdale. Palmdale Regional Airport has a small airline terminal and a hangar. The airport terminal is at the southwest corner of the airport and began civilian operations in 1971. The FAA's Los Angeles Air Route Traffic Control Center is next to the facility.

Santa Monica Airport: A general aviation airport in Santa Monica. The airport is about 2 miles from the Pacific Ocean and 6 miles north of LAX. It is categorized by the FAA's National Plan of Integrated Airport Systems as a reliver airport, and is expected to remain open until 2029.

Van Nuys Airport: A public airport in Van Nuys in the San Fernando Valley section of the City limits of Los Angeles. No major airlines fly into this airport. This airport is owned and operated by Los Angeles World Airports.

Whiteman Airport: A general aviation airport in the northeastern San Fernando Valley community of Pacoima, in Los Angeles. The airport is open to general aviation aircraft 24 hours per day, seven days per week. It is home to over 600 aircraft, a restaurant, and numerous aviation-related businesses.

Zamperini Airfield: A City of Los Angeles-owned public airport located three miles southwest of downtown Torrance, in Los Angeles County. The FAA classifies this airport as a Regional Reliever. This airport was once known as Torrance Municipal Airport.

National Transportation Safety Board Aviation Accident Database

The National Transportation Safety Board Aviation Accident Database identifies a total of 19 aircraft accidents at the John Wayne airport since 1998. The earliest record for an aircraft accident at the John Wayne Airport is July 16, 1982 (nonfatal). The most recent incident is from January 30, 2018 (fatal). The incident prior to this one occurred on December 26, 2017 (nonfatal). Out of the 19 recorded aircraft accidents at the John Wayne airport since 1998, four were fatal accidents causing a total of nine deaths (NTSB, 2018). These incidents were small-scale (primarily prop planes, helicopters, and other small planes) occurring during takeoff and landing from John Wayne Airport. None of these accidents occurred within the City of Lake Forest.

References

California Department of Transportation, Division of Aeronautics. 2001. California Airport Land Use Planning Handbook.

City of Lake Forest General Plan. 2018. Adopted 1994. Available at: https://www.lakeforestca.gov/292/Planning-Documents.

National Transportation Safety Board. 2018. Available at: https://www.ntsb.gov/_layouts/ntsb.aviation/index.aspx

8.3 FIRE HAZARDS

This section addresses the hazards associated with wildfires in the City of Lake Forest. The discussion of fire suppression resources is located in Chapter 7 (Community Services) of this report.

Federal Regulatory Setting

FY 2001 Appropriations Act

Title IV of the Appropriations Act required the identification of "Urban Wildland Interface Communities in the Vicinity of Federal Lands that are at High Risk from Wildfire" by the U.S. Departments of the Interior and Agriculture.

Disaster Mitigation Act (2000–present)

Section 104 of the Disaster Mitigation Act of 2000 (Public Law 106-390) enacted Section 322, Mitigation Planning of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, which created incentives for state and local entities to coordinate hazard mitigation planning and implementation efforts, and is an important source of funding for fuels mitigation efforts through hazard mitigation grants.

National Incident Management System (NIMS)

The City adopted NIMS, which provides a systematic, proactive approach to guide government agencies, nongovernmental organizations, and the private sector to work together to prevent, respond to, recover from, and mitigate the effects of incidents, regardless of cause, size, location, or complexity, in order to reduce the loss of life and property and harm to the environment. NIMS improves the City's ability to prepare for and respond to potential incidents and hazard scenarios.

National Fire Plan (NFP) 2000

The summer of 2000 marked a historic milestone in wildland fire records for the United States. Dry conditions (across the western United States), led to destructive wildfire events on an estimated 7.2 million acres, nearly double the 10-year average. Costs in damages including fire suppression activities were approximately 2.1 billion dollars. Congressional direction called for substantial new appropriations for wildland fire management. This resulted in action plans, interagency strategies, and the Western Governor's Association's "A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment - A 10-Year Comprehensive Strategy - Implementation Plan", which collectively became known as the National Fire Plan. This plan places a priority on collaborative work within communities to reduce their risk from large-scale wildfires.

Healthy Forest Initiative (HFI) 2002/Healthy Forest Restoration Act (HFRA) 2003

In August 2002, the Healthy Forests Initiative (HFI) was launched with the intent to reduce the severe wildfires risks that threaten people, communities, and the environment. Congress then passed the Healthy Forests Restoration Act (HFRA) on December 3, 2003 to provide the additional administrative tools needed to implement the HFI. The HFRA strengthened efforts to restore healthy forest conditions near communities by authorizing measures such as expedited environmental assessments for hazardous fuels projects on federal land. This Act emphasized the need for federal agencies to work collaboratively with communities in developing hazardous fuel reduction projects and places priority on fuel treatments identified by communities themselves in their Community Wildfire Protection Plans.

State Regulatory Framework

California Strategic Fire Plan

This statewide plan is a strategic document, which guides fire policy for much of California. The plan is aimed at reducing wildfire risk through pre-fire mitigation efforts tailored to local areas through assessments of fuels, hazards, and risks.

California State Multi-Hazard Mitigation Plan

The purpose of the State Multi-Hazard Mitigation Plan (SHMP) is to significantly reduce deaths, injuries, and other losses attributed to natural- and human-caused hazards in California. The SHMP provides guidance for hazard mitigation activities emphasizing partnerships among local, state, and federal agencies as well as the private sector.

California Government Code

California Government Code Section 65302.5 requires the State Board of Forestry and Fire Protection to provide recommendations to a local jurisdiction's General Plan fire safety element at the time that the General Plan is amended. While not a direct and binding fire prevention requirement for individuals, General Plans that adopt the Board's recommendations will include goals and policies that provide for contemporary fire prevention standards for the jurisdiction.

California Government Code Section 51175 defines Very High Fire Hazard Severity Zones and designates lands considered by the State to be a very high fire hazard.

California Government Code Section 51189 directs the Office of the State Fire Marshal to create building standards for wildland fire resistance. The code includes measures that increase the likelihood of a structure withstanding intrusion by fire (such as building design and construction requirements that use fire-resistant building materials) and provides protection of structure projections (such as porches, decks, balconies and eaves), and structure openings (such as attics, eave vents, and windows).

California Public Resources Code

The State's Fire Safe Regulations are set forth in Public Resources Code §4290, which include the establishment of State Responsibility Areas (SRA).

Public Resources Code §4291 sets forth defensible space requirements, which are applicable to anyone that …owns, leases, controls, operates, or maintains a building or structure in, upon, or adjoining a mountainous area, forest-covered lands, brush-covered lands, grass-covered lands, or land that is covered with flammable material (§4291(a)).

Public Resources Code § 4292-4296 and 14 CCR 1256: Fire Prevention for Electrical Utilities address the vegetation clearance standards for electrical utilities. They include the standards for clearing around energy lines and conductors such as power-line hardware and power poles. These regulations are critical to wildland fire safety because of the substantial number of power lines in wildlands, the historic source of fire ignitions associated with power lines, and the extensive damage that results from power line caused wildfires in severe wind conditions.

Assembly Bill 337

Per AB 337, local fire prevention authorities and the California Department of Forestry and Fire Protection (CalFire) are required to identify "Very High Fire Hazard Severity Zones (VHFHSZ) in Local Responsibility Areas (LRA). Standards related to brush clearance and the use of fire resistant materials in fire hazard severity zones are also established.

Uniform Fire Code

The Uniform Fire Code (UFC) establishes standards related to the design, construction, and maintenance of buildings. The standards set forth in the UFC range from designing for access by firefighters and equipment and minimum requirements for automatic sprinklers and fire hydrants to the appropriate storage and use of combustible materials.

CA Code of Regulations Title 8

In accordance with CCR, Title 8, §1270 and §6773 (Fire Prevention and Fire Protection and Fire Equipment), the Occupational Safety and Health Administration (Cal OSHA) establishes fire suppression service standards. The standards range from fire hose size requirements to the design of emergency access roads.

CA Code of Regulations Title 14 (Natural Resources)

Division 1.5 (Department of Forestry and Fire Protection), Title 14 of the CCR establishes a variety of wildfire preparedness, prevention, and response regulations.

CA Code of Regulations Title 19 (Public Safety)

Title 19 of the CCR establishes a variety of emergency fire response, fire prevention, and construction and construction materials standards.

CA Code of Regulations Title 24 (CA Building Standards Code)

The California Fire Code is set forth in Part 9 of the Building Standards Code. The CA Fire Code, which is pre-assembled with the International Fire Code by the ICC, contains fire-safety building standards referenced in other parts of Title 24.

CA Health and Safety Code and UBC Section 13000 et seq.

State fire regulations are set forth in §13000 et seq. of the California Health and Safety Code, which is divided into "Fires and Fire Protection" and "Buildings Used by the Public." The regulations provide for the enforcement of the UBC and mandate the abatement of fire hazards.

The code establishes broadly applicable regulations, such as standards for buildings and fire protection devices, in addition to regulations for specific land uses, such as childcare facilities and high-rise structures.

CA Health and Safety Code Division 11 (Explosives)

Division 11 of the Health and Safety Code establishes regulations related to a variety of explosive substances and devices, including high explosives and fireworks. Section 12000 et seq. establishes regulations related to explosives and explosive devices, including permitting, handling, storage, and transport (in quantities greater than 1,000 pounds).

CA Health and Safety Code Division 12.5 (Buildings Used by the Public)

This Division establishes requirements for buildings used by the public, including essential services buildings, earthquake hazard mitigation technologies, school buildings, and postsecondary buildings.

CA Vehicle Code §31600 (Transportation of Explosives)

Establishes requirements related to the transportation of explosives in quantities greater than 1,000 pounds, including licensing and route identification.

Local Regulatory Framework

City of Lake Forest Municipal Code

Title 6- Health and Sanitation (6.16 Hazardous Materials); this section discusses hazardous materials including disclosure to the Orange County Fire Department.

Title 7 – Subdivisions (7.08.145 Fire Protection); this section discusses the requirements for subdivisions in high or extremely high hazard areas including providing appropriate fire protection by means of fire breaks, fuel modification programs, access roads, sufficient water supply, landscaping, and open spaces.

Title 8- Buildings and Construction (8.24 Fire Code); this section includes the adoption of the 2016 California Fire code and the adoption of additional amendments.

Title 9- Planning and Zoning (9.144.070.7 Public display of fireworks); this section covers public firework displays including requiring permits from the Orange County Fire Authority or Fire Chief.

Title 11- Peace and Safety (11.56 Fire Alarm Systems); this section covers regulations relating to fire alarm systems.

City of Lake Forest General Plan

The existing City of Lake Forest General Plan identifies goals and policies related to fire protection services. For a full list of the City's goals and policies, please see the City's Current General Plan.

Identifying Fire Hazards

Fuel Rank

Fuel rank is a ranking system developed by CalFire that incorporates four wildfire factors: fuel model, slope, ladder index, and crown index.

The U.S. Forest Service has developed a series of fuel models, which categorize fuels based on burn characteristics. These fuel models help predict fire behavior. In addition to fuel characteristics, slope is an important contributor to fire hazard levels. A surface ranking system has been developed by CalFire, which incorporates the applicable fuel models and slope data. The model categorizes slope into six ranges: 0-10%, 11-25%, 26-40%, 41-55%, 56-75% and >75%. The combined fuel model and slope data are organized into three categories, referred to as surface rank. Thus, surface rank is a reflection of the quantity and burn characteristics of the fuels and the topography in a given area.

The ladder index is a reflection of the distance from the ground to the lowest leafy vegetation for tree and plant species. The crown index is a reflection of the quantity of leafy vegetation present within individual specimens of a given species.

The surface rank, ladder index, and crown index for a given area are combined in order to establish a fuel rank of medium, high, or very high. Fuel rank is used by CalFire to identify areas in the California Fire Plan where large, catastrophic fires are most likely.

The fuel rank data are used by CalFire to delineate fire threat based on a system of ordinal ranking. Thus, the Fire Threat model creates discrete regions, which reflect fire probability and predicted fire behavior. The four classes of fire threat range from moderate to extreme.

Fire Hazard Severity Zones

The state has charged CalFire with the identification of Fire Hazard Severity Zones (FHSZ) within State Responsibility Areas. In

addition, CalFire must recommend Very High Fire Hazard Severity Zones (VHFHSZ) identified within any Local Responsibility Areas. The FHSZ maps are used by the State Fire Marshall as a basis for the adoption of applicable building code standards. The Planning Area includes only Local Responsibility Areas with State Responsibility Areas to the north just outside city boundaries. Figure 8-1 shows Fire Hazard Severity Zones near Lake Forest while Figure 8-2 shows Fire Threat to People.

Local Responsibility Areas

Local Responsibility Areas (LRA) covers all of the City of Lake Forest. The City of Lake Forest is served by the Orange County Fire Authority. Most of the Foothill Ranch and Portola Hills area is within the very high Fire Hazard Severity Zone.

State Responsibility Areas

State Responsibility Areas (SRA) are found to north of the City in unincorporated areas of the county. Some of these areas are within the Very High Fire Hazard Severity Zone in an SRA.

Fire Threat to People

Most of the area north of Trabuco is in an area that is considered either very high or extremely high Fire Threat to People.

References

Data and information in this section primarily came from the following sources:

California Department of Forestry and Fire Protection and State Board of Forestry and Fire Protection. 2010. 2010 Strategic Fire Plan for California.

California Department of Forestry and Fire Protection. 2017. http://www.fire.ca.gov

City of Lake Forest General Plan. 2018. Adopted 1994. Available at: https://www.lakeforestca.gov/292/Planning-Documents.

8.4 FLOODING

This section addresses the hazards associated with flooding in the Planning Area. The discussion of storm drainage infrastructure is located in Chapter 7 (Community Services) of this report. The discussion of hydrological conditions and water quality is located in Chapter 9 (Conservation).

Federal Regulatory Framework

Federal Emergency Management Agency (FEMA)

FEMA operates the National Flood Insurance Program (NFIP). Participants in the NFIP must satisfy certain mandated floodplain management criteria. The National Flood Insurance Act of 1968 has adopted as a desired level of protection, an expectation that developments should be protected from floodwater damage of the Intermediate Regional Flood (IRF). The IRF is defined as a flood that has an average frequency of occurrence on the order of once in 100 years, although such a flood may occur in any given year. Communities are occasionally audited by the California Department of Water Resources to insure the proper implementation of FEMA floodplain management regulations.

Rivers and Harbors Appropriation Act of 1899

One of the country's first environmental laws, this Act established a regulatory program to address activities that could affect navigation in Waters of the United States.

Water Pollution Control Act of 1972

The Water Pollution Control Act (WPCA) established a program to regulate activities that result in the discharge of pollutants to waters of the United States

Clean Water Act of 1977

The CWA, which amended the WPCA of 1972, sets forth the §404 program to regulate the discharge of dredged and fill material into Waters of the U.S. and the §402 National Pollutant Discharge Elimination System (NPDES) to regulate the discharge of pollutants into Waters of the U.S. The §401 Water Quality Certification program establishes a framework of water quality protection for activities requiring a variety of Federal permits and approvals (including CWA §404, CWA §402, FERC Hydropower and §10 Rivers and Harbors).

Flood Control Act

The Flood Control Act (1917) established survey and cost estimate requirements for flood hazards in the Sacramento Valley. All levees and structures constructed per the Act were to be maintained locally but controlled federally. All rights of way necessary for the construction of flood control infrastructure were to be provided to the Federal government at no cost.

Federal involvement in the construction of flood control infrastructure, primarily dams and levees, became more pronounced upon passage of the Flood Control Act of 1936.

National Flood Insurance Program (NFIP)

Per the National Flood Insurance Act of 1968, the NFIP has three fundamental purposes: ***Better indemnify individuals for flood losses through insurance; Reduce future flood damages through State and community floodplain management regulations; and Reduce Federal expenditures for disaster assistance and flood control.***

While the Act provided for subsidized flood insurance for existing structures, the provision of flood insurance by FEMA became contingent on the adoption of floodplain regulations at the local level.

Flood Disaster Protection Act (FDPA)

The FDPA of 1973 was a response to the shortcomings of the NFIP, which were experienced during the flood season of 1972. The FDPA prohibited Federal assistance, including acquisition, construction, and financial assistance, within delineated floodplains in non-participating NFIP communities. Furthermore, all Federal agencies and/or federally insured and federally regulated lenders must require flood insurance for all acquisitions or developments in designated Special Flood Hazard Areas (SFHAs) in communities that participate in the NFIP.

Improvements, construction, and developments within SFHAs are generally subject to the following standards:

- All new construction and substantial improvements of residential buildings must have the lowest floor (including basement) elevated to or above the base flood elevation (BFE).

- All new construction and substantial improvements of non-residential buildings must either have the lowest floor (including basement) elevated to or above the BFE or dry-floodproofed to the BFE.
- Buildings can be elevated to or above the BFE using fill, or they can be elevated on extended foundation walls or other enclosure walls, on piles, or on columns.
- Extended foundation or other enclosure walls must be designed and constructed to withstand hydrostatic pressure and be constructed with flood-resistant materials and contain openings that will permit the automatic entry and exit of floodwaters. Any enclosed area below the BFE can only be used for the parking of vehicles, building access, or storage.

State Regulatory Framework

Assembly Bill 162

This bill requires a General Plan's land use element to identify and annually review those areas covered by the General Plan that are subject to flooding as identified by flood plain mapping prepared by the Federal Emergency Management Agency (FEMA) or the Department of Water Resources (DWR). The bill also requires, upon the next revision of the housing element, on or after January 1, 2009, the conservation element of the General Plan to identify rivers, creeks, streams, flood corridors, riparian habitat, and land that may accommodate floodwater for purposes of groundwater recharge and stormwater management. By imposing new duties on local public officials, the bill creates a State-mandated local program.

This bill also requires, upon the next revision of the housing element, on or after January 1, 2009, the safety element to identify, among other things, information regarding flood hazards and to establish a set of comprehensive goals, policies, and objectives, based on specified information for the protection of the community from, among other things, the unreasonable risks of flooding.

Assembly Bill 70

This bill provides that a city or county may be required to contribute its fair and reasonable share of the property damage caused by a flood to the extent that it has increased the State's exposure to liability for property damage by unreasonably approving, as defined, new development in a previously undeveloped area, as defined, that is protected by a State flood control project, unless the City or county meets specified requirements.

CA Government Code

The Senate and Assembly bills identified above have resulted in various changes and additions to the California Government Code. Key sections related to the above referenced bills are identified below.

Section 8589.4

California Government Code §8589.4, commonly referred to as the Potential Flooding-Dam Inundation Act, requires owners of dams to prepare maps showing potential inundation areas in the event of dam failure. A dam failure inundation zone is different from a flood hazard zone under the National Flood Insurance Program (NFIP). NFIP flood zones are areas along streams or coasts where storm flooding is possible from a "100-year flood." In contrast, a dam failure inundation zone is the area downstream from a dam that could be flooded in the event of dam failure due to an earthquake or other catastrophe. Dam failure inundation maps are reviewed and approved by the California Office of Emergency Services (OES). Sellers of real estate within inundation zones are required to disclose this information to prospective buyers.

Local Regulatory Framework

City of Lake Forest Municipal Code

Chapter 8.70 (Flood Damage Prevention and Floodplain Management) of the City of Lake Forest Municipal Code provides standards provisions for flood hazard reduction for flood-prone areas within Lake Forest. It includes floodplain management regulations to promote the public health, safety, and general welfare of the public and to minimize the potential for private losses due to flood conditions.

Environmental Setting

Flooding is a temporary increase in water flow that overtops the banks of a river, stream, or drainage channel to inundate adjacent areas not normally covered by water.

Much of Lake Forest has steep topography and a minimal risk of flooding. However, there are a few low-lying areas of the City where storm water can percolate into the ground. Nevertheless, the steep topography and large amounts of paved area reduce infiltration and increase surface runoff, which can increase the risk of localized flooding. Localized flooding may occur in low

spots or where infrastructure is unable to accommodate peak flows during a storm event. In most cases, water dissipates quickly after heavy rain ceases. For additional information on stormwater and drainage infrastructure see Chapter 7 (Community Services and Facilities).

FEMA Flood Zones

FEMA mapping provides important guidance for the City in planning for flooding events and regulating development within identified flood hazard areas. FEMA's National Flood Insurance Program (NFIP) is intended to encourage State and local governments to adopt responsible floodplain management programs and flood measures. As part of the program, the NFIP defines floodplain and floodway boundaries that are shown on Flood Insurance Rate Maps (FIRMs). The FEMA FIRM for the Planning Area is shown on Figure 8-3.

As shown in Figure 8-3, only a small area within Lake Forest is located within a mapped portion of either the 100-year and 500-year FEMA flood zones. The areas documented to be subject to 100-year and 500-year flooding within Lake Forest are located along Aliso Creek, Serrano Creek, Borrego Canyon Wash, San Diego Creek, and the lakes. Risk of flooding along these areas is limited, since flooding within this location would be likely to only affect a small area outside of the normal creek bed. The largest area of Lake Forest within the 100-year and 500-year FEMA flood zones is along the Aliso Creek bed and bike trail near Heroes Park along the eastern edge of the City. Nevertheless, areas within FEMA flood zones within Lake Forest are largely undeveloped, and therefore damage is expected to be relatively limited within these areas during a large-scale flooding event.

Dam Inundation

Earthquakes centered close to a dam are typically the most likely cause of dam failure. Dam Inundation maps have been required in California since 1972, following the 1971 San Fernando Earthquake and near failure of the Lower Van Norman Dam. Monitoring and mitigation of dam failure is constantly occurring at both the federal and state levels. There are no potential dam inundation areas in the City of Lake Forest. The closest threats of dam failure would be the El Toro Reservoir Dam and the Upper Oso Reservoir Dam in the City of Mission Viejo, but they pose no immediate threat to residents of Lake Forest.

References

California Dept. of Water Resources. 2016. Dams Owned and Operated by a Federal Agency and Dams within the Jurisdiction of the State of California. http://www.water.ca.gov/damsafety/docs/Juris%20(H-M)2012.pdf

Department of Water Resources (DWR) Best Available Mapping 2016 (BAM). http://gis.bam.water.ca.gov/bam/

Orange County. 2018. California GIS (Dam Inundation layers). August 2018.

Orange County. 2018. FEMA National Flood Hazard Layer (Official). August 2018.

U.S. Army Corp of Engineers. 2012. Dam Safety Program. San Antonio Dam. June 28, 2012. http://www.spl.usace.army.mil/Media/Fact-Sheets/Article/477345/dam-safety-program/

8.5 NOISE

This section provides a discussion of the regulatory setting and a general description of existing noise sources in the City of Lake Forest. The analysis in this section was prepared with assistance from Saxelby Acoustics.

Key Terms

Acoustics The science of sound.

Ambient Noise The distinctive acoustical characteristics of a given area consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.

Attenuation The reduction of noise.

A-Weighting A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.

Decibel or dB Fundamental unit of sound, defined as ten times the logarithm of the ratio of the sound pressure squared over the reference pressure squared.

CNEL Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.

Frequency The measure of the rapidity of alterations of a periodic acoustic signal, expressed in cycles per second or Hertz.

Impulsive Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.

Ldn Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.

Leq Equivalent or energy-averaged sound level.

Lmax The highest root-mean-square (RMS) sound level measured over a given period of time.

L(n) The sound level exceeded a described percentile over a measurement period. For instance, an hourly L50 is the sound level exceeded 50 percent of the time during the one hour period.

Loudness A subjective term for the sensation of the magnitude of sound.

Noise Unwanted sound.

SEL A rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy into a one-second event

Federal Regulatory Framework

Federal Highway Administration (FHWA)

The FHWA has developed noise abatement criteria that are used for federally funded roadway projects or projects that require federal review. These criteria are discussed in detail in Title 23 Part 772 of the Federal Code of Regulations (23CFR772).

Environmental Protection Agency (EPA)

The EPA has identified the relationship between noise levels and human response. The EPA has determined that over a 24-hour period, an Leq of 70 dBA will result in some hearing loss. Interference with activity and annoyance will not occur if exterior levels are maintained at an Leq of 55 dBA and interior levels at or below 45 dBA. Although these levels are relevant for planning and design and useful for informational purposes, they are not land use planning criteria because they do not consider economic cost, technical feasibility, or the needs of the community.

The EPA has set 55 dBA Ldn as the basic goal for residential environments. However, other federal agencies, in consideration of their own program requirements and goals, as well as difficulty of actually achieving a goal of 55 dBA Ldn, have generally agreed on the 65 dBA Ldn level as being appropriate for residential uses. At 65 dBA Ldn activity interference is kept to a minimum, and annoyance levels are still low. It is also a level that can realistically be achieved.

The Department of Housing and Urban Development (HUD) was established in response to the Urban Development Act of 1965 (Public Law 90-448). HUD was tasked by the Housing and Urban Development Act of 1965 (Public Law 89-117) “to determine feasible methods of reducing the economic loss and hardships suffered by homeowners as a result of the depreciation in the value of their properties following the construction of airports in the vicinity of their homes.”

HUD first issued formal requirements related specifically to noise in 1971 (HUD Circular 1390.2). These requirements contained standards for exterior noise levels along with policies for approving HUD-supported or assisted housing projects in high noise areas. In general, these requirements established the following three zones:

- 65 dBA Ldn or less - an acceptable zone where all projects could be approved.
- Exceeding 65 dBA Ldn but not exceeding 75 dBA Ldn - a normally unacceptable zone where mitigation measures would be required and each project would have to be individually evaluated for approval or denial. These measures must provide 5 dBA of attenuation above the attenuation provided by standard construction required in a 65 to 70 dBA Ldn area and 10 dBA of attenuation in a 70 to 75 dBA Ldn area.
- Exceeding 75 dBA Ldn - an unacceptable zone in which projects would not, as a rule, be approved.

HUD's regulations do not include interior noise standards. Rather a goal of 45 dBA Ldn is set forth and attenuation requirements are geared towards achieving that goal. HUD assumes that using standard construction techniques, any building will provide sufficient attenuation so that if the exterior level is 65 dBA Ldn or less, the interior level will be 45 dBA Ldn or less. Thus, structural attenuation is assumed at 20 dBA. However HUD regulations were promulgated solely for residential development requiring government funding and are not related to the operation of schools or churches.

The federal government regulates occupational noise exposure common in the workplace through the Occupational Health and Safety Administration (OSHA) under the EPA. Noise exposure of this type is dependent on work conditions and is addressed through a facility's or construction contractor's health and safety plan. With the exception of construction workers involved in facility construction, occupational noise is irrelevant to this study and is not addressed further in this document.

State Regulatory Framework

California Department of Transportation (Caltrans)

Caltrans has adopted policy and guidelines relating to traffic noise as outlined in the Traffic Noise Analysis Protocol (Caltrans 2011). The noise abatement criteria specified in the protocol are the same as those specified by FHWA.

Governor's Office of Planning and Research (OPR)

OPR has developed guidelines for the preparation of General Plans (Office of Planning and Research, 2017). The guidelines include land use compatibility guidelines for noise exposure.

Local Regulatory Framework

Existing City Noise Thresholds

The City of Lake Forest General Plan Safety and Noise Element (June 21, 1994) establishes goals and policies, as well as criteria for evaluating the compatibility of individual land uses with respect to noise exposure. The intent is to provide guidance for determining noise impacts due to, and upon proposed projects. For a full list of the City's goals and policies, please see the City's Current General Plan.

Environmental Setting

Fundamentals of Acoustics

Acoustics is the science of sound. Sound may be thought of as mechanical energy of a vibrating object transmitted by pressure waves through a medium to human (or animal) ears. If the pressure variations occur frequently enough (at least 20 times per second), then they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second or Hertz (Hz).

Noise is a subjective reaction to different types of sounds. Noise is typically defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals), as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels (dB) correspond closely to human perception of relative loudness.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be

approximated by A-weighted sound levels. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels, but are expressed as dB, unless otherwise noted.

The decibel scale is logarithmic, not linear. In other words, two sound levels 10 dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted, an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70 dBA sound is half as loud as an 80 dBA sound, and twice as loud as a 60 dBA sound.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (Leq), which corresponds to a steady-state A weighted sound level containing the same total energy as a time varying signal over a given time period (usually one hour). The Leq is the foundation of the composite noise descriptor, Ldn, and shows very good correlation with community response to noise.

The day/night average level (Ldn) is based upon the average noise level over a 24-hour day, with a +10 decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because Ldn represents a 24-hour average, it tends to disguise short-term variations in the noise environment. CNEL is similar to Ldn, but includes a +3 dB penalty for evening noise. Table 8-4 lists several examples of the noise levels associated with common situations.

Table 8-2 Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 300 m (1,000 ft)	--100--	
Gas Lawn Mower at 1 m (3 ft)	--90--	
Diesel Truck at 15 m (50 ft), at 80 km/hr (50 mph)	--80--	Food Blender at 1 m (3 ft) Garbage Disposal at 1 m (3 ft)
Noisy Urban Area, Daytime Gas Lawn Mower, 30 m (100 ft)	--70--	Vacuum Cleaner at 3 m (10 ft)
Commercial Area Heavy Traffic at 90 m (300 ft)	--60--	Normal Speech at 1 m (3 ft)
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing

Source: Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol. November 2009.

Effects of Noise on People

The effects of noise on people can be placed in three categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction;
- Interference with activities such as speech, sleep, and learning; and
- Physiological effects such as hearing loss or sudden startling.

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so-called ambient noise level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it.

With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived;
- Outside of the laboratory, a 3 dBA change is considered a just-perceivable difference;
- A change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- A 10 dBA change is subjectively heard as approximately a doubling in loudness, and can cause an adverse response.

Stationary point sources of noise – including stationary mobile sources such as idling vehicles – attenuate (lessen) at a rate of approximately 6 dB per doubling of distance from the source, depending on environmental conditions (i.e. atmospheric conditions and either vegetative or manufactured noise barriers, etc.). Widely distributed noises, such as a large industrial facility spread over many acres, or a street with moving vehicles, would typically attenuate at a lower rate.

Existing Noise Levels

The FHWA Highway Traffic Noise Prediction model (FHWA-RD 77-108) was used to develop community noise equivalent level (CNEL) noise contours for all highways and major roadways in the General Plan study area. The model is based upon the CALVENO noise emission factors for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver and the acoustical characteristics of the site. The FHWA model predicts hourly L_{eq} values for free-flowing traffic conditions and is generally considered to be accurate within 1.5 dB. To predict CNEL values, it is necessary to determine the day/evening/night distribution of traffic for a typical 24-hour period.

Existing traffic volumes were obtained from the traffic modeling performed for the General Plan study area. Day/evening/night traffic distributions were based upon continuous hourly noise measurement data. Caltrans vehicle truck counts were obtained for Interstate 5 and Route 241. Arterial roadway truck percentages were obtained from vehicle classification count data provided by the traffic engineer. Using these data sources and the FHWA traffic noise prediction methodology, traffic noise levels were calculated for existing conditions. Table 8-5 shows the results of this analysis.

Traffic noise levels are predicted at the sensitive receptors located at the closest typical setback distance along each project-area roadway segments. In some locations sensitive receptors may be located at distances which vary from the assumed calculation distance and may experience shielding from intervening barriers or sound walls. However, the traffic noise analysis is believed to be representative of the majority of sensitive receptors located closest to the project-area roadway segments analyzed in this report.

The actual distances to noise level contours may vary from the distances predicted by the FHWA model due to roadway curvature, grade, shielding from local topography or structures, elevated roadways, or elevated receivers. The distances reported in Table 8-5 are generally considered to be conservative estimates of noise exposure along roadways in the City of Lake Forest Lake Forest. Figure 8-4 shows existing citywide traffic noise contours.

Table 8-3 Predicted Existing Traffic Noise Levels

Roadway Segment	Noise Level at Closest Receptors (dB, Ldn)[1]	Distances to Traffic Noise Contours, Ldn (feet)		
		60 dB	65 dB	70 dB
Trabuco w/o Lake Forest	61.9	288	134	62
Trabuco w/o Ridge Route	63.9	295	137	64
Trabuco w/o El Toro	64.4	319	148	69
Trabuco e/o El Toro	61.0	250	116	54
Toledo w/o Lake Forest	56.4	125	58	27
Toledo e/o Lake Forest	60.8	121	56	26
Toledo e/o Ridge Route	59.7	103	48	22
Jeronimo w/o Lake Forest	63.2	177	82	38

Roadway Segment	Noise Level at Closest Receptors (dB, Ldn)[1]	Distances to Traffic Noise Contours, Ldn (feet)		
		60 dB	65 dB	70 dB
Jeronimo w/o Ridge Route	60.7	144	67	31
Jeronimo w/o El Toro	62.2	151	70	33
Jeronimo e/o El Toro	64.0	198	92	43
Muirlands w/o Lake Forest	61.7	181	84	39
Muirlands w/o Ridge Route	63.1	208	96	45
Muirlands e/o Ridge Route	62.2	227	105	49
Muirlands e/o El Toro	64.5	235	109	51
Rockfield w/o Lake Forest	66.2	257	119	55
Rockfield w/o Ridge Route	69.7	222	103	48
Rockfield w/o El Toro	63.3	231	107	50
Rockfield w/o Los Alisos	60.7	155	72	33
Portola w/o Alton Pkwy	57.7	151	70	32
Portola w/o Bake	59.0	220	102	47
Portola w/o Lake Forest	60.5	269	125	58
Portola w/o Glenn Ranch	66.6	331	153	71
Portola n/o SR-241	60.5	281	131	61
Portola s/o SR-241	60.9	297	138	64
Portola w/o El Toro	60.3	406	189	88
Portola e/o El Toro	61.3	423	196	91
Rancho South w/o Bake	59.8	97	45	21
Rancho e/o Bake	63.9	181	84	39
Rancho e/o Lake Forest	61.0	226	105	49
Glenn n/o Portola to s/o Saddleback Ranch Road	59.8	239	111	51
Glenn Ranch w/o El Toro n/o Saddleback Ranch Road	56.0	135	63	29
Alton s/o Portola	57.3	143	66	31
Alton s/o SR-241	66.8	311	144	67
Alton s/o Rancho South	68.0	411	191	89
Alton n/o Trabuco	64.7	488	226	105
Bake s/o Towne Centre Drive	69.3	352	164	76
Bake n/o Commercentre	63.7	381	177	82
Bake s/o Commercentre	64.1	404	188	87
Bake s/o Trabuco	66.5	499	232	107
Bake s/o Toledo	63.6	521	242	112
Lake Forest s/o Portola	63.9	183	85	39
Lake Forest n/o Rancho	66.8	285	132	61
Lake Forest s/o Rancho	65.9	309	143	67
Lake Forest n/o Trabuco	65.6	408	189	88
Lake Forest s/o Trabuco	65.6	383	178	83
Lake Forest n/o Jeronimo	65.9	398	185	86
Lake Forest n/o Muirlands	65.4	395	183	85
Lake Forest s/o Muirlands	63.4	273	127	59
Lake Forest s/o Rockfield	68.7	381	177	82

Roadway Segment	Noise Level at Closest Receptors (dB, Ldn)[1]	Distances to Traffic Noise Contours, Ldn (feet)		
		60 dB	65 dB	70 dB
Ridge Route n/o Toledo	58.2	90	42	19
Ridge Route n/o Jeronimo	58.7	97	45	21
Ridge Route s/o Jeronimo	61.8	100	46	21
Ridge Route n/o Muirlands	56.4	92	43	20
Ridge Route n/o Rockfield	57.8	92	43	20
Ridge Route s/o Rockfield	53.5	47	22	10
El Toro n/o Glenn Ranch	61.7	233	108	50
El Toro s/o Glenn Ranch	62.3	284	132	61
El Toro n/o Sta Margarita	63.0	271	126	58
El Toro s/o Sta Margarita	64.8	406	188	87
El Toro n/o Trabuco	68.4	399	185	86
El Toro s/o Trabuco	66.0	436	202	94
El Toro n/o Jeronimo	72.4	437	203	94
El Toro n/o Moorlands	70.5	453	210	98
El Toro s/o Muirlands	64.2	309	143	67
El Toro s/o Rockfield	68.2	350	163	75
Los Alisos n/o Jeronimo	63.9	294	137	63
Los Alisos n/o Muirlands	63.6	301	140	65
Los Alisos s/o Muirlands	64.1	283	131	61
Los Alisos s/o Rockfield	65.9	267	124	58
Commercentre e/o Alton	67.5	173	80	37
Dimension n/o Commercentre	60.5	108	50	23
Dimension s/o Commercentre	63.3	167	77	36
Commercentre e/o Bake	64.0	185	86	40
Commercentre w/o Dimension	61.4	124	57	27
Interstate 5	72.2	3326	1544	717
Route 241	62.4	712	330	153

Notes: Distances to traffic noise contours are measured in feet from the centerlines of the roadways.

[1] Traffic noise levels are predicted at the closest sensitive receptors

Source: Kittelson & Associates, Inc., Caltrans, and Saxelby Acoustics

Railroad Noise Levels

To quantify noise exposure from existing train operations, a continuous (24-hour) noise level measurement survey was conducted along the existing Metrolink commuter rail tracks. Based upon the current online schedules, approximately 7 commuter trains travel this line during nighttime (10:00 p.m. – 7:00 a.m.) with 63 daytime (7:00 a.m. – 10:00 p.m.) trains. Noise measurement data also indicated approximately 5 freight trains per day.

The purpose of the noise level measurements was to determine typical sound exposure levels (SEL) for railroad line operations, while accounting for the effects of travel speed, warning horns and other factors which may affect noise generation. In addition, the noise measurement equipment was programmed to identify individual train events, so that the typical number of train operations could be determined.

Table 8-6 shows a summary of the noise measurement results for railroad activity within the City.

Table 8-4 Railroad Noise Measurement Results

Measurement Location	Railroad Track	Grade Crossing /Warning Horn	Train Events Per 24-hr period	Average SEL at 75
LT-2	Metrolink	No grade crossing. Occasional horn usage.	75 (54 day, 13 night, 8 evening)	94 dBA

Source: Saxelby Acoustics - 2018

Noise measurement equipment consisted of Larson Davis Laboratories (LDL) model 831 precision integrating sound level meters equipped with a GRAS ½" microphone. The measurement system was calibrated using a B&K 4230 acoustical calibrator before and after testing. Audio recordings of events were captured along with sound measurement data to help with source identification of events. The measurement equipment meets all of the pertinent requirements of the American National Standards Institute (ANSI) for Type 1 (precision) sound level meters.

To determine the distances to the CNEL railroad contours, it is necessary to calculate the CNEL for typical train operations. This was done using the SEL values and above-described number and distribution of daily train operations. The Ldn may be calculated as follows:

$$Ldn = SEL + 10 \log N_{eq} - 49.4 \text{ dB, where:}$$

SEL is the mean Sound Exposure Level of the event, N_{eq} is the sum of the number of daytime (7 a.m. to 7 p.m.) events, plus 3.163 times the number of evening (7 p.m. to 10 p.m.) events, plus 10 times the number of nighttime (10 p.m. to 7 a.m.) events per day, and 49.4 is ten times the logarithm of the number of seconds per day. Based upon the above-described noise level data, number of operations and methods of calculation, the CNEL value for railroad line operations have been calculated, and the distances to the CNEL noise level contours are shown in Table 8-7.

Table 8-5 Approximate Distances to the Railroad Noise Contours

Exterior noise Level at 75 feet, L_{dn}	Distance to Exterior Noise Level Contours, feet		
	60 dB L_{dn}	65 dB L_{dn}	70 dB L_{dn}
Metrolink Line			
68 dB	264'	123'	57'

Source: Saxelby Acoustics - 2018.

Fixed Noise Sources

The production of noise is a result of many industrial processes, even when the best available noise control technology is applied. Noise exposures within industrial facilities are controlled by federal and state employee health and safety regulations (OSHA and Cal-OSHA), but exterior noise levels may exceed locally acceptable standards. Commercial, recreational and public service facility activities can also produce noise which affects adjacent sensitive land uses. These noise sources can be continuous and may contain tonal components which have a potential to annoy individuals who live nearby. In addition, noise generation from fixed noise sources may vary based upon climatic conditions, time of day and existing ambient noise levels.

In the City of Lake Forest Lake Forest, fixed noise sources typically include parking lots, loading docks, parks, schools, and other commercial/retail use noise sources (HVAC, exhaust fans, etc.)

From a land use planning perspective, fixed-source noise control issues focus upon two goals:

- To prevent the introduction of new noise-producing uses in noise-sensitive areas, and
- To prevent encroachment of noise sensitive uses upon existing noise-producing facilities.

The first goal can be achieved by applying noise level performance standards to proposed new noise-producing uses. The second goal can be met by requiring that new noise-sensitive uses in near proximity to noise-producing facilities include mitigation measures that would ensure compliance with noise performance standards.

Fixed noise sources which are typically of concern include but are not limited to the following:

- HVAC Systems
- Pump Stations
- Steam Valves
- Generators
- Air Compressors
- Conveyor Systems
- Pile Drivers
- Drill Rigs
- Welders
- Outdoor Speakers
- Chippers
- Loading Docks
- Cooling Towers/Evaporative Condensers
- Lift Stations
- Steam Turbines
- Fans
- Heavy Equipment
- Transformers
- Grinders
- Gas or Diesel Motors
- Cutting Equipment
- Blowers
- Cutting Equipment
- Amplified music and voice

The types of uses which may typically produce the noise sources described above, include, but are not limited to: wood processing facilities, pump stations, industrial/agricultural facilities, trucking operations, tire shops, auto maintenance shops, metal fabricating shops, shopping centers, drive-up windows, car washes, loading docks, public works projects, batch plants, bottling and canning plants, recycling centers, electric generating stations, race tracks, landfills, sand and gravel operations, special events such as concerts, and athletic fields. Typical noise levels associated with various types of stationary noise sources are shown in Table 8-8.

Table 8-6 Typical Stationary Source Noise Levels

Use	Noise Level at 100 feet, Leq [1]	Distance to Noise Contours, feet			
		50 dB Leq (No Shielding)	45 dB Leq (No Shielding)	50 dB Leq (With 5 dB Shielding)	45 dB Leq (With 5 dB Shielding)
Auto Body Shop	56 dB	200	355	112	200
Auto Repair (Light)	53 dB	141	251	79	141
Busy Parking Lot	54 dB	158	281	89	158
Cabinet Shop	62 dB	398	708	224	398
Car Wash	63 dB	446	792	251	446
Cooling Tower	69 dB	889	1,581	500	889
Loading Dock	66 dB	596	1,059	335	596
Lumber Yard	68 dB	794	1,413	447	794
Maintenance Yard	68 dB	794	1,413	447	794
Outdoor Music Venue	90 dB	10,000	17,783	5,623	10,000
Paint Booth Exhaust	61 dB	355	631	200	355
Skate Park	60 dB	316	562	178	316
School Playground / Neighborhood Park	54 dB	158	281	89	158
Truck Circulation	48 dB	84	149	47	84
Vendor Deliveries	58 dB	251	446	141	251

[1] Analysis assumes a source-receiver distance of approximately 100 feet, no shielding, and flat topography. Actual noise levels will vary depending on site conditions and intensity of the use. This information is intended as a general rule only, and is not suitable for final site-specific noise studies.

Source: Saxelby Acoustics 2018.

Community noise survey

A community noise survey was conducted to document ambient noise levels at various locations throughout the City. Short-term noise measurements were conducted at six locations throughout the City on April 18 and April 19, 2018 during daytime (7 am – 10 pm) and nighttime (10 pm - 7 am) periods. In addition, four continuous 24-hour noise monitoring sites were also conducted to record day-night statistical noise level trends. The data collected included the hourly average (Leq), median (L50), and the maximum level (Lmax) during the measurement period. Noise monitoring sites and the measured noise levels at each site are summarized in Table 8-9 and Table 8-10. Figure 8-5 shows the locations of the noise monitoring sites.

Community noise monitoring equipment included Larson Davis Laboratories (LDL) model 812, 820, and 831 precision integrating sound level meters equipped with ½" microphones. The measurement systems were calibrated using a B&K model 4230 acoustical calibrator before and after testing. The measurement equipment meets all of the pertinent requirements of the American National Standards Institute (ANSI) for Type 1 (precision) sound level meters.

Table 8-7 Existing Continuous 24-Hour Ambient Noise Monitoring Results

Site	Location	CNEL (dBA)	Measured Hourly Noise Levels, dBA Low-High (Average)					
			Daytime (7:00 am - 10:00 pm)			Nighttime (10:00 pm – 7:00 am)		
			Leq	L50	Lmax	Leq	L50	Lmax
1	24621 Bridger Road, 220 feet to I-5 centerline. Partially screened by 16 foot tall sound wall.	72	62-69 (67)	61-68 (67)	71-76 (74)	58-69 (64)	57-69 (62)	64-74 (69)
2	Open space near west end of Shadowfax Drive - 75' to railroad line.	69	57-69 (63)	42-49 (46)	84-101 (89)	35-68 (62)	35-47 (40)	40-92 (78)
3	Skate Park of Etnies Lake Forest, 150' to CL Route 241	62	56-61 (60)	54-61 (58)	69-78 (72)	47-59 (53)	37-56 (45)	66-74 (69)
4	350' South of Portola, 140' to CL of El Toro, on west side of El Toro	61	55-60 (58)	53-58 (55)	70-88 (76)	45-57 (52)	39-55 (46)	61-80 (69)

Source – Saxelby Acoustics– 2018.

Table 8-8 Existing Short-Term Community Noise Monitoring Results

Site	Location	Time[1]	Measured Sound Level, dB			Notes
			Leq	L50	Lmax	
1	Mountain View Park	4:36 p.m.	52	51	59	Park noise. Kids playing. Local traffic. Single engine aircraft overflight, 50-55 dBA.
		11:47 p.m.	44	44	48	Distant traffic. Jet overflight. HNL to ORD. Jets around 45-46 dBA. LAX to Miami.
2	Heroes Park	5:07 p.m.	56	55	65	Ball fields. Traffic. Driving range. Ball "whacks." Single engine aircraft. Two Amtrak passenger trains.
		12:07 a.m.	44	42	52	Traffic. Jet, LAX to ORD. Sprinklers at park.
3	Rancho Serrano Park	3:52 p.m.	47	44	63	Traffic noise from Bake Pkwy. Single engine airplane overflights. High flying jet, LAX to Atlanta.
		11:27 p.m.	42	40	53	Distant traffic. Sprinklers 37 dBA. Jets, 42 dBA. LAX to NYC. LAX to Washington IAD. LAX to Boston. LAX to Toronto.

Table 8-8 Existing Short-Term Community Noise Monitoring Results

Site	Location	Time[1]	Measured Sound Level, dB			Notes
			Leq	L50	Lmax	
4	Autumn Glenn & Lake Forest – 120 feet to centerline of Lake Forest	3:31 p.m.	58	56	71	Traffic on Forest Lake dominant. 6' wall at play area. Site of meter not fully shielded.
		11:01 p.m.	52	49	65	Sprinklers 43-47 dBA. Traffic. Jet overflight. LAX to NC
5	Foothill Ranch Community Park	2:01 p.m.	49	47	58	Light breeze. Birds. Helicopter flyover to south. No kids at play equipment. Local traffic. Skater at hockey rink.
		10:41 p.m.	39	37	51	Distant and local traffic.
6	Santiago Canyon Park	2:52 p.m.	47	43	59	Distant and local traffic.
		10:16 p.m.	43	38	60	Distant and local traffic.

1 - All Community Noise Measurement Sites have a test duration of 10:00 minutes.
Source - Saxelby Acoustics 2018.

The results of the community noise survey indicate that existing transportation (traffic) noise sources were the major contributor of noise observed during daytime hours, especially during vehicle pass-bys. Additionally, while frequent jet aircraft overlflights from the Los Angeles International Airport (LAX) were audible, with typical noise levels of 42-47 dBA.

8.6 WILDLIFE HAZARDS

This section contains a brief account of the species of wildlife found in the Southern California that are considered at times to be nuisances or pose a danger to humans and domestic animals.

Information in this section is primarily from the California Wildlife Habitat Relationships System, California Department of Fish and Wildlife, and the California Interagency Wildlife Task Group. For additional information of on local species see Chapter 9 (Conservation).

Background

Southern California is home to a variety of species, many of which are encountered in urban and suburban areas. Some of these species are attracted to human landscapes, as these are artificial sources of food, water, and shelter; additionally, wildlife may find areas of human habitation to be void of predators and competitors. Other environmental conditions may also be driving wildlife into developed urban and suburban areas including drought, lack of food sources, wildfire, and climate change. The following discussion focuses of several species common in Southern California including Coyotes, Mountain Lions, and Rattlesnakes.

State Regulatory Framework

Section 1801 of the Fish and Game Code establishes state policy regarding wildlife resources. The ultimate goal of this policy is to maintain sufficient wildlife populations to accomplish the following goals:

- to provide for the beneficial use and enjoyment of wildlife by all citizens of the state;
- to perpetuate all species for their intrinsic and ecological values;
- to provide for aesthetic, educational, and non-appropriative uses;
- to maintain diversified recreational uses of wildlife including sport hunting;
- to provide for economic contributions to the citizens of the state through the recognition that wildlife is a renewable resource, and;
- to alleviate economic losses or public health and safety problems caused by wildlife.

Environmental Setting

In Southern California, coyotes, mountain lions, and to a lesser extent bobcat, represent common species that are considered Nuisance species when moving from the wildlands to the urban interface. In many areas of southern California wildlife interactions between human and domestic animals are becoming more prevalent due to environmental conditions such as drought causing reductions in food and water sources, and wildfires limiting foraging areas and driving animals from wildlands, as well as the draw of easy food sources that urban areas provide. Additionally, behavioral changes in many animals who venture into urban areas are also observed and contribute to the increase in animal encounters form the wild animal normalizing these conditions (i.e. becoming uses to and unafraid of humans).

Coyotes are medium-sized members of the dog family, larger than foxes but smaller than wolves. Native to western North America, they are extremely adaptable. Coyotes have increased in numbers and have increased their geographical range during the past fifty years, due in part to human modification of the landscape. Coyotes now are found almost everywhere in North America.

Coyotes can live in almost any habitat in California, from arid deserts in the south to wet meadows and foggy coastal regions in the north. They are not as common in densely forested regions or in agricultural environments planted mainly to annual crops, because they find few food resources in these situations. In recent decades, they have become more numerous in many suburban environments where an ample food supply is available. Some of the highest population densities on record occur in suburban Southern California.

Around humans coyotes normally are elusive animals that avoid contact with humans. Most active after dusk and before daylight, they are typically seen only at a distance. This trait may be a response to hunting, trapping, and other efforts to control coyote predation. Coyotes have been harassed and killed ever since settlers' first arrived in western North America with their livestock. In most areas of California, coyotes continue to behave in ways that minimize their contact with humans. Within urban and suburban areas in California, however, some coyotes have adapted to residential neighborhoods, parks, and open spaces, and seemingly have lost their fear of humans. This may be a result of behavioral changes that have occurred over several generations of coyotes, in localities where predator control is no longer practiced. Coyotes thrive in such areas because food, water, and shelter are abundant, and coyotes living in these environments may come to associate humans with food and protection. Once attracted to suburban areas, they prey on the abundant rodents, rabbits, birds, house cats, and small dogs that live in residential habitats. They also will feed on household garbage, pet food, and seeds and fruits of many garden and landscape plants. In some localities, this has resulted in the development of local coyote populations that seemingly ignore people, while a few coyotes have become increasingly aggressive toward humans. Coyotes have been implicated in only one human death in U.S. history - that of a three-year-old girl in Glendale, California in 1981 (Fox, C.H. and C.M. Papouchis. 2005).

Wild Cats are large felid carnivores that reside in the plan area and include the mountain lion (Puma concolor) and the bobcat (Lynx rufus). Problems associated with mountain lions include their predation upon pets and attacks on humans; bobcats have recently been implicated in southern California for a small number of pet predation instances.

The distribution of prevalence of large cats in California are Widespread, but uncommon, ranging from sea level to alpine meadows, large cats are found in nearly all habitats, except xeric regions of the Mojave and Colorado deserts that do not support mule deer populations, and are considered most abundant in riparian areas, and brushy stages of most habitats. Recent studies by the California Department of Fish and Wildlife, and others, suggest that 2500-5000, or more, mountain lions currently live in California, and the numbers appear to be increasing. Populations of mountain lions are generally associated closely with deer populations (Nowak 1976). Fragmentation of habitats by spread of human developments and associated roads, power transmission corridors, and other support facilities, restricts movements and increases association with humans. Figure 8-6 shown mapped mountain lion range within the planning area.

The chance of conflict with wild cats may be reduced by addressing the availability of live food sources (pets and natural prey) and habitat (brush to hide in). Reducing the availability of live natural food sources entails landscaping private properties and public spaces in such ways that these animals' prey are not attracted to the area (Department of Fish and Game 2004).

Rattlesnakes are found throughout Southern California, in a variety of habitats. Lake Forest is within the habitat area of the Western Rattlesnake, Speckled Rattlesnake, and the Red Diamond Rattlesnake. The rattlesnake is California's only venomous snake. Snakes help to keep the rodent population in check, and are an important part of the ecosystem. The California Kingsnake which is also endemic to Lake Forest, is a non-venomous snake that is a natural predator of the rattlesnake.

While they are often encountered in the foothills, they have been found in a variety of settings including urban areas, along riverbeds, and in parks and golf courses. Although generally not aggressive, rattlesnakes can strike if threatened. They will generally retreat if given room and not deliberately provoked, but if they are startled they may strike without warning. On rare occasions, rattlesnake bites have caused injury and even death. Most snake bites occur between April and October when both

humans and snakes are most active outdoors. However, those occurrences are rare and the risk of being bitten is small compared to the risk of other environmental injuries.

The California Poison Control System (CPCS) reports that approximately 300 snake bites are reported in California annually. Reports of snake bites in Southern California are up by more than 15% in 2018 when compared to the previous year. Of the estimated 7,000- 8,000 people per year that are bit by poisonous snakes in the United States, the Center for Disease Control (CDC) reports that only about 5 of those people die from their injuries.

Drought, wildfires, and loss of habitat have all contributed to wildlife habitats shrinking. These activities increasingly push wildlife into areas inhabited by humans and increase the chance of interaction. Property owners can decrease the likelihood of finding rattlesnakes on their property by building a snake-proof fence. This involves making sure that the fence is either solid or has openings no larger than a quarter-inch. The bottom of the fence should extend at least several inches below the ground, and it should be at least 3 feet high. Slanting the fence outwards at a 30-degree angle will also help. Vegetation and piles of rocks or boards should be removed from around the home and fence.

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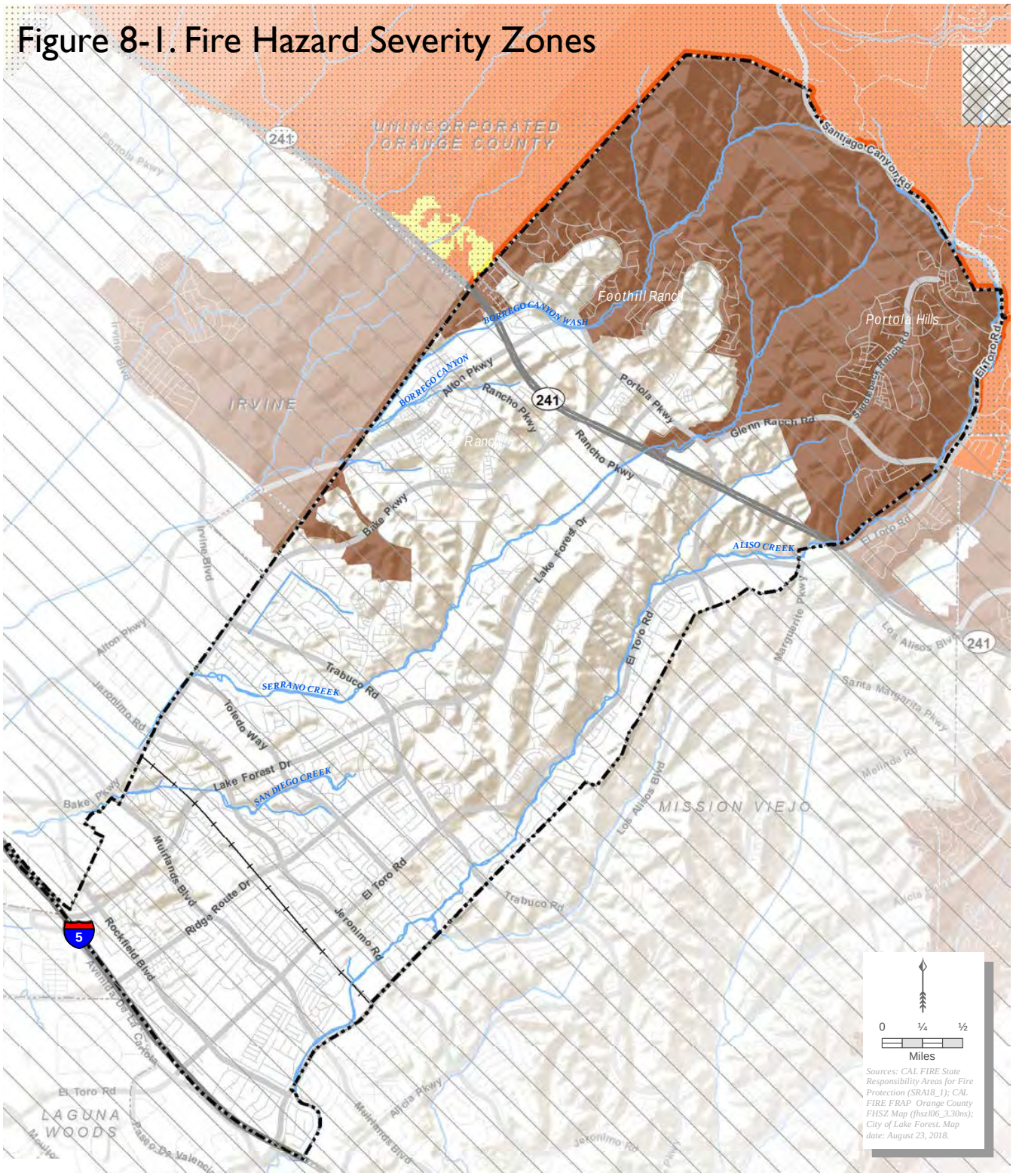
Figure 8-1. Fire Hazard Severity Zones



Legend

City of Lake Forest

Responsibility Areas

- Federal
- Local
- State

Fire Hazard Severity Zones

In Local Responsibility Areas

- Very High

In State Responsibility Areas

- Moderate
- High
- Very High

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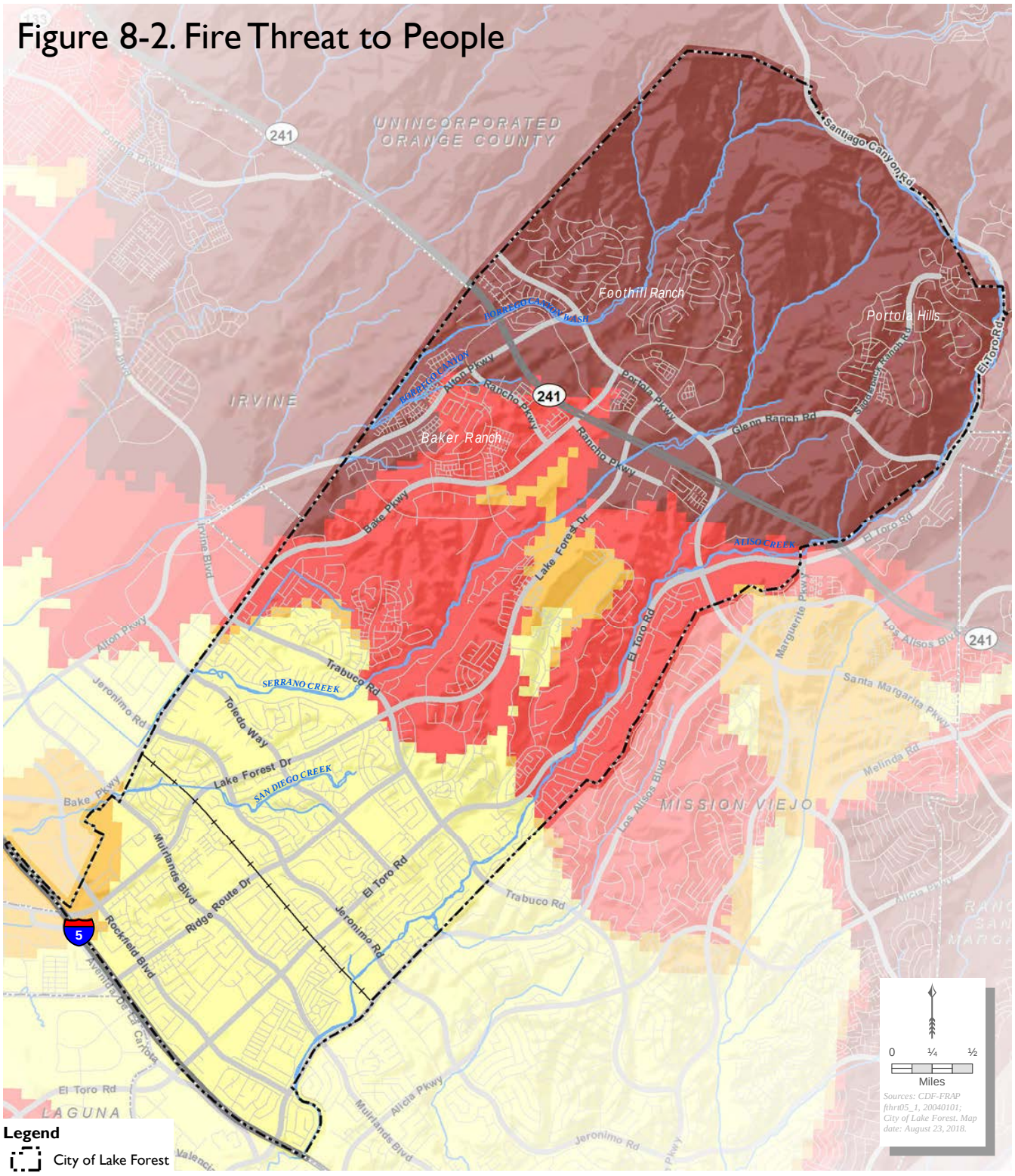
Figure 8-2. Fire Threat to People



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City of Lake Forest

Fire Threat to People*

- Little or No Threat to People
- Moderate Threat to People
- High Threat to People
- Very High Threat to People
- Extreme Threat to People

** Fire Threat is a combination of two factors: 1) fire frequency, or the likelihood of a given area burning, and 2) potential fire behavior (hazard). These two factors are combined to create 4 threat classes ranging from moderate to extreme. Fire threat can be used to estimate the potential for impacts on various assets and values susceptible to fire. Impacts are more likely to occur and/or be of increased severiety for the higher threat classes.*

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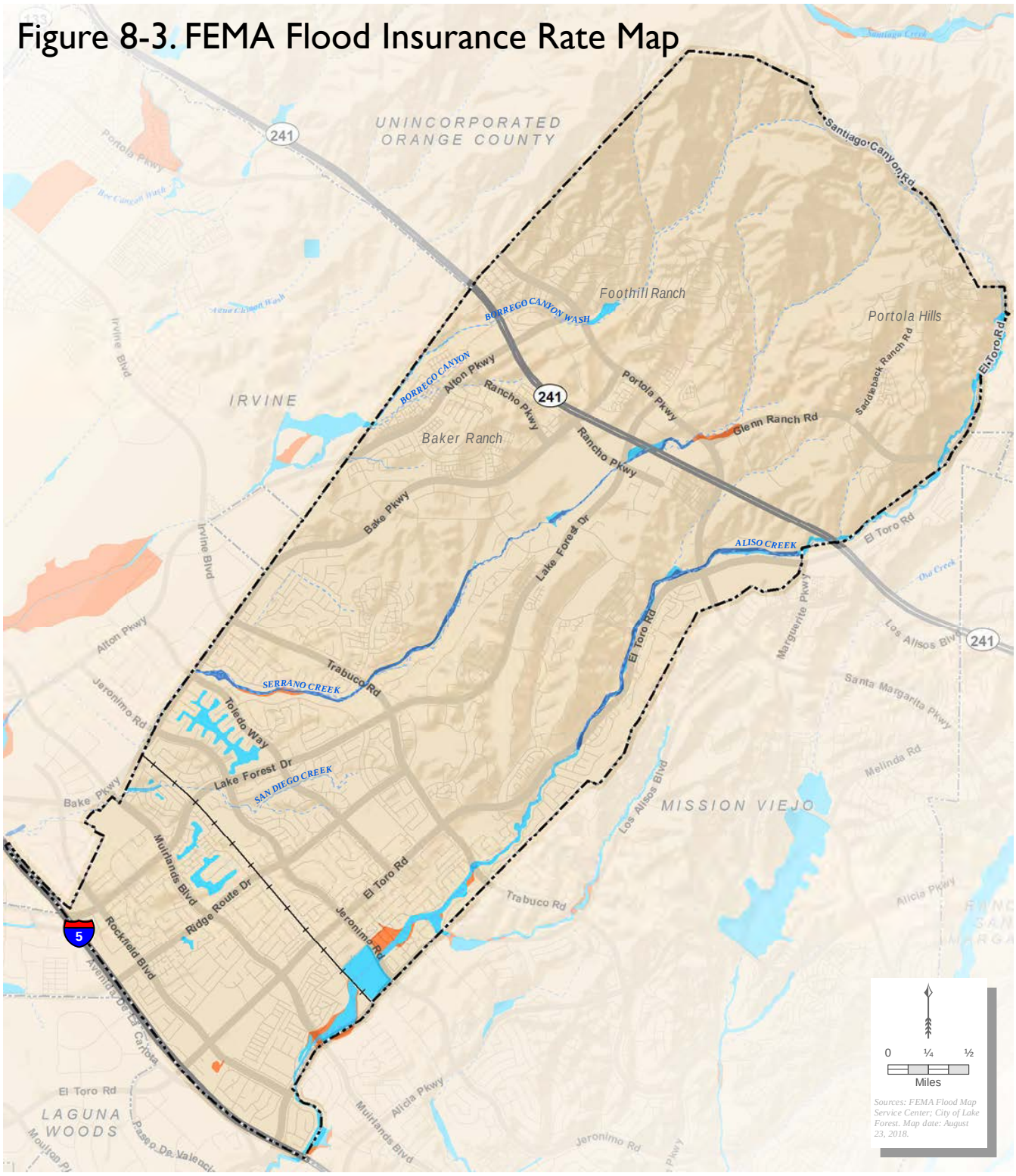
Figure 8-3. FEMA Flood Insurance Rate Map



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City of Lake Forest

FEMA Flood Hazard Zones

1% Annual Chance Flood Hazard (100-year Flood)

0.2% Annual Chance Flood Hazard (500-year Flood)

Regulatory Floodway

Area of Minimal Flood Hazard

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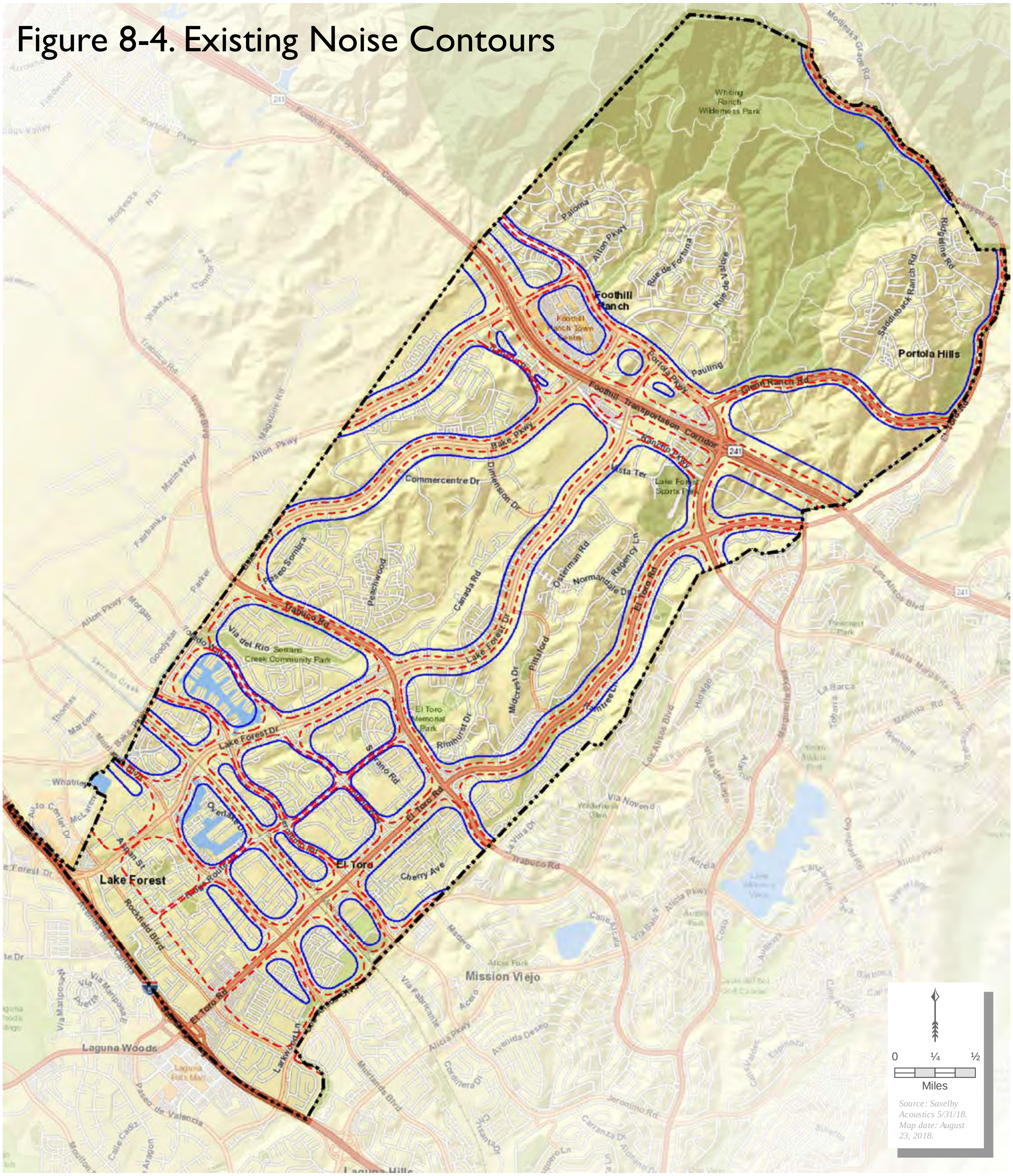
Figure 8-4. Existing Noise Contours



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- City of Lake Forest
- 60 dba CNEL
- 65 dba CNEL

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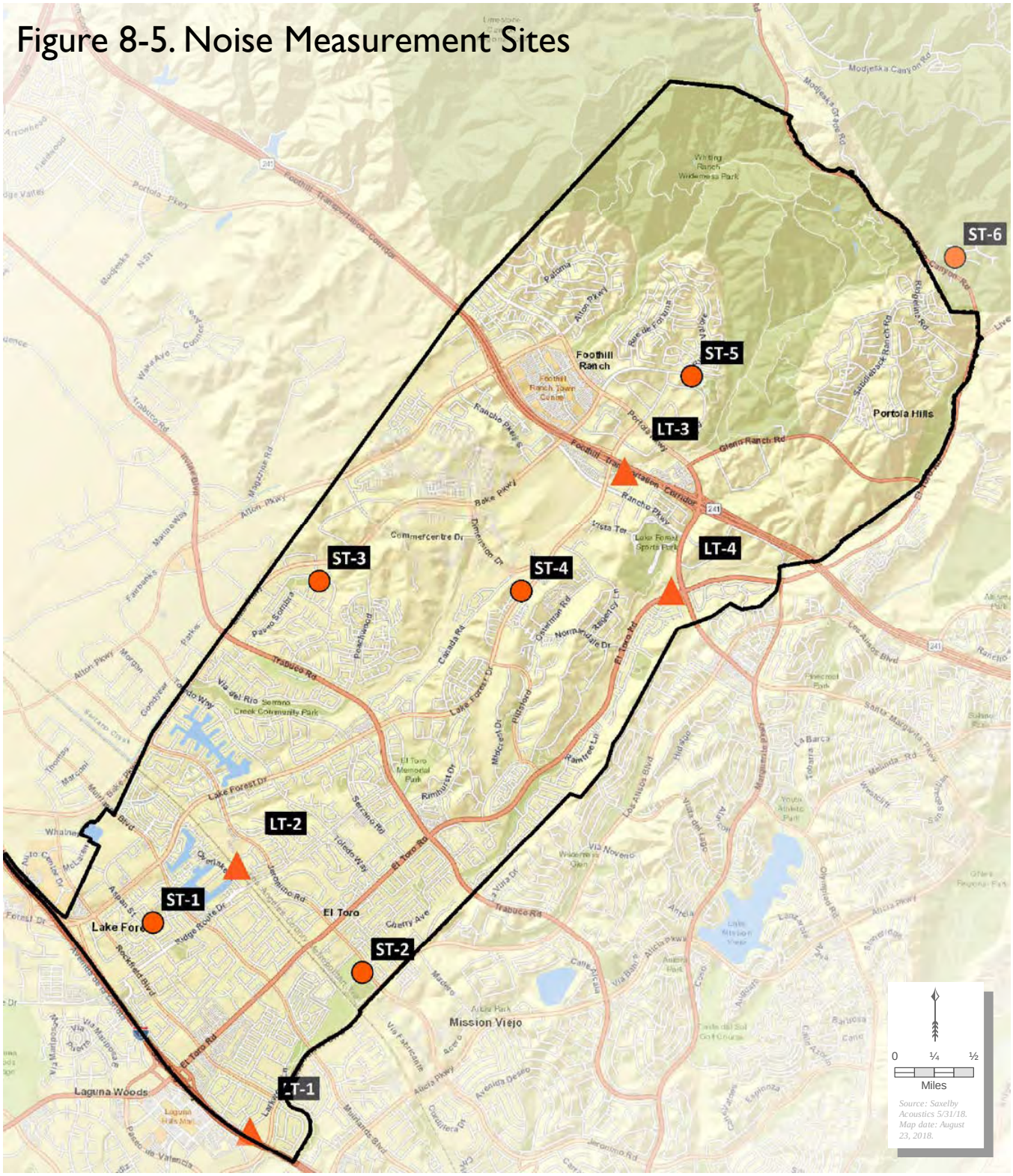
Figure 8-5. Noise Measurement Sites



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- City of Lake Forest
- Noise Measurement - Long Term
- Noise Measurement - Short Term

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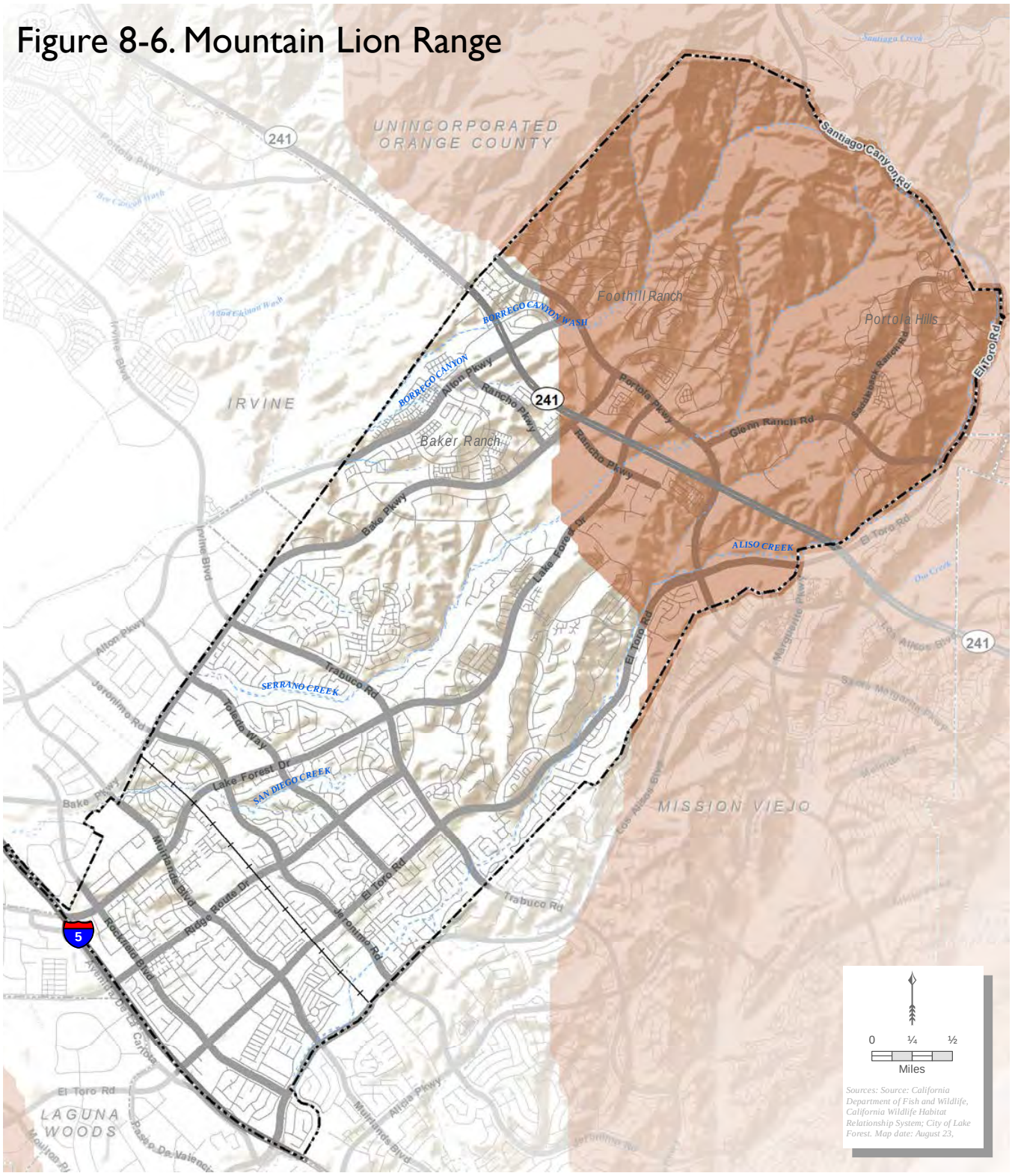
Figure 8-6. Mountain Lion Range



Legend

- City of Lake Forest
- Mountain Lion Range

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CHAPTER 9
CONSERVATION

The City's natural resources form an important part of its unique character and quality of life. In Lake Forest, these resources include the City's biological resources, geology and soils, mineral and energy resources, hydrology and water quality, visual resources, and cultural resources.

This Chapter includes the following topics:

Figures are located at the end of the Chapter.

9.1 BIOLOGICAL RESOURCES

This section describes biological resources in the City of Lake Forest from both a qualitative and quantitative perspective. The results of this assessment may be used in planning and management decisions that may affect biological resources in the City of Lake Forest.

Key Terms

The following key terms are used throughout this section to describe biological resources and the framework that regulates them:

Hydric Soils. One of the three wetland identification parameters, according to the Federal definition of a wetland, hydric soils have characteristics that indicate they were developed in conditions where soil oxygen is limited by the presence of saturated soil for long periods during the growing season. There are approximately 2,000 named soils in the United States that may occur in wetlands.

Hydrophytic Vegetation. Plant types that typically occur in wetland areas.

Nearly 5,000 plant types in the United States may occur in wetlands. Plants are listed in regional publications of the U.S. Fish and Wildlife Service (USFWS) and include such species as cattails, bulrushes, cordgrass, sphagnum moss, bald cypress, willows, mangroves, sedges, rushes, arrowheads, and water plantains.

Sensitive Natural Community. A sensitive natural community is a biological community that is regionally rare, provides important habitat opportunities for wildlife, is structurally complex, or is in other ways of special concern to local, State, or Federal agencies. CEQA identifies the elimination or substantial degradation of such communities as a significant impact. The California Department of Fish and Wildlife (CDFW) tracks sensitive natural communities in the California Natural Diversity Database (CNDDB).

Special-Status Species. Special-status species are those plants and animals that, because of their recognized rarity or vulnerability to various causes of habitat loss or population decline, are recognized by Federal, State, or other agencies. Some of these species receive specific protection that is defined by Federal or State endangered species legislation. Others have been designated as "sensitive" on the basis of adopted policies and expertise of State resource agencies or organizations with acknowledged expertise, or policies adopted by local governmental agencies such as counties, cities, and special districts to meet local conservation objectives. These species are referred to collectively as "special status species" in this report, following a convention that has developed in practice but has no official sanction. For the purposes of this assessment, the term "special status" includes those species that are:

- Federally listed or proposed for listing under the Federal Endangered Species Act (50 CFR 17.11-17.12);
- Candidates for listing under the Federal Endangered Species Act (61 FR 7596-7613);
- State listed or proposed for listing under the California Endangered Species Act (14 CCR 670.5);
- Species listed by the U.S. Fish and Wildlife Service (USFWS) or the CDFW as a species of concern (USFWS), rare (CDFW), or of special concern (CDFW);
- Fully protected animals, as defined by the State of California (California Fish and Game Code Section 3511, 4700, and 5050);
- Species that meet the definition of threatened, endangered, or rare under CEQA (CEQA Guidelines Section 15380);
- Plants listed as rare or endangered under the California Native Plant Protection Act (California Fish and Game Code Section 1900 et seq.); and
- Plants listed by the California Native Plant Society (CNPS) as rare, threatened, or endangered (List 1A and List 2 status plants in Skinner and Pavlik 1994).

Waters of the U.S. The Federal government defines waters of the U.S. as "lakes, rivers, streams, intermittent drainages, mudflats, sandflats, wetlands, sloughs, and wet meadows" [33 C.F.R. §328.3(a)]. Waters of the U.S. exhibit a defined bed and bank and ordinary high water mark (OHWM). The OHWM is defined by the USACE as "that line on shore established by the fluctuations of water and indicated by physical character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas" [33 C.F.R. §328.3(e)].

Wetlands. Wetlands are ecologically complex habitats that support a variety of both plant and animal life. The Federal government defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" [33 C.F.R. §328.3(b)]. Wetlands require wetland hydrology, hydric soils, and hydrophytic vegetation. Examples of wetlands include freshwater marsh, seasonal wetlands, and vernal pool complexes that have a hydrologic link to waters of the U.S.

Federal Regulatory Setting

There are a number of regulatory agencies whose responsibility includes the oversight of the natural resources of the State and nation including the California Department of Fish and Wildlife (CDFW), the U.S. Fish and Wildlife Service (USFWS), the U.S. Army Corps of Engineers (USACE), and the National Marine Fisheries Service (NMFS). These agencies often respond to declines in the quantity of a particular habitat or plant or animal species by developing protective measures for those species or habitat type.

Federal Endangered Species Act

The Federal Endangered Species Act, passed in 1973, defines an endangered species as any species or subspecies that is in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as any species or subspecies that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Once a species is listed it is fully protected from a "take" unless a take permit is issued by the United States Fish and Wildlife Service. A take is defined as the harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting wildlife species or any attempt to engage in such conduct, including modification of its habitat (16 USC 1532, 50 CFR 17.3). Proposed endangered or threatened species are those species for which a proposed regulation, but not a final rule, has been published in the Federal Register.

Migratory Bird Treaty Act

To kill, posses, or trade a migratory bird, bird part, nest, or egg is a violation of the Federal Migratory Bird Treaty Act (FMBTA: 16 U.S.C., §703, Supp. I, 1989), unless it is in accordance with the regulations that have been set forth by the Secretary of the Interior.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 USC Section 668) protects these birds from direct take and prohibits the take or commerce of any part of these species. The USFWS administers the act, and reviews Federal agency actions that may affect these species.

Clean Water Act – Section 404

Section 404 of the Clean Water Act (CWA) regulates all discharges of dredged or fill material into waters of the U.S. Discharges of fill material includes the placement of fill that is necessary for the construction of any structure, or impoundment requiring rock, sand, dirt, or other material for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; and fill for intake and outfall pipes and subaqueous utility lines [33 C.F.R. §323.2(f)].

Waters of the U.S. include lakes, rivers, streams, intermittent drainages, mudflats, sandflats, wetlands, sloughs, and wet meadows [33 C.F.R. §328.3(a)]. Wetlands are defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" [33 C.F.R. §328.3(b)]. Waters of the U.S. exhibit a defined bed and bank and ordinary high water mark (OHWM). The OHWM is defined by the USACE as "that line on shore established by the fluctuations of water and indicated by physical character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas" [33 C.F.R. §328.3(e)].

The USACE is the agency responsible for administering the permit process for activities that affect waters of the U.S. Executive Order 11990 is a Federal implementation policy, which is intended to result in no net loss of wetlands.

Clean Water Act - Section 401

Section 401 of the CWA (33 U.S.C. 1341) requires an applicant who is seeking a 404 permit to first obtain a water quality certification from the Regional Water Quality Control Board. To obtain the water quality certification, the Regional Water Quality Control Board must indicate that the proposed fill would be consistent with the standards set forth by the State.

Department of Transportation Act - Section 4(f)

Section 4(f) has been part of Federal law since 1966. It was enacted as Section 4(f) of the Department of Transportation (DOT) Act of 1966 and set forth in Title 49 United States Code (U.S.C.), Section 1653(f). In January 1983, as part of an overall recodification of the DOT Act, Section 4(f) was amended and codified in 49 U.S.C. Section 303. This law established policy on Lands, Wildlife and Waterfowl Refuges, and Historic Sites as follows:

It is the policy of the United States Government that special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites. The Secretary of Transportation shall cooperate and consult with the Secretaries of the Interior, Housing and Urban Development, and Agriculture, and with the States, in developing transportation plans and programs that include measures to maintain or enhance the natural beauty of lands crossed by transportation activities or facilities. The Secretary of Transportation may approve a transportation program or project (other than any project for a park road or parkway under section 204 of title 23) requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of a historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) only if: a) There is no prudent and feasible alternative to using that land; and b) The program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use.

State Regulatory Setting

Fish and Game Code §2050-2097 - California Endangered Species Act

The California Endangered Species Act (CESA) protects certain plant and animal species when they are of special ecological, educational, historical, recreational, aesthetic, economic, and scientific value to the people of the State. CESA established that it is State policy to conserve, protect, restore, and enhance endangered species and their habitats.

CESA was expanded upon the original Native Plant Protection Act and enhanced legal protection for plants. To be consistent with Federal regulations, CESA created the categories of "threatened" and "endangered" species. It converted all "rare" animals into the Act as threatened species, but did not do so for rare plants. Thus, there are three listing categories for plants in California: rare, threatened, and endangered. Under State law, plant and animal species may be formally designated by official listing by the California Fish and Game Commission.

Fish and Game Code §1900-1913 California Native Plant Protection Act

In 1977 the State Legislature passed the Native Plant Protection Act (NPPA) in recognition of rare and endangered plants of the State. The intent of the law was to preserve, protect, and enhance endangered plants. The NPPA gave the California Fish and Game Commission the power to designate native plants as endangered or rare, and to require permits for collecting, transporting, or selling such plants. The NPPA includes provisions that prohibit the taking of plants designated as "rare" from the wild, and a salvage mandate for landowners, which requires notification of the CDFW 10 days in advance of approving a building site.

Fish and Game Code §3503, 3503.5, 3800 - Predatory Birds

Under the California Fish and Game Code, all predatory birds in the order Falconiformes or Strigiformes in California, generally called "raptors," are protected. The law indicates that it is unlawful to take, posses, or destroy the nest or eggs of any such bird unless it is in accordance with the code. Any activity that would cause a nest to be abandoned or cause a reduction or loss in a reproductive effort is considered a take. This generally includes construction activities.

Fish and Game Code §1601-1603 - Streambed Alteration

Under the California Fish and Game Code, CDFW has jurisdiction over any proposed activities that would divert or obstruct the natural flow or change the bed, channel, or bank of any lake or stream. Private landowners or project proponents must obtain a "Streambed Alteration Agreement" from CDFW prior to any alteration of a lake bed, stream channel, or their banks. Through this agreement, the CDFW may impose conditions to limit and fully mitigate impacts on fish and wildlife resources. These agreements are usually initiated through the local CDFW warden and will specify timing and construction conditions, including any mitigation necessary to protect fish and wildlife from impacts of the work.

Public Resources Code § 21000 - California Environmental Quality Act

The California Environmental Quality Act (CEQA) identifies that a species that is not listed on the Federal or State endangered species list may be considered rare or endangered if the species meets certain criteria. Under CEQA public agencies must determine if a project would adversely affect a species that is not protected by FESA or CESA. Species that are not listed under FESA or CESA, but are otherwise eligible for listing (i.e., candidate or proposed) may be protected by the local government until the opportunity to list the species arises for the responsible agency.

Species that may be considered for review are included on a list of "Species of Special Concern," developed by the CDFW. Additionally, the California Native Plant Society (CNPS) maintains a list of plant species native to California that have low numbers, limited distribution, or are otherwise threatened with extinction. This information is published in the Inventory of Rare and Endangered Vascular Plants of California. List 1A contains plants that are believed to be extinct. List 1B contains plants that are rare, threatened, or endangered in California and elsewhere. List 2 contains plants that are rare, threatened, or endangered in California, but more numerous elsewhere. List 3 contains plants where additional information is needed. List 4 contains plants with a limited distribution.

Public Resources Code § 21083.4 - Oak woodlands conservation

In 2004, the California legislature enacted SB 1334, which added oak woodland conservation regulations to the Public Resources Code. This new law requires a county to determine whether a project, within its jurisdiction, may result in a conversion of oak woodlands that will have a significant effect on the environment. If a county determines that there may be a significant effect to oak woodlands, the county must require oak woodland mitigation alternatives to mitigate the significant effect of the conversion of oak woodlands. Such mitigation alternatives include: conservation through the use of conservation easements; planting and

maintaining an appropriate number of replacement trees; contribution of funds to the Oak Woodlands Conservation Fund for the purpose of purchasing oak woodlands conservation easements; and/or other mitigation measures developed by the county.

California Oak Woodland Conservation Act

The California Legislature passed Assembly Bill 242, known as the California Oak Woodland Conservation Act, in 2001 as a result of widespread changes in land use patterns across the landscape that were fragmenting oak woodland character over extensive areas. The Act created the California Oak Woodland Conservation Program within the Wildlife Conservation Board. The legislation provides funding and incentives to ensure the future viability of California's oak woodland resources by maintaining large scale land holdings or smaller multiple holdings that are not divided into fragmented, nonfunctioning biological units. The Act acknowledged that the conservation of oak woodlands enhances the natural scenic beauty for residents and visitors, increases real property values, promotes ecological balance, provides habitat for over 300 wildlife species, moderates temperature extremes, reduces soil erosion, sustains water quality, and aids with nutrient cycling, all of which affect and improve the health, safety, and general welfare of the residents of the State.

California Wetlands Conservation Policy

In August 1993, the Governor announced the "California Wetlands Conservation Policy." The goals of the policy are to establish a framework and strategy that will:

- Ensure no overall net loss and to achieve a long-term net gain in the quantity, quality, and permanence of wetland acreage and values in California in a manner that fosters creativity, stewardship, and respect for private property.
- Reduce procedural complexity in the administration of State and Federal wetland conservation programs.
- Encourage partnerships to make landowner incentive programs and cooperative planning efforts the primary focus of wetland conservation and restoration.

The Governor also signed Executive Order W-59-93, which incorporates the goals and objectives contained in the new policy and directs the Resources Agency to establish an Interagency Task Force to direct and coordinate administration and implementation of the policy.

Local Regulatory Setting

City of Lake Forest General Plan

The existing City of Lake Forest General Plan identifies policies related to biological resources in its Recreation and Resources Element. Please see the existing General Plan for additional detail.

Environmental Setting

The City of Lake Forest is surrounded by the City of Irvine to the west; Whiting Ranch Wilderness Park and an unincorporated area of Orange County to the north; the City of Mission Viejo to the east and south; and the Cities of Laguna Hills and Laguna Woods to the south. Terrain in the City of Lake Forest ranges from the Saddleback Valley in the southern part of the City, to low hills in the north that lead up to the foothills of the Santa Ana Mountains further north of the City. Much of the City of Lake Forest has a gentle southwest slope, with elevations ranging from approximately 300 feet above mean sea level (amsl) at the southwestern corner of the City to approximately 1,500 feet amsl at the northern end of the City.

Bioregions

Lake Forest is located within the South Coast bioregion. Landscapes in this bioregion range from flatlands to mountains; ecosystems range from ocean to desert. The City is bounded on the north by the southern edge of Los Padres National Forest and the northern base of the San Gabriel and San Bernardino Mountains and bounded on the east by the western edge of the BLM California Desert Conservation Area and on south by the Mexican border. The regions also contains two of California's largest cities (Los Angeles and San Diego) more than any other bioregion urbanization has caused intense effects of natural resources. Urbanization in the south coast bioregion has resulted in the loss of habitat, spread of nonnative species and the loss of native species.

California Wildlife Habitat Relationship System

The California Wildlife Habitat Relationship (CWHR) habitat classification scheme has been developed to support the CWHR System, a wildlife information system and predictive model for California's regularly-occurring birds, mammals, reptiles and amphibians. When first published in 1988, the classification scheme had 53 habitats. At present, there are 59 wildlife habitats in

the CWHR System: 27 tree, 12 shrub, 6 herbaceous, 4 aquatic, 8 agricultural, 1 developed, and 1 non-vegetated.

According to the California Wildlife Habitat Relationship System there are 12 cover types (wildlife habitat classifications) in the City of Lake Forest out of 59 found in the State. These include: Annual Grassland, Barren, Chamise-Redshank Chaparral, Coastal Oak Woodland, Coastal Scrub, Deciduous Orchard, Evergreen Orchard, Lacustrine, Mixed Chaparral, Pasture, Urban, and Valley Foothill Riparian.

Table 9-1 identifies the total area by acreage for each cover type (wildlife habitat classification) found in Lake Forest. Figure 9-1 illustrates the location of each cover type (wildlife habitat classification) within Lake Forest. A brief description of each cover type follows.

Table 9-1 Cover Types - California Wildlife Habitat Relationship System

NAME	CITY ACRES
Annual Grassland	539.17
Barren	188.07
Chamise-Redshank Chaparral	76.79
Coastal Oak Woodland	247.72
Coastal Scrub	1,366.39
Deciduous Orchard	28.71
Evergreen Orchard	128.76
Lacustrine	2.89
Mixed Chaparral	527.31
Pasture	41.81
Urban	7,448.39
Valley Foothill Riparian	146.60
Total	10,742.61

Source: City of Lake Forest GIS, CWHR 2018.

Developed Cover Types

Deciduous Orchard in California is typically open single species tree dominated habitats. Depending on the tree type and pruning methods they are usually low, bushy trees with an open understory to facilitate harvest. Deciduous orchards include trees, such as, almonds, apples, apricots, cherries, figs, nectarines, peaches, pears, pecans, pistachios, plums, pomegranates, prunes and walnuts. Trees range in height at maturity for many species from 5 to 10 meters (m) (15 to 30 feet) (ft), but may be 3 m (10 ft) or less in pomegranates and some dwarf varieties, or 18 m (60 ft) or more in pecans and walnuts. Crowns usually touch, and are usually in a linear pattern. Spacing between trees is uniform depending on desired spread of mature trees. The understory is usually composed of low-growing grasses, legumes, and other herbaceous plants, but may be managed to prevent understory growth totally or partially, such as along tree rows. Within the City limits, there are 28.71 acres of deciduous orchard habitat.

Evergreen Orchard in California is typically open single species tree dominated habitats. Depending on the tree type and pruning methods they are usually low, bushy trees with an open understory to facilitate harvest. Evergreen orchards include trees, such as, avocados, dates, grapefruit, lemons, limes, olives, oranges, tangerines, tangelos and tangors. Trees range in height at maturity for many species from 5 to 10 m (15 to 30 ft), but may be 3 m (10 ft) or less in some dwarf varieties, or 18 m (60 ft) or more in date palms. Crowns often do not touch, and are usually in a linear pattern. Spacing between trees is uniform depending on desired spread of mature trees. The understory is usually composed of low-growing grasses, legumes, and other herbaceous plants, but may be managed to prevent understory growth totally or partially, such as along tree rows. Within the City limits, there are 128.76 acres of evergreen orchard habitat.

Urban habitats are not limited to any particular physical setting. Three urban categories relevant to wildlife are distinguished: downtown, urban residential, and suburbia. The heavily-developed downtown is usually at the center, followed by concentric zones of urban residential and suburbs. There is a progression outward of decreasing development and increasing vegetative cover. Species richness and diversity is extremely low in the inner cover. The structure of urban vegetation varies, with five types of vegetative structure defined: tree grove, street strip, shade tree/lawn, lawn, and shrub cover. A distinguishing feature of the urban wildlife habitat is the mixture of native and exotic species. Within the City limits, there are 7,448.36 acres of urban habitat.

Herbaceous Cover Types

Annual Grassland habitat occurs mostly on flat plains to gently rolling foothills. Climatic conditions are typically Mediterranean, with cool, wet winters and dry, hot summers. The length of the frost-free season averages 250 to 300 days. Annual precipitation is highest in northern California. Within the Lake Forest city limits, there are 539.17 acres of annual grassland habitat.

Pasture habitats comprise a mix of perennial grasses and legumes that normally provide 100 percent canopy closure. Height of vegetation varies, according to season and livestock stocking levels, from a few inches to two or more feet on fertile soils before grazing. Pastures often occur in association with agricultural habitats. The mix of grasses and legumes varies according to management practices such as seed mixture, fertilization, soil type, irrigation, weed control, and the type of livestock on the pasture. Plan species seeded in pastures also vary with geographic area. In southern California, Bermuda grass is prevalent. Within the Lake Forest city limits, there are 41.81 acres of pasture habitat.

Hardwood Woodland Cover Types

Coastal oak woodland habitats occupy a variety of Mediterranean type climates that vary from north to south and west to east. Precipitation occurs in the milder winter months, almost entirely as rainfall, followed by warm to hot, dry summers. Near the coast, the summers are tempered by fogs and cool, humid sea breezes. Mean annual precipitation varies from about 40 inches in the north to about 15 inches in southern and interior regions. Mean minimum winter temperatures are 29 to 44 °F, and the mean maximum summer temperatures are 75 to 96 °F. The growing season ranges from six months (180 frost-free days) in the north to the entire year in mild coastal regions to the south. The soils and parent material on which coastal oak woodlands occur are extremely variable. In San Luis Obispo County alone they are found on over fifteen different parent materials ranging from unconsolidated siliceous sand to diatomaceous earth to serpentinite to volcanic ash and basalt. Coastal oak woodlands generally occur on moderately to well-drained soils that are moderately deep and have low to medium fertility. Within the Lake Forest city limits, there are 247.72 acres of coastal oak woodland habitat.

Valley foothill riparian habitats are found in valleys bordered by sloping alluvial fans, slightly dissected terraces, lower foothills, and coastal plains. They are generally associated with low velocity flows, flood plains, and gentle topography. Valleys provide deep alluvial soils and a high water table. The substrate is coarse, gravelly, or rocky soils more or less permanently moist, but probably well aerated. Frost and short periods of freezing occur in winter (200 to 350 frost-free days). This habitat is characterized by hot, dry summers and mild and wet winters. Temperatures range from 75 to 102 °F in the summer to 29 to 44 °F in the winter. Average precipitation ranges from 6 to 30 inches, with little or no snow. The growing season is 7 to 11 months. Within the Lake Forest city limits, there are 146.30 acres of valley-foothill riparian habitat.

Shrub-Dominated Cover Types

Coastal scrub habitat is typified by low to moderate-sized shrubs with mesophytic leaves, flexible branches, semi-woody stems growing from a woody base, and a shallow root system. Coastal Scrub seems to tolerate drier conditions than its associated habitats. It is typical of areas with steep, south-facing slopes; sandy, mudstone or shale soils; and average annual rainfall of less than 12 inches. However, coastal scrub habitat also regularly occurs on stabilized dunes, flat terraces, and moderate slopes of all aspects where average annual rainfall is up to 24 inches. Stand composition and structure differ markedly in response to these physiographic features. Within the Lake Forest city limits, there are 1,366.39 acres of coastal scrub habitat.

Chamise-Redshank Chaparral habitat structure is influenced by fire. Mature Chamise-Redshank Chaparral is single layered, generally lacking well-developed herbaceous ground cover and overstory trees. Shrub canopies frequently overlap, producing a nearly impenetrable canopy of interwoven branches. Chamise-dominated stands average 1 to 2 m (3.3 to 6.6 ft) in height, but can reach 3 m (9.8 ft). Total shrub cover frequently exceeds 80 percent, but may be considerably lower on extremely xeric sites with poor soils. Redshank stands are slightly taller, averaging 2 to 4 m (6.6 to 13.1 ft) but occasionally reaching 6 m (19.7 ft). Mature redshank frequently is more open than chamise and can have sparse herbaceous cover between shrubs. Composition In southern California includes white sage, black sage, and California buckwheat are common at lower elevations and on recently disturbed sites. Within the Lake Forest city limits, there are 76.79 acres of chamise-redshank chaparral habitat.

Mixed Chaparral is a structurally homogeneous brushland type dominated by shrubs with thick, stiff, heavily cutinized evergreen leaves. Shrub height and crown cover vary considerably with age since last burn, precipitation regime, aspect, and soil type. At maturity, cismontane Mixed Chaparral typically is a dense, nearly impenetrable thicket with greater than 80 percent absolute shrub cover. Canopy height ranges from 1 to 4 m (3.3 to 13.1 fl), occasionally to 6 m (19.6 fl). Mixed Chaparral is a floristically rich type that supports approximately 240 species of woody plants. Composition changes between northern and southern California and with precipitation regime, aspect, and soil type. Dominant species in cismontane Mixed Chaparral include scrub oak, chaparral oak, and several species of ceanothus and manzanita. Within the Lake Forest city limits, there are 527.31 acres of mixed chaparral habitat.

Aquatic Cover Types

Lacustrine habitats are inland depressions or dammed riverine channels containing standing water. These habitats may occur in association with any terrestrial habitats, Riverine, or Fresh Emergent Wetlands. They may vary from small ponds less than one acre to large areas covering several square miles. Depth can vary from a few inches to hundreds of feet. Typical lacustrine habitats include permanently flooded lakes and reservoirs, and intermittent lakes and ponds (including vernal pools) so shallow that rooted plants can grow over the bottom. Most permanent lacustrine systems support fish life; intermittent types usually do not. Within the Lake Forest city limits, there are 2.89 acres of lacustrine habitat.

Non-vegetated Habitats

Barren habitat is defined by the absence of vegetation, and habitat with <2% total vegetation cover by herbaceous, desert, or non-wildland species, and <10% cover by tree or shrub species. Structure and composition of the substrate is largely determined by the region of the state and surrounding environment. Urban settings covered in pavement and buildings may classified as barren as long as vegetation, including non-native landscaping, does not reach the % cover thresholds for vegetated habitats. Within the Lake Forest city limits, there are 188.07 acres of barren land.

Special-Status Species

The following discussion is based on a background search of special-status species that are documented in the California Natural Diversity Database (CNDDB), the California Native Plant Survey (CNPS) Inventory of Rare and Endangered Plants, and the USFWS endangered and threatened species lists. The background search was regional in scope and focused on the documented occurrences within a 9 quad (approximately 10 mile), and a 1 mile search area.

Special Status Plants

The search revealed documented occurrences of 46 special status plant species within the 9 quad search area. Of these 46 special status plant species within the 9 quad search area, seven species were documented within one mile of Lake Forest.

Table 9-2 provides a list of special-status plant species that are documented within a 9 quad search area (approximately a 10 mile radius) of Lake Forest, and current protective status. Figure 9-2 illustrates the special status species located within one mile of Lake Forest. Figure 9-3 illustrates the special status species located within the 9 quad search area.

Table 9-2 Special Status Plants Present or Potentially Present (9 Quad Search Area)

Scientific Name	Common Name	Federal Status	State Status	CNPS*
Abronia villosa var. aurita	Chaparral sand-verbena	None	None	1B.1
Aphanisma blitoides	Aphanisma	None	None	1B.2
Astragalus brauntonii	Braunton's milk-vetch	Endangered	None	1B.1
Atriplex coulteri	Coulter's saltbush	None	None	1B.2
Atriplex pacifica	South coast saltscale	None	None	1B.2
Atriplex parishii	Parish's brittlescale	None	None	1B.1
Atriplex serenana var. davidsonii	Davidson's saltscale	None	None	1B.2
Baccharis malibuensis	Malibu baccharis	None	None	1B.1
Brodiaea filifolia	Thread-leaved brodiaea	Threatened	Endangered	1B.1
Calochortus plummerae	Plummer's mariposa-lily	None	None	4.2
Calochortus weedii var. intermedius	Intermediate mariposa-lily	None	None	1B.2
Centromadia parryi ssp. australis	Southern tarplant	None	None	1B.1
Chaenactis glabriuscula var. orcuttiana	Orcutt's pincushion	None	None	1B.1
Chorizanthe parryi var. fernandina	San Fernando Valley spineflower	Proposed Threatened	Endangered	1B.1
Chorizanthe polygonoides var. longispina	Long-spined spineflower	None	None	1B.2
Clinopodium chandleri	San Miguel savory	None	None	1B.2
Comarostaphylis diversifolia ssp. diversifolia	Summer holly	None	None	1B.2
Dudleya multicaulis	Many-stemmed dudleya	None	None	1B.2

Scientific Name	Common Name	Federal Status	State Status	CNPS*
Dudleya stolonifera	Laguna Beach dudleya	Threatened	Threatened	1B.1
Dudleya viscida	Sticky dudleya	None	None	1B.2
Eriastrum densifolium ssp. sanctorum	Santa Ana River woollystar	Endangered	Endangered	1B.1
Euphorbia misera	Cliff spurge	None	None	2B.2
Helianthus nuttallii ssp. parishii	Los Angeles sunflower	None	None	1A
Hesperocyparis forbesii	Tecate cypress	None	None	1B.1
Horkelia cuneata var. puberula	Mesa horkelia	None	None	1B.1
Imperata brevifolia	California satintail	None	None	2B.1
Isocoma menziesii var. decumbens	Decumbent goldenbush	None	None	1B.2
Lasthenia glabrata ssp. coulteri	Coulter's goldfields	None	None	1B.1
Lepechinia cardiophylla	Heart-leaved pitcher sage	None	None	1B.2
Lepidium virginicum var. robinsonii	Robinson's pepper-grass	None	None	4.3
Monardella hypoleuca ssp. intermedia	Intermediate monardella	None	None	1B.3
Monardella macrantha ssp. hallii	Hall's monardella	None	None	1B.3
Nama stenocarpa	Mud nama	None	None	2B.2
Nasturtium gambelii	Gambel's water cress	Endangered	Threatened	1B.1
Navarretia prostrata	Prostrate vernal pool navarretia	None	None	1B.1
Nolina cismontana	Chaparral nolina	None	None	1B.2
Penstemon californicus	California beardtongue	None	None	1B.2
Pentachaeta aurea ssp. allenii	Allen's pentachaeta	None	None	1B.1
Phacelia keckii	Santiago Peak phacelia	None	None	1B.3
Pseudognaphalium leucocephalum	White rabbit-tobacco	None	None	2B.2
Quercus dumosa	Nuttall's scrub oak	None	None	1B.1
Senecio aphanactis	Chaparral ragwort	None	None	2B.2
Sidalcea neomexicana	Salt spring checkerbloom	None	None	2B.2
Suaeda esteroa	Estuary seablite	None	None	1B.2
Symphyotrichum defoliatum	San Bernardino aster	None	None	1B.2
Verbesina dissita	Big-leaved crownbeard	Threatened	Threatened	1B.1

Source: CDFW CNDDB 2018

Notes: California Native Plant Society (CNPS) Key:

1A CNPS – Presumed Extirpated in California and either Rare or Extinct Elsewhere

1B CNPS - Rare, Threatened, or Endangered in California and Elsewhere

2B CNPS - Rare, Threatened, or Endangered in California, But More Common Elsewhere

4 CNPS - Plants of Limited Distribution - A Watch List

Ranks at each level also include a threat rank (e.g. 4.3) and are determined as follows:

0.1 – Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)

0.2 – Moderately threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat)

0.3 – Not very threatened in California (less than 20% of occurrences threatened/low degree and immediacy of threat or no current threats known).

Special Status Animals

The search revealed documented occurrences of 65 special status animal species within the 9 quad search areas. This includes: three amphibians, 26 birds, six fish, 15 mammals, 10 reptiles, and five invertebrates. Of the 65 special status animal species within the 9 quad search areas, 30 species are located within one mile of Lake Forest. Table 9-3 provides a list of the special-status animal species that are documented within the 9 quad search area, and current protective status. Figure 9-2 illustrates the special

status species located within one mile of Lake Forest. Figure 9-3 illustrates the special status species located within the 9 quad search area.

Table 9-3 Special Status Animals Present or Potentially Present (9 Quad Search Area)

Scientific Name	Common Name	Federal Status	State Status	CFDW Status
Amphibians				
Anaxyrus californicus	Arroyo toad	Endangered	None	SSC
Lithobates pipiens	Northern leopard frog	None	None	SSC
Spea hammondii	Western spadefoot	None	None	SSC
Birds				
Falco peregrinus anatum	American peregrine falcon	Delisted	Delisted	FP
Haliaeetus leucocephalus	Bald eagle	Delisted	Endangered	FP
Passerculus sandwichensis beldingi	Belding's savannah sparrow	None	Endangered	--
Artemisiospiza belli	Bell's sage sparrow	None	None	WL
Athene cunicularia	Burrowing owl	None	None	SSC
Laterallus jamaicensis coturniculus	California black rail	None	Threatened	FP
Eremophila alpestris actia	California horned lark	None	None	WL
Sternula antillarum browni	California least tern	Endangered	Endangered	FP
Campylorhynchus brunneicapillus sandiegensis	Coastal cactus wren	None	None	SSC
Polioptila californica	Coastal California gnatcatcher	Threatened	None	SSC
Accipiter cooperii	Cooper's hawk	None	None	WL
Buteo regalis	Ferruginous hawk	None	None	WL
Aquila chrysaetos	Golden eagle	None	None	FP; WL
Ammodramus savannarum	Grasshopper sparrow	None	None	SSC
Ardea Herodias	Great blue heron	None	None	--
Vireo bellii pusillus	Least Bell's vireo	Endangered	Endangered	--
Rallus obsoletus levipes	Light-footed Ridgway's rail	Endangered	Endangered	FP
Asio otus	Long-eared owl	None	None	SSC
Circus cyaneus	Northern harrier	None	None	SSC
Empidonax traillii extimus	Southwestern willow flycatcher	Endangered	Endangered	--
Agelaius tricolor	Tricolored blackbird	None	Candidate Endangered	SSC
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	Threatened	Endangered	--
Elanus leucurus	White-tailed kite	None	None	FP
Coturnicops noveboracensis	Yellow rail	None	None	SSC
Setophaga petechia	Yellow Warbler	None	None	SSC
Icteria virens	Yellow-breasted chat	None	None	SSC
Fish				
Gila orcuttii	Arroyo chub	None	None	SSC
Rhinichthys osculus	Santa Ana speckled dace	None	None	SSC
Catostomus santaanae	Santa Ana sucker	Threatened	None	--
Southern California Arroyo Chub/ Santa Ana Sucker Stream	Southern California Arroyo Chub/ Santa Ana Sucker Stream	None	None	--

Scientific Name	Common Name	Federal Status	State Status	CFDW Status
Aimophila ruficeps canescens	Southern California rufous-crowned sparrow	None	None	WL
Eucyclogobius newberryi	Tidewater goby	Endangered	None	SSC
Mammals				
Taxidea taxus	American badger	None	None	SSC
Nyctinomops macrotis	Big free-tailed bat	None	None	SSC
Choeronycteris mexicana	Mexican long-tongued bat	None	None	SSC
Chaetodipus fallax	Northwestern San Diego pocket mouse	None	None	SSC
Perognathus longimembris pacificus	Pacific pocket mouse	Endangered	None	SSC
Antrozous pallidus	Pallid bat	None	None	SSC
Nyctinomops femorosaccus	Pocketed free-tailed bat	None	None	SSC
Neotoma lepida intermedia	San Diego desert woodrat	None	None	SSC
Aimophila ruficeps canescens	Southern California saltmarsh shrew	None	None	WL
Onychomys torridus ramona	Southern grasshopper mouse	None	None	SSC
Dipodomys stephensi	Stephens' kangaroo rat	Endangered	Threatened	--
Eumops perotis californicus	Western mastiff bat	None	None	SSC
Lasiurus blossevillii	Western red bat	None	None	SSC
Lasiurus xanthinus	Western yellow bat	None	None	SSC
Myotis yumanensis	Yuma myotis	None	None	--
Reptiles				
Arizona elegans occidentalis	California glossy snake	None	None	SSC
Lampropeltis zonata (pulchra)	California mountain kingsnake (San Diego population)	None	None	WL
Phrynosoma blainvillii	Coast horned lizard	None	None	SSC
Salvadora hexalepis virgultea	Coast patch-nosed snake	None	None	SSC
Taricha torosa	Coast range newt	None	None	SSC
Aspidoscelis tigris stejnegeri	Coastal whiptail	None	None	SSC
Aspidoscelis hyperythra	Orange-throated whiptail	None	None	WL
Crotalus ruber	Red-diamond rattlesnake	None	None	SSC
Thamnophis hammondii	Two-striped gartersnake	None	None	SSC
Emys marmorata	Western pond turtle	None	None	SSC
Invertebrates				
Bombus crotchii	Crotch bumble bee	None	None	SSC
Tryonia imitator	California brackishwater snail	None	None	--
Danaus plexippu	Monarch butterfly	None	None	--
Streptocephalus woottoni	Riverside fairy shrimp	Endangered	None	--
Branchinecta sandiegonensis	San Diego fairy shrimp	Endangered	None	--

Source: CDFW CNDDB 2018

Notes: Status is shown for (Federal, State). (--) indicates no listing status.

Abbreviations:

FP California Fully Protected

SSC *CDFW Species of Special Concern*

WL *CDFW Watch List*

Sensitive Natural Communities

The California Department of Fish and Wildlife (CDFW) considers sensitive natural communities to have significant biotic value, with species of plants and animals unique to each community. The CNDDB search revealed 12 sensitive natural communities within the 9 quad search area, with four sensitive natural communities within one mile of Lake Forest. The sensitive natural communities within the 9 quad search area include the terrestrial communities of California Walnut Woodland, Canyon Live Oak Ravine Forest, Southern Coast Live Oak Riparian Forest, Southern Cottonwood Willow Riparian Forest, Southern Interior Cypress Forest, Southern Mixed Riparian Forest, Southern Riparian Forest, Southern Riparian Scrub, Southern Sycamore Alder Riparian Woodland, Southern Woodland Scrub, and Valley Needlegrass Grassland, and the aquatic community of Southern Coast Marsh.

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9.2 GEOLOGY, SOILS, AND SEISMICITY

This section addresses soil, seismic, and geologic hazards in the City of Lake Forest.

Federal Regulatory Setting

International Building Code (IBC)

The purpose of the International Building Code (IBC) is to provide minimum standards to preserve the public peace, health, and safety by regulating the design, construction, quality of materials, certain equipment, location, grading, use, occupancy, and maintenance of all buildings and structures. IBC standards address foundation design, shear wall strength, and other structurally related conditions.

State Regulatory Setting

The State of California has established a variety of regulations and requirements related to seismic safety and structural integrity, including the California Building Standards Code, the Alquist-Priolo Earthquake Fault Zoning Act and the Seismic Hazards Mapping Act.

California Building Standards Code

Title 24 of the California Code of Regulations, known as the California Building Standards Code (CBSC) or simply "Title 24," contains the regulations that govern the construction of buildings in California. The CBSC includes 12 parts: California Building Standards Administrative Code, California Building Code, California Residential Building Code, California Electrical Code, California Mechanical Code, California Plumbing Code, California Energy Code, California Historical Building Code, California Fire Code, California Existing Building Code, California Green Building Standards Code (CALGreen Code), and the California Reference Standards Code. Through the CBSC, the State provides a minimum standard for building design and construction. The CBSC contains specific requirements for seismic safety, excavation, foundations, retaining walls, and site demolition. It also regulates grading activities, including drainage and erosion control.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 sets forth the policies and criteria of the State Mining and Geology Board, which governs the exercise of governments' responsibilities to prohibit the location of developments and structures for human occupancy across the trace of active faults. The policies and criteria are limited to potential hazards resulting from surface faulting or fault creep within Earthquake Fault Zones, as delineated on maps officially issued by the State Geologist. Working definitions include:

Fault – a fracture or zone of closely associated fractures along which rocks on one side have been displaced with respect to those on the other side;

Fault Zone – a zone of related faults, which commonly are braided and sub parallel, but may be branching and divergent. A fault zone has a significant width (with respect to the scale at which the fault is being considered, portrayed, or investigated), ranging from a few feet to several miles;

Sufficiently Active Fault – a fault that has evidence of Holocene surface displacement along one or more of its segments or branches (last 11,000 years); and

Well-Defined Fault – a fault whose trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface. The geologist should be able to locate the fault in the field with sufficient precision and confidence to indicate that the required site-specific investigations would meet with some success.

"Sufficiently Active" and "Well Defined" are the two criteria used by the State to determine if a fault should be zoned under the Alquist-Priolo Earthquake Fault Zoning Act.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act, passed in 1990, addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically-induced landslides. Under the Act, seismic hazard zones are to be mapped by the State Geologist to assist local governments in land use planning. The program and actions mandated by the Seismic Hazards Mapping Act closely resemble those of the Alquist-Priolo Earthquake Fault Zoning Act (which addresses only surface fault-rupture hazards) and are outlined below:

- The State Geologist is required to delineate the various "seismic hazard zones."

- Cities and counties, or other local permitting authority, must regulate certain development "projects" within the zones. They must withhold the development permits for a site within a zone until the geologic and soil conditions of the site are investigated and appropriate mitigation measures, if any, are incorporated into development plans.
- The State Mining and Geology Board provides additional regulations, policies, and criteria to guide cities and counties in their implementation of the law. The Board also provides guidelines for preparation of the Seismic Hazard Zone Maps and for evaluating and mitigating seismic hazards.
- Sellers (and their agents) of real property within a mapped hazard zone must disclose that the property lies within such a zone at the time of sale.

Caltrans Seismic Design Criteria

The California Department of Transportation (Caltrans) has Seismic Design Criteria (SDC), which is an encyclopedia of new and currently practiced seismic design and analysis methodologies for the design of new bridges in California. The SDC adopts a performance-based approach specifying minimum levels of structural system performance, component performance, analysis, and design practices for ordinary standard bridges. The SDC has been developed with input from the Caltrans Offices of Structure Design, Earthquake Engineering and Design Support, and Materials and Foundations. Memo 20-1 Seismic Design Methodology (Caltrans 1999) outlines the bridge category and classification, seismic performance criteria, seismic design philosophy and approach, seismic demands and capacities on structural components, and seismic design practices that collectively make up Caltrans' seismic design.

Local Regulatory Setting

City of Lake Forest General Plan

The existing City of Lake Forest General Plan identifies policies related to geological resources in its Safety and Noise Element. Please see the existing General Plan for additional detail.

City of Lake Forest Municipal Code

The City of Lake Forest Municipal Code includes Chapter 7.04 that requires a soils report if expansive soils or other problem soils are found, prior to a subdivision. Chapter 8.30 requires that a soil engineering and engineering geology report be prepared for grading projects within Lake Forest, unless otherwise waived by the City Engineer.

Environmental Setting

The City of Lake Forest is near the coastal margin of the Los Angeles Basin, which includes Orange County, and is underlain by more than 15,000 feet of stratified sedimentary rocks of marine origin. The regional geologic framework of the Los Angeles Basin area can be understood through the theory of plate tectonics. Earth's mantle is composed of several large plates that move relative to each other and are bounded by major fault zones. The San Andreas Fault zone, about 40 miles northeast of the City of Lake Forest, is the boundary between the Pacific Plate, on the west side of the zone, and the North American Plate on the east side. One of the results of the movement of these plates is the regional rock deformation that is expressed in the general northwest trend of valleys and ridges in the Los Angeles Basin. All of the geologic formations in the Los Angeles Basin are on the Pacific Plate.

The Santa Monica and San Gabriel Mountains, about 50 miles north of the City of Lake Forest, form the northern boundary of the Los Angeles Basin, and are part of the Transverse Ranges Geomorphic Province, which is characterized by east-west trending faults, folds, and mountain ranges. The Santa Ana Mountains and adjacent hills are located in the northeastern portion of the City and form the eastern boundary of the Los Angeles Basin. The Santa Ana Mountains are part of the Peninsular Ranges Geomorphic Province, which is characterized by northwest-southeast trending faults, folds, and mountain ranges. Both of these provinces, as well as the Los Angeles Basin, are considered to be highly active seismically.

Geomorphic Provinces

California's geomorphic provinces are naturally defined geologic regions that display a distinct landscape or landform. Earth scientists recognize eleven provinces in California. Each region displays unique, defining features based on geology, faults, topographic relief, and climate. These geomorphic provinces are remarkably diverse. They provide spectacular vistas and unique opportunities to learn about Earth's geologic processes and history. As described above, Lake Forest lies within the Los Angeles Basin geomorphic province.

Regional Geology

The geology of southern California formed as a result of complex plate tectonics and fault movement. The most notable fault in southern California, the San Andreas Fault, is a right lateral strike-slip (or transform) fault that marks the boundary between the Pacific tectonic plate and the North American tectonic plate (Wallace 1990). Both plates are moving northward, but the Pacific plate is moving at a faster rate than the North American plate and the relative difference in the two rates results in movement along the San Andreas Fault (Wallace 1990). Northwest of the Los Angeles basin, where the southern San Joaquin Valley meets the San Emigdio and Tehachapi Mountains, the orientation of the San Andreas Fault changes from generally northwest to west-northwest (Wallace 1990). This portion of the fault system is known as the "Big Bend" (Singer, 2005). Another large fault in southern California, the left-lateral Garlock Fault, intersects the San Andreas Fault system at this location. This bend in the San Andreas Fault system results in transpressional forces between the two tectonic plates, a geologic result of which was the uplift of the Transverse Ranges, including the San Gabriel Mountains that rise to the north of the City (Wallace 1990).

The compression between the two plates also resulted in the formation of numerous reverse and thrust faults throughout the Los Angeles Basin. Several of these thrust faults are located near the City of Lake Forest and are discussed in more detail below. South of the Big Bend, several other major strike-slip faults, including the San Jacinto and the Elsinore faults, parallel the trace of the San Andreas Fault (Singer 2005).

The Los Angeles Basin is an alluviated lowland, or coastal plain, underlain by a structural depression (Yerkes et al. 1965: A1). Deposition of mostly marine sediments has occurred sporadically since the Late Cretaceous period and continuously since the middle Miocene period (Yerkes et al. 1965: A1). This marine and non-marine deposition over a long geologic timeframe resulted in a layer of organic-rich sediments that is up to several miles thick in some places (Yerkes et al. 1965: A1). These organic-rich sediments are the source of the vast petroleum reserves extracted from the basin throughout the twentieth century (Yerkes et al. 1965: A53).

Local Characteristics

The City of Lake Forest comprises about 17 square miles in a transition zone between an elevated coastal terrace and the Santa Ana Mountains. The western portion of the City, on the coastal terrace, is about 200 feet amsl. The land becomes progressively higher and steeper to the east, eventually reaching elevations above 1,500 feet amsl along the ridgeline of the Santa Ana Mountains. Traces of fault segments associated with the Newport-Inglewood Fault Zones parallel the ocean edge of the coastal terrace. Traces of the Elsinore Fault Zone follow the ridge of the Santa Ana Mountains (Yerkes 1965).

The geology of the region is complex and has undergone several alternating periods of subsidence and uplift, mass wasting (erosion), and sediment deposition. In the Santa Ana Mountains igneous, metavolcanic, and metasedimentary rocks of Jurassic age (208 million to 144 million years ago) and younger form the core of the range. The exposed rocks in the mountainous areas are slightly metamorphosed volcanics, which have been intruded by granitic rocks of Cretaceous age (144 million to 66.4 million years ago), principally granites, gabbros, and tonalites. Overlying these rocks are about 15,000 feet of younger sandstones, siltstones, and conglomerates of upper Cretaceous age, composed largely of material eroded from the older igneous and metavolcanic rocks now underlying the Santa Ana Mountains.

Faults

Faults are classified as Historic, Holocene, Late Quaternary, Quaternary, and Pre-Quaternary according to the age of most recent movement (California Geological Survey, 2002). These classifications are described as follows:

Historic: faults on which surface displacement has occurred within the past 200 years;

Holocene: shows evidence of fault displacement within the past 11,000 years, but without historic record;

Late Quaternary: shows evidence of fault displacement within the past 700,000 years, but may be younger due to a lack of overlying deposits that enable more accurate age estimates;

Quaternary: shows evidence of displacement sometime during the past 1.6 million years; and

Pre-Quaternary: without recognized displacement during the past 1.6 million years.

Faults are further distinguished as active, potentially active, or inactive. (California Geological Survey, 2002).

Active: An active fault is a Historic or Holocene fault that has had surface displacement within the last 11,000 years;

Potentially Active: A potentially active fault is a pre-Holocene Quaternary fault that has evidence of surface displacement between about 1.6 million and 11,000 years ago; and

Inactive: An inactive fault is a pre-Quaternary fault that does not have evidence of surface displacement within the past 1.6 million years. The probability of fault rupture is considered low; however, this classification does not mean that inactive faults cannot, or will not, rupture.

The most significant active fault traces in the vicinity of the City of Lake Forest are along the Newport-Inglewood and Elsinore fault zones, which are considered active. Figure 9-4 illustrates the location of local faults within the vicinity City of Lake Forest. There are numerous active faults located in the regional vicinity of Lake Forest. Below is a brief summary of the most notable faults in the regional vicinity:

Newport-Inglewood Fault: The Newport-Inglewood Fault zone was responsible for both the 1933 Long Beach Earthquake (magnitude M6.3) and the 1920 Inglewood Earthquake (estimated magnitude M4.9). This zone is visible on the surface as a series of northwest trending elongated hills extending from Newport Beach to Beverly Hills, including Signal Hill and Dominguez Hills. The fault zone exhibits as much as 6,000 feet of right lateral displacement that has occurred since mid-Pliocene time, about 3.4 million years ago, with a maximum displacement of 10,000 feet since late Miocene time, at least 5.3 million years ago (Woodward-Clyde Consultants 1979). An estimated characteristic earthquake of MW 7.1 is assigned to the zone based on its estimated rupture length and slip rate. Active or potentially active fault segments of the Newport-Inglewood Fault zone closest to Lake Forest include the north and south branches of the Newport-Inglewood Fault. The City of Lake Forest is 10 to 14 miles northeast of these fault segments, which places it just outside the CBC Near-Source Area for known active faults.

Palos Verdes Fault: The Palos Verdes Fault zone trends southeast offshore through San Pedro Bay about 26 miles southwest of Lake Forest. The fault is thought to contain active segments (CBC Seismic Source Type B) that could produce severe seismic shaking in the City of Lake Forest. One of several major faults of similar trend in Southern California, the Palos Verdes Fault is nearly parallel in orientation to the Newport-Inglewood Fault zone. The characteristic earthquake for the Palos Verdes Fault is MW 7.1, based on comparisons with the Newport-Inglewood zone.

San Andreas Fault: The San Andreas Fault zone trends east-southeast about 43 miles northeast of Lake Forest. This fault is widely recognized as the longest and most active fault in the state. It has been mapped from Cape Mendocino in northern California to an area near the Mexican border, approximately 500 miles. Abundant evidence of historic earthquakes indicates that the fault is active, including those that have caused extensive surface rupture and displacement of recent sediments. Current work indicates that large earthquakes have occurred along the fault at widely varying intervals, but averaging 160 years. A maximum probable earthquake of M 8.3 (magnitude of 8.3 on the Richter Scale) has been assigned to the San Andreas in Southern California (City of Lake Forest NHMP 2012).Lo

San Jacinto Fault: This active fault is similar to the San Andreas in that it is a large strike-slip fault that has been active for several million years. It has been the principal focus of historical release of strain in Southern California between the North American continental plate and Pacific Ocean plate. Surface rupture has been associated with several historic earthquakes on the fault. A maximum probable earthquake for the San Jacinto of M 7.2 is based upon historic seismicity and rupture length. (City of Lake Forest NHMP 2012). The San Jacinto Fault Zone trends southeast about 35 miles northeast of Lake Forest. The fault contains active segments (CBC Seismic Source Type A) that would cause severe seismic shaking in the City.

Santa Monica-Raymond Fault: The Santa Monica–Raymond Fault Zone trends east about 42 miles northwest of Lake Forest. The fault is thought to contain active segments (CBC Seismic Source Type B) that could produce severe seismic shaking in the City. The characteristic earthquake for the Santa Monica and Raymond faults is MW 6.6. There is evidence that at least eight surface-rupturing events have occurred along the fault in this area during the last 36,000 years, but none in historic times.

Sierra Madre Fault: The Sierra Madre Fault Zone Segment E (Cucamonga Fault Zone) trends east about 32 miles north of Lake Forest. The fault is thought to contain active segments (CBC Seismic Source Type B) that could produce severe seismic shaking in the City. The characteristic earthquake for the Cucamonga fault is MW 7.0. Segment E represents the easternmost part of the Sierra Madre Fault Zone, and at its eastern end, it meets several other faults including several; traces of the San Jacinto Fault. The general trend of the fault zone continues east along the base of the San Gabriel Mountains.

Whittier-Elsinore Fault: This active fault parallels the San Jacinto Fault and is approximately 14 miles northeast of the City. In 1987, an M 5.9 earthquake occurred along a previously unknown thrust fault attached to this system. A maximum probable of M6.7 is assigned to the combined Whitter-Elsinore Fault (City of Lake Forest NHMP 2012). The fault contains active segments (CBC Seismic Source Type A) that would cause severe seismic shaking in the City. At 112 miles in length, the Elsinore Fault Zone is one of the largest in Southern California, and in historic times, has been one of the least active. At its northern end, the Elsinore fault splays into two segments, the Chino fault and the Whittier fault.

Seismic Hazards

Seismic hazards include both rupture (surface and subsurface) along active faults and ground shaking, which can occur over wider areas. Ground shaking, produced by various tectonic phenomena, is the principal source of seismic hazards in areas devoid of active faults. All areas of the state are subject to some level of seismic ground shaking.

Several scales may be used to measure the strength or magnitude of an earthquake. Magnitude scales (ML) measure the energy released by earthquakes. The Richter scale, which represents magnitude at the earthquake epicenter, is an example of an ML. As the Richter scale is logarithmic, each whole number represents a 10-fold increase in magnitude over the preceding number. Table 9-4 represents effects that would be commonly associated with Richter Magnitudes:

Table 9-4 Richter Magnitudes and Effects

Magnitude	Effects
< 3.5	Typically not felt
3.5 – 5.4	Often felt but damage is rare
5.5 – 6.0	Damage is slight for well-built buildings
6.1 – 6.9	Destructive potential over ±60 miles of occupied area
7.0 – 7.9	“Major Earthquake” with the ability to cause damage over larger areas
≥ 8	“Great Earthquake” can cause damage over several hundred miles

Source: USGS, earthquake program.

Historically active regional faults and their associated size and frequency are shown in Table 9-5.

Table 9-5 Principal Historically Active and Active Faults in the Region

Fault	Maximum Moment Magnitude	Historical Seismicity (Last 150 Years)	Slip Rate (mm/year)
Newport-Inglewood	7.1	M 6.4 (1933)	1.0
Palos Verdes	7.3	--	3.0
San Andreas (Mojave section)	7.4	M 7.0 (1899)	30.0
San Jacinto	7.2	--	--
Santa Monica	6.6	--	1.0
Sierra Madre (San Fernando section)	6.7	M 6.4 (1971)	2.0
Whittier-Elsinore	6.8	M 5.9 (1987)	2.5

Source: California Geological Survey, 2003, 2010.

The 2015 Uniform California Earthquake Rupture Forecast, Version 3, or UCERF3, is the latest official earthquake rupture forecast (ERF) for the state of California. It provides estimates of the likelihood and severity of potentially damaging earthquake ruptures in the long- and near-term. Combining this with ground motion models produces estimates of the severity of ground shaking that can be expected during a given period (seismic hazard), and of the threat to the built environment (seismic risk). This information is used to inform engineering design and building codes, planning for disaster, and evaluating whether earthquake insurance premiums are sufficient for the prospective losses.

UCERF3 was prepared by the Working Group on California Earthquake Probabilities (WGCEP), a collaboration between the United States Geological Survey (USGS), the California Geological Survey (CGS), and the Southern California Earthquake Center (SCEC), with significant funding from the California Earthquake Authority (CEA). The UCERF3 Model represents the latest model from the Working Group on California Earthquake Probabilities (WGCEP) (WGCEP, 2014). Results for the Los Angeles region faults based on the UCERF3 are shown in Table 9-6.

Table 9-6 Likelihood of Having One or More Earthquakes by Size in the Next 30 Years (Starting From 2014)

Magnitude (Greater than or Equal to)	Average Repeat Time (years)	30-year Likelihood of One or More Events	Readiness
5	1.4	100%	1.0
6	10	96%	1.0
6.7	40	60%	1.1
7	61	46%	1.2
7.5	109	31%	1.3
8	532	7%	1.3

Source. U.S. Department of the Interior U.S. Geological Survey (2015)

Notes: Tabulated values represent the likelihood of having one or more earthquakes in the next 30 years (starting from 2014). "Readiness" indicates the factor by which probabilities are currently elevated, or lower, because of the length of time since the previous large earthquake.

The Working Group on California Earthquake Probabilities, (UCERF32015) predicts that the probability that an earthquake will occur in the Los Angeles region within the next 30 years is:

- 60% that an earthquake measuring magnitude 6.7 will occur
- 46% that an earthquake measuring magnitude 7 will occur
- 31% that an earthquake measuring magnitude 7.5 will occur

In contrast, other scales describe earthquake intensity, which can vary depending on local characteristics. The Modified Mercalli Scale (MM) expresses earthquake intensity at the surface on a scale of I through XII. The Lake Forest areas could experience considerable ground shaking generated by faults within or near the City of Lake Forest. For example, Lake Forest could experience an intensity of MM X generated by seismic events occurring along the Sierra Madre fault. Table 9-7 represents the potential effects of an earthquake based on the Modified Mercalli Intensities.

Table 9-7 Modified Mercalli Intensities and Effects

MM	Effects
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.

MM	Effects
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Total damage. Few, if any, structures standing. Bridges destroyed. Wide cracks in ground. Waves seen on ground.
XII	Total damage. Waves seen on ground. Objects thrown up into air.

Source: USGS General Interest Publication 1989-288-913

Seismic Hazard Zones

Alquist-Priolo Fault Zones

An active earthquake fault, per California's Alquist-Priolo Act, is one that has ruptured within the Holocene Epoch (≈11,000 years). Based on this criterion, the California Geological Survey identifies Earthquake Fault Zones. These Earthquake Fault Zones are identified in Special Publication 42 (SP42), which is updated as new fault data become available. The SP42 lists all counties and cities within California that are affected by designated Earthquake Fault Zones. The Fault Zones are delineated on maps within SP42 (Earthquake Fault Zone Maps).

Southern California is a region of high seismic activity. Similar to most cities in the region, the City of Lake Forest is subject to risks associated with potentially destructive earthquakes. The Plan Area is located in the seismically active southern California region, but not within an Earthquake Study Zone defined by the Alquist-Priolo Earthquake Hazards Act

Seismic Hazard Zones

The State Seismic Hazards Mapping Act (1990) addresses hazards along active faults. The Southern California counties affected by the Program include San Bernardino, Los Angeles, Orange, and Ventura. Seismic hazard zones are currently mapped in Lake Forest, and include areas mapped for liquefaction and earthquake induced landslide hazards.

Liquefaction

Liquefaction, which is primarily associated with loose, saturated materials, is most common in areas of sand and silt or on reclaimed lands. Cohesion between the loose materials that comprise the soil may be jeopardized during seismic events and the ground will take on liquid properties. Thus, liquefaction requires specific soil characteristics and seismic shaking. Liquefaction susceptibility based on soil types, deposit, and age is presented below.

Liquefaction Zones are areas where historical occurrence of liquefaction, or local geological, geotechnical and ground water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required. Figure 9-5 shows liquefaction seismic hazard zones mapped within the City of lake Forest, which delineates areas where liquefaction may occur during a strong earthquake. Areas along existing waterways, such as Borrego Canyon Wash, Serrano Creek, and Aliso Creek, are defined as having the greatest potential for liquefaction. Table 9-8 provides liquefaction potential based on sediment type and age of deposit.

Table 9-8 Liquefaction Potential Based on Sediment Type and Age of Deposit

Sediment	Susceptibility Based on Age of Deposits (Years Before Present)			
	Modern (< 500)	Holocene (< 10,000)	Pleistocene (< 2 Million)	Pre-Pleistocene (> 2 Million)
River Channel	Very High	High	Low	Very Low
Flood Plain	High	Moderate	Low	Very Low
Alluvial Fan/Plain	Moderate	Low	Low	Very Low
Lacustrine/Playa	High	Moderate	Low	Very Low
Colluvium	High	Moderate	Low	Very Low
Talus	Low	Low	Very Low	Very Low
Loess	High	High	High	- ? -
Glacial Till	Low	Low	Very Low	Very Low
Tuff	Low	Low	Very Low	Very Low
Tephra	High	High	- ? -	- ? -
Residual Soils	Low	Low	Very Low	Very Low
Sebka	High	Moderate	Low	Very Low
Un-compacted Fill	Very High	NA	NA	NA
Compacted fill	Low	NA	NA	NA

Source: Youd and Perkins, 1978.

Earthquake-Induced Landslide

Earthquake-Induced Landslide Zones Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required. Figure 9-6 shows the earthquake-induced landslide seismic hazard zones mapped within the City of Lake Forest. Most areas susceptible to landslides are located in the higher-elevation portions of the City.

Other Geologic Hazards

Soils

According to the Natural Resource Conservation Service (2018), there are 30 different soil series located in the City of Lake Forest. Table 9-9 below, and Figure 9-7 presents the soils located in the City of Lake Forest.

Table 9-9 City of Lake Forest Soils

Soils Type	Acres
Alo Clay/clay variant	67.23
Anaheim clay loam	85.43
Balcom clay loam	395.76
Blasingame stony loam	4.32
Bosanko clay	308.16
Bosanko-Balcom complex	36.99
Botella loam/clay loam	70.74
Calleguas clay loam	828.06
Capistrano sandy loam	944.80
Chino silty clay loam	9.44
Cieneba sandy loam	2,487.08
Cieneba-Rock outcrop complex	310.46
Corralitos loamy sand	458.52
Cropley clay	72.80
Metz loamy sand	0.32
Mocho loam	46.57
Modjeska gravelly loam	9.94
Myford sandy loam	3,218.91
Pits	8.19
Rincon	15.10
Riverwash	218.53
Rock outcrop-Cieneba complex	39.31
San Andreas sandy loam	147.68
San Emigdio fine sandy loam	8.56
Soboba cobbly loam sand	10.95
Soper loam/gravelly loam	21.24
Sorrento loam/clay loam/sandy loam	799.11
Water	6.87
Xeralfic arents, loamy	42.38
Yorba cobbly/gravelly sand loam	68.82
Total	10,742.61

Source: Natural Resource Conservation Service, 2018.

Erosion

The U.S. Natural Resource Conservation Service (NRCS) delineates soil units and compiles soils data as part of the National Cooperative Soil Survey. The following description of erosion factors is provided by the NRCS Physical Properties Descriptions:

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. Erosion factor Kw indicates the erodibility of the whole soil, whereas Kf indicates the erodibiity of the fine soils. The estimates are modified by the presence of rock fragments.

Soil erosion data for the City of Lake Forest were obtained from the NRCS. As identified by the NRCR web soil survey, the erosion factor K within the City of Lake Forest varies widely. The NRCS does not provide erosion factors for the urban land soils in the City, however, the erosion potential for the urban land soils in the City is considered to be low.

Expansive Soils

The NRCS delineates soil units and compiles soils data as part of the National Cooperative Soil Survey. The following description of linear extensibility (also known as shrink-swell potential or expansive potential) is provided by the NRCS Physical Properties Descriptions:

"Linear extensibility" refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

The linear extensibility of the soils within Lake Forest ranges from Low to Very High. Figure 9-8 illustrates the shrink-swell potential of soils in the City of Lake Forest. The majority of the City of Lake Forest has low potential for expansive soils, including most of the developed land. The areas with moderate to high expansive soils represent only a small portion of the City of Lake Forest, and would require special design considerations due to shrink-swell potentials.

Landslide

The California Geological Survey classifies landslides with a two-part designation based on Varnes (1978) and Cruden and Varnes (1996). The designation captures both the type of material that failed and the type of movement that the failed material exhibited. Material types are broadly categorized as either rock or soil, or a combination of the two for complex movements. Landslide movements are categorized as falls, topples, spreads, slides, or flows.

Landslide potential is influenced by physical factors, such as slope, soil, vegetation, and precipitation. Landslides require a slope, and can occur naturally from seismic activity, excessive saturation, and wildfires, or from human-made conditions such as construction disturbance, vegetation removal, wildfires, etc.

Figure 9-9 illustrates the landslide potential (for non-seismically included potential) in the vicinity of the City of Lake Forest. The landslide potential is relatively low in the southwestern portion of the City, where elevation change is relatively low. However, the landslide potential increases in the central and northern portions of the City, which contains areas with increased elevation change.

Subsidence

Subsidence is the settlement of soils of very low density generally from either oxidation of organic material, or desiccation and shrinkage, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. Drainage sufficient to create subsidence is uncommon within the City of Lake Forest.

Collapsible Soils

Hydroconsolidation occurs when soil layers collapse, or settle, as water is added under loads. Natural deposits susceptible to hydroconsolidation are typically aeolian, alluvial, or colluvial materials, that have a high apparent strength when dry. The dry strength of the materials may be attributed to the clay and silt constituents in the soil and the presence of cementing agents (i.e., salts). Capillary tension may tend to act to bond soil grains. Once these soils are subjected to excessive moisture and foundation loads, the constituency including soluble salts or bonding agents is weakened or dissolved, capillary tensions are reduced and collapse occurs resulting in settlement. Existing alluvium within the City of Lake Forest may be susceptible to collapse and excessive settlements, which could create the risk of hydroconsolidation if these soils were exposed to excessive moisture.

Naturally Occurring Asbestos

The term "asbestos" is used to describe a variety of fibrous minerals that, when airborne, can result in serious human health effects. Naturally occurring asbestos is commonly associated with ultramafic rocks and serpentinite. Ultramafic rocks, such as dunite, peridotite, and pyroxenite are igneous rocks comprised largely of iron-magnesium minerals. As they are intrusive in nature, these rocks often undergo metamorphosis, prior to their being exposed on the Earth's surface. The metamorphic rock serpentinite is a common product of the alteration process. There is no naturally occurring asbestos mapped within Lake Forest.

Tsunami/Seiches

Tsunamis and seiches are standing waves that occur in the ocean or relatively large, enclosed bodies of water that can follow seismic, landslide, and other events from local sources (California, Oregon, Washington coast) or distant sources (Pacific Rim, South American Coast, Alaska/Canadian coast). The City of Lake Forest is not within a tsunami or seiche hazard area.

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9.3 MINERAL AND ENERGY RESOURCES

This section describes mineral and energy resources in the City of Lake Forest from both qualitative and quantitative perspectives. The results of this assessment may be used in planning and management decisions that may affect mineral and energy resources in the City of Lake Forest.

State Regulatory Setting

Surface Mining and Reclamation Act of 1975

The California Department of Conservation Surface Mining and Reclamation Act of 1975 (§ 2710), also known as SMARA, provides a comprehensive surface mining and reclamation policy that permits the continued mining of minerals, as well as the protection and subsequent beneficial use of the mined and reclaimed land. The purpose of SMARA is to ensure that adverse environmental effects are prevented or minimized and that mined lands are reclaimed to a usable condition and readily adaptable for alternative land uses. The production and conservation of minerals are encouraged, while giving consideration to values relating to recreation, wildlife, range and forage, as well as aesthetic enjoyment. Residual hazards to public health and safety are eliminated. These goals are achieved through land use planning by allowing a jurisdiction to balance the economic benefits of resource reclamation with the need to provide other land uses.

If a use is proposed that might threaten the potential recovery of minerals from an area that has been classified mineral resource zone 2 (MRZ-2), SMARA would require the jurisdiction to prepare a statement specifying its reasons for permitting the proposed use, provide public notice of these reasons, and forward a copy of the statement to the State Geologist and the State Mining and Geology Board (Cal. Pub. Res. Code Section 2762). Lands classified MRZ-2 are areas that contain identified mineral resources.

Local Regulatory Setting

Lake Forest Sustainability Plan

The Lake Forest Sustainability Plan includes the goals related to reducing the amount of fossil fuels consumed within the City of Lake Forest including the following goals: (1) Reduce energy consumption in homes and businesses, and (2) Expand the use of renewable energy throughout the community.

Lake Forest Municipal Code

The existing Lake Forest Municipal Code contains Chapter 9.150 (Surface Mining and Land Reclamation Regulations), which includes provisions for regulating surface mining and quarrying, and the processing of these materials, consistent with SMARA.

Environmental Setting

Mineral Resource Classification

Pursuant to SMARA, the California State Mining and Geology Board oversees the MRZ classification system. The MRZ system characterizes both the location and known/presumed economic value of underlying mineral resources. The mineral resource classification system uses four main MRZs based on the degree of available geologic information, the likelihood of significant mineral resource occurrence, and the known or inferred quantity of significant mineral resources. The four classifications are described in Table 9-10 below.

Table 9-10 Mineral Resources Classification System

Classification	Descriptions
MRZ-1	Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
MRZ-2	Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence.
MRZ-3	Areas containing mineral deposits, the significance of which cannot be evaluated.
MRZ-4	Areas where available information is inadequate for assignment to any other MRZ classification.

Source: California Department of Conservation Division of Mines and Geology, 2002.

Mineral Resources

Mineral resources include commercially viable oil and gas deposits, and nonfuel mineral resources deposits. Nonfuel mineral resources include metals such as gold, silver, iron, and copper; industrial metals such as boron compounds, rare-earth elements, clays, limestone, gypsum, salt, and dimension stone; and construction aggregate, including sand, gravel, and crushed stone. California is the largest producer of sand and gravel in the nation.

According to Orange County's existing General Plan, Orange County has a significant amount of mineral resources. As identified in California Geological Survey's Special Report 143, Parts III and IV, for the Orange County Region, the areas classified and designated as deposits containing significant sand and gravel resources are located in portions of the Santa Ana River, Santiago Creek, San Juan Creek, Arroyo Trabuco, as well as other scattered areas. The California Geological Survey also identifies fire clay and industrial sand as having historically been produced in large quantities within Orange County.

Orange County is located in the State of California Department of Conservation's Santa Ana 30' x 60' Quadrangle (the Santa Ana quadrangle). The Santa Ana quadrangle includes some of the most complex and varied terrain in the United States. The California Geological Survey estimates that there is demand for 1,079 million tons and current permitted reserves of 862 million tons of supply over the next fifty years (California Geological Survey, 2018).

In addition to the County, the City of Lake Forest contains many important natural resources and features, including mineral resource areas and other open lands. Extractions of mineral resources in the City of Lake Forest include sand and gravel. According to the City's existing General Plan, approximately 62 acres of land in the eastern portion of the City is designated as MRZ-2. The MRZ-2 resource area in the eastern portion of the City is currently excavated for sand and gravel materials. Specifically, the area is classified as an important MRZ for Portland cement concreate (PCC) grade aggregate by the State Department of Conservation (DOC). PCC-grade aggregate is valuable in Southern California where it used for a variety of construction purposes.

Location of Permitted Aggregate Mines

The California Office of Mine Reclamation periodically publishes a list of qualified permitted aggregate mines regulated under SMARA that is generally referred to as the AB 3098 List. The Public Contract Code precludes mining operations that are not on the AB 3098 List from selling sand, gravel, aggregates or other mined materials to State or local agencies. As of August 21, 2018, there are two aggregate mines on the AB 3098 list in Orange County: Lapeyre Industrial Sands, Inc; and Ortega Rock). None of the two listed mines are within the City of Lake Forest.

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9.4 HYDROLOGY AND WATER QUALITY

This section describes the regulatory setting, regional hydrology and water quality, and local hydrology and water quality.

Key Terms

Groundwater: Water that is underground and below the water table, as opposed to surface water, which flows across the ground surface. Water beneath the earth's surface fills the spaces in soil, gravel, or rock formations. Pockets of groundwater are often called "aquifers" and are the source of drinking water for a large percentage of the population in the United States. Groundwater is often extracted using wells which pump the water out of the ground and up to the surface. Groundwater is naturally replenished by surface water from precipitation, streams, and rivers when this recharge reaches the water table.

Surface water: Water collected on the ground or from a stream, river, lake, wetland, or ocean. Surface water is replenished naturally through precipitation, but is lost naturally through evaporation and seepage into soil.

Federal Regulatory Setting

Clean Water Act (CWA)

The Federal Water Pollution Control Act, also known as the Clean Water Act (CWA), is the primary statute governing water quality. The CWA establishes the basic structure for regulating the discharges of pollutants into the waters of the United States and gives the US Environmental Protection Agency (EPA) the authority to implement pollution control programs. The statute's goal is to regulate all discharges into the nation's waters and to restore, maintain, and preserve the integrity of those waters. The CWA sets water quality standards for all contaminants in surface waters and mandates permits for wastewater and stormwater discharges. The CWA also requires states to establish site-specific water quality standards for navigable bodies of water and regulates other activities that affect water quality, such as dredging and the filling of wetlands. The following CWA sections assist in ensuring water quality for the water of the United States:

CWA Section 208 requires the use of best management practices (BMPs) to control the discharge of pollutants in stormwater during construction

CWA Section 303(d) requires the creation of a list of impaired water bodies by states, territories, and authorized tribes; evaluation of lawful activities that may impact impaired water bodies, and preparation of plans to improve the quality of these water bodies. CWA Section 303(d) also establishes Total Maximum Daily Loads (TMDLs), which is the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards

CWA Section 404 authorizes the US Army Corps of Engineers to require permits that will discharge dredge or fill materials into waters in the US, including wetlands.

In California, the EPA has designated the State Water Resources Control Board (SWRCB) and its nine Regional Water Quality Control Boards (RWQCBs) with the authority to identify beneficial uses and adopt applicable water quality objectives.

National Pollutant Discharge Elimination System (NPDES)

National Pollutant Discharge Elimination System (NPDES) permits are required for discharges to navigable waters of the United States, which includes any discharge to surface waters, including lakes, rivers, streams, bays, oceans, dry stream beds, wetlands, and storm sewers that are tributary to any surface water body. NPDES permits are issued under the Federal Clean Water Act, Title IV, Permits and Licenses, Section 402 (33 USC 466 et seq.)

The RWQCB issues these permits in lieu of direct issuance by the Environmental Protection Agency, subject to review and approval by the EPA Regional Administrator (EPA Region 9). The terms of these NPDES permits implement pertinent provisions of the Federal Clean Water Act and the Act's implementing regulations, including pre-treatment, sludge management, effluent limitations for specific industries, and anti-degradation. In general, the discharge of pollutants is to be eliminated or reduced as much as practicable so as to achieve the Clean Water Act's goal of "fishable and swimmable" navigable (surface) waters. Technically, all NPDES permits issued by the RWQCB are also Waste Discharge Requirements issued under the authority of the CWA.

NPDES permitting authority is administered by the California State Water Resources Control Board (SWRCB) and its nine Regional Water Quality Control Boards (RWQCB). The Plan Area is in a watershed administered by the LARWQCB. Individual projects in the City that disturb more than one acre would be required to obtain NPDES coverage under the California General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit). The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) describing Best Management Practices (BMP) the discharger would use to prevent and retain storm water runoff. The SWPPP must contain a

visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a waterbody listed on the 303(d) list for sediment.

State Regulatory Setting

California Fish and Wildlife Code

The California Department of Fish and Wildlife (CDFW) protects streams, water bodies, and riparian corridors through the streambed alteration agreement process under Section 1600 to 1616 of the California Fish and Game Code. The California Fish and Game Code establishes that "an entity may not substantially divert or obstruct the natural flow or substantially change the bed, channel or bank of any river, stream or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river stream, or lake" (Fish and Game Code Section 1602(a)) without notifying the CDFW, incorporating necessary mitigation and obtaining a streambed alteration agreement. The CDFWs jurisdiction extends to the top of banks and often includes the outer edge of riparian vegetation canopy cover.

California Water Code

California's primary statute governing water quality and water pollution issues with respect to both surface waters and groundwater is the Porter-Cologne Water Quality Control Act of 1970 (Division 7 of the California Water Code) (Porter-Cologne Act). The Porter-Cologne Act grants the SWRCB and each of the RWQCBs power to protect water quality, and is the primary vehicle for implementation of California's responsibilities under the Federal Clean Water Act. The Porter-Cologne Act grants the SWRCB and the RWQCBs authority and responsibility to adopt plans and policies, to regulate discharges to surface and groundwater, to regulate waste disposal sites, and to require cleanup of discharges of hazardous materials and other pollutants. The Porter-Cologne Act also establishes reporting requirements for unintended discharges of any hazardous substance, sewage, or oil or petroleum product.

Each RWQCB must formulate and adopt a Water Quality Control Plan (Basin Plan) for its region. The regional plans are to conform to the policies set forth in the Porter-Cologne Act and established by the SWRCB in its State water policy. The Porter-Cologne Act also provides that a RWQCB may include within its regional plan water discharge prohibitions applicable to particular conditions, areas, or types of waste.

State Updated Model Landscape Ordinance

Under Assembly Bill (AB) 1881, the updated Model Landscape Ordinance requires cities and counties to adopt landscape water conservation ordinances by January 31, 2010 or to adopt a different ordinance that is at least as effective in conserving water as the updated Model Ordinance (MO). Chapter 9.146 of the Lake Forest Municipal Code (Water Efficient Landscape Regulations) includes landscaping water use standards.

California Department of Health Services

The Department of Health Services, Division of Drinking Water and Environmental Management, oversees the Drinking Water Program. The Drinking Water Program regulates public water systems and certifies drinking water treatment and distribution operators. It provides support for small water systems and for improving their technical, managerial, and financial capacity. It provides subsidized funding for water system improvements under the State Revolving Fund ("SRF") and Proposition 50 programs. The Drinking Water Program also oversees water recycling projects, permits water treatment devices, supports and promotes water system security, and oversees the Drinking Water Treatment and Research Fund for MTBE and other oxygenates.

Consumer Confidence Report Requirements

California Code of Regulations (CCR) Title 22, Chapter 15, Article 20 requires all public water systems to prepare a Consumer Confidence Report for distribution to its customers and to the Department of Health Services. The Consumer Confidence Report provides information regarding the quality of potable water provided by the water system. It includes information on the sources of the water, any detected contaminants in the water, the maximum contaminant levels set by regulation, violations and actions taken to correct them, and opportunities for public participation in decisions that may affect the quality of the water provided.

Urban Water Management Planning Act

The Urban Water Management Planning Act has as its objectives the management of urban water demands and the efficient use of urban water. Under its provisions, every urban water supplier is required to prepare and adopt an urban water management plan. An "urban water supplier" is a public or private water supplier that provides water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. The plan must identify and

quantify the existing and planned sources of water available to the supplier, quantify the projected water use for a period of 20 years, and describe the supplier's water demand management measures. The urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry years. The Department of Water Resources must receive a copy of an adopted urban water management plan.

Senate Bill (SB) 610 and Assembly Bill (AB) 901

The State Legislature passed SB 610 and AB 901 in 2001. Both measures modified the Urban Water Management Planning Act.

SB 610 requires additional information in an urban water management plan if groundwater is identified as a source of water available to an urban water supplier. It also requires that the plan include a description of all water supply projects and programs that may be undertaken to meet total projected water use. SB 610 requires a city or county that determines a project is subject to CEQA to identify any public water system that may supply water to the project and to request identified public water systems to prepare a specified water supply assessment. The assessment must include, among other information, an identification of existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, and water received in prior years pursuant to these entitlements, rights, and contracts.

AB 901 requires an urban water management plan to include information, to the extent practicable, relating to the quality of existing sources of water available to an urban water supplier over given time periods. AB 901 also requires information on the manner in which water quality affects water management strategies and supply reliability. The bill requires a plan to describe plans to supplement a water source that may not be available at a consistent level of use, to the extent practicable. Additional findings and declarations relating to water quality are required.

Senate Bill (SB) 221

SB 221 adds Government Code Section 66455.3, requiring that the local water agency be sent a copy of any proposed residential subdivision of more than 500 dwelling units within five days of the subdivision application being accepted as complete for processing by the City or county. It also adds Government Code Section 66473.7, establishing detailed requirements for establishing whether a "sufficient water supply" exists to support any proposed residential subdivisions of more than 500 dwellings, including any such subdivision involving a development agreement. When approving a qualifying subdivision tentative map, the City or county must include a condition requiring availability of a sufficient water supply. The applicable public water system must provide proof of availability. If there is no public water system, the City or county must undertake the analysis described in Government Code Section 66473.7. The analysis must include consideration of effects on other users of water and groundwater.

Local Regulatory Setting

Orange County Water District Groundwater Management Plan 2015 Update

The Orange County Water District's (OCWD) first Groundwater Management Plan was published in 1989; the Groundwater Management Plan 2015 Update is the fifth update. In 2014, the California Sustainable Groundwater Management Act was passed. The new law provided authority for agencies to develop and implement Groundwater Sustainability Plans or alternative plans that demonstrate the basin has operated within its sustainable yield over a period of at least 10 years. This plan was developed to help the OCWD manage the Orange County Groundwater Basin.

South Orange County (San Juan Hydrologic Unit) Water Quality Improvement Plan

The South County Water Quality Improvement Plan for the San Juan Hydrologic Unit was developed through a regulatory partnership comprising the cities of Aliso Viejo, Dana Point, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, Mission Viejo, Rancho Santa Margarita, San Clemente, San Juan Capistrano, the County of Orange and the Orange County Flood Control District, who operate an interconnected stormwater sewer system (MS4) which discharges stormwater and urban runoff. The partnership developed the Plan to address the adverse impacts to surface waters, often collectively referred to as "urban stream syndrome" that can arise from the imprint of urbanization on the landscape.

City of Lake Forest General Plan

The existing City of Lake Forest General Plan principles, policies, and actions related to hydrology and water quality in its Recreation and Resources Element. Please see the existing General Plan for additional details.

City of Lake Forest Municipal Code

The City of Lake Forest is required to implement procedures with respect to the entry of non-storm water discharges into its municipal storm water system. The City of Lake Forest regulates storm water discharge in accordance with the NPDES permit through Chapter 15.14 of the Lake Forest Municipal Code, Stormwater Quality Management. Additionally, Chapter 8.30 provides erosion control and protection measures.

Environmental Setting

The State of California uses a hierarchical naming and numbering convention to define watershed areas for management purposes. This means that boundaries are defined according to size and topography, with multiple sub-watersheds within larger watersheds. Table 9-11 shows the primary watershed classification levels used by the State of California. The second column indicates the approximate size that a watershed area may be within a particular classification level, although variation in size is common.

Table 9-11 State of California Watershed Hierarchy Naming Convention

Watershed Level	Approximate Square Miles (Acres)	Description
Hydrologic Region (HR)	12,735 (8,150,000)	Defined by large-scale topographic and geologic considerations. The State of California is divided into ten HRs.
Hydrologic Unit (HU)	672 (430,000)	Defined by surface drainage; may include a major river watershed, groundwater basin, or closed drainage, among others.
Hydrologic Area (HA)	244 (156,000)	Major subdivisions of hydrologic units, such as by major tributaries, groundwater attributes, or stream components.
Hydrologic Sub-Area (HSA)	195 (125,000)	A major segment of an HA with significant geographical characteristics or hydrological homogeneity.

Source: Calwater, California Interagency Watershed Mapping Committee, 2008.

Hydrologic Region

The City of Lake Forest is located within the South Coast Hydrologic Region (HR), a large coastal watershed in southern California (DWR 2003: 148). The South Coast HR spans approximately 6.78 million acres and is bounded on the west by the Pacific Ocean, on the north by the Transverse Ranges, on the east by the Colorado River HR, and on the south by the international boundary with Mexico.

Hydrologic Unit

Within the South Coast HR, the City of Lake Forest is located within two hydrologic units (HU), the San Juan HU and Santa Ana River HU. The San Diego Regional Water Quality Control Board (SDRWQCB) governs basin planning and water quality within the San Juan HU and the Santa Ana Regional Water Quality Control Board (SARWQCB) governs basin planning and water quality within the Santa Ana River HU. Figure 9-10 shows Hydrologic Units within and surrounding the City.

Hydrologic Area

For purposes of planning on a city-wide basis, hydrologic areas (HA) are generally considered to be the appropriate watershed planning level. Within the Santa Ana River HU, the Lower Santa Ana River HA is located in the western half of the City of Lake Forest; within the San Juan HU, the Laguna HA is located in the eastern half of the City of Lake Forest. Figure 911- shows the Hydrologic Areas within and surrounding the City.

Hydrologic Sub-Area

There are several hydrologic sub-areas within and throughout City of Lake Forest. Analysis of hydrologic sub-areas is appropriate for the review of individual projects, but is not appropriate for the watershed analysis of the City's General Plan.

Creeks and Waterways

The City of Lake Forest lies within the Aliso Creek Watershed and the Newport Bay Watershed. Aliso Creek is a natural creek located along the west side of El Toro Road. The creek flows through open space and urban development and outlets at the ocean at Aliso Creek Beach. Aliso Creek's watershed encompasses 23,000 acres, and includes natural open space, rural and urban development, agriculture and ranching, regional parks and other recreational facilities. The Newport Bay Watershed covers 112.2 square miles in central Orange County. Its main tributary, San Diego Creek, drains into Upper Newport Bay. Small tributaries include Serrano Creek, Borrego Canyon Wash, Agua Chinon Wash, Bee Canyon Wash, Peters Canyon Wash, Sand Canyon Wash, Bonita Canyon Creek, and the Santa Ana Delhi Channel. Figure 9-11 (Hydrologic Areas) shows local waterways in relation to the City.

Groundwater

The City of Lake Forest is underlain by the Orange County Groundwater Basin (OCWD 2015). The Orange County Groundwater Basin, as defined by DWR Bulletin 118 Basin 8-1, can be subdivided into subbasins and the coastal region can be distinguished by higher and lower elevation areas. The Main Basin is the largest sub-basin, where the majority of groundwater production occurs (note: the City of Lake Forest is located above the Main Basin).

The Orange County Groundwater Basin stores an estimated 66 million acre-feet of water, although only a fraction of this can be sustainably pumped without causing physical damage such as seawater intrusion or potential land subsidence. The basin underlies north and central Orange County beneath broad lowland known as the Tustin and Downey plains. The basin covers an area of approximately 350 square miles, bordered by the Coyote and Chino Hills to the north, the Santa Ana Mountains to the northeast, and the Pacific Ocean to the southwest. The basin boundary extends to the Orange County-Los Angeles line to the northwest, where groundwater flow is unrestricted across the county line into the Central Basin of Los Angeles County.

The groundwater basin was formed in a synclinal, northwest-trending trough that deepens as it continues beyond the Orange-Los Angeles county line. The Newport-Inglewood fault zone, San Joaquin Hills, Coyote Hills, and Santa Ana Mountains form the uplifted margins of the syncline. The total thickness of sedimentary rocks in the basin surpasses 20,000 feet, of which only the upper 2,000 to 4,000 feet contain fresh water.

OCWD subdivided the groundwater basin into three major aquifer systems. The three aquifer systems, known as the Shallow, Principal, and Deep, are hydraulically connected, as groundwater is able to flow between them via leakage through the intervening aquitards or discontinuities in the aquitards. The Shallow Aquifer system overlies the entire basin and includes the prolific Talbert Aquifer. It generally occurs from the surface to approximately 250 feet below ground surface. The majority of groundwater from the shallow aquifer is pumped by small water systems for industrial and agricultural use, although the cities of Garden Grove and Newport Beach, and the Yorba Linda Water District, operate wells that pump from the shallow aquifer for municipal use.

Over 90 percent of groundwater production occurs from wells that are screened within the Principal Aquifer system at depths between 200 and 1,300 feet. A minor amount of groundwater is pumped from the Deep Aquifer, which underlies the Principal Aquifer system and is up to 2,000 feet deep in the center of the basin. Hindering production from the Deep Aquifer system is the depth and the presence of amber colored groundwater in some areas.

Water Quality

Surface water quality is affected by point source and non-point source pollutants. Point source pollutants are those emitted at a specific point, such as a pipe, while non-point source pollutants are typically generated by surface runoff from diffuse sources, such as streets, paved areas, and landscaped areas. Point source pollutants are controlled with pollutant discharge regulations or WDRs. Non-point source pollutants are more difficult to monitor and control although they are important contributors to surface water quality in urban areas.

Stormwater runoff pollutants vary based on land use, topography, the amount of impervious surface, and the amount and frequency of rainfall and irrigation practices. Runoff in developed areas typically contains oil, grease, and metals accumulated in streets, driveways, parking lots, and rooftops, as well as pesticides, herbicides, particulate matter, nutrients, animal waste, and other oxygen-demanding substances from landscaped areas. The highest pollutant concentrations usually occur at the beginning of the wet season during the "first flush."

Water quality in the City is governed by the SDRWQCB and the SARWQCB, which set water quality standards in their Water Quality Control Plan for the respective basins (Basin Plans). The Basin Plans identify beneficial uses for surface water and groundwater and establishes water quality objectives to attain those beneficial uses.

The Clean Water Act (CWA) 303(d) list is a register of impaired and threatened waters which the CWA requires all states to submit for Environmental Protection Agency approval. The list identifies all waters where the required pollution control measures have so far been unsuccessful in reaching or maintaining the required water quality standards. Waters that are listed are known as "impaired." CWA Section 303(d) lists four water bodies within the City of Lake Forest: Aliso Creek, Serrano Creek, Borrego Creek (from SR 241 to Irvine Boulevard), and San Diego Creek Reach 2. These are described in more detail as follows (with estimated Total Maximum Daily Load completion date in parenthesis):

Aliso Creek is listed as impaired from the following pollutants: benthic community effects (2025), indicator bacteria (2011), malathion (2029), nitrogen (2019), phosphorus (2019), selenium (2021), and toxicity (2019).

Serrano Creek is listed as impaired from the following pollutants: ammonia (2021), benthic community effects (2027), indicator bacteria (2021), and toxicity (2027).

Borrego Creek (from SR 241 to Irvine Boulevard) is listed as impaired from the following pollutants: ammonia (2021), and indicator bacteria (2021).

San Diego Creek Reach 2 is listed as impaired from the following pollutants: benthic community effects (2027), indicator bacteria (2021), nutrients (1999), and sedimentation/siltation (1999).

Storm water runoff may play a role in the water quality impairments described above. Runoff that occurs as overland flow across yards, driveways, and public streets is intercepted by the storm water drainage system and conveyed to local drainages before eventually being routed to the Pacific. This storm water can carry pollutants that can enter the local waterways and result in the types of water quality impairments described above. Common sources of storm water pollution in the City include litter, trash, pet waste, paint residue, organic material (yard waste), fertilizers, pesticides, sediments, construction debris, metals from automobile brake pad dust, air pollutants that settle on the ground or attach to rainwater, cooking grease, illegally dumped motor oil, and other harmful fluids.

Flooding

The City of Lake Forest is a participant in the National Flood Insurance Program (NFIP). Communities participating in the NFIP must adopt and enforce minimum floodplain management standards, including identification of flood hazards and flooding risks. Participating in the NFIP allows communities to purchase lower-cost insurance protection against losses from flooding. During the 100-year and 200-year flood events, flooding would be localized around the City's existing water bodies (California Department of Water Resources, 2018). Figure 8-3 within the Utilities section of this document demonstrates the location of expected location of flooding during the 100-year flood event.

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9.5 CULTURAL RESOURCES

This section describes the buildings, sites, structures, or objects that may have historical, architectural, archaeological, cultural, or scientific importance. Preservation of the city's cultural heritage should be considered when planning for the future. Information in this section was taken from a paleontological and cultural resource assessment of Lake Forest prepared by Cogstone Resource Management Inc..

Key Terms

Archaeology. The study of historic or prehistoric peoples and their cultures by analysis of their artifacts and monuments.

Complex. A patterned grouping of similar artifact assemblages from two or more sites, presumed to represent an archaeological culture.

Ethnography. The study of contemporary human cultures.

Midden. A deposit marking a former habitation site and containing such materials as discarded artifacts, bone and shell fragments, food refuse, charcoal, ash, rock, human remains, structural remnants, and other cultural leavings.

Paleontology. The science of the forms of life existing in former geologic periods, as represented by their fossils.

Federal Regulatory Setting

National Historic Preservation Act

Most regulations at the Federal level stem from the National Environmental Policy Act (NEPA) and historic preservation legislation such as the National Historic Preservation Act (NHPA) of 1966, as amended. NHPA established guidelines to "preserve important historic, cultural, and natural aspects of our national heritage, and to maintain, wherever possible, an environment that supports diversity and a variety of individual choice." The NHPA includes regulations specifically for Federal land-holding agencies, but also includes regulations (Section 106) which pertain to all projects that are funded, permitted, or approved by any Federal agency and which have the potential to affect cultural resources. All projects that are subject to NEPA are also subject to compliance with Section 106 of the NHPA and NEPA requirements concerning cultural resources. Provisions of NHPA establish a National Register of Historic Places (The National Register) maintained by the National Park Service, the Advisory Councils on Historic Preservation, State Historic Preservation Offices, and grants-in-aid programs.

American Indian Religious Freedom Act and Native American Graves and Repatriation Act

The American Indian Religious Freedom Act recognizes that Native American religious practices, sacred sites, and sacred objects have not been properly protected under other statutes. It establishes as national policy that traditional practices and beliefs, sites (including right of access), and the use of sacred objects shall be protected and preserved. Additionally, Native American remains are protected by the Native American Graves and Repatriation Act of 1990.

Other Federal Legislation

Historic preservation legislation was initiated by the Antiquities Act of 1966, which aimed to protect important historic and archaeological sites. It established a system of permits for conducting archaeological studies on Federal land, as well as setting penalties for noncompliance. This permit process controls the disturbance of archaeological sites on Federal land. New permits are currently issued under the Archeological Resources Protection Act (ARPA) of 1979. The purpose of ARPA is to enhance preservation and protection of archaeological resources on public and Native American lands. The Historic Sites Act of 1935 declared that it is national policy to "Preserve for public use historic sites, buildings, and objects of national significance."

State Regulatory Setting

California Register of Historic Resources (CRHR)

California State law also provides for the protection of cultural resources by requiring evaluations of the significance of prehistoric and historic resources identified in documents prepared pursuant to the California Environmental Quality Act (CEQA). Under CEQA, a cultural resource is considered an important historical resource if it meets any of the criteria found in Section 15064.5(a) of the CEQA Guidelines. Criteria identified in the CEQA Guidelines are similar to those described under the NHPA. The State Historic Preservation Office (SHPO) maintains the CRHR. Historic properties listed, or formally designated for eligibility to be listed, on The National Register are automatically listed on the CRHR. State Landmarks and Points of Interest are also automatically listed. The CRHR can also include properties designated under local preservation ordinances or identified through local historical resource surveys.

California Environmental Quality Act (CEQA)

CEQA requires that lead agencies determine whether projects may have a significant effect on archaeological and historical resources. This determination applies to those resources which meet significance criteria qualifying them as "unique," "important," listed on the California Register of Historic Resources (CRHR), or eligible for listing on the CRHR. If the agency determines that a project may have a significant effect on a significant resource, the project is determined to have a significant effect on the environment, and these effects must be addressed. If a cultural resource is found not to be significant under the qualifying criteria, it need not be considered further in the planning process.

CEQA emphasizes avoidance of archaeological and historical resources as the preferred means of reducing potential significant environmental effects resulting from projects. If avoidance is not feasible, an excavation program or some other form of mitigation must be developed to mitigate the impacts. In order to adequately address the level of potential impacts, and thereby design appropriate mitigation measures, the significance and nature of the cultural resources must be determined. The following are steps typically taken to assess and mitigate potential impacts to cultural resources for the purposes of CEQA:

- identify cultural resources,
- evaluate the significance of the cultural resources found,
- evaluate the effects of the project on cultural resources, and
- develop and implement measures to mitigate the effects of the project on cultural resources

Treatment of paleontological resources under CEQA is generally similar to treatment of cultural resources, requiring evaluation of resources in a project's area of potential affect, assessment of potential impacts on significant or unique resources, and development of mitigation measures for potentially significant impacts, which may include monitoring combined with data recovery and/or avoidance.

In 2015, CEQA was amended to require lead agencies to determine whether projects may have a significant effect on tribal cultural resources. (Public Resources Code [PRC] § 21084.2). To qualify as a tribal cultural resource, the resource must be a site, feature, place, cultural landscape, sacred place, or object, which is of cultural value to a California Native American Tribe and is listed, or eligible for listing, on the national, state, or local register of historic resources. Lead agencies may also use their discretion to treat any notable resource as a tribal cultural resource. To determine whether a project may have an impact on a resource, the lead agency is required to consult with any California Native American tribe that requests consultation and is affiliated with the geographic area of a proposed project (PRC § 21080.3.1). CEQA requires that a lead agency consider the value of the cultural resource to the tribe and consider measures to mitigate any adverse impact.

State Laws Pertaining to Human Remains

Section 7050.5 of the California Health and Safety Code requires that construction or excavation be stopped in the vicinity of discovered human remains until the county coroner can determine whether the remains are those of a Native American. If the

remains are determined to be Native American, the coroner must contact the California Native American Heritage Commission. CEQA Guidelines (Section 15064.5) specify the procedures to be followed in case of the discovery of human remains on non-Federal land. The disposition of Native American burials falls within the jurisdiction of the Native American Heritage Commission.

Several sections of the California Public Resources Code protect paleontological resources.

Section 5097.5 prohibits "knowing and willful" excavation, removal, destruction, injury, and defacement of any "vertebrate paleontological site, including fossilized footprints," on public lands, except where the agency with jurisdiction has granted express permission. "As used in this section, 'public lands' means lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof."

California Public Resources Code, Section 30244 requires reasonable mitigation for impacts on paleontological resources that occur as a result of development on public lands.

The sections of the California Administrative Code relating to the State Division of Beaches and Parks afford protection to geologic features and "paleontological materials" but grant the director of the State park system authority to issue permits for specific activities that may result in damage to such resources, if the activities are in the interest of the State park system and for State park purposes (California Administrative Code, Title 14, Section 4307 – 4309).

Senate Bill 18 (Burton, Chapter 905, Statutes 2004)

SB 18, authored by Senator John Burton and signed into law by Governor Arnold Schwarzenegger in September 2004, requires local (city and county) governments to consult with California Native American tribes to aid in the protection of traditional tribal cultural places ("cultural places") through local land use planning. This legislation, which amended §65040.2, §65092, §65351, §65352, and §65560, and added §65352.3, §653524, and §65562.5 to the Government Code, also requires the Governor's Office of Planning and Research (OPR) to include in the General Plan Guidelines advice to local governments on how to conduct these consultations. The intent of SB 18 is to provide California Native American tribes an opportunity to participate in local land use decisions at an early planning stage, for the purpose of protecting, or mitigating impacts to, cultural places. These consultation and noticing requirements apply to adoption and amendment of both general plans (defined in Government Code §65300 et seq.) and specific plans (defined in Government Code §65450 et seq.).

Assembly Bill 52

Assembly Bill (AB) 52, approved in September 2014, creates a formal role for California Native American tribes by creating a formal consultation process and establishing that a substantial adverse change to a tribal cultural resource has a significant effect on the environment. Tribal cultural resources are defined as:

1) Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either of the following:

A) Included or determined to be eligible for inclusion in the CRHR

B) Included in a local register of historical resources as defined in PRC Section 5020.1(k)

2) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in PRC Section 5024.1 (c). In applying the criteria set forth in PRC Section 5024.1 (c) the lead agency shall consider the significance of the resource to a California Native American tribe.

A cultural landscape that meets the criteria above is also a tribal cultural resource to the extent that the landscape is geographically defined in terms of the size and scope of the landscape. In addition, a historical resource described in PRC Section 21084.1, a unique archaeological resource as defined in PRC Section 21083.2(g), or a "non-unique archaeological resource" as defined in PRC Section 21083.2(h) may also be a tribal cultural resource if it conforms with above criteria.

AB 52 requires a lead agency, prior to the release of a negative declaration, mitigated negative declaration, or environmental impact report for a project, to begin consultation with a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project if: (1) the California Native American tribe requested to the lead agency, in writing, to be informed by the lead agency through formal notification of proposed projects in the geographic area that is traditionally and culturally affiliated with the tribe, and (2) the California Native American tribe responds, in writing, within 30 days of receipt of the formal notification, and requests the consultation.

Local Regulatory Setting

City of Lake Forest General Plan

The existing City of Lake Forest General Plan identifies goals and policies related to cultural resources. Please see the existing General Plan for additional detail.

Geological and Paleontological Setting

The City of Lake Forest is in the northern portion of the California Geomorphic Province known as the Peninsular Ranges. The Peninsular Ranges geomorphic province extends from Mount San Jacinto in the north, through the tip of Baja, Mexico in the south. Subparallel to these ranges on the east is the San Andreas Fault Zone. The northwestwards motion of the Pacific Plate has created these ranges and their corresponding valleys (Wagner 2002).

The City has a complicated paleoenvironmental history which began at the age of dinosaurs about 66 million years old (66 Ma). The past 66 Ma has seen the City transition from coastal lowlands during the Paleocene to Oligocene, to shallow marine during the early Miocene, to deep marine during the early to early-late Miocene, back to shallow marine in the latest Miocene through the Pliocene, and finally to increasingly arid terrestrial deposits from the Pleistocene to the Holocene (Cogstone, 2018).

Ethnography

The City of Lake Forest is primarily located within the traditional boundaries of the Tongva (Gabrielino) tribal territory. The City is also located along the boundary of the territory of the Acjachemen (Juaneño) (McCawley 1996). Ethnographically, Aliso Creek was recorded as the boundary between the Gabrielino to the northeast and the Juaneño to the southwest (Kroeber 1976). Therefore, both of these native traditions are culturally relevant for the City. The names Juaneño and Gabrielino were names imposed on Native Americans by Spanish missionaries to identify the indigenous peoples who occupied the surrounding areas of Mission San Juan Capistrano and Mission San Gabriel Arcángel, respectively (Cogstone, 2018).

Tongva

The Tongva speak a language that is part of the Takic language family. At the time of Spanish contact, their territory encompassed a vast area stretching from Topanga Canyon in the northwest, to the base of Mount Wilson in the north, to San Bernardino in the east, Aliso Creek in the southeast and the four Southern Channel Islands, in all an area of more than 2,500 square miles (Bean and Smith 1978, McCawley 1996).

The Tongva are considered to have been one of the wealthiest tribes and to have greatly influenced tribes they traded with (Kroeber 1976:621). Houses were domed and circular structures thatched with tule or similar materials (Bean and Smith 1978:542). The best known artifacts were made of steatite and were highly prized. Many common everyday items were decorated with inlaid shell or carvings reflecting an elaborately developed artisanship (Bean and Smith 1978:542).

The main food zones utilized were marine, woodland, and grassland (Bean and Smith 1978). Plant foods were, by far, the greatest part of the traditional diet at contact. Acorns were the most important single food source. Villages were located near water sources necessary for the leaching of acorns, which was a daily occurrence. Grass seeds were the next most abundant plant food used along with chia. Seeds were parched, ground, and cooked as mush in various combinations according to taste and availability. Greens and fruits were eaten raw or cooked or sometimes dried for storage. Bulbs, roots, and tubers were dug in the spring and summer and usually eaten fresh. Mushrooms and tree fungus were prized as delicacies (Cogstone, 2018).

The principal game animals were deer, rabbit, jackrabbit, woodrat, mice, ground squirrels, antelope, quail, dove, ducks and other birds. Most predators were avoided as food, as were tree squirrels and most reptiles. Trout and other fish were caught in the streams, while salmon were available when they ran in the larger creeks. Marine foods were extensively utilized. Sea mammals, fish and crustaceans were hunted and gathered from both the shoreline and the open ocean, using reed and dugout canoes. Shellfish were the most common resource, including abalone, turbans, mussels, clams, scallops, bubble shells, and others (Bean and Smith 1978:538-540).

Acjachemen

The Acjachemen (Juaneño) speak a language that is part of the Takic language family also. Their traditional tribal territory was situated partly in northern San Diego County and partly in southern Orange County (Figure 5). The boundaries were Las Pulgas Creek (south), Aliso Creek (north), the Pacific Ocean (west) and the Santa Ana Mountains (east). Villages were mostly along San Juan Creek, Aliso Creek, Trabuco Creek and San Mateo Creek (O'Neil and Evans 1980).

Historic Period Background

Spanish Exploration

Juan Cabrillo was the first European to sail along the coast of California in 1542 and was followed in 1602 by Sebastian Vizcaino (Bean and Rawls 1993). The Spanish colonization of what was then known as Alta California began with the 1769 overland expedition led by Gaspar de Portolá with a crew of 63 men in order to explore the land between San Diego and Monterey (Fox 1979). Between 1769 and 1822 the Spanish had colonized California and established missions, presidios, and pueblos and documented the people and landscape along the way (McCawley 1996).

Portola and his expedition crossed the area north of Lake Forest in July 1769, naming the perennial creek that empties from the Santa Ana Mountains "aliso", the Spanish work alder; an error on the Spanish identifier, since they were in fact, referring to the sycamore tree, which still grow along the creek. It should be noted that the Juaneño term for the creek was Seeevenga, meaning "at the sycamores" (O'Neil 1988). However, historically, alder and sycamore trees were much more prominent, particularly in the riparian and floodplain areas where an oak-woodland habitat existed. During the Mission period, many of the trees along the creek, including alder, oak, sycamore, and other species were cut down for the construction of ships and structures, charcoal production, and other uses (Nasser 2003).

Following the Portolá Expedition, vast tracts of land were granted to the Missions. The seventh of the Franciscan missions in California was Mission San Juan Capistrano, founded in 1776; shortly after Portolá's visit to the area. The goals of the missions were tri-fold: they helped establish a Spanish presence on the west coast, allowed for a means to Christianize the native peoples, and served to exploit the native population as laborers. The Spanish also hoped each mission would become a town center, whereas, "the pueblo would receive a ground of four square leagues of land… and other property would be parceled out among the Indians". The missionaries, or padres, would essentially serve as a mayor, or head of the town (Bean 1968:29-30).

Mexican Period

In 1821 Mexico won its independence from Spain and eventually appropriated the vast mission lands that existed and redistributed them in the form of land grants, to private owners (Bean and Rawls 1993; Robinson 1948). The lands were often granted to soldiers who proved their loyalty to the Mexican government. One these Mexican soldiers was José António Fernando Serrano who was the youngest son of Francisco Serrano, former Acalade (mayor) of the Pueblo of Los Angeles (Fox 1979). José António Fernando Serrano was granted the 10,688-acre Rancho Canada De Los Alisos, or "glen of the alders", which was enlarged in 1846 by a second grant (Robinson 1948). The two combined grants made the rancho closely mirror the shape of the present-day City of Lake Forest (Figure 6). The boundaries of the land grant were El Camino Real to the west, Aliso Creek and Rancho Trabuco to the south, Santiago Road and the Santa Ana Foothills to the east, and Rancho san Juaquin and Lomas Santiago to the north.

Rancho Canada de Los Alisos, like the other ranchos that previously existed in what is now Orange County, was centered on cattle husbandry and was a self-sustaining operation at its conception (Arbuckle 1980). Cattle dominated and transformed the landscape. As the hide and tallow industry grew, and rancheros began trading their raw goods for manufactured good that came by the way of ship in the Bay (Bahía) of San Juan Capistrano, what is now present-day Dana Point. The area was long known as "El Toro" after the steers who roamed Canada de Los Alisos, whose loud, bellowing sounds could be heard from great distances (Arbuckle 1980).

Serrano used the local Native American population as well as the Mestizo (Spanish and Native) population to build, plant, plow, and tend to the livestock of the rancho, resembling the feudal system (Osterman 1992). In addition to cattle, Serrano bred Mustangs and sheep, he also grew grain, corn, watermelons, and grapes. José Serrano acted as the Juez de Campo, or judge of the fields, an official role that was tasked with settling disputes between rancheros over livestock ownership as well as presiding over (Arbuckle 1980).

American Period

Following the cession of California to the United States after the Mexican-American War, a claim for the Rancho was filed with the Public Land Commission in 1852 as required by the Land Act of 1851, and the grant was eventually patented to Serrano in 1871 after much litigation (Carpenter 2003). After the cession of California to the United States, a stagecoach route passed through the El Toro as early as the late 1850s and a stagecoach stop was established just south of El Toro (Fox 1979). Stagecoaches primarily carried mail, but carried passengers as well. The El Toro stop became a popular holdover for passengers traveling to the coast via Laguna Canyon.

A series of droughts affected the area from 1863 until 1883 causing the death of Serrano's herds as well as the herds of the surrounding ranchos (Fox 1979). Serrano eventually went bankrupt and was forced to mortgage and ultimately foreclose the

ranch to J.S. Slauson, a Los Angeles banker. Slauson subdivided the land into ten parcels and leased a portion of the rancho lands to families that settled into the Saddleback Valley. Settlers raised cattle and sheep, planted vineyards and fruit trees. By 1886 the majority of the Saddleback Valley was planted in grapes, until plant disease called the "Anaheim Disease" decimated the vineyards. Orange and walnuts trees soon replaced the failed vineyards (Arbuckle 1980).

By the time Bostonian Dwight Whiting purchased 10,000 acres of the former Rancho de Los Alisos in 1884, the area was already a stagecoach stop that connected San Diego and Los Angeles, with later diversions to Santa Ana and Laguna Beach (Figure 7). Whiting intended to establish a new town inhabited by English gentlemen farmers. Whiting was able bring the San Bernardino and San Diego Railway Co. through his land in 1887, thus founding the town of Aliso City (Arbuckle 1980) (Figure 8). The railroad "boom" brought an influx of people into southern California and numerous cities were proposed. On paper, many of these cities were absorbed by larger ones, while most, like Aliso City, remained small towns (Osterman 1992). Whiting established a 400 acre of dense Eucalyptus tree forest located between present day Ridge Route, Jeronimo, Lake Forest and Serrano Road. The Eucalyptus is now a ubiquitous characteristic of the present day Lake Forest, the city's name originating from Whiting's man-made forest (Arbuckle 1980).

In the 1890s, the Saddleback Valley was dry framed by tenant farming, in which farmers did not own their land, but rented it from their landlords, also known as sharecropping (Osterman 1992). Dry farming crops included barley (the major grain crop), and hay for the livestock. Black-eyed beans were also dry farmed and, while more difficult to farm, turned a higher profit (Osterman 1992). It wasn't until the 1920s that citrus came to the Saddleback Valley. Charles Bennet, an early pioneer attracted to the former Aliso City, pioneered the citrus industry in El Toro by drilling deeper wells (Osterman 1992). Despite the success in citrus in El Toro, the City remained small, serving as the Saddleback Valley's shipping and social center (Osterman 1992)

Modern Period

In 1942, El Toro Marine Corps Air Station was established and was designated as a Master Jet Station and after World War II all United States Presidents landed in Air Force One at this base. After World War II the agricultural land was developed into residential, commercial, and industrial areas. In 1999 the Marine Corps Air Station El Toro was decommissioned.

In 1958, Whiting sold the Rancho to V.P. Baker and associates. In 1969, the Bakers sold the property to the Deane Bros. who later incorporated into the Occidental Petroleum, Land Development Division. They started the residential development of the area, executing a master planned community that eventually became the City of Lake Forest. During the 1960s, a steady supply of water brought in by aqueducts from Northern California, as well as from the Colorado River, facilitated the transformation of the Saddleback Valley from and agricultural community to the multi-city, suburban sprawl it is known as today (Osterman 1992). The City of Lake Forest was incorporated in 1991 and is named for the two man-made lakes within the city as well as the man-made Eucalyptus forest (Cogstone, 2018).

Cultural Resources in Lake Forest General Plan Study Area

The City of Lake Forest currently has 93 previously recorded archaeological sites and six built historic resources within the City boundaries (refer to Table 9-12). A search of the California Historic Resources Inventory System (CHRIS) at the South Central Coastal Information Center (SCCIC) located on the campus of California State University, Fullerton (CSUF) was conducted on March 28, 2018 by Cogstone archaeologist Megan Wilson. The records search covered the entire 10,748.50-acres of the City of Lake Forest and covered portions of the El Toro, San Juan Capistrano, and Santiago Peak USGS 7.5 topographic maps. Results of the record search indicate that 167 previous cultural resources studies have been completed within the boundaries of the City of Lake Forest.

The records search determined that 138 previously recorded cultural resources are located within the City boundaries (Table 9-12). Of these 138 resources, one resource includes a portion of the Upper Aliso Creek Archaeological District, 87 prehistoric archaeological sites, 36 prehistoric archaeological isolates, five multicomponent sites, one historic archaeological site, two historic isolates, six historic resources, one historic district listed (Heritage Hill Historical Park) on the NRHP and CHL.

The site labelled P- 30-156547 in Table 9-12, consists of a historic district, the Heritage Hill Historical Park located at 25151 Serrano Road, Lake Forest CA 92630-2534. This site is registered on the National Register of Historic Places (NR No. 7600050), California Historical Landmark (No. 199), and is registered as an Orange County Historical Landmark. The Site consists of the original location of the Serrano Adobe (1868) as well as the relocated Bennet Ranch House (1908), the El Toro Grammar School (1890), and the St. George's Episcopal Mission (1891). In prehistory, the Acjachemen had a patrilineal society and lived in groups with other relatives. These groups had established claims to places including the sites of their villages and resource areas. Marriages were usually arranged from outside villages establishing a social network of related peoples in the region. There was a well-developed political system including a hereditary chief. Religion was an important aspect of their society. Religious ceremonies included rites of passage at puberty and mourning rituals (Kroeber 1925:636-647).

Houses were typically conical in shape and thatched with locally available plant materials. Work areas were often shaded by rectangular brush-covered roofs (ramada). Each village had a ceremonial structure in the center enclosed by a circular fence where all religious activities were performed (Bean and Shipek 1978:553).

Women are known to have been the primary gathers of plants foods, but also gathered shellfish and trapped small game animals. Men hunted large game, most small game, fished, and assisted with plant food gathering, especially of acorns. Adults were actively involved in making tools including nets, arrows, bows, traps, food preparation items, pottery and ornaments. Tribal elders had important political and religious responsibilities and were involved in education of younger members (Bean and Shipek 1978:555).

Table 9-12 Previously Recorded Cultural Resources Within the City of Lake Forest

Primary No.	Other Identifier	Site Type	Site Description	Year Recorded	Maps
P-30-000016	CA-ORA-000016	Prehistoric Archaeological Site	Lithic scatter	1949	San Juan Capistrano
P-30-000037	CA-ORA-000037	Prehistoric Archaeological Site	Unidentified	1949	El Toro
P-30-000038	CA-ORA-000038	Multicomponent Site	Multicomponent	1949	El Toro
P-30-000039	CA-ORA-000039	Prehistoric Archaeological Site	Lithic scatter	1949, 1976,1978	El Toro
P-30-000040	CA-ORA-000040	Prehistoric Archaeological Site	Lithic scatter	1949	El Toro
P-30-000042	CA-ORA-000042	Prehistoric Archaeological Site	Lithic scatter	1949, 1980	El Toro
P-30-000176	CA-ORA-000176	Prehistoric Archaeological Site	Lithic scatter	1966, 1991	El Toro
P-30-000438	CA-ORA-000438	Prehistoric Archaeological Site	Lithic scatter	1973, 1995, 1997, 2001	El Toro
P-30- 000439	CA-ORA- 000439	Prehistoric Archaeological Site	Lithic scatter	1973, 2001	El Toro, Santiago Peak
P-30-000440	CA-ORA-000440	Prehistoric Archaeological Site	Lithic scatter	1973, 2001	El Toro
P-30-000441	CA-ORA-000441	Prehistoric Archaeological Site	Lithic scatter, cairn	1973, 2001, 2007, 2014	El Toro
P-30-000442	CA-ORA-000442	Prehistoric Archaeological Site	Lithic scatter	1973, 2007	El Toro
P-30-000443	CA-ORA-000443	Prehistoric Archaeological Site	Lithic scatter	1973, 2001, 2007	El Toro
P-30- 000444	CA-ORA- 000444	Prehistoric Archaeological Site	Lithic scatter	1974, 1994, 20017	El Toro
P-30-000445	CA-ORA-000445	Prehistoric Archaeological Site	Lithic scatter	1973, 2001, 2007	El Toro
P-30-000446	CA-ORA-000446	Prehistoric Archaeological Site	Lithic scatter	1973, 2001, 2007	El Toro
P-30-000447	CA-ORA-000447	Prehistoric Archaeological Site	Lithic scatter	1973, 1978, 2007	El Toro
P-30-000448	CA-ORA-000448/H	Multicomponent Site	Lithic scatter, foundations	1974, 2001	El Toro

Primary No.	Other Identifier	Site Type	Site Description	Year Recorded	Maps
P-30- 000449	CA-ORA- 000449	Prehistoric Archaeological Site	Lithic scatter	1974, 2001	El Toro, Santiago Peak
P-30- 000450	CA-ORA- 450	Prehistoric Archaeological Site	Lithic scatter	1974, 2001	El Toro, Santiago Peak
P-30-000451	CA-ORA-000451	Prehistoric Archaeological Site	Lithic scatter	1973, 1982	Santiago Peak
P-30-000452	CA-ORA-000452	Prehistoric Archaeological Site	Lithic scatter, projectile points	1974, 2001	El Toro
P-30- 000453	CA-ORA- 000453	Multicomponent Site	Rockshelter, lithic scatter, historic carving "1887/4"	1974, 2001	El Toro
P-30-000454	CA-ORA-000454	Prehistoric Archaeological Site	Lithic scatter	1974, 2001	El Toro
P-30-000455	CA-ORA-000455	Prehistoric Archaeological Site	Lithic scatter	1974, 2001	El Toro
P-30-000456	CA-ORA-000456	Prehistoric Archaeological Site	Lithic scatter	1974, 1978, 2001	El Toro
P-30-000460	CA-ORA-000460	Prehistoric Archaeological Site	Lithic scatter	1974	El Toro
P-30-000489	CA-ORA-000489	Prehistoric Archaeological Site	Lithic scatter	1973, 1980, 2004	El Toro
P-30-000490	CA-ORA-000490	Prehistoric Archaeological Site	Lithic scatter	1973, 1982	El Toro
P-30-000491	CA-ORA-000491	Prehistoric Archaeological Site	Lithic scatter	1973, 1980, 1980	El Toro
P-30-000510	CA-ORA-000510	Prehistoric Archaeological Site	Lithic scatter	1975, 1994	El Toro
P-30- 000514	CA-ORA- 000514	Prehistoric Archaeological Site	Habitation site, diiscoidal	1976, 1977	El Toro
P-30-000536	CA-ORA-000536	Prehistoric Archaeological Site	Lithic scatter	1976	El Toro
P-30-000544	CA-ORA-000544	Prehistoric Archaeological Site	Lithic scatter	1976, 1977	El Toro
P-30-000566	CA-ORA-000566	Prehistoric Archaeological Site	Lithic scatter	1973, 1977	El Toro
P-30-000579	CA-ORA-000579	Prehistoric Archaeological Site	Shell scatter	1975	San Juan Capistrano
P-30- 000594	CA-ORA- 000594	Prehistoric Archaeological Site	Lithic scatter	1977	El Toro
P-30-000602	CA-ORA-000602	Prehistoric Archaeological Site	Lithic scatter	1976, 2002	El Toro
P-30- 000612	CA-ORA- 000612/H	Multicomponent Site	Lithic scatter, habitation debris, and historic refuse scatter. Serrano-Whiting Adobe Site	1977	El Toro
P-30- 000628	CA-ORA- 000628	Prehistoric Archaeological Site	Lithic scatter	1977	El Toro

Primary No.	Other Identifier	Site Type	Site Description	Year Recorded	Maps
P-30-000647	CA-ORA-000647	Prehistoric Archaeological Site	Quarry site, lithic tools and scatter	1977, 1986, 1994	El Toro
P-30-000648	CA-ORA-000648	Prehistoric Archaeological Site	Temporary habitation area	1977, 1994	El Toro
P-30-000693	CA-ORA-693	Prehistoric Archaeological Site	Lithic Scatter	1977, 1978	El Toro
P-30-000694	CA-ORA-000694	Prehistoric Archaeological Site	Lithic Scatter	1977, 1978	El Toro
P-30- 000695	CA-ORA- 000695	Prehistoric Archaeological Site	Lithic Scatter	1977, 1978	El Toro
P-30-000696	CA-ORA-000696	Prehistoric Archaeological Site	Habitation area, lithic scatter	1977, 1978	El Toro
P-30-000697	CA-ORA-000697	Prehistoric Archaeological Site	Lithic scatter	1977, 1978	El Toro
P-30-000698	CA-ORA-000698	Prehistoric Archaeological Site	Lithic scatter	1977	El Toro
P-30-000699	CA-ORA-000699	Prehistoric Archaeological Site	Lithic scatter	1977, 1978	El Toro
P-30-000739	CA-ORA-000739	Prehistoric Archaeological Site	Lithic scatter	1978	El Toro
P-30-000742	CA-ORA-000742	Prehistoric Archaeological Site	Lithic scatter	1978	El Toro
P-30-000743	CA-ORA-000743	Prehistoric Archaeological Site	Lithic scatter	1978	El Toro
P-30-000741	CA-ORA-000741	Prehistoric Archaeological Site	Lithic scatter	1978	El Toro
P-30-000756	CA-ORA-000756	Prehistoric Archaeological Site	Lithic scatter	1978, 1996	El Toro
P-30-000773	CA-ORA-000773	Prehistoric Archaeological Site	Lithic scatter	1978	El Toro
P-30-000825	CA-ORA-000825	Prehistoric Archaeological Site	Lithic scatter	1979, 1997, 2014	El Toro
P-30- 000826	CA-ORA- 000826	Prehistoric Archaeological Site	Lithic scatter	1979, 1982, 1997	El Toro
P-30-000827	CA-ORA-000827	Prehistoric Archaeological Site	Lithic scatter	1979, 1995	El Toro
P-30-000828	CA-ORA-000828	Prehistoric Archaeological Site	Lithic scatter	1979, 1980	El Toro
P-30-000905	CA-ORA-000905	Prehistoric Archaeological Site	Lithic scatter	1980, 1982	El Toro
P-30-000949	CA-ORA-000949	Prehistoric Archaeological Site	Lithic scatter	1980	El Toro
P-30- 000950	CA-ORA- 000950	Prehistoric Archaeological Site	Lithic scatter	1980	El Toro
P-30- 000951	CA-ORA- 000951	Prehistoric Archaeological Site	Rockshelter, habitation area, midden, lithic scatter, hearth	1980	El Toro
P-30-000952	CA-ORA-000952	Prehistoric Archaeological Site	Lithic scatter	1980	El Toro
P-30-000953	CA-ORA-000953	Prehistoric Archaeological Site	Lithic scatter	1980	El Toro

Primary No.	Other Identifier	Site Type	Site Description	Year Recorded	Maps
P-30-000954	CA-ORA-000954	Prehistoric Archaeological Site	Lithic scatter, shell scatter	1980	El Toro
P-30-000955	CA-ORA-000955	Prehistoric Archaeological Site	Bedrock milling features	1980	El Toro
P-30-000957	CA-ORA-000957	Prehistoric Archaeological Site	Lithic scatter	1980	El Toro
P-30-000958	CA-ORA-000958	Prehistoric Archaeological Site	Lithic scatter	1980	El Toro
P-30-000959	CA-ORA-000959	Prehistoric Archaeological Site	Lithic scatter	1980	El Toro
P-30- 000960	CA-ORA- 000960	Prehistoric Archaeological Site	Lithic scatter	1980	El Toro
P-30-001004	CA-ORA-001004	Prehistoric Archaeological Site	Lithic scatter	1981	El Toro
P-30-001057	CA-ORA-001057	Prehistoric Archaeological Site	Rock carin, lithic scatter	1984	El Toro
P-30-	CA-ORA-	Prehistoric Archaeological Site	Rock carin, lithic	1984	El Toro
P-30- 001146	CA-ORA- 001146	Prehistoric Archaeological Site	Lithic scatter, hearth	1988	El Toro
P-30-001147	CA-ORA-001147	Prehistoric Archaeological Site	Quarry, lithic scatter	1988	El Toro
P-30-001148	CA-ORA-001148	Prehistoric Archaeological Site	Lithic scatter	1988	El Toro
P-30-001149	CA-ORA-001149	Prehistoric Archaeological Site	Lithic scatter, hearth	1988	El Toro
P-30-001150	CA-ORA-001150	Prehistoric Archaeological Site	Lithic scatter, hearth	1988	El Toro
P-30-001171	CA-ORA-001171	Prehistoric Archaeological Site	Lithic scatter	1988, 1994	El Toro
P-30-001242	CA-ORA-001242	Prehistoric Archaeological Site	Lithic scatter	1990	El Toro
P-30-001345	CA-ORA-001345	Prehistoric Archaeological Site	23 hearths	1992	El Toro
P-30-001362	CA-ORA-001362	Prehistoric Archaeological Site	Lithic scatter	1994	El Toro
P-30-001373	CA-ORA-001373	Prehistoric Archaeological Site	Lithic scatter	1994	El Toro
P-30-001430	CA-ORA-001430	Prehistoric Archaeological Site	Lithic scatter	1995	El Toro
P-30-001496		Historic Resource	Concrete and metal troughs, holding pen	1980	El Toro
P-30-001497		Historic Resource	Water tower	1980	El Toro
P-30-001498		Historic Resource	Metal shed	1998	El Toro
P-30-001500	CA-ORA-001500H	Historic Resource	Wood water tank	1998	El Toro
P-30-001501	CA-ORA-001501H	Historic Archaeological Site	Collapsed shed and structural debris	1998	El Toro
P-30- 001728		Archaeological District	Upper Aliso Creek Archaeological District	1978, 2001	El Toro, Santiago Peak
P-30-001741	CA-ORA-001741	Prehistoric Archaeological Site	Lithic scatter	1986	El Toro
P-30-	N/A	Prehistoric Isolate	Utilized chert flake	1977	El Toro
P-30-100187	N/A	Prehistoric Isolate	Scraper-core fragment and flake	1977	El Toro
P-30-100188	N/A	Prehistoric Isolate	Cobble and debitage	1977	El Toro

Primary No.	Other Identifier	Site Type	Site Description	Year Recorded	Maps
P-30-100219	N/A	Prehistoric Isolate	Granitic mano	2014	El Toro
P-30-100220	N/A	Prehistoric Isolate	Chert flake	2014	El Toro
P-30-100276	N/A	Prehistoric Isolate	Core tool	1980	El Toro
P-30-100278	N/A	Prehistoric Isolate	Hammerstone	1980	El Toro
P-30-100279	N/A	Prehistoric Isolate	Mano	1980	El Toro
P-30-100280	N/A	Prehistoric Isolate	Core tool	1980	El Toro
P-30- 100281	N/A	Prehistoric Isolate	Flake tool	1980	El Toro
P-30-100282	N/A	Prehistoric Isolate	Mano	1980	El Toro
P-30-100283	N/A	Prehistoric Isolate	Core tool	1980	El Toro
P-30-100285	N/A	Prehistoric Isolate	Flake tool	1980	El Toro
P-30-100288	N/A	Prehistoric Isolate	Flake tool	1980	El Toro
P-30- 100289	N/A	Prehistoric Isolate	Metate	1980	El Toro
P-30-100290	N/A	Prehistoric Isolate	Core tool	1980	El Toro
P-30-100294	N/A	Prehistoric Isolate	Core tool	1980	El Toro
P-30-100295	N/A	Prehistoric Isolate	Core	1980	El Toro
P-30-100296	N/A	Prehistoric Isolate	Flake tool	1980	El Toro
P-30-100305	N/A	Prehistoric Isolate	Utilized flake	1980	El Toro
P-30-100309	N/A	Historic Isolate	Concrete foundation/ slab	1984	El Toro
P-30-100310	N/A	Prehistoric Isolate	Chert flake	1998	El Toro
P-30-100311	N/A	Prehistoric Isolate	Chopper/scraper	1984	El Toro
P-30-100312	N/A	Historic Isolate	Concrete trough	1980	El Toro
P-30-100313	N/A	Prehistoric Isolate	Quartzite core	1993	El Toro
P-30- 100371	N/A	Prehistoric Isolate	Abalone shell fragment	2006	El Toro
P-30-100438	N/A	Prehistoric Isolate	Chert scraper	1984	El Toro
P-30-100439	N/A	Prehistoric Isolate	Mano fragment	1984	El Toro
P-30-100444	N/A	Prehistoric Isolate	Quartzite chopper	1989	El Toro
P-30-100445	N/A	Prehistoric Isolate	Chert flake	1991	El Toro
P-30-100446	N/A	Prehistoric Isolate	Metate fragment	1991	El Toro
P-30-100447	N/A	Prehistoric Isolate	Core	1991	El Toro
P-30-100448	N/A	Prehistoric Isolate	Mortar and core	1991	El Toro
P-30-100449	N/A	Prehistoric Isolate	Chert flake	1991	El Toro
P-30-100453	N/A	Prehistoric Isolate	Flake	1994	El Toro
P-30- 100463	N/A	Prehistoric Isolate	2 utilized chert flakes	1991	El Toro
P-30-100464	N/A	Prehistoric Isolate	Chert flake	1991	El Toro
P-30-100491	N/A	Prehistoric Isolate	Mano fragment	2011	El Toro
P-30- 156547	NR. No 76000505, CHL No. 199, HRI No. 035907, OC Historical Landmark	Historic Resource	Heritage Hill Historic Site; Serrano Adobe, :1856-1860, Bennet House (1908), El Toro School (1890), St. George's Church (1891).	1935, 1959, 1976, 1980	El Toro
P-30- 176663	N/A	Historic Resource	Railroad, Aitchison-Topeka-Santa Fe	2002, 2002, 2007, 2012, 2016	El Toro, San Juan Capistrano

In addition to the SCCIC records search, a variety of sources were consulted in February and May 2018 to obtain information regarding the cultural context of the City of Lake Forest (Table 9-13). Sources included the National Register of Historic Places (NRHP) and the California Register of Historic Resources (CRHR) which includes the California Historical Resources Inventory (CHRI), California Historical Landmarks (CHL), and California Points of Historical Interest (CPHI). The Bureau of Land Management (BLM) General Land Office records were also searched (Table 9-14).

Table 9-13 Additional Sources Consulted

Source	Results
National Register of Historic Places (NRHP/NR; 1979-2002 & supplements)	Positive: one listing, the Serrano Adobe, NR. 76000505
Historic USGS Topographic (Topo) Maps	Positive: The earliest USGS Topo map for the area is the 1901 30'Southern California Sheet no. 1 that shows the Canada de Ls Alisos Rancho the then Southern California Railroad, El Toro Road (then Los Alisos Avenue), El Camino Real, as well as the town of El Toro and the old stagecoach stop can be inferred from this Topo map. No new information can be gleaned from following Topo maps until the 1942 Santiago Peak 7.5' Topo map that shows El Toro Road (still Los Alisos Avenue at that time) as a secondary highway and shows Highway 101 as a primary highway. More development is present at old El Toro's historic downtown core. The area around Aliso Creek is symbolized as agricultural enterprises and likely included citrus orchards. The 1968 El Toro and San Juan Capistrano 7.5' Topo maps show the completed of Interstate 5 at the former location of Highway 101 and the beginning of small housing tracts near the old El Toro downtown area.
Historic US Department of Agriculture Aerial Photographs	The earliest historical aerial for the City dates to 1938 and shows numerous agricultural fields surrounding El Toro Road, then Los Alisos Avenue. Development is concentrated with old El Toro's Historic downtown core and near the area of the Serrano Adobe/Heritage Hill Area. A conspicuous feature on the landscape is Whiting experimental Eucalyptus forest, which can been seen spanning the area north of the railroad to Jeronimo Road, centered along Ridge Route. The landscape dramatically changes in the 1967 aerial with the replacement of Highway 101 with Interstate 5 and the aggressive commercial and residential development south of Jeronimo Road and north of Interstate 5. Development creeps northwest in later years.
California Historical Resources Inventory (CHRI/ HRI; 1976-2014)	Positive: one listing, the Serrano Adobe HRI No. 035907
California Historical Landmarks (CHL; 1995 & supplements to 2014)	Positive: one listing, the Serrano Adobe, CHL 199
California Points of Historical Interest (CPHI; 1992 to 2014)	Negative
Orange County Historical Sites	Positive: one listing, Heritage Hill Historical Park
Mills Act Property Contract Program	Negative
Historic Bridges	Positive: 55C0212, Ridge Route Drive, Union Pacific:1967
Bureau of Land Management (BLM) General Land Office Records (GLO)	Positive: See Table 6
Local Historical Society, Saddleback Valley Historical Society (SVHS)	Positive: 3572 Prothero, Lake Forest. "Prothero House": 1920 23512 El Toro Rd, Lake Forest, CA 92630, Big Shots Pool Hall and El Toro Meat Market, original location of the El Toro General Store (1890s) (Figure 8).

Table 9-14 BLM General Land Office Records

USGS 7.5 Topographic Quad(s)	Township	Range	Section(s)	Year, Name
El Toro	5S	7W	29,	1866, Southern Pacific Railroad; 1871, Jose Serrano; 1878, Samuel Shrewsbury
			30, 31,	1871, Jose Serrano;
			32	18591, Joaquin Serrano
		8W	36	1871, Jose Serrano
	6S	7W	07, 08, 18	1866, Juan Forster
		8W	01	1871, Jose Serrano; 1868 Theodocio Yorba
			13, 23, 24	1866, Juan Forster; 1871, Jose Serrano
			22	1867 Jose Sepulveda; 1871 Jose Serrano
			01, 02, 10, 11, 12, 14, 15, 16, 21	1871, Jose Serrano
El Toro and San Juan Capistrano	6W	8W	26	1866 Juan Forster; 1871, Jose Serrano; 1875 & 1666, George Y. Barry; 1892 Charles M. Salter
			27	1871, Jose Serrano
			28	1871, Jose Serrano; 1877, 1882, State of California;
San Juan Capistrano	6W	8W	34	1871, Jose Serrano; 1883 Hiram H. & Cyrus Rawson, J.E. Bacon
			35	1871 Jose Serrano

Native American Consultation

A Sacred Lands File (SLF) search was requested from the Native American Heritage Commission (NAHC) on March 23, 2018, the NAHC replied the same day and indicated that a search of the SFL was completed with positive results in the Santiago Peak USGS Quadrangle and that the Juaneño Band of Mission Indians should be contacted for more information about the site.

The City of Lake Forest conducted Native American consultations under Senate Bill 18 (Chapter 905, Statutes of 2004), also known as SB18, which requires local governments to consult with Tribes prior to making certain planning decisions and requires consultation and notice for a general and specific plan adoption or amendments in order to preserve, or mitigate impacts to, cultural places that may be affected. In addition to SB18 consultation, the City conducted tribal consultations under the provisions of the California Environmental Quality Act (CEQA) (Public Resources Code section 21080.3.1 subdivisions (b), (d) and (e)), also known as AB 52, which requires consulting for projects within the City of Lake Forest's jurisdiction and within the traditional territory of the Tribal Organizations who have previously requested AB52 consultations with the City. Three Tribal Organizations were contacted under AB52 and 13 were contacted under SB18.

The City of Lake Forest sent letters to all 15 Tribal Organizations on June 4, 2018 via certified mail. Follow up emails were sent on June 26, 2018, and follow up phone calls were made on July 18, 2018; however, additional contact attempts were made to the Juaneño Band of Mission Indians Acjachemen Nation. To date, four responses have been received and are summarized below:

On August 31, 2018 Ms. Joyce Perry of the Juaneño Band of Mission Indians Acjachemen Nation, via phone conversation, requested that the City of Lake Forest notify the Tribe regarding any development projects located within the City limits. She informed that the Santa Ana foothills and area around the Aliso Creek watershed are extremely sensitive for tribal cultural resources including ancestor remains.

On August 31, 2018, Mr. Marcos Guerrero indicated that he believed the UAIC was placed on the City of Forest /Orange County list by accident.

On June 12, 2018 Mr. Ray Teran indicated that Viejas Tribe as determined that the project has little cultural significance to the Viejas Tribe. He recommended that local Tribes be consulted.

On July 18, 2018 the receptionist of the Jamul Indian Village indicated that the City of Lake Forest is off their reservation and outside of their traditional tribal territory and defers to local Tribes.

Although Native American human remains are normally associated with former residential village locations, isolated burials and cremations have been found in many other locations. Future projects may disturb or destroy buried Native American human remains, including those interred outside of formal cemeteries. Consistent with state laws protecting these remains (that is, Health and Safety Code Section 7050.5 and Public Resources Code Section 5097.98), sites containing Native American human remains must be treated in a sensitive manner

Paleontological Resources

The City has a complicated paleoenvironmental history which began at the age of dinosaurs about 66 million (Ma) years old. Geologic mapping by Morton and Miller (2006) maps the City area as 28 separate units ranging from modern deposits to Paleocene sediments (Table 9-15). Epoch's including Holocene, Pleistocene, Pliocene, etc. are distinctive periods in the history of the earth. Geological units are discussed in order from oldest to youngest based on these time periods in the table below.

Table 9-15 Geologic units within the City

Epoch	Age Range	Unit Name	Paleoenvironment
modern	<200 years	artificial fill (Qaf)	man-made
late Holocene	<5,000 years (<5 ka)	very young colluvial deposits (Qc)	slope deposit
		very young landslide deposits (Qls, Qls?)	landslide
		very young slope wash deposits (Qsw)	slope wash
late Pleistocene to Holocene	<120 ka	young axial-channel deposits (Qya)	flood-plains
		young alluvial-fan deposits (Qyf)	alluvial fan
		young landslide deposits (Qyls)	landslide
early to middle Pleistocene	~11.7 ka - ~2.6 million years (Ma)	very old axial-channel deposits (Qvoa, $Qvoa_2$, $Qvoa_3$)	flood-plains
		very old alluvial-fan deposits (Qvof)	alluvial fan
Pliocene	~2.6 Ma - ~5.3 Ma	Niguel Formation (Tn)	shallow marine
late Miocene to early Pliocene	~3.6 Ma - ~11.6 Ma	Capistrano Formation (Tc, Tco, Tcs)	shallow-marine
late Miocene	~5.3 Ma - ~11.6 Ma	Puente Formation (Tp, Tplv, Tpsq)	deep marine, submarine fan
		Monterey Formation (Tm)	deep marine
middle Miocene	~11.6 Ma - ~16 Ma	Topanga Group (Tt)	shallow to deeper marine
latest Oligocene to latest early Miocene	~16 Ma - ~23 Ma	Vaqueros Formation (Tv)	shallow marine
		Vaqueros-Sespe Formation (Tvs)	shallow marine - nonmarine

late Eocene to early Miocene	~16 Ma - ~41.2 Ma	Sespe Formation (Ts)	nonmarine
Paleocene	~56 Ma - ~66 Ma	Santiago Formation (Tsa)	coastal lowland
		Silverado Formation (Tsi, Tsicg, Tsis)	coastal nonmarine to very shallow-marine

A search for paleontological records was completed by the Natural History Museum of Los Angeles County (LACM; McLeod 2018). Published literature, unpublished paleontological reports, and online databases were also searched for fossil records. Databases included the Natural History Museum of Los Angeles County Invertebrate Paleontology (LACMIP 2018), the Paleobiology Database (PBDB 2018), and the University of California Museum of Paleontology (UCMP 2018). The artificial fill and Holocene sediments do not contain fossil resources due to their age, by nature of their formation, or paleoenvironment. Although the Paleocene Silverado Formation and Santiago Formation, as well as the Pleistocene alluvial deposits have produced fossils within Orange County, there are no records of fossils from these formations from within the City. The rest of the formations have produced fossils from within the City. Formations are discussed from oldest to youngest.

Paleocene: Silverado Formation

At least 25 fossils of marine snails and bivalves have been recovered from the northwestern Santa Ana Mountains in Orange County (Schoellhamer et al. 1981). Sixteen localities were recovered from the Black Star Canyon 7.5' USGS topographic quadrangle and a single locality was recovered from the Orange 7.5' USGS topographic quadrangle. The Eastern Transportation Corridor (ETC) database listed one potential Silverado Formation locality from the El Toro 7.5' USGS topographic quadrangle which produced plant fossils.

Paleocene: Santiago Formation

At least 100 fossils of marine snails and bivalves have been recovered from this formation in the northwestern Santa Ana Mountains in Orange County. Eleven localities was recovered from the Black Star Canyon 7.5' USGS topographic quadrangle, four localities were recovered from the El Toro 7.5' USGS topographic quadrangle, three localities were recovered from the Orange 7.5' USGS topographic quadrangle, and a single locality was recovered from the Tustin 7.5' USGS topographic quadrangle (Schoellhamer et al. 1981). The Orange County Paleontological Database (OCPC 2018) listed one locality from the Black Star Canyon 7.5' USGS topographic quadrangle which produced a crocodile and plant fossils.

Late Eocene to Latest Early Miocene: Sespe Formation

At least 25 fossils of terrestrial animals have been recovered from 17 localities in the Sespe Formation in Orange County. Two localities was recovered from the Lower Bowerman Landfill, nine localities were recovered from the Upper Bowerman Landfill, four localities were recovered from the Foothill Transportation Corridor-Oso segment, a locality was recovered from the San Joaquin Hills, and a locality was recovered from the San Joaquin Hills (Whistler and Lander 2003). The OCPC listed one locality from the El Toro 7.5' USGS topographic quadrangle. These localities have produced fossils of canine, weasel, peccary, oreodont, camel, musk deer, opossum, shrew, pika, squirrel, rodent, and iguana.

Early Miocene: Vaqueros-Sespe Formation

At least 2400 fossils of terrestrial animals and plants have been recovered from 122 localities in the Vaqueros-Sespe Formation in Orange County (OCPC 2018, Whistler and Lander 2003, McLeod 2018). These localities have produced fossils of canine, bear, weasel, rhinoceros, horse, peccary, pig-like artiodactyl, oreodont, camel, deer-like artiodactyl, musk deer, hedgehog, shrew, pika, rabbit, squirrel, rodent, opossum, and reptile.

Early Miocene: Vaqueros Formation

At least 150 fossils of marine animals have been recovered from 24 localities in the Vaqueros Formation in Orange County (LACMIP 2018, SDNHM 2018, UCMP 2018). These localities have produced fossils of baleen and toothed whales, sea cows, birds, sea turtles, bony fish, sharks and rays, and invertebrates.

Middle Miocene: Topanga Group

At least 375 fossils of marine and terrestrial animals have been recovered from 37 localities in the Topanga Group in Orange County (McLeod 2018, UCMP 2018, OCPC 2018). These localities have produced fossils of pinnipeds, baleen and toothed whales, dugongs, sea cows, desmostylians, proboscideans, rodents, birds, sea turtles, bony fish, sharks, rays, and invertebrates.

Late Miocene: Monterey Formation

At least 150 fossils of marine animals have been recovered from 31 localities within and near to the City of Lake Forest (McLeod 2018, OCPC 2018, SDNHM 2018, UCMP 2018). These localities have produced fossils of pinnipeds, baleen and toothed whales, dugongs, desmostylians, birds, crocodile, sea turtles, bony fish, sharks and rays, and invertebrates.

Late Miocene: Puente Formation

At least 275 fossils of marine animals have been recovered from 32 localities from the La Vida Member (OCPC 2018). These localities have produced fossils of sea lions, desmostylians, bony fish, sharks and rays, and invertebrates. Numerous species of land plants and algae have also been recovered from these localities. A fossil of a herring have been recovered a locality in the Soquel Member (OCPC 2018). Two fossils of bony fish have been recovered two localities in undifferentiated Puente Formation (OCPC 2018).

Late Miocene to Early Pliocene: Capistrano Formation

At least 375 fossils of marine and terrestrial animals have been recovered from 33 localities from the Oso Sand of the Capistrano Formation (OCPC 2018, SDNHM 2018). These localities have produced fossils of pinnipeds, rodents, camels, baleen and toothed whales, horses, rhinoceros, mastodon, dugong, sea cows, desmostylians, birds, sea turtles, tortoise, bony fish, sharks and rays, and invertebrates. Numerous species of land plants and algae have also been recovered from these localities.

At least 100 fossils of marine and terrestrial animals have been recovered from 30 localities from undifferentiated deposits of Capistrano Formation (McLeod 2018, UCMP 2018). These localities have produced fossils of pinnipeds, camels, baleen and toothed whales, horses, birds, sea turtles, tortoise, crocodile, bony fish, sharks and rays, and invertebrates.

Pliocene: Niguel Formation

An unknown number of fossils of marine and terrestrial animals have been recovered from four localities from undifferentiated deposits of Niguel Formation (McLeod 2018). These localities have produced fossils of camels, baleen whales, dugongs, and bony fish.

Pliocene To Pleistocene: Niguel Formation- Quaternary Terrace

A fossil of a sea lion and a camel have been recovered two localities in Niguel Formation – Quaternary terrace deposits (McLeod 2018).

Pleistocene Deposits

At least 225 fossils of terrestrial animals have been recovered from 29 localities from Pleistocene deposits outside of the City of Lake Forest (McLeod 2018, OCPC 2018, Jefferson 1991b). These localities have produced fossils of ground sloth, short faced bear, American lion, mammoth, mastodon, horses, ancient bison, shrews, reptiles, and amphibians. The most significant of these localities is Costeau Pit located in the City of Laguna Hills, just south of Lake Forest which has additionally produced coyote, dire wolf, saber-toothed cat, camel, llama, diminutive pronghorn, long-horned bison, rabbits, rodents, and birds.

The following units include Pleistocene sediments:

- Quaternary very old axial channel deposits (Qvoa, $Qvoa_2$, $Qvoa_3$); early to middle Pleistocene
- Quaternary very old alluvial fan deposit (Qvof); early to middle Pleistocene
- Quaternary young axial channel deposit (Qya); late Pleistocene to Holocene
- Quaternary young alluvial fan deposit (Qyf); late Pleistocene to Holocene
- Quaternary young landslide deposit (Qyls); late Pleistocene to Holocene

Holocene Deposits

No fossils are known from any of the Holocene deposits as they are all too young to contain fossils. The following units are Holocene in age:

- Very young colluvial deposits (Qc); late Holocene
- Very young slope wash deposits (Qsw); late Holocene
- Very young landslide deposits (Qls); late Holocene
- Artificial fill; modern

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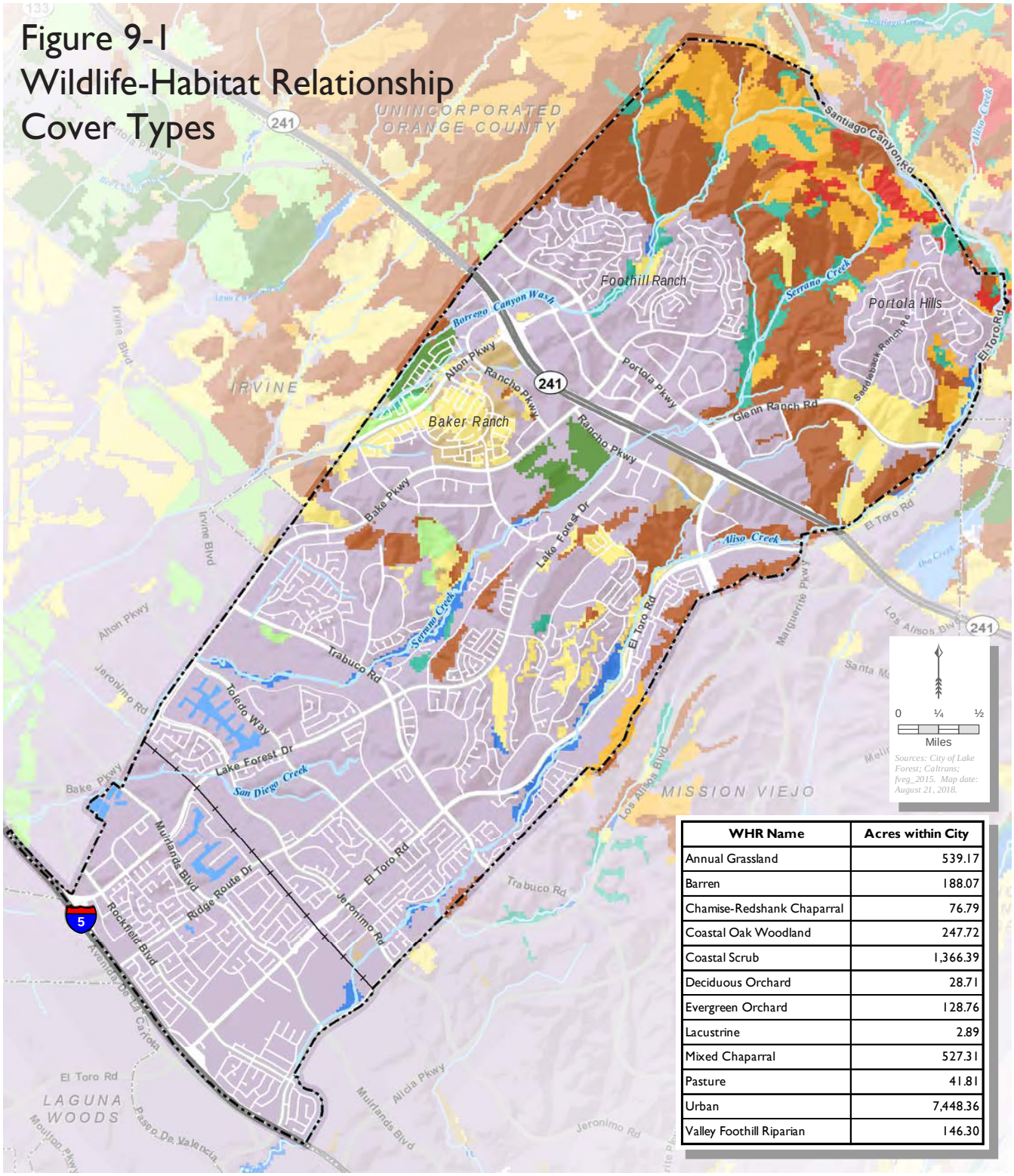
Figure 9-1
Wildlife-Habitat Relationship Cover Types



WHR Name	Acres within City
Annual Grassland	539.17
Barren	188.07
Chamise-Redshank Chaparral	76.79
Coastal Oak Woodland	247.72
Coastal Scrub	1,366.39
Deciduous Orchard	28.71
Evergreen Orchard	128.76
Lacustrine	2.89
Mixed Chaparral	527.31
Pasture	41.81
Urban	7,448.36
Valley Foothill Riparian	146.30

Legend

City of Lake Forest

Wildlife-Habitat Relationship (WHR) Name

- Annual Grassland
- Barren
- Chamise-Redshank Chaparral
- Coastal Oak Woodland
- Coastal Scrub
- Deciduous Orchard
- Evergreen Orchard
- Lacustrine
- Mixed Chaparral
- Pasture
- Urban
- Valley Foothill Riparian

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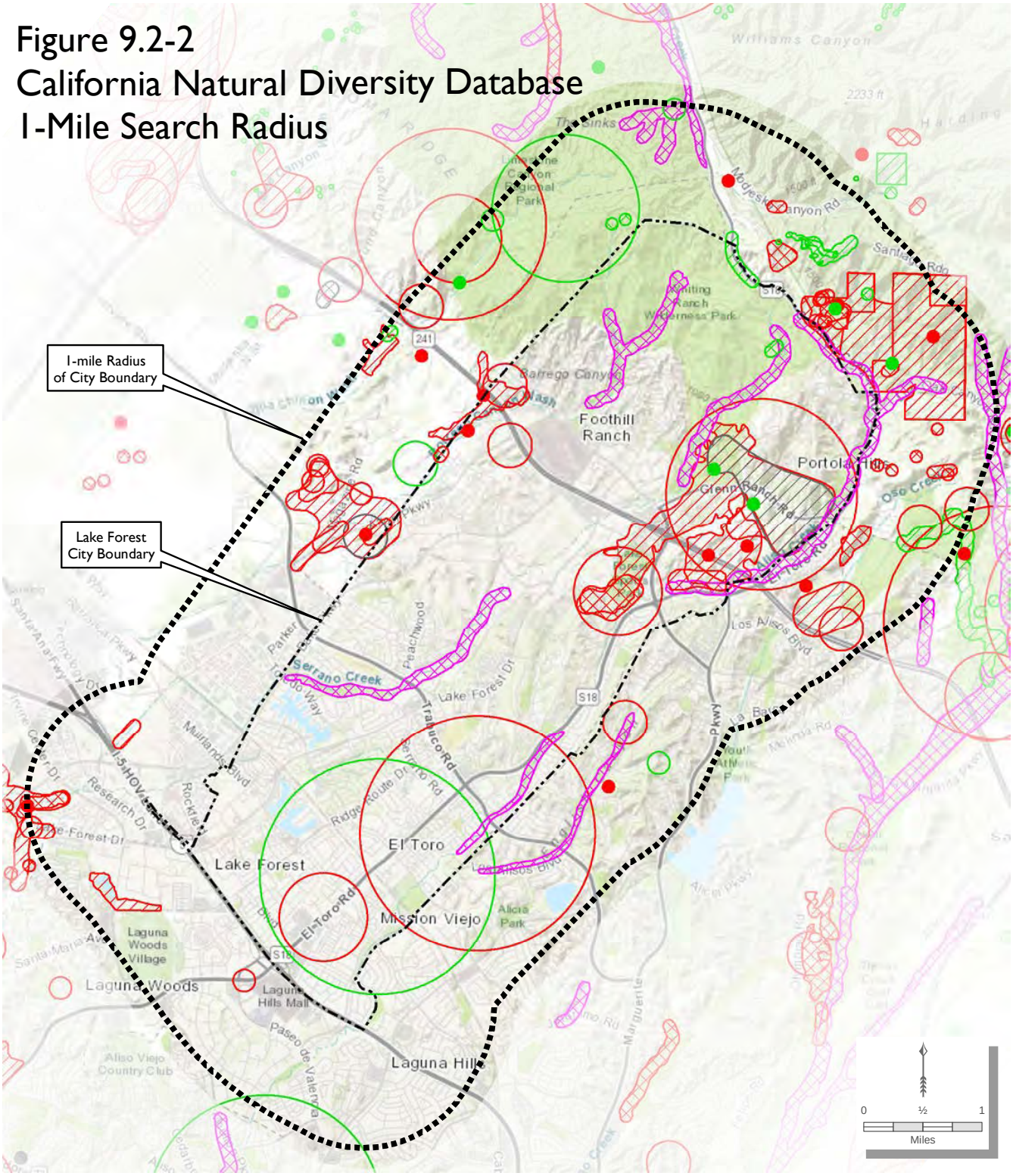
Figure 9.2-2
California Natural Diversity Database
1-Mile Search Radius



Special Status Species Occurrences

- Plant (80m)
- Plant (specific)
- Plant (non-specific)
- Plant (circular)
- Animal (80m)
- Animal (specific)
- Animal (non-specific)
- Animal (circular)
- Terrestrial Comm. (specific)
- Multiple (80m)
- Multiple (specific)
- Multiple (non-specific)
- Multiple (circular)

CNDDB version 08/2018. Please Note: the occurrences shown on this map represent the known locations of the species listed here as of the date of this version. There may be additional occurrences or additional species within this area which have not been surveyed and/or mapped. Lack of information in the CNDDB about a species or an area can never be used as proof that no special status species occur in an area. Basemap: ArcGIS Online Topographic Map Service. Map date: August 21, 2018.

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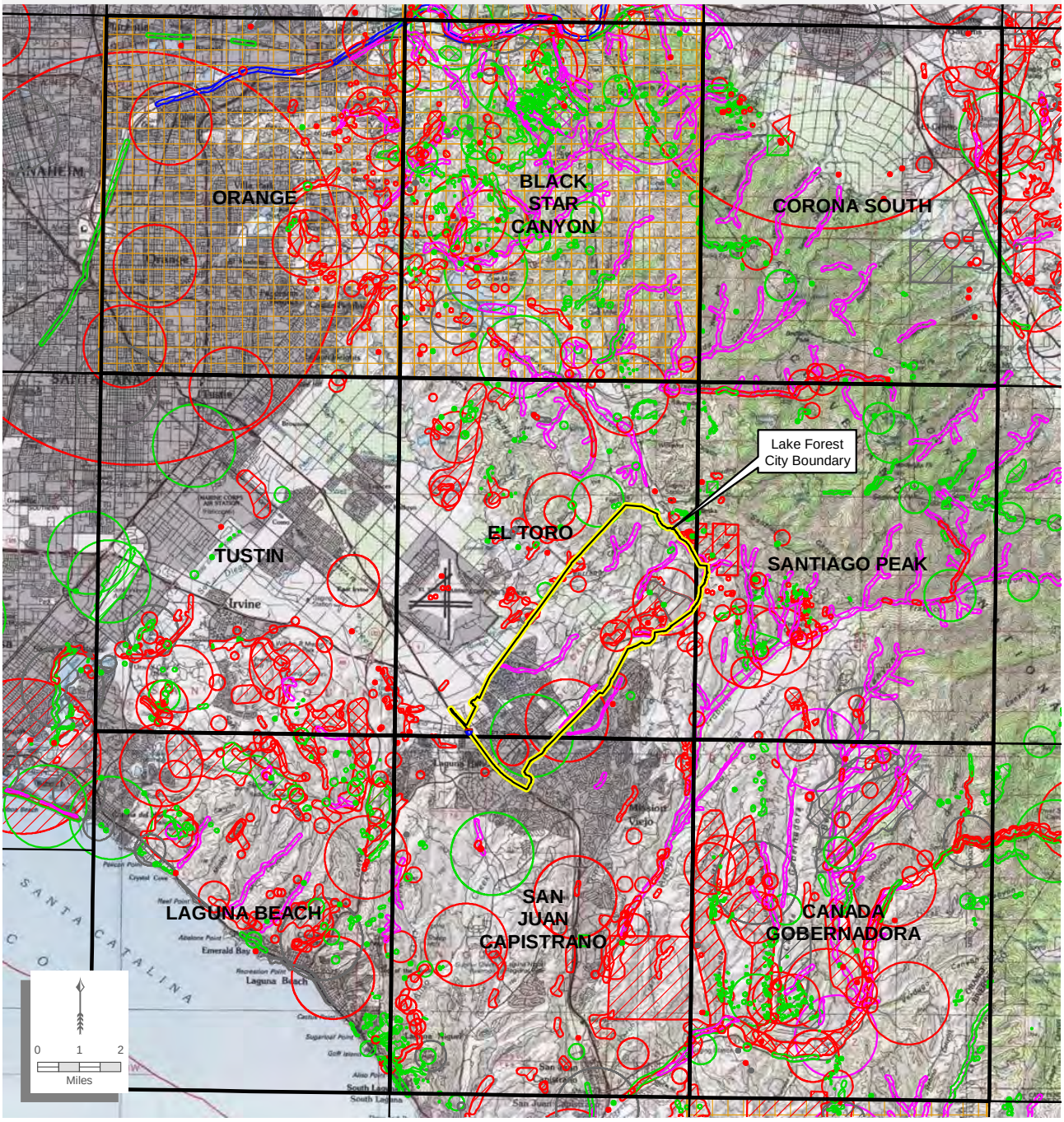
Figure 9-3 California Natural Diversity Database - 9-Quad Search



Special Status Species Occurrences

- Plant (80m)
- Plant (specific)
- Plant (non-specific)
- Plant (circular)
- Animal (80m)
- Animal (specific)
- Animal (non-specific)
- Animal (circular)
- Terrestrial Comm. (specific)
- Terrestrial Comm. (non-specific)
- Terrestrial Comm. (circular)
- Aquatic Comm. (non-specific)
- Multiple (80m)
- Multiple (specific)
- Multiple (non-specific)
- Multiple (circular)
- Sensitive EO's (Commercial only)

CNDDB version 08/2018. Please Note: the occurrences shown on this map represent the known locations of the species listed here as of the date of this version. There may be additional occurrences or additional species within this area which have not been surveyed and/or mapped. Lack of information in the CNDDB about a species or an area can never be used as proof that no special status species occur in an area. Basemap: ArcGIS Online Topographic Map Service. Map date: August 21, 2018.

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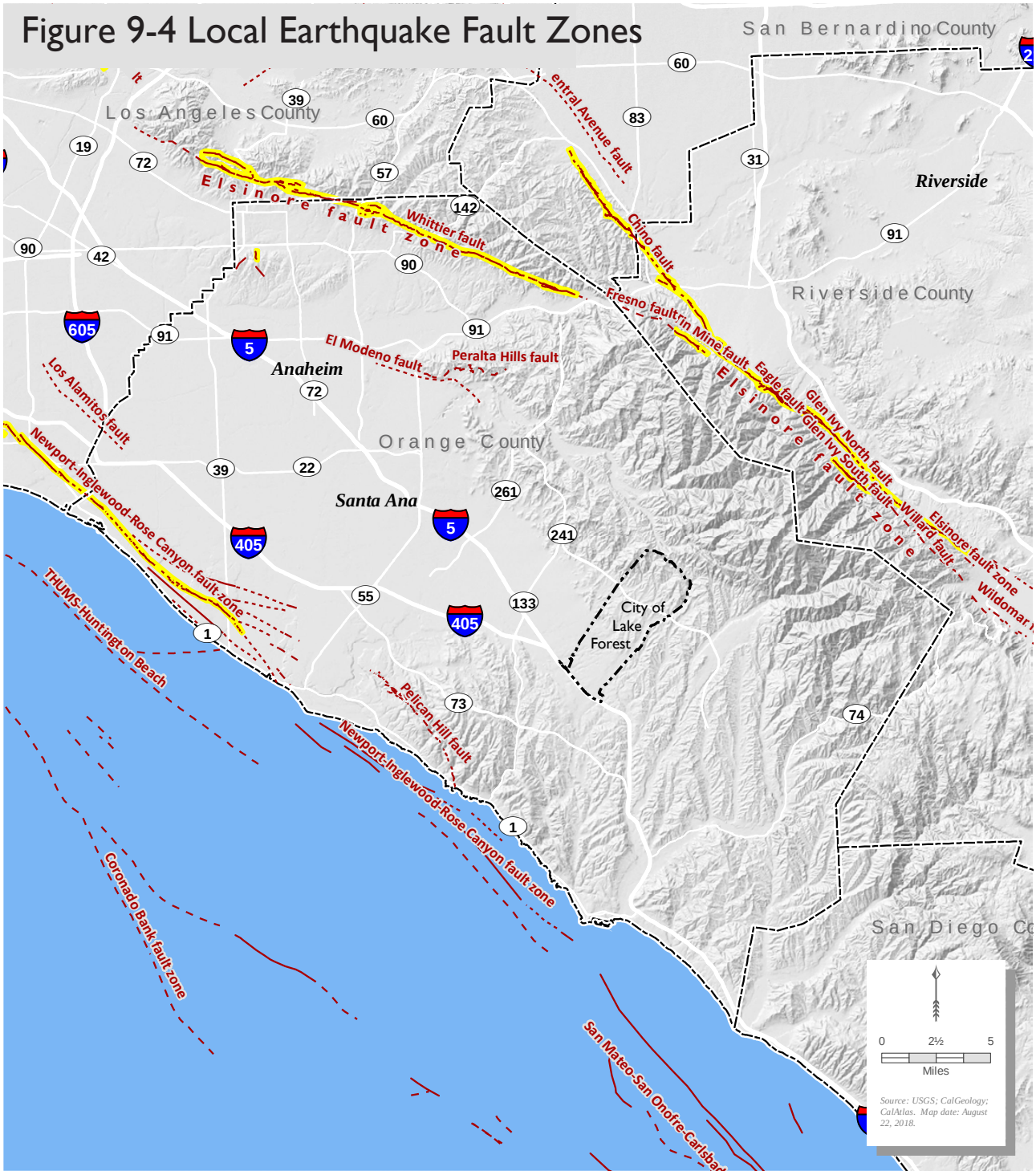
Figure 9-4 Local Earthquake Fault Zones



Legend

- Alquist-Priolo Fault Zones

Quaternary Faults

- Well-constrained
- Moderately-constrained
- Inferred

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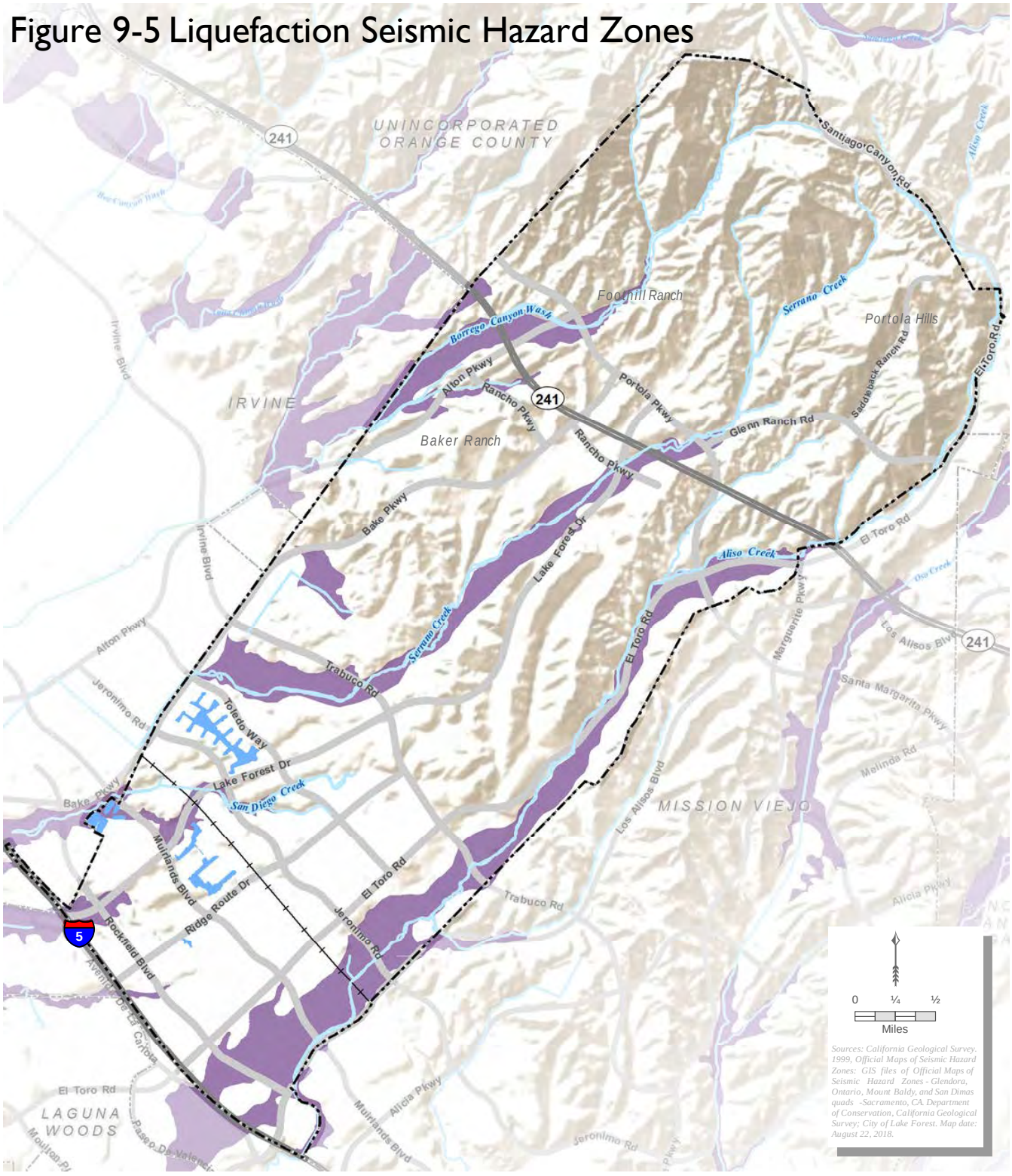
Figure 9-5 Liquefaction Seismic Hazard Zones



Legend

- City of Lake Forest
- Area where Liquefaction may occur during a Strong Earthquake

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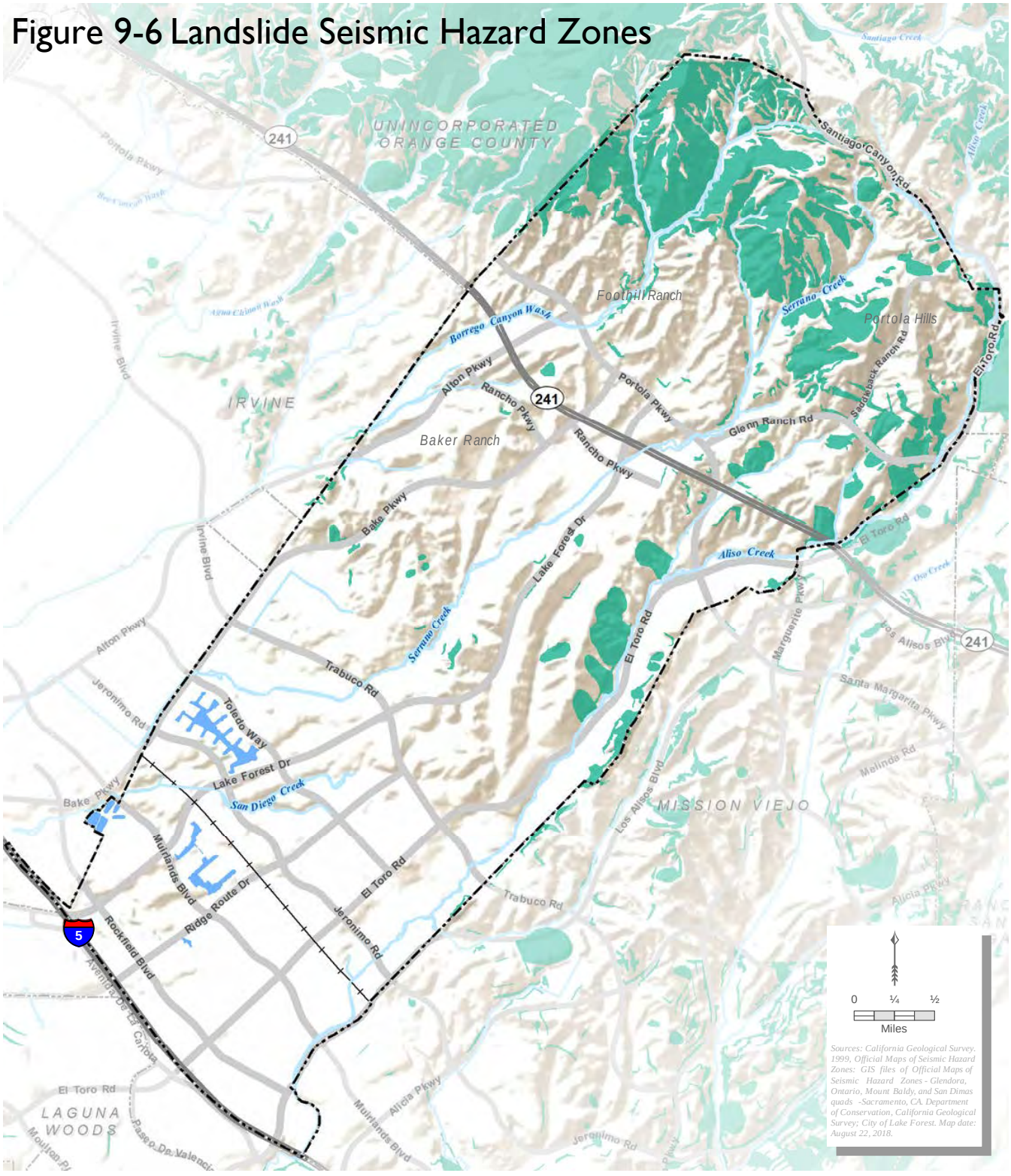
Figure 9-6 Landslide Seismic Hazard Zones



Sources: California Geological Survey, 1999, Official Maps of Seismic Hazard Zones: GIS files of Official Maps of Seismic Hazard Zones - Glendora, Ontario, Mount Baldy, and San Dimas quads -Sacramento, CA. Department of Conservation, California Geological Survey; City of Lake Forest. Map date: August 22, 2018.

Legend

- City of Lake Forest
- Area where Landslide may occur during a Strong Earthquake

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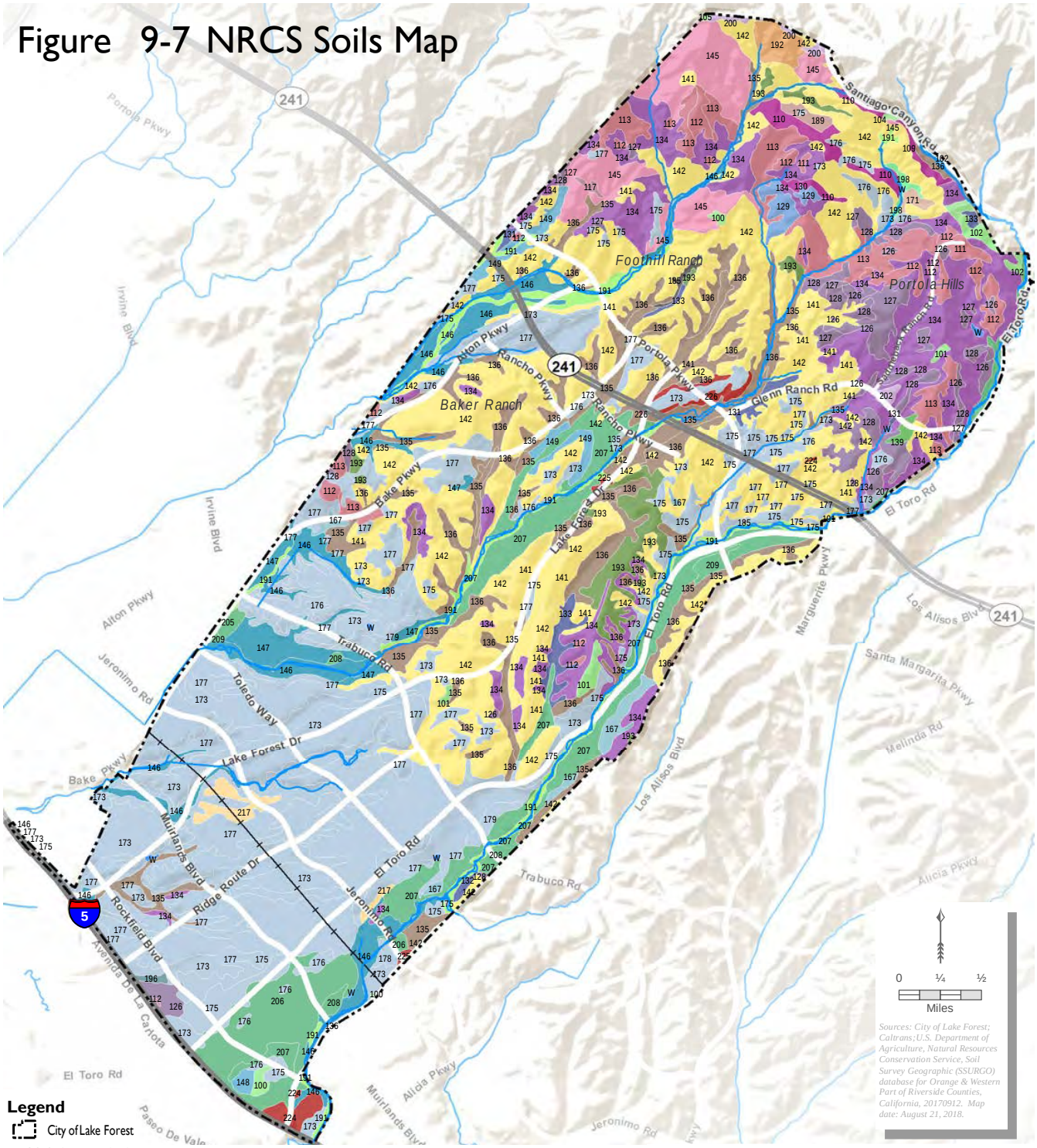
Figure 9-7 NRCS Soils Map



Legend

City of Lake Forest

NRCS Soil Description

- Alo clay/clay variant (100-105)
- Anaheim clay loam (109-110)
- Balcom clay loam (111-113)
- Blasingame stony loam (117)
- Bosanko clay (126-128)
- Bosanko-Balcom complex (129-130)
- Botella loam/clay loam (131-133)
- Calleguas clay loam (134)
- Capistrano sandy loam (135-136)
- Chino silty clay loam (139)
- Cieneba sandy loam (141-142)
- Cieneba-Rock outcrop complex (145)
- Corralitos loamy sand (146-147)
- Cropley clay (148-149)
- Metz loamy sand (163)
- Mocho loam (167)
- Modjeska gravelly loam (171)
- Myford sandy loam (173-179)
- Pits (185)
- Rincon clay loam (189)
- Riverwash (191)
- Rock outcrop-Cieneba complex (192)
- San Andreas sandy loam (193)
- San Emigdio fine sandy loam (195-196)
- Soboba cobbly loam sand (198)
- Soper loam/gravelly loam (199-202)
- Sorrento loam/clay loam/sandy loam (205-209)
- Water (W)
- Xeralfic arents, loamy (217)
- Yorba cobbly/gravelly sand loam (224-226)

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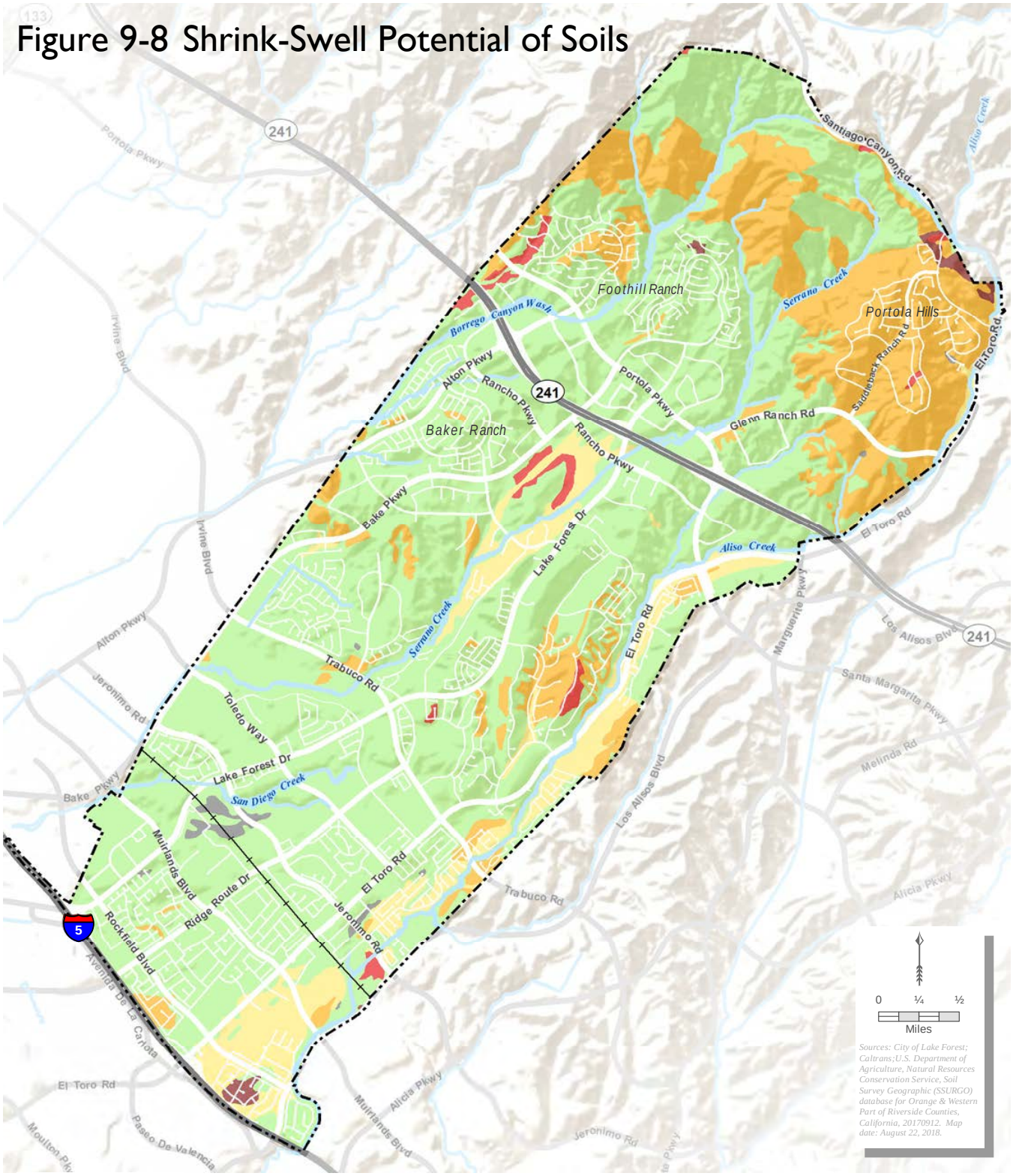
Figure 9-8 Shrink-Swell Potential of Soils



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City of Lake Forest

Shrink-Swell Potential* of Surface Horizon

- N/A
- Low Potential
- Low to Moderate
- Moderate
- High
- High to Very High

*Shrink-Swell Potential is determined by linear extensibility. Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Soils are considered to have low potential when the linear extensibility is less than 3%, moderate if 3-6%, high if 6-9%, and very high if greater than 9%.

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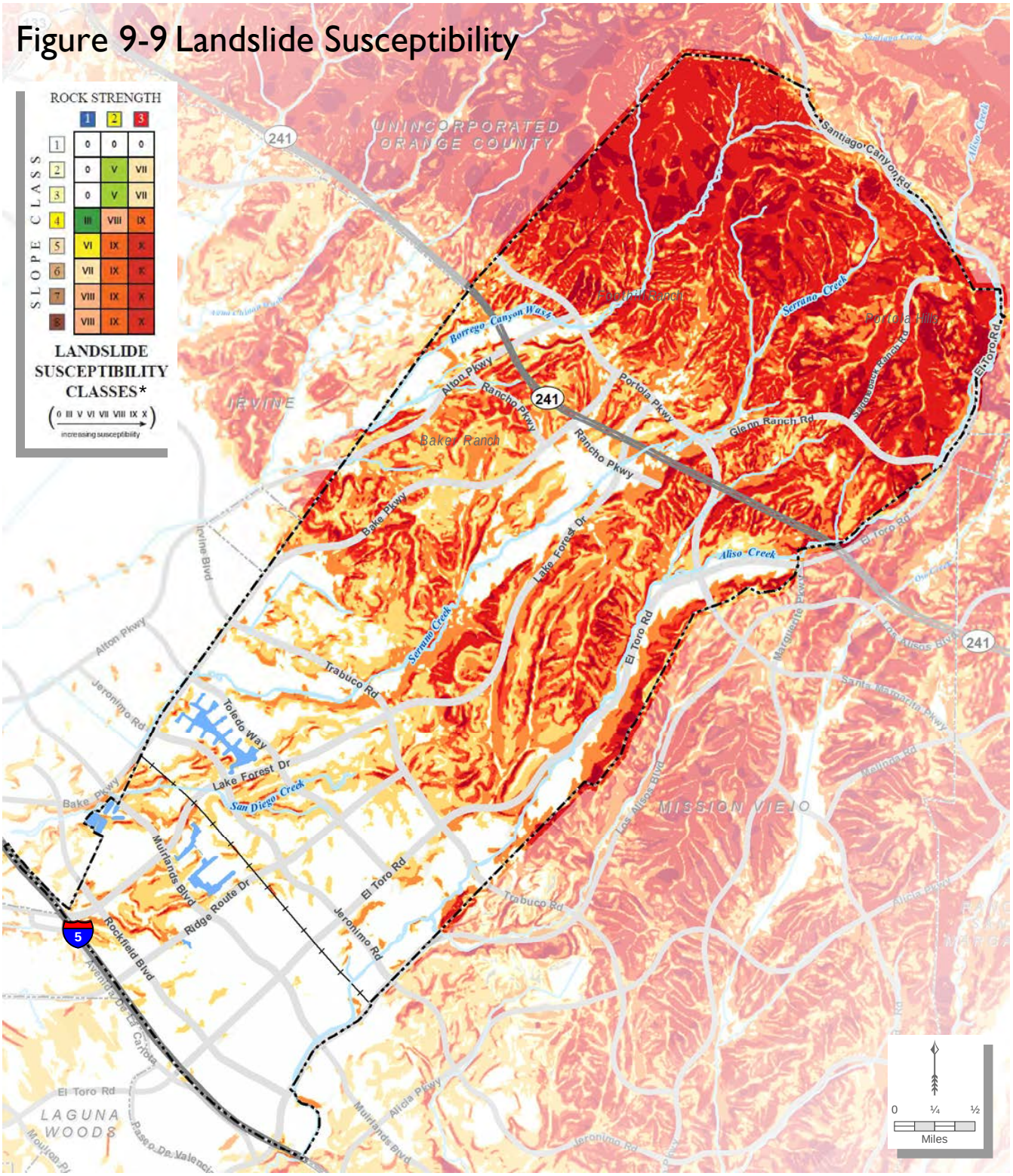
Figure 9-9 Landslide Susceptibility



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City of Lake Forest

** Rock Strength and slope are combined to create classes of landslide susceptibility. These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with slope and in weaker rocks. Very high landslide susceptibility, classes VIII, IX, and X, includes very steep slopes in hard rocks and moderate to very steep slopes in weak rocks. Source: "Susceptibility to Deep-Seated Landslides in California, 2011, Map sheet 58, California Geological Survey. Map date: August 22, 2018.*

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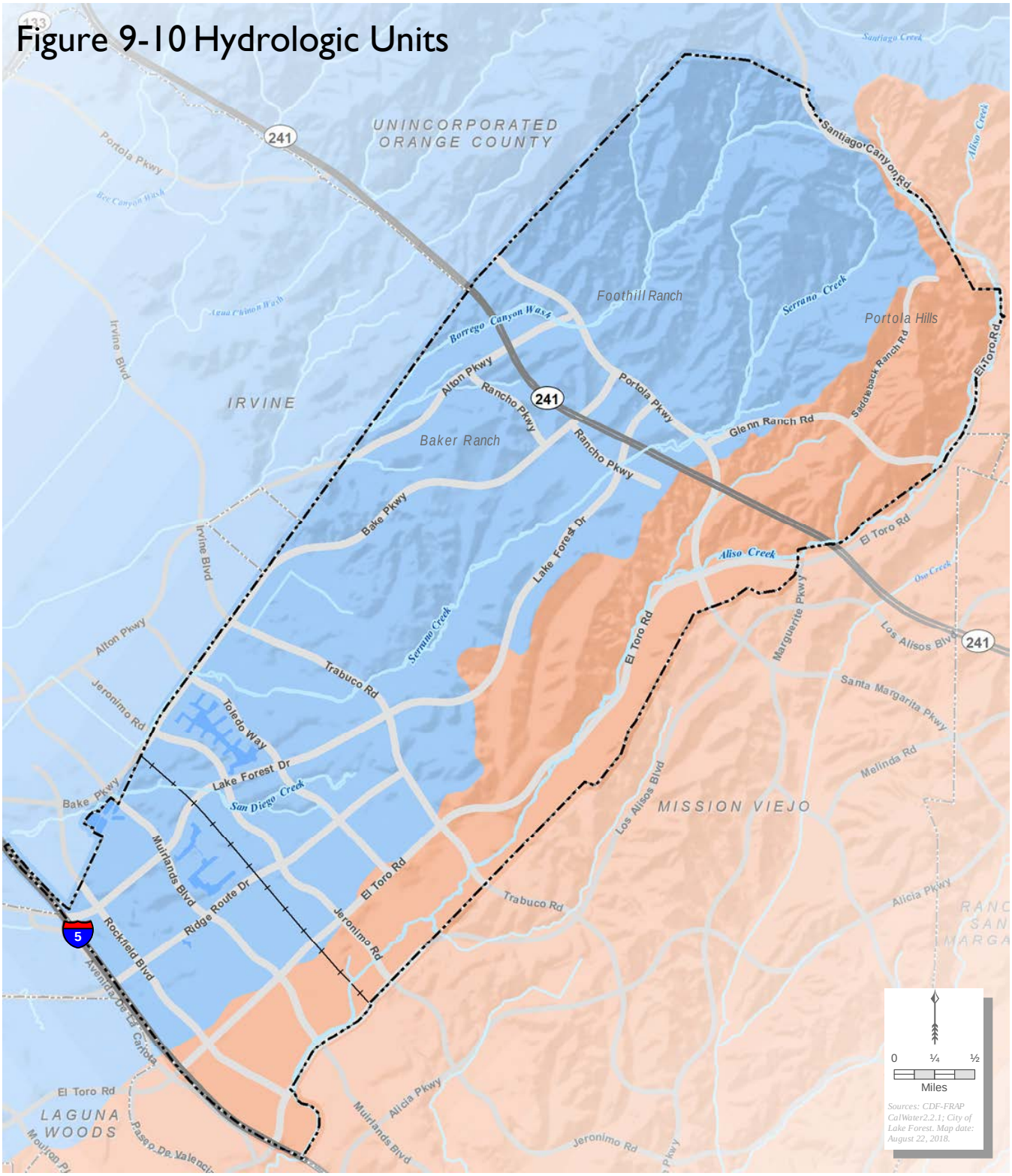
Figure 9-10 Hydrologic Units



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Hydrologic Unit Name

San Juan

Santa Ana River

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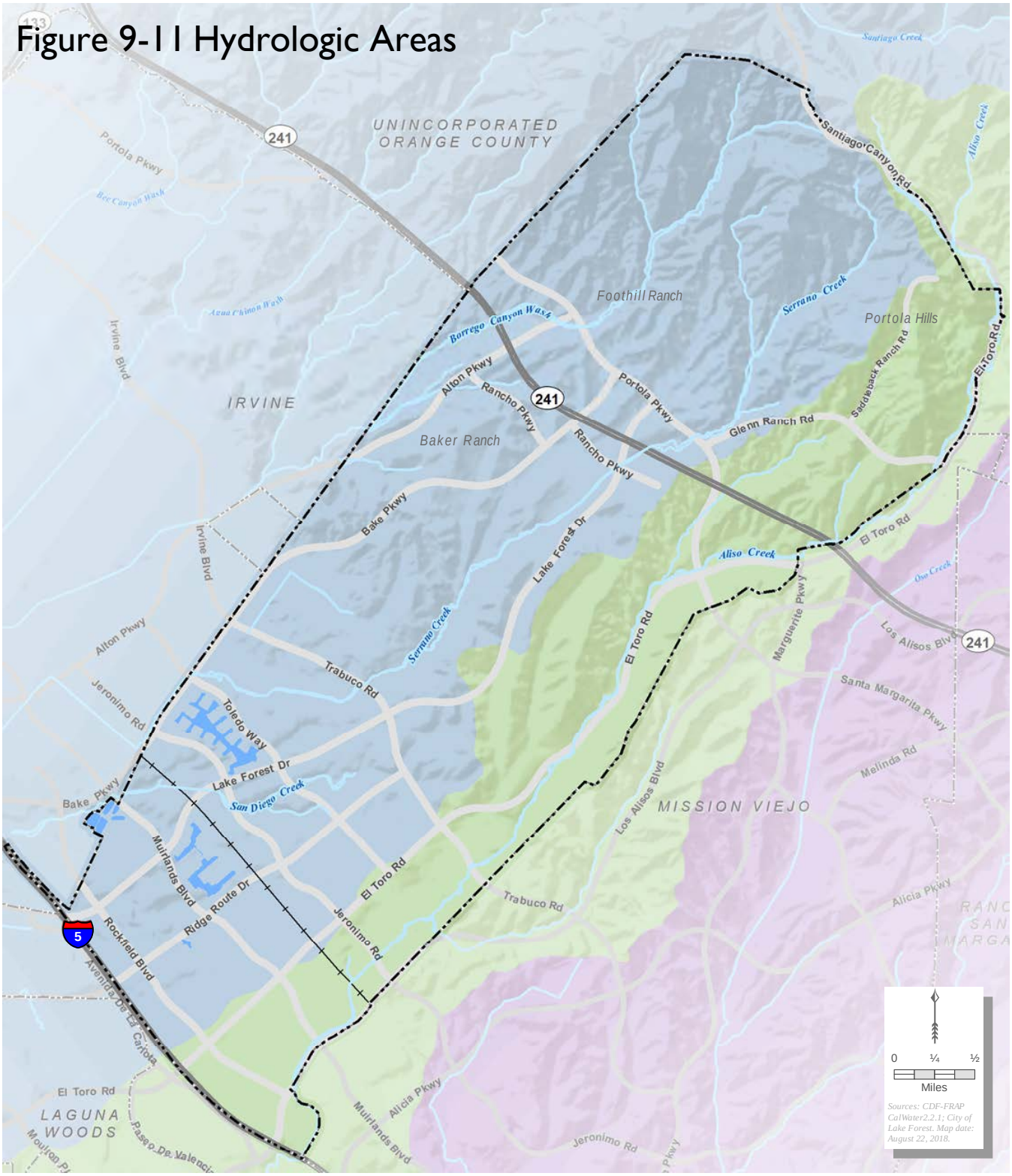
Figure 9-11 Hydrologic Areas



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Hydrologic Area Name

- Laguna
- Lower Santa Ana River
- Mission Viejo

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