AGENDA
PUBLIC SAFETY COMMITTEE

September 12, 2012
9:30 A.M.

Laguna Woods City Hall
Council Chambers
24264 El Toro Road
Laguna Woods, CA 92637

AGENDA DESCRIPTION: The agenda descriptions are intended to give notice, to members of the public, of a general summary of items of business to be transacted or discussed. Any person wishing to address the Public Safety Committee on any matter, whether or not it appears on this agenda, may do so under the appropriate section of the agenda. Whenever possible, lengthy testimony should be presented to the Committee in writing (12 copies) and only pertinent points presented orally. Requests to speak to items on the agenda shall be heard at the appropriate point on the agenda; requests to speak about subjects not on the agenda will be heard during the Public Comment section of the meeting.

I. CALL TO ORDER

II. ROLL CALL

III. COMMITTEE BUSINESS

A. Local Hazard Mitigation Plan (Attachment)

Staff will review a draft of the Hazard Analysis section for the City's Local Hazard Mitigation Plan and solicit public input.

RECOMMENDED ACTION: Receive and file.

IV. STAFF AND SUBCOMMITTEE REPORTS

A. Public Safety Project Updates and General Information

V. COMMITTEE MEMBER COMMENTS

VI. PUBLIC COMMENTS

VII. ADJOURN

The next regular meeting of the Public Safety Committee will be at 9:30 a.m. on October 10, 2012, at Laguna Woods City Hall, 24264 El Toro Road, Laguna Woods, CA 92637. Meetings may be cancelled due to a lack of agenda items.

PUBLIC SAFETY COMMITTEE
Meeting Recap

August 8, 2012
9:30 A.M.

Laguna Woods City Hall
Council Chambers
24264 El Toro Road
Laguna Woods, CA 92637

I. CALL TO ORDER

Vice Chair Troutman called the meeting to order at 9:30 a.m.

II. ROLL CALL

Present: Horne, May, Pollard, Rook, Senser, Troutman, Whitehead

Absent: Henderson, Monin, Riedel

III. COMMITTEE BUSINESS

A. Interstate 5 Widening Project

Orange County Transportation Authority (OCTA) representatives Julie Toledo and Hamid Torkamanha provided information on the Interstate 5 Widening Project. Assistant City Manager Reilly noted that the City is concerned about the impacts to residents along Avenida Carlota and Paseo de Valencia. He also noted that the City has recommended that OCTA's El Toro Road & Interstate 5 Interchange Project be combined with the Widening Project in order to minimize construction impacts. Mr. Torkamanha acknowledged the City's request, but responded that combining the projects would require delaying the Widening Project.

B. Traffic Signal Synchronization

Bernard Lee from Iteris, Inc. provided an informational overview of the City's traffic signal synchronization program.

C. “No Right Turn on Red” Restrictions

The Committee discussed a resident’s request for a “no right turn on red” restriction at Moulton Parkway into Laguna Woods Village Gate 12. One member of the public spoke in opposition. The Committee reached consensus that present conditions do not warrant a restriction.

IV. STAFF AND SUBCOMMITTEE REPORTS

A. Public Safety Project Updates and General Information

Director of Public Safety Macon and Chief of Police Services Rudy discussed a recent bank robbery.

Assistant City Manager Reilly discussed traffic control improvements that private property owners will be making near San Sebastian, as well as the City’s upcoming project at El Toro Road & Aliso Creek Road.

B. Animal Services Subcommittee

None

V. COMMITTEE MEMBER COMMENTS

None

VI. PUBLIC COMMENTS

None

VII. ADJOURN

The next regular meeting of the Public Safety Committee will be at 9:30 a.m. on September 12, 2012, at Laguna Woods City Hall, 24264 El Toro Road, Laguna Woods, CA 92637. Meetings may be cancelled due to a lack of agenda items.

(3.1) HAZARD ANALYSIS

3.1.1. IDENTIFICATION OF HAZARDS

In accordance with 44 CFR §201.6(c)(2)(i), this Plan addresses all natural hazards that can affect the City. This Plan exceeds the requirements of Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5165, as amended by the Disaster Mitigation Act of 2000 (DMA) (P.L. 106-390), by also addressing manmade and technological hazards. The planning process described in Chapter 2.2 identified the following 14 hazards for inclusion in this Plan:

Table 3-1: Identified Hazards

Hazard	*Section Number*	*Page Number*
Wildfires and Urban Conflagrations	3.1.4	4
Earthquakes	3.1.5	8
Energy Shortages	3.1.6	24
Public Health Crises	3.1.7	28
Terrorism	3.1.8	32
Radiological Accidents	3.1.9	33
Floods and Storms	3.1.10	37
Extreme Heat	3.1.11	49
Water Shortages	3.1.12	50
Hazardous Materials Accidents	3.1.13	51
Landslides	3.1.14	52
Airplane Accidents	3.1.15	53
Civil Disturbances	3.1.15	53
Natural Gas Pipeline Failures	3.1.15	54

3.1.2. RISK ASSESSMENT CATEGORIZATION METHODOLOGY

Risk is the estimated impact that a hazard would have on people, services, and property in the City. It refers to the likelihood of a hazard event resulting in one or more adverse impacts, including loss of life, personal injury, economic injury, or property damage.

A qualitative categorization process was used to provide a general sense of the degree of risk posed by each of the identified hazards, as well as to assist with the prioritization of mitigation actions. Following consideration of probability and impact, each hazard was assigned a priority level for the sole purpose of prioritizing mitigation action items.

Probability

- **High** – High probability hazards are thought to be likely to occur as evidenced by continuing conditions that have adversely impacted the City more than once in the past 10 years and/or other compelling evidence.
- **Medium** – Medium probability hazards are thought to have the potential to occur as evidenced by continuing conditions that have adversely impacted the City at least once in recorded history and/or other compelling evidence.
- **Low** – Low probability hazards are thought to be unlikely to occur as evidenced by the absence of continuing conditions that have adversely impacted the City in recorded history and/or other compelling evidence.

Impact

- **High** – High impact hazards are thought to be highly significant or catastrophic in terms of loss of life, personal injury, economic injury, and property damage. They generally affect at least a majority of the City's residents or land area.
- **Medium** – Medium impact hazards are thought to be modest in terms of loss of life, personal injury, economic injury, and property damage. They generally affect between 25% and 50% of the City's residents or land area.
- **Low** – Low impact hazards are thought to be negligible or minor in terms of loss of life, personal injury, economic injury, and property damage. They generally affect less than 25% of the City's residents or land area.

Hazard Planning Priority Levels

44 CFR §201.6(c)(2) requires this Plan to "provide sufficient information to enable the [City] to... prioritize mitigation actions to reduce losses from identified hazards." To that end, the following Hazard Planning Priority Levels have been established to identify the hazards for which mitigation actions should be afforded higher relative priority given the probability of occurrence and likely impact. The Priority Levels should not be construed or interpreted in any other context, including as it pertains to response activities.

- **Level 1 (Highest Priority Hazards for Mitigation Action)** – Level 1 hazards are generally high impact with at least one occurrence in recorded history, as well as continuing conditions that make reoccurrence likely.
- **Level 2 (2nd Highest Priority Hazards for Mitigation Action)** – Level 2 hazards are generally medium impact with at least one occurrence in recorded history, as well as continuing conditions that make reoccurrence likely.
- **Level 3 (3rd Highest Priority Hazards for Mitigation Action)** – Level 3 hazards are generally medium impact with no occurrences in recorded history or low impact regardless of the number of occurrences.

The following table illustrates the general assignment of Hazard Planning Priority Levels.

Table 3-2: Sample Risk Assessment Categorization Matrix

		Impact		
		High	Medium	Low
Probability	High	Level 1	Level 2	Level 3
	Medium	Level 1	Level 2	Level 3
	Low	Level 2	Level 3	Level 3

3.1.3. RISK ASSESSMENT CATEGORIZATION

The planning process described in Chapter 2.2 and the methodology outlined in Section 3.1.2 resulted in the following categorization of risk. The rationale for each categorization is included in the hazard profiles beginning with Section 3.1.4.

Table 3-3: Risk Assessment Categorization Matrix

		Impact		
		High	Medium	Low
Probability	High	Wildfires and Urban Conflagrations Earthquakes	Floods and Storms	
	Medium	Energy Shortages Public Health Crises	Extreme Heat Water Shortages	Hazardous Materials Accidents Landslides
	Low	Terrorism Radiological Accidents		Airplane Accidents Civil Disturbances Natural Gas Pipeline Failures

Based on the Risk Assessment Categorization, the highest priority will be assigned to mitigation action items associated with the following Level 1 hazards: wildfires and urban conflagrations, earthquakes, energy shortages, and public health crises. Terrorism, radiological accidents, floods and storms, extreme heat, and water shortages are Level 2 hazards. Level 3 hazards consist of hazardous materials accidents, landslides, airplane accidents, civil disturbances, and natural gas pipeline failures.

3.1.4. HAZARD PROFILE – WILDFIRES AND URBAN CONFLAGRATIONS

Wildfires are considered to pose a very significant risk to the City with high probability and impacts. Wildfires in the wildland-urban interface area that borders the westernmost edge of the City could cause loss of life, personal injury, and extensive property damage. Economic processes may be disrupted due to road closures and poor air quality.

A wildfire is defined as an unplanned and unwanted wildland fire, including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to extinguish the fire. The severity of a wildfire is dependent on the amount of oxygen, heat, relative humidity, and fuel.

Although this Plan focuses primarily on wildfires, it also recognizes urban conflagrations (or, large disastrous fires in urban areas) as posing a very significant risk to the City that can occur as a result of wildfires, earthquakes, hazardous materials incidents, arson, or other hazards. The significant amount of residential multi-family and infill development in the City increases the probability and likely impact of urban conflagrations.

Secondary Environmental Effects

According to the State of California's Hazard Mitigation Plan (2010), fires can have the following adverse effects on the environment:

After a fire, significant alteration of watershed lands and the associated stream systems is noticeable for periods varying from a few years to decades. In the short term, the presence of partially burnt vegetation reduces recreational and open space values. Fires can also destroy campgrounds, trails, bridges, and other recreational facilities within the area. Increased amounts of downstream sedimentation may significantly affect streams and lakes, which tend to be the most heavily used spots within larger recreational areas. As the vegetation grows back and damaged recreational infrastructures are replaced, the recreational and open space values would increase. However, it may take decades before vegetation types such as mature forests return to pre-burn character. Grasslands and shrublands, on the other hand, can return to pre-burn character within a decade.

Wildfires can have significant adverse effects on watershed lands, watercourses, and water quality. Large, hot fires cause serious, immediate damage from which a watershed can take decades to recover. By burning off vegetation and exposing mineral soil, fire impairs the ability of a watershed to hold soil in place and to trap sediment before it enters stream systems. Loss of vegetation also means less water being absorbed by plants, causing a short-term increase in the quantity and the delivery rate of water entering streams. This can have significant effects downstream from the site of a fire, such as with the fire-flood cycle commonly experienced in Southern California. This increased runoff and its large sediment load can cause costly damage to downstream assets such as homes, roads, debris basins, and other infrastructure. It can also result in the loss of human life when at-risk residents are not evacuated.

Fire presents a significant risk to soil, especially in denuded watersheds, through accelerated erosion potential in the immediate post-fire environment, particularly when subjected to severe rainstorms prior to any vegetation recovery (Wells et al., 1979). Erosion is a natural process that occurs across a watershed at varying rates, depending on soils, geology, slope, vegetation, and precipitation. The intensity of a fire and the subsequent removal of vegetative cover increase the potential rate of soil erosion and new sediment sources. Wildfires can affect surface erosion in a watershed by altering detachment, transport, and deposition of soil particles. Most wildfires create a patchwork of burned areas that vary in severity. Severely burned areas suffer increased erosion due to loss of protective forest floor layers and creation of water-repellent soil conditions that can cause flooding, downstream sedimentation, and other threats.

Wildfires can potentially affect water quality through increased sedimentation and increased turbidity and through increases in nutrient loadings. Concentration of nutrients (phosphorous and nitrogen) are increased from burned vegetation and delivered to streams through surface runoff. Stream temperatures often increase after fires, typically through the removal of overhead protective vegetation. Elevated stream temperatures are detrimental to most coldwater fish species. The City drains to two water bodies (Aliso Creek and San Diego Creek) that are currently impaired for sediment and nutrients.

Local Wildfire Activity

Traditionally, fire season in Southern California has been from May through September. Over the past 15 years, a trend has emerged where Orange County has experienced some of its most devastating wildfires between October and April [e.g., the Sierra Fire (2/2006), Santiago Fire (10/2007), and Freeway Complex Fire (11/2008)].

Table 3-4: Major Wildfires in Orange County

Fire Name	*Year*	*Acres Claimed*
Green River	1948	53,079
Steward	1958	69,444
Paseo Grande	1967	51,075
Indian	1980	28,408
Owl	1980	18,332
Gypsum	1982	19,986
Laguna	1993	16,682
Ortega	1993	21,010
Sierra	2006	10,584
Santiago	2007	28,517
Freeway	2008	30,305

- *Laguna Fire (October 1993)*

In late October and early November 1993, the Laguna Fire burned 16,682 acres of land in the City of Laguna Beach and unincorporated County areas. Much of this area was in close proximity to the City's westernmost boundary in the wildland areas comprising what is today the Laguna Coast Wilderness Park. Roughly 400 homes and structures were destroyed. Estimated costs totaled $528 million.

Photographs courtesy of the Historical Society of Laguna Woods

Looking west from Via La Mesa toward what is today the City's Woods End Wilderness Preserve

Looking west from an unknown location toward what is today the City's Woods End Wilderness Preserve

As the Laguna Fire occurred several years prior to both the City's incorporation and the formation of the Orange County Fire Authority, there is limited information available on the specific governmental response. According to residents and the Historical Society of Laguna Woods, the fire was extremely visible and smoke inundation was heavy. There was also substantial concern about the threat to homes and potential need to evacuate; however, the fire ultimately did not encroach on the City or result in evacuations.

- *Freeway Complex Fire (November 2008)*

In November 2008, the Freeway Complex Fire burned 30,305 acres in areas of Orange County and Riverside County between the cities of Anaheim, Brea, Corona, Chino Hills, and Yorba Linda. 314 residences, four commercial buildings, and 43 outbuildings were destroyed. Estimated costs totaled $16.1 million.

While the City was not burned by the Freeway Complex Fire, residents did experience significant degradation of air quality, as well as some concern regarding whether or not evacuation would be required. A South Coast Air Quality Management District advisory warned that drifting smoke could cause localized concentrations of fine particulates to reach the "Unhealthy for Sensitive Groups" level (including for individuals with heart and respiratory diseases, older adults, children, and pregnant women) or higher.

As a precautionary measure, the City briefly activated its Emergency Operations Center (EOC) to better monitor the situation. The City was included in the County of Orange's countywide local emergency proclamation, which was signed on November 15, 2008, as well as the subsequent state proclamation and federal declaration.

<u>Wildland-Urban Interface Area and Fire Hazard Severity Zones</u>

Wildland-Urban Interface areas are commonly described as zones where structures and other human development meet and intermingle with undeveloped wildland or vegetative fuels. The City's Wildland-Urban Interface is located along the westernmost edge of the City and is composed entirely of residential and open space land uses.

The Wildland-Urban Interface includes approximately 2,243 residential dwelling units (or, an estimated 3,185 residents, using the 2010 United States Census figure of 1.42 for the average household size), all within the gated community of Laguna Woods Village.

Map 3-1: Fire Hazard Severity Zones

In 2012, the City Council took action to designate three fire hazard severity zones within the Wildland-Urban Interface as shown in Map 3-1. The Very High Fire Hazard Severity Zone was identified by the California Department of Forestry and Fire Protection (Cal FIRE), while the High and Moderate Fire Hazard Severity Zones were identified by the Orange County Fire Authority based on an assessment of vegetation, slope, fire history, weather patterns, and the impact of flames, heat, and flying fire embers. Collectively, these areas face the highest risk of wildfires within the City.

3.1.5. HAZARD PROFILE – EARTHQUAKES

Earthquakes are considered to pose a very significant risk to the City with high probability and impacts. A significant earthquake along any of the five major faults and fault zones that are of particular concern to the City could cause substantial casualties and injury, disruption of economic processes, and extensive property damage.

According to the United States Geological Survey (USGS), an earthquake is defined as sudden ground motion or trembling caused by a release of strain accumulated within or along the edge of Earth's tectonic plates. The severity of these effects is dependent on the amount of energy that is released.

A fault is defined as a fracture or zone of fractures between two blocks of rock. Faults allow the blocks to move relative to each other. This movement may occur rapidly, in the form of an earthquake, or may occur slowly, in the form of creep. Most faults produce repeated displacements over geologic time. During an earthquake, the rock on one side of the fault suddenly slips with respect to the other. The fault surface can be horizontal or vertical or some arbitrary angle in between.

Earth scientists use the angle of the fault with respect to the surface (known as the dip) and the direction of slip along the fault to classify faults. Faults which move along the direction of the dip plane are dip-slip faults and described as either normal or reverse (thrust), depending on their motion. Faults which move horizontally are known as strike-slip faults and are classified as either right-lateral or left-lateral. Faults which show both dip-slip and strike-slip motion are known as oblique-slip faults.

Earthquakes occur without warning and typically result in effects such as ground motion, surface faulting, and ground failure (including landslides and liquefaction). The most common measures of the effects of an earthquake are Peak Ground Velocity and Peak Ground Acceleration, as well as Richter Magnitude and Modified Mercalli Intensity.

<u>Ground Motion</u>

Ground motion is the vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter, but soft soils can further amplify ground motions.

<u>Surface Faulting</u>

Surface faulting is the differential movement of two sides of a fracture – in other words, the location where the ground breaks apart. The length, width, and displacement of the ground characterize surface faults, which occur based on the type of underlying fault.

<u>Ground Failure</u>

Earthquakes are often a contributing factor of landslides, which include a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows.

Liquefaction is the phenomenon that occurs when ground shaking causes loose soils to lose strength and act like viscous fluid. Liquefaction causes two types of ground failure:

lateral spread and loss of bearing strength. The former develops on gentle slopes and entails the sidelong movement of soil as an underlying layer liquefies. The latter results when the soil supporting structures liquefies causing structures to tip and topple.

Peak Ground Velocity (PGV)

Velocity (or, speed) represents the rate that an object travels in any given direction. The PGV is the maximum horizontal velocity experienced during earthquake motion.

Peak Ground Acceleration (PGA)

Acceleration represents the rate at which velocity increases (e.g., if you are standing on the surface of the earth and drop an object, with the exception of wind resistance, it will fall toward the earth faster and faster, until it reaches terminal velocity).

One way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity ("g"). The acceleration due to gravity at the Earth's surface is approximately 9.8 meters per second squared, meaning that for every second an object falls toward the surface of Earth its velocity increases by 9.8 meters per second. The PGA is the maximum horizontal acceleration experienced during earthquake motion.

Richter Magnitude Scale

Seismic waves are the vibrations from earthquakes that travel through the Earth; they are recorded on instruments called seismographs. Seismographs record a zig-zag trace that show the varying amplitude of ground oscillations beneath the instrument. The time, locations, and magnitude of an earthquake can be determined from the data recorded.

The Richter Magnitude Scale was developed in 1935 by Charles Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for variation in the distance between the various seismographs and the epicenter of the earthquakes.

On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions beginning at zero with no upper limit. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude and the release of about 31 times more energy than the amount associated with the preceding whole number value.

Earthquakes with magnitude of about 2.0 or less are usually called "microearthquakes" and not commonly felt by people. Earthquakes with magnitudes of about 4.5 or greater, of which there are several thousand in the United States each year, are strong enough to be felt by people. Earthquakes with a magnitude of 8.0 or higher are called "great earthquakes". On average, one great earthquake occurs in the world each year.

The Richter Scale is not used to express damage. An earthquake in a densely populated area which results in numerous deaths and considerable damage may have the same magnitude as a shock in a remote area that does nothing more than frighten wildlife.

Modified Mercalli Intensity (MMI) Scale

The effect of earthquakes on the Earth's surface is called "intensity". The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and finally - total destruction. Although numerous scales have been developed over the last several hundred years to evaluate the effects of earthquakes, the scale currently used in the United States is the MMI Scale. MMI was developed in 1931 by American seismologists Harry Wood and Frank Neumann. This scale, composed of 12 increasing levels of intensity ranging from imperceptible shaking to catastrophic destruction, is designated by Roman numerals "I" through "XII". It does not have a mathematical basis and is an arbitrary ranking based on observed effects.

The MMI level of intensity assigned to a specific location is a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects actually experienced at that place.

The lower MMI levels generally deal with the manner in which the earthquake is felt by people and the higher MMI levels are based on observed structural damage. Structural engineers usually contribute information for assigning levels of VIII or above.

The following is an abbreviated description of the 12 MII levels of intensity.

Table 3-5: Abbreviated Modified Mercalli Intensity Level Descriptions

Value	Description
I	Not felt. Marginal and long period effects of large earthquakes.
II	Felt by persons at rest, on upper floors, or favorably placed.
III	Felt indoors. Hanging objects swing. Vibration like passing of heavy trucks. Duration estimated. May not be recognized as an earthquake.
IV	Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motor cars rock. Windows, dishes, doors rattle. In the upper range of IV, wooden walls and frame creak.
V	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.
VI	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, broken. Knickknacks, books, etc., fall off shelves. Pictures off walls. Furniture moved or overturned. Weak masonry D cracked. Small bells ring (church). Trees, bushes shaken (visibly, or heard to rustle).
VII	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimney broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments). Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.

Value	Description
VIII	Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.
IX	General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. (General damage to foundations.) Frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluvial areas sand and mud ejected, earthquake fountains, sand craters.
X	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand mud shifted horizontally on beaches and flat land. Rails bent slightly.
XI	Rails bent greatly. Underground pipelines completely out of service.
XII	Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into air.

Masonry A: Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.
Masonry B: Good workmanship and mortar; reinforced, but not designed in detail to resist lateral forces.
Masonry C: Ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at corners, but neither reinforced nor designed against forces.
Masonry D: Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.

Local Earthquake Activity

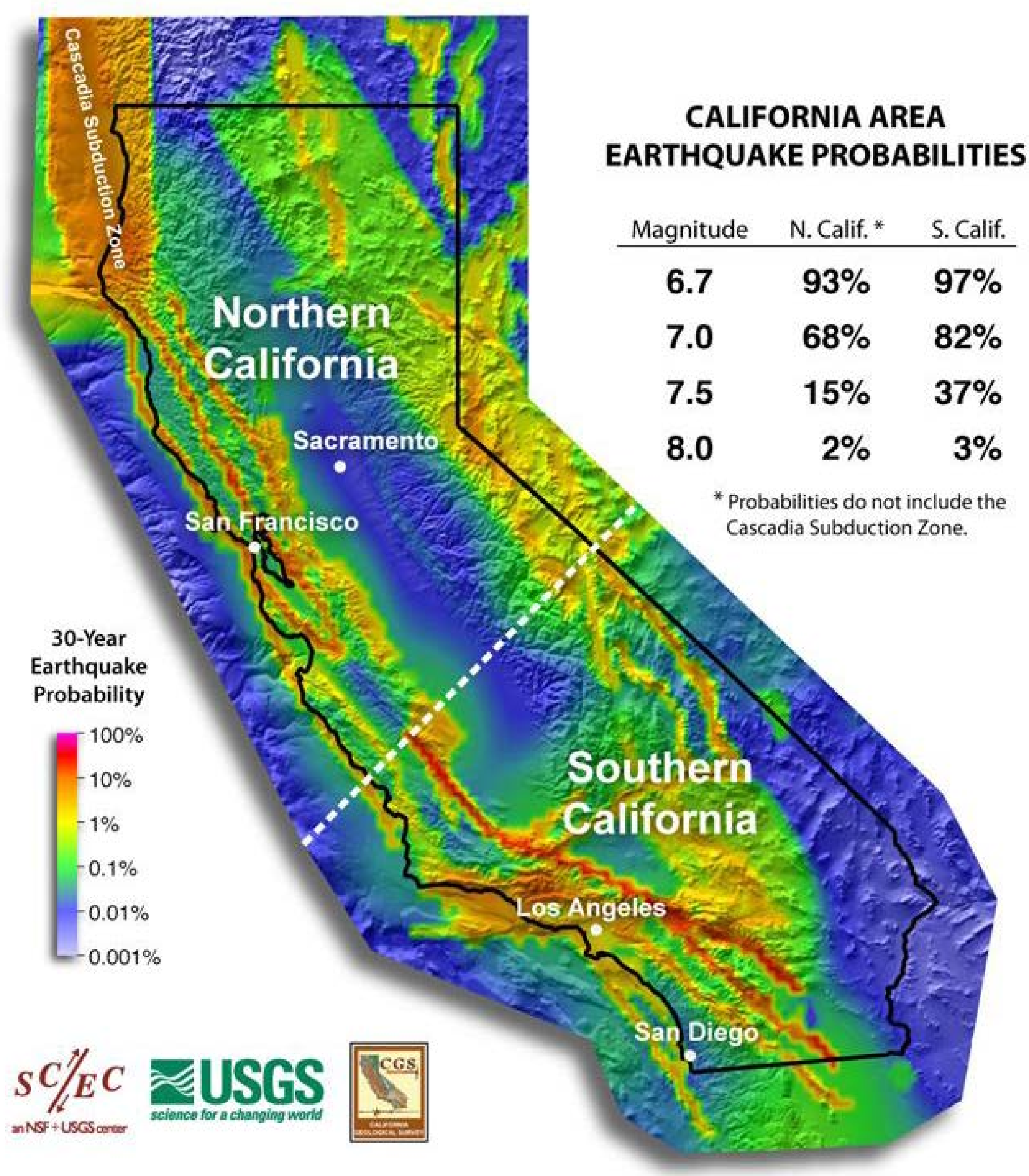
Thousands of earthquakes occur in Southern California each year; however, most are not felt by humans. Table 3-6 provides a sampling of historical earthquakes within 100 miles of the City, according to the Southern California Earthquake Data Center.

Table 3-6: Sampling of Historical Earthquakes within 100 Miles of Laguna Woods

Earthquake Name	*Year*	*Estimated Magnitude*	*Earthquake Name*	*Year*	*Estimated Magnitude*
Wrightwood	1812	7.5	Long Beach	1933	6.4
Los Angeles	1855	6.0	San Fernando	1971	6.5
San Bernardino	1858	6.0	Whittier Narrows	1987	5.8
Elsinore	1910	6.0	Newport Beach	1989	4.7
San Jacinto	1918	6.8	Northridge	1994	6.7
North San Jacinto	1923	6.3	Chino Hills	2008	5.4

A 2008 study by the United States Geological Survey and California Geological Survey (*The Uniform California Earthquake Rupture Forecast, V. 2*), estimates the probability of an earthquake with a Magnitude 6.7 or greater occurring in Southern California within the next 30 years at 97%. A Magnitude 7.0 earthquake is estimated at 82%, a Magnitude 7.5 is estimated at 37%, and a Magnitude 8.0 is estimated at 3%.

Map 3-2: California Area Earthquake Probabilities



Earthquake faults of particular concern to the City are the Elsinore, Newport-Inglewood, San Andreas, and San Jacinto fault zones, as well as the more recently discovered San

Joaquin Blind Thrust Fault. Fault locations relative to the City are shown in Map 3-3 and attributes from the Southern California Earthquake Data Center are listed in Table 3-7.

Map 3-3: Earthquake Faults of Particular Concern near Laguna Woods

Table 3-7: Attributes of Earthquake Faults of Particular Concern near Laguna Woods

Fault Name	*Type of Faulting*	*Last Major Rupture*	*Interval Between Major Ruptures*	*Probable Magnitudes*
Elsinore	Right-lateral strike slip	May 15, 1910 Magnitude 6.0	Roughly 250 years	6.5 – 7.5
Newport-Inglewood	Right-lateral; local reverse slip	March 10, 1933 Magnitude 6.4	Unknown	6.0 – 7.4
San Andreas	Right-lateral strike slip	January 9, 1857 and April 18, 1906	Varies; 140 years	6.8 – 8.0
San Jacinto	Right-lateral strike slip; minor right reverse	April 9, 1968 Magnitude 6.5	Varies; 100 – 300 years by segment	6.5 – 7.5
San Joaquin Hills	Blind thrust	Approximately 200 – 300 years	Undetermined	Undetermined

In addition to the major faults described above, ruptures on a number of smaller faults could potentially impact the City, including the Norwalk Fault (located in the north part of Orange County in the Fullerton area), the El Modena Fault (located in the city of Orange area), and the Peralta Hills Fault (located in the Anaheim Hills area).

Local Ground Failure Risk from Landslides

The following areas are known to be susceptible to earthquake-induced landslides:

Map 3-4: Earthquake-Induced Landslide Hazard Zones

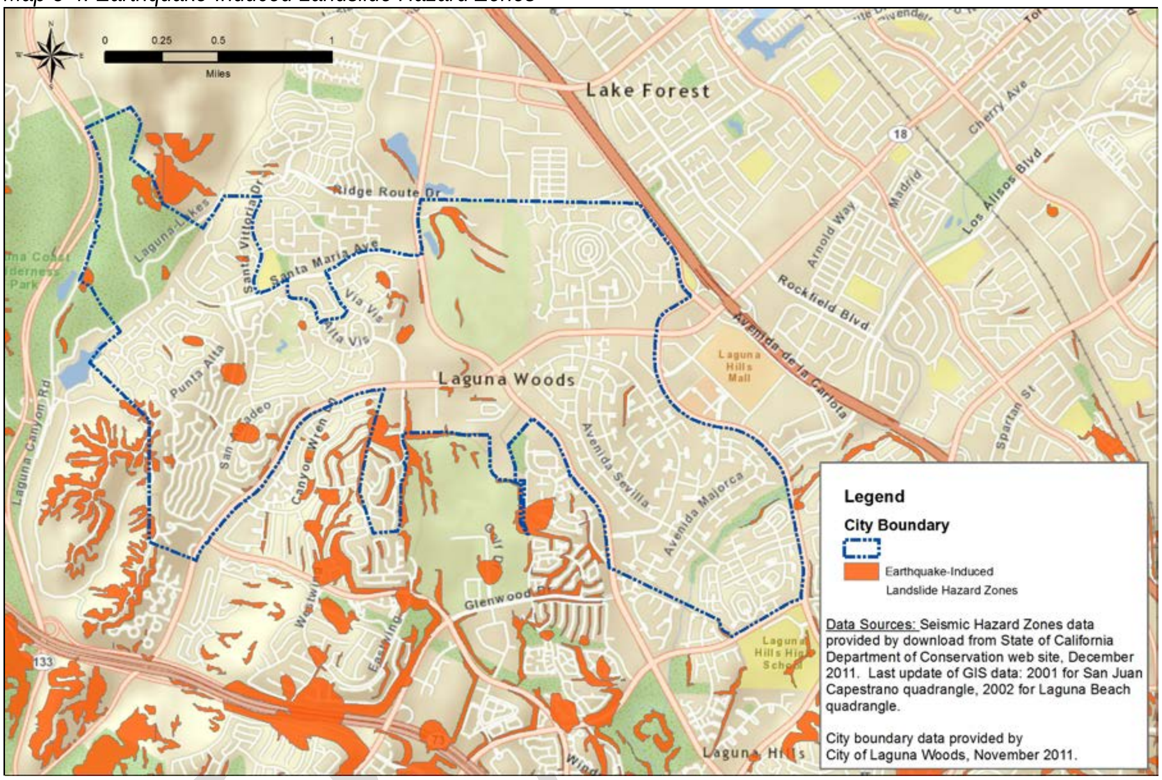


Table 3-8: Known Earthquake-Induced Landslide Susceptibility

Affected	*Estimate*	*Affected*	*Estimate*
Acres	77.13		
Projected Impact on General Plan Land Use Categories			
Residential	Potential	Commercial	Potential
Community Facilities	Unlikely	Open Space	Potential
Urban Activities Center	Potential		
Projected Impact on City-owned Infrastructure			
City Hall	Unlikely	El Toro Road	Potential
Moulton Parkway	Potential	Santa Maria Avenue	Potential
Traffic Signals	Potential	Storm Drain System	Unlikely
City Centre Park	Potential	Ridge Route Park	Potential
Woods End Park	Potential	Laguna Laurel	Potential

Local Ground Failure Risk from Liquefaction

The following areas are known to be susceptible to earthquake-induced liquefaction:

Map 3-5: Liquefaction Hazard Zones

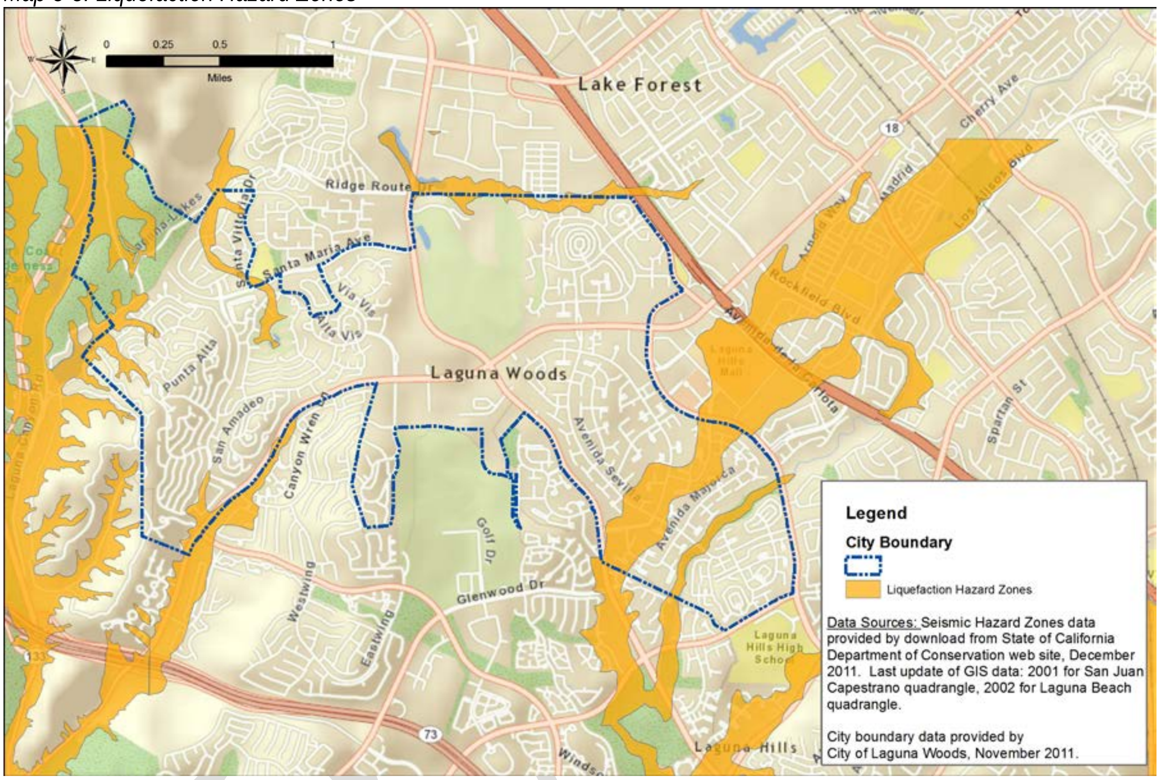


Table 3-9: Known Liquefaction Susceptibility

Affected	*Estimate*	*Affected*	*Estimate*
Acres	255.59		
Projected Impact on General Plan Land Use Categories			
Residential	Potential	Commercial	Potential
Community Facilities	Unlikely	Open Space	Potential
Urban Activities Center	Unlikely		
Projected Impact on City-owned Infrastructure			
City Hall	Unlikely	El Toro Road	Potential
Moulton Parkway	Potential	Santa Maria Avenue	Potential
Traffic Signals	Potential	Storm Drain System	Potential
City Centre Park	Unlikely	Ridge Route Park	Potential
Woods End Park	Potential	Laguna Laurel	Potential

Hazus-MH for Earthquake Modeling

Hazus-MH is the Federal Emergency Management Agency's (FEMA) methodology for estimating potential losses from disasters. It is a nationally applicable and standardized software modeling program that estimates the physical, economic, and social impacts of earthquakes, floods, and hurricanes based on scientific and engineering knowledge.

This Plan uses Hazus-MH as both a means of estimating loss and visualizing the spatial impacts of earthquakes. In total, five planning scenarios were analyzed, one for each of the five earthquake faults identified as being of particular concern to the City (Elsinore, Newport-Inglewood, San Andreas, San Jacinto, and San Joaquin Hills).

➢ *STEP 1: Identification of Hazus Analysis Level*

Hazus-MH provides three levels of analysis based on the amount of locally available information. This Plan uses a Level 1 Analysis Level, which is a basic estimate of losses produced with national databases and expert-based analysis parameters included in the Hazus-MH software. This is commonly referred to as an "out-of-the-box" or "default" loss estimate. The following local datasets were added to enhance loss estimation:

- ServiceSoil Survey Geographic database for Orange & Western Part of Riverside Counties, California. United States Department of Agriculture, Natural Resources Conservation. Beginning Date: 1999-04-29, Ending Date: 2008-01-03.
- Topographic map with 25-foot contour lines provided by the City Engineer. Based on aerial mapping conducted in 2002.
- Information provided by City personnel on Laguna Woods City Hall, including its real and personal property valuations, average number of daytime and nighttime occupants; average daily business income; and, average daily wages.

Hazus-MH Level 1 Analysis is limited by its predominant reliance on national databases, as opposed to more specific local datasets. For example, Level 1 earthquake modeling is based on United States Census tract level data. Census tracts do not align with City boundaries and, as a result, many of the loss estimation tools lose their relevance and specificity (e.g., portions of the City are included in Census tracts with the Laguna Hills Mall which greatly skews the accuracy of economic loss estimations). Recognizing these limitations, STEP 4 below details the estimations selected for inclusion in this Plan.

Hazus-MH analysis was performed using ESRI ArcGIS software version 9.3, Build 1850, ArcInfo license level. ESRI ArcGIS Spatial Analyst Extension was used to process the United States Geological Survey's Digital Elevation Models (DEMs).

➢ *STEP 2: Identification of Earthquake Planning Scenarios*

The United States Geological Survey (USGS) develops earthquake planning scenarios that describe the expected ground motions and effects of realistic, hypothetical, large earthquakes. The following earthquake planning scenarios were analyzed in relation to the City for the five earthquake faults identified as being of particular concern (Elsinore, Newport-Inglewood, San Andreas, San Jacinto, and San Joaquin Hills):

Table 3-10: Summary of Earthquake Planning Scenarios

Fault Name	*Scenario Magnitude*	*Epicenter (Longitude, Latitude)*
Elsinore	Magnitude 7.6	-117.60, 33.82 (≈ Corona)
Newport-Inglewood	Magnitude 7.5	-117.82, 33.53 (≈ Laguna Beach)
San Andreas	Magnitude 7.8	-117.38, 34.23 (≈ Devore)
San Jacinto	Magnitude 6.7	-117.26, 34.03 (≈ Grand Terrace)
San Joaquin Hills	Magnitude 6.6	-117.75, 33.50 (≈ Laguna Beach)

➢ *STEP 3: Production of Peak Ground Acceleration Maps*

Peak Ground Acceleration (PGA or Peak ACC, below) maps were developed for each of the five earthquake planning scenarios. PGA can be generally interpreted, as follows:

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

➢ *STEP 4: Inventory of Estimated Losses*

An inventory of estimated losses was compiled for each of the five earthquake planning scenarios. The use of Census tract level data could cause the estimates contained in this Plan to overestimate potential impacts; however, for the planning purposes for which they are used, there are no significantly negative or detrimental implications.

- Debris Generation and Removal – For planning purposes, Hazus-MH estimates for debris generation and removal are viewed as the best available data as little research has been done on the national or state levels to develop more exact methodologies. The following estimates are provided in this Plan:
  - Total amount of debris generated in tons
  - Brick/wood as a percent of the debris generated
  - Reinforced concrete/steel as a percent of the debris generated
  - Total truckloads required to remove the debris generated (a truckload is calculated as having an individual carrying capacity of 25 tons)
- Shelter Requirements – Estimates of the number of households displaced from their homes are included in this Plan. A non-Hazus-MH calculation based on the 2010 Census figure of 1.42 for the average household size is also included.
- City Hall Damage – Probability estimates of structural and non-structural damage to Laguna Woods City Hall are included in this Plan. Structural damage resultant of drift (displacement) is estimated seperate from acceleration (shaking).

Hazus-MH Earthquake Planning Scenario #1: Elsinore Fault Zone

Table 3-11: Elsinore Fault Zone Earthquake Planning Scenario

Fault Name	*Scenario Magnitude*	*Epicenter (Longitude, Latitude)*
Elsinore	Magnitude 7.6	-117.60, 33.82 (≈ Corona)

Map 3-6: Elsinore Fault Zone Earthquake Planning Scenario Peak Ground Acceleration

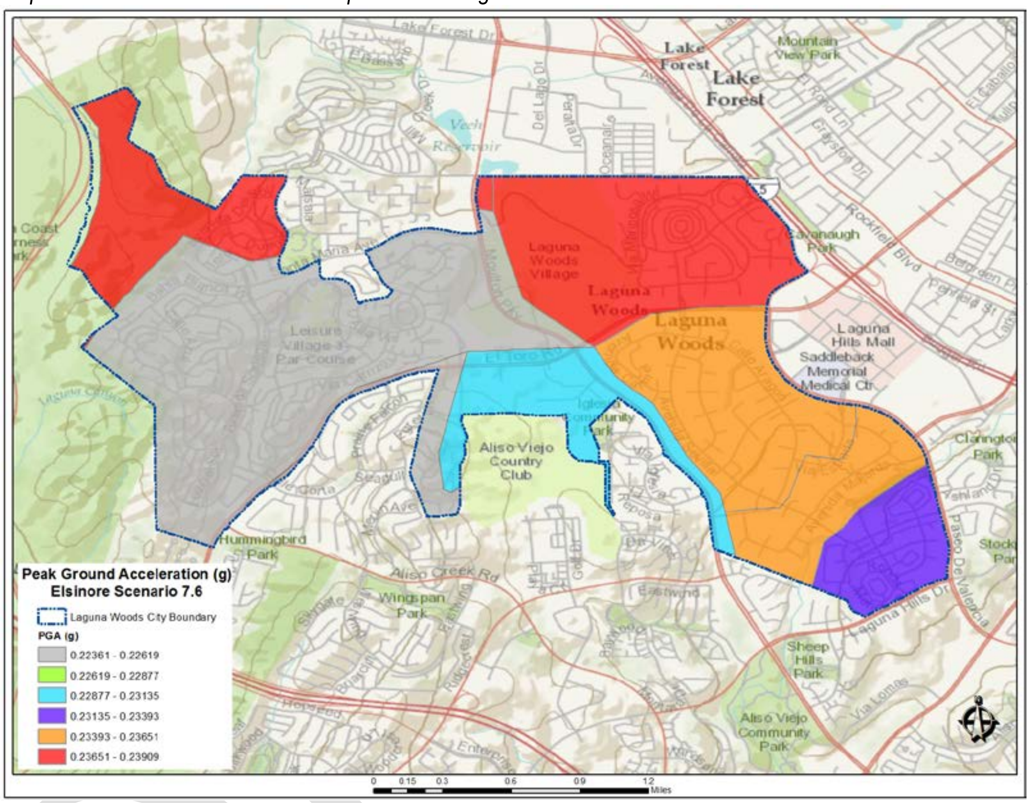


Table 3-12: Elsinore Fault Zone Earthquake Planning Scenario Debris, Shelter, and Damage Estimates

Measure	*Estimate*
Debris Generation and Removal	
Total Amount of Debris Generated	0.1 million tons
Brick/Wood as a Percent of the Debris Generated	26
Reinforced Concrete/Steel as a Percent of the Debris Generated	74
Truckloads Required to Remove the Debris Generated	4,080 (@ 25 tons/truck)
Shelter Requirements	
Total Number of Displaced Households	344
Total Number of Displaced Residents	489

Hazus-MH Earthquake Planning Scenario #2: Newport-Inglewood Fault Zone

Table 3-13: Newport-Inglewood Fault Zone Earthquake Planning Scenario

Fault Name	*Scenario Magnitude*	*Epicenter (Longitude, Latitude)*
Newport-Inglewood	Magnitude 7.5	-117.82, 33.53 (≈ Laguna Beach)

Map 3-7: Newport-Inglewood Fault Zone Earthquake Planning Scenario Peak Ground Acceleration

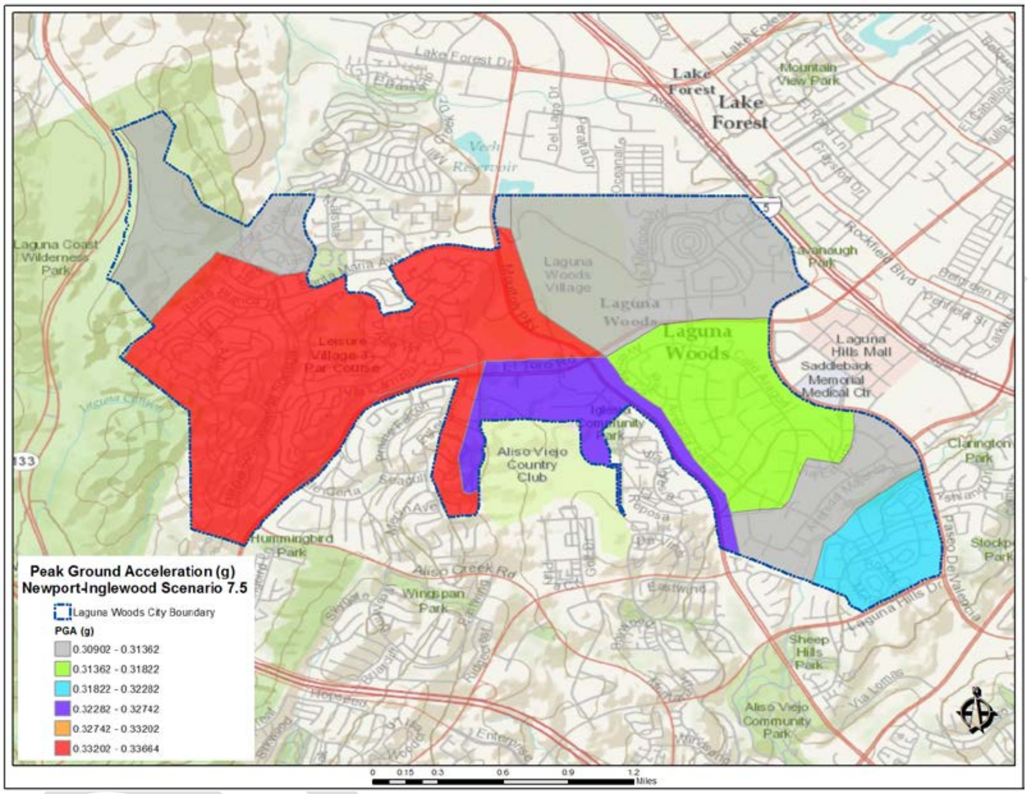


Table 3-14: Newport-Inglewood Fault Zone Earthquake Planning Scenario Debris, Shelter, and Damage Estimates

Measure	*Estimate*
Debris Generation and Removal	
Total Amount of Debris Generated	0.22 million tons
Brick/Wood as a Percent of the Debris Generated	28
Reinforced Concrete/Steel as a Percent of the Debris Generated	72
Truckloads Required to Remove the Debris Generated	8,920 (@ 25 tons/truck)
Shelter Requirements	
Total Number of Displaced Households	1,030
Total Number of Displaced Residents	1,463

Hazus-MH Earthquake Planning Scenario #3: San Andreas Fault Zone

Table 3-15: San Andreas Fault Zone Earthquake Planning Scenario

Fault Name	*Scenario Magnitude*	*Epicenter (Longitude, Latitude)*
San Andreas	Magnitude 7.8	-117.38, 34.23 (≈ Devore)

Map 3-8: San Andreas Fault Zone Earthquake Planning Scenario Peak Ground Acceleration

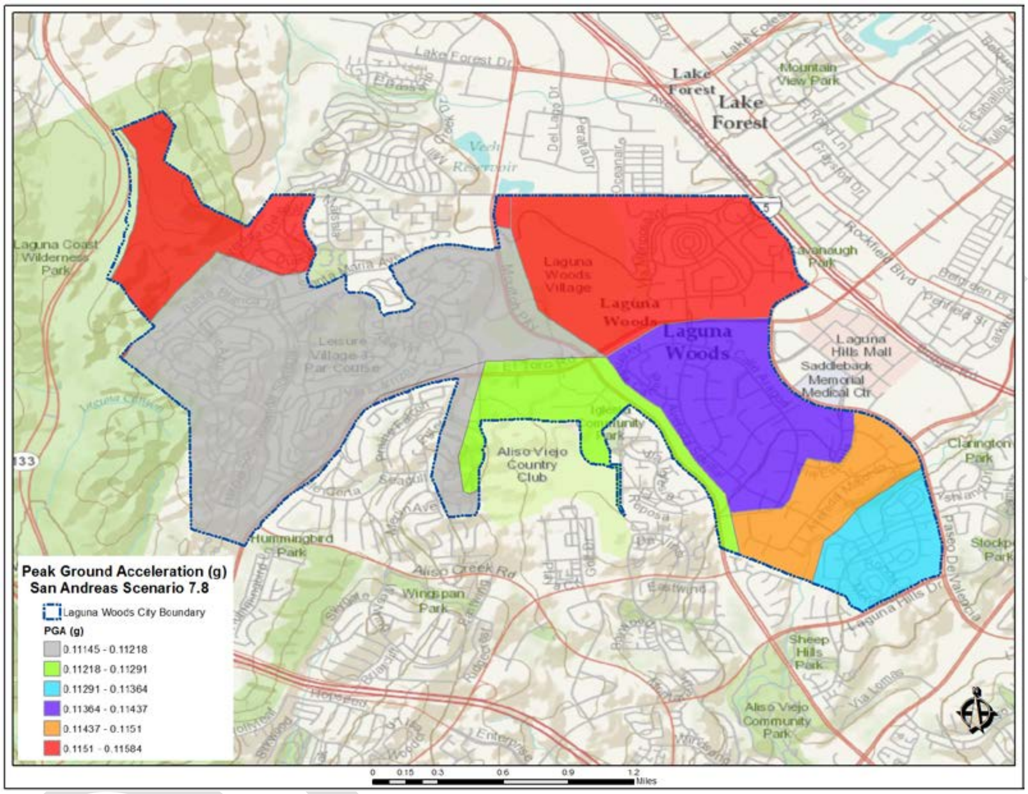


Table 3-16: San Andreas Fault Zone Earthquake Planning Scenario Debris, Shelter, and Damage Estimates

Measure	*Estimate*
Debris Generation and Removal	
Total Amount of Debris Generated	0
Brick/Wood as a Percent of the Debris Generated	0
Reinforced Concrete/Steel as a Percent of the Debris Generated	0
Truckloads Required to Remove the Debris Generated	0 (@ 25 trucks/ton)
Shelter Requirements	
Total Number of Displaced Households	8
Total Number of Displaced Residents	12

Hazus-MH Earthquake Planning Scenario #4: San Jacinto Fault Zone

Table 3-17: San Jacinto Fault Zone Earthquake Planning Scenario

Fault Name	*Scenario Magnitude*	*Epicenter (Longitude, Latitude)*
San Jacinto	Magnitude 6.7	-117.26, 34.03 (≈ Grand Terrace)

Map 3-9: San Jacinto Fault Zone Earthquake Planning Scenario Peak Ground Acceleration

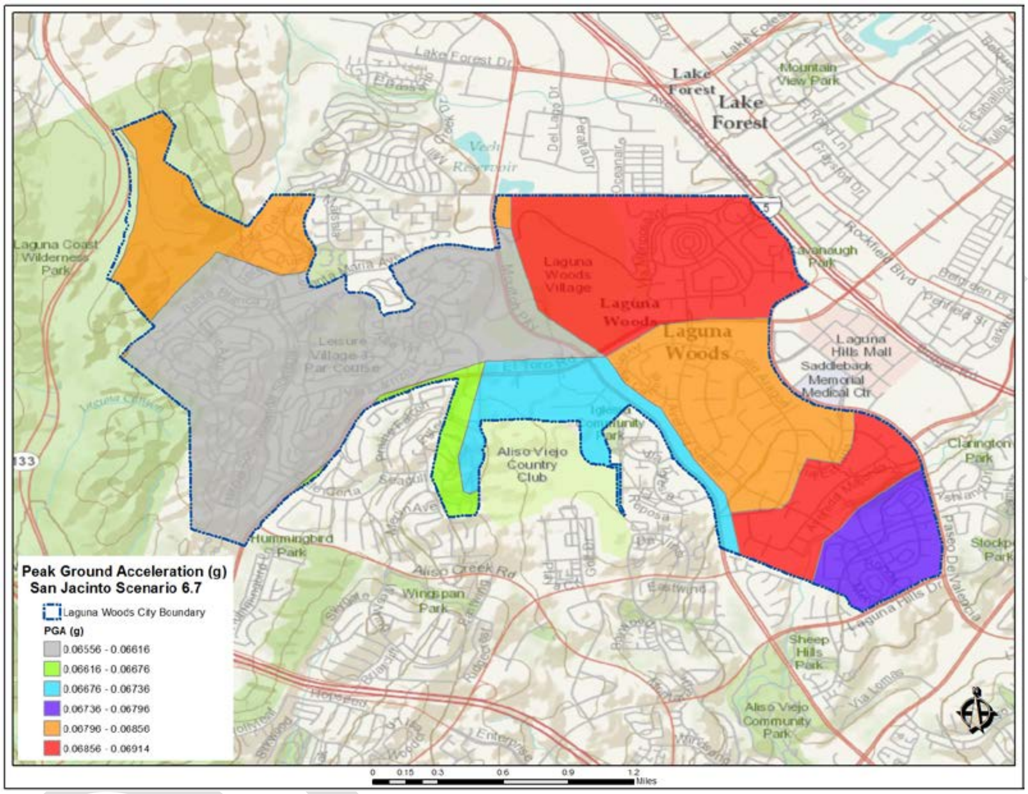


Table 3-18: San Jacinto Fault Zone Earthquake Planning Scenario Debris, Shelter, and Damage Estimates

Measure	*Estimate*
Debris Generation and Removal	
Total Amount of Debris Generated	0.47 million tons
Brick/Wood as a Percent of the Debris Generated	27
Reinforced Concrete/Steel as a Percent of the Debris Generated	73
Truckloads Required to Remove the Debris Generated	18,840 (@ 25 tons/truck)
Shelter Requirements	
Total Number of Displaced Households	1
Total Number of Displaced Residents	2

Hazus-MH Earthquake Planning Scenario #5: San Joaquin Hills Blind Thrust Fault

Table 3-19: San Joaquin Hills Blind Thrust Fault Earthquake Planning Scenario

Fault Name	*Scenario Magnitude*	*Epicenter (Longitude, Latitude)*
San Joaquin Hills	Magnitude 6.6	-117.75, 33.50 (≈ Laguna Beach)

Map 3-10: San Joaquin Hills Blind Thrust Earthquake Planning Scenario Peak Ground Acceleration

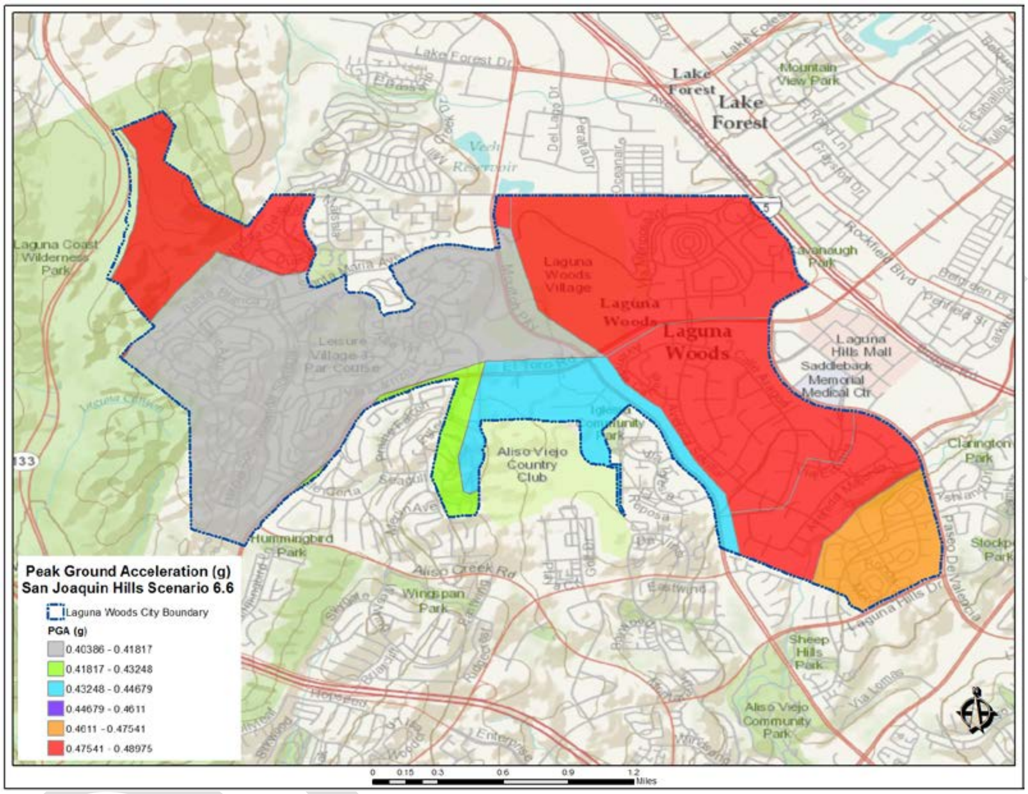


Table 3-20: San Joaquin Hills Blind Thrust Fault Earthquake Planning Scenario Debris, Shelter, and Damage Estimates

Measure	*Estimate*
Debris Generation and Removal	
Total Amount of Debris Generated	0.22 million tons
Brick/Wood as a Percent of the Debris Generated	28
Reinforced Concrete/Steel as a Percent of the Debris Generated	72
Truckloads Required to Remove the Debris Generated	8,920 (@ 25 tons/truck)
Shelter Requirements	
Total Number of Displaced Households	1,030
Total Number of Displaced Residents	1,463

Hazus-MH Earthquake Planning Scenarios: City Hall Damage Estimates

Table 3-21: Probability of City Hall Damage Based on Earthquake Planning Scenarios

Probability of Damage to City Hall	*Estimate (%)*		
Elsinore Earthquake (M 7.6)	*Structural*	*Non-Struct. Drift*	*Non-Struct. Accl.*
No Damage	61	50	48
Slight Damage	25	28	38
Moderate Damage	13	20	15
Extensive Damage	1	2	2
Complete Damage	0	0	0
Newport-Inglewood Earthquake (M 7.5)	*Structural*	*Non-Struct. Drift*	*Non-Struct. Accl.*
No Damage	33	24	31
Slight Damage	33	30	39
Moderate Damage	30	37	24
Extensive Damage	5	7	5
Complete Damage	0	1	0
San Andreas Earthquake (M 7.8)	*Structural*	*Non-Struct. Drift*	*Non-Struct. Accl.*
No Damage	93	88	86
Slight Damage	6	10	12
Moderate Damage	1	3	2
Extensive Damage	0	0	0
Complete Damage	0	0	0
San Jacinto Earthquake (M 6.7)	*Structural*	*Non-Struct. Drift*	*Non-Struct. Accl.*
No Damage	98	96	97
Slight Damage	2	3	3
Moderate Damage	0	1	0
Extensive Damage	0	0	0
Complete Damage	0	0	0
San Jacinto Earthquake (M 6.6)	*Structural*	*Non-Struct. Drift*	*Non-Struct. Accl.*
No Damage	25	18	22
Slight Damage	32	28	38
Moderate Damage	36	42	30
Extensive Damage	7	10	9
Complete Damage	0	2	1

3.1.6. ENERGY SHORTAGES

Energy shortages are considered to pose a significant risk to the City with high impact and medium probability. Energy shortages could cause loss of life, property damage, personal injury, and economic loss. Of particular concern to Laguna Woods residents is the loss of power to personal medical devices, including oxygen machines, ventilators, ventricular assist devices, dialysis machines, nebulizers, and intravenous pumps.

According to Southern California Edison (SCE), energy shortages include:

- **Pre-planned Local Power Outages** – SCE routinely implements pre-planned localized power outages to facilitate infrastructure repairs and upgrades. At least three days notice is given to affected customers.

- **Unplanned Local Power Outages** – Unplanned power outages may occur as a result of traffic accidents, storms, construction, natural disasters, high power demand, or other events that damage or overload SCE systems.

- **Flex Alert** – When current system conditions and forecasted demand indicate immediate conservation is needed, a Flex Alert is issued as an urgent call to immediately conserve electricity and to shift demand to off-peak hours (after 6 p.m.). The California Independent System Operator (CAISO) decides when and where conservation will be helpful in reducing strain on the power grid.

- **Warning** – CAISO may issue a Warning an hour ahead of a forecasted shortfall in energy reserves. If a Warning is issued, the CAISO may call for activation of voluntary load reduction programs (Summer Discount Plan, Base Interruptible Program, and Agricultural Pumping Interruptible Program).

- **Stage 1 Emergency** – A Stage 1 Emergency may be called when power reserves of less than 7 percent exist or shortfalls are forecasted to occur within the next two hours. CAISO may call for activation of voluntary load reduction programs and strongly encourage every consumer and business to reduce power usage.

- **Stage 2 Emergency** – A Stage 2 Emergency may be called when power reserves fall under 5 percent. During this stage, CAISO and SCE will communicate with customers that it is critical that they reduce/conserve power immediately.

- **Stage 3 Emergency** – A Stage 3 Emergency may be called when power reserves fall below three percent. During this stage, CAISO will likely direct SCE to conduct a series of controlled rotating power outages in its service territory with the purpose of preventing a potential widespread disturbance to California's electric transmission grid. To conduct this process, SCE will take circuits (or “groups” of customers) out of service on a rotational basis until the CAISO can sustain reserve levels above three percent. The controlled rotating outages will last approximately one hour for affected communities, but could be shorter or longer depending upon circumstances. Before initiating the outages, the CAISO, SCE, and California’s other investor-owned power utilities exhaust all possible alternatives, including supplementing in-state power supplies with imported generation and urging customers to conserve energy when reserves drop below

5 percent. During this stage, SCE may be able to avoid power outages for "essential-use customers," which includes hospitals, police and fire departments, and vital government service departments. Essential-use customers are set in accordance with California Public Utilities Commission Decision 02-04-060.

- **Transmission Emergency** – The CAISO may declare a Transmission Emergency for any event that threatens, harms or limits capabilities of any element of the transmission grid and threatens grid reliability. SCE will make every attempt to avoid cutting power to essential-use customers, but it is possible, depending on circumstances, that electric service will be cut for all customers.

- **Under Voltage Load Shedding** – Utility regulations require SCE to have plans to mitigate grid reliability impacts due to transmission contingencies. When the San Onofre Nuclear Generating Station (SONGS) is non-operational or only partially operational, SCE's broader transmission system may not be able to support high loads and hold voltage. During these events, SCE will implement Under Voltage Load Shedding (power outages) in an area of Orange County that includes the City. Due to the rapid nature of these emergencies, outages will occur without warning and will not preserve power for essential-use customers.

California ISO Historical Energy Shortages

The California Independent System Operator, a nonprofit public benefit corporation that manages the State's electric grid, reported the following energy shortages from 2010 to 2011 in their "Cumulative Totals of Restricted Maintenance Operations, Alert, Warning, Emergency, and Flex Alert Notices Issued from 1998 to Present (4/10/12)" report.

Table 3-22: California ISO Historical Energy Shortages (2002-2011)

Date	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
Flex Alert	1	0	6	7	18	6	3	0	0	2
Warning	4	0	2	2	5	3	1	2	1	1
Stage 1 Emergency	2	1	1	1	3	1	0	0	0	0
Stage 2 Emergency	1	0	0	2	1	0	0	0	0	0
Stage 3 Emergency	0	0	0	0	0	0	0	0	0	0
Transmission Emergency	-	-	6	5	0	4	0	6	2	2

Southern California Edison Historical System Reliability

According to SCE's Electric System Reliability Annual Report for the 2011 calendar year (filed with the California Public Utilities Commission pursuant to Decision 96-09-045), historical system reliability for all SCE customers is as shown in Table 3-28.

The following terms apply to Tables 3-28 and 3-29:

- **IEEE Std 1366-2003** – Institute of Electrical Electronics Engineers (IEEE) Guide for Electric Power Distribution Reliability Indices.

- **System Average Interruption Duration Index (SAIDI)**. SAIDI is the average length of time customers were without power. It is calculated by dividing the total minutes of sustained customer interruptions by the total number of customers. It is typically calculated for a one-year period; for example, a SAIDI might be expressed as "100 minutes in 1995." A variation of this index, AIDI, may be calculated to identify the reliability of a region or circuit; for example, "84 minutes in Santa Barbara in 1995."

- **System Average Interruption Frequency Index (SAIFI)**. SAIFI is the average number of sustained power interruptions for each customer during a specified time period. It is calculated by dividing the total number of sustained customer interruptions by the total number of customers. It is typically calculated for a year. SAIFI may be calculated for region or circuit.

- **Momentary Average Interruption Frequency Index (MAIFI)**. MAIFI is the total number of momentary customer interruptions divided by the total number of customers. It differs from SAIFI by tracking only the frequency of momentary, rather than sustained, interruptions.

Table 3-23: Southern California Edison Historical System Reliability

Southern California Edison
Historical System Reliability (IEEE Std 1366-2003)
2002 - 2005 Using DTOM Outage Database
2006 - 2011 Using ODRM Outage Database

	All Interruptions Included			Major Event Days Excluded Per IEEE 1366		
YEAR	**SAIDI**	**SAIFI**	**MAIFI**	**SAIDI**	**SAIFI**	**MAIFI**
2002	52.29	1.27	1.15	44.95	1.05	1.09
2003	89.26	1.39	1.43	53.37	1.11	1.15
2004	74.93	1.34	1.21	55.30	1.15	1.05
2005	92.26	1.53	1.47	72.57	1.33	1.23
2006	142.14	1.05	1.85	96.59	0.89	1.52
2007	151.32	1.10	1.74	85.34	0.88	1.37
2008	118.91	1.06	1.73	99.35	0.95	1.56
2009	105.80	0.90	1.45	88.77	0.83	1.31
2010	140.91	1.05	1.69	98.69	0.82	1.41
2011	232.39	1.04	1.53	108.15	0.91	1.36

All calculations utilize a definition of "sustained" interruption as described in IEEE Std 1366, 2003 Edition, which is an interruption lasting longer than 5 minutes.

In years 2006 - 2011, values of SAIDI, SAIFI, and MAIFI were calculated per the guidance of IEEE 1366 with the exception of using five years of historical data in applying the "2.5 beta method" to determine excludable days. Per IEEE 1366, days are excluded from a given year's metric if their SAIDI exceeds 2.5 times the standard deviation of the natural logarithm of daily SAIDI over the previous five year period. However, complete ODRM data did not exist prior to 2006. Therefore, excludable days for years 2006 and 2007 were both determined based on daily SAIDI data in year 2006. Excludable days for 2008 were determined based on daily SAIDI data in years 2006 and 2007. Excludable days for 2009 were determined based on daily SAIDI data in years 2006, 2007, and 2008. Excludable days for 2010 were determined based on daily SAIDI data in years 2006, 2007, 2008, and 2009. This interim approach is consistent with IEEE 1366.

Southern California Edison Major Events

According to SCE's Electric System Reliability Annual Report for the 2011 calendar year (filed with the California Public Utilities Commission pursuant to Decision 96-09-045), major events impacting SCE customers have occurred as shown in Table 3-29. A "major event" is defined by Decision 96-09-045 as any outage that meets the following criteria:

- (a) The event is caused by earthquake, fire, or storms of sufficient intensity to give rise to a state of emergency being declared by the government; or (b) Any other disaster not in (a) that affects more than 15% of the [SCE] system facilities or 10% of [SCE's] customers, whichever is less for each event.

SCE does not provide locations for major events disclosed in electric system reliability annual reports; however, the generalized information illustrates the impact and frequency of major events affecting SCE's customers.

Table 3-24: Southern California Edison Major Events in 2010 and 2011

Date	*Cause*	*SAIDI*	*SAIFI*	*MAIFI*
1/18/2010	Vegetation Blown	3.97	0.02	0.04
1/21/2010	Vegetation Blown	5.83	0.02	0.03
1/22/2010	Vegetation Blown	3.52	0.01	0.01
1/23/2010	Vegetation Blown	1.98	0.01	0.00
7/15/2010	Lightning & Toppled/Broken	2.39	0.01	0.03
9/27/2010	Overloaded	3.38	0.01	0.01
10/1/2010	Lightning	2.48	0.03	0.02
10/4/2010	Lightning & Fire	3.15	0.02	0.01
10/19/2010	Lightning & Protection	3.50	0.04	0.04
12/19/2010	Vegetation Blown & Overload	2.99	0.01	0.03
12/22/2010	Vegetation Blown	3.82	0.02	0.02
12/29/2010	Vegetation Blown & Low Voltage	2.25	0.01	0.02
12/30/2010	Vegetation Blown & Wind	2.97	0.01	0.02
1/1/2011	Unknown	2.40	0.00	0.00
3/20/2011	Snow & Vegetation Blown	8.85	0.03	0.05
3/21/2011	Vegetation Blown & Lightning	2.76	0.01	0.01
7/31/2011	Lightning	2.77	0.01	0.01
11/30/2011	Vegetation Blown & Wind	47.89	0.02	0.02
12/1/2011	Wind & Vegetation Blown	59.56	0.05	0.06

<u>Southern California Gas Company</u>

The State of California does not require natural gas utilities to publically disclose system reliability information to the same extent as electric utilities. While interruptions in natural gas are, generally speaking, less frequent than electrical energy shortages, widespread outages may occur in connection with transmission system disruptions and conditions affecting out-of-state suppliers. Electrical energy shortages may also cause interruptions in natural gas service due to production and processing-related interdependencies.

3.1.7. PUBLIC HEALTH CRISES

Public health crises, including outbreaks, epidemics, and pandemics, are considered to pose a significant risk to the City with high impact and medium probability. Public health crises could cause loss of life, personal injury, and economic loss.

The United States Centers for Disease Control and Prevention (CDC) define epidemics, outbreaks, and pandemics, as follows:

- *Epidemic* – The occurrence of more cases of disease than expected in a given area or among a specific group of people over a particular period of time.
- *Outbreak* – Synonymous with epidemic. Sometimes the preferred word, as it may escape the sensationalism associated with the word epidemic. Alternatively, a localized as opposed to generalized epidemic.
- *Pandemic* – An epidemic occurring over a very wide area (several countries or continents) and usually affecting a large proportion of the population.

Public health crises are caused by the emergence or reemergence of diseases, bacteria, parasites, fungi, viruses, and/or other agents. Diseases resulting from transmission from humans to animals are known as zoonoses.

The severity ("virulence") of a public health crisis is dependent on a number of factors including the size and vulnerability of affected populations. Public health crises can be exacerbated by poor health, hygiene, and sanitation; microbial adaptation; and, changes in population, the environment, and human behavior.

Although this Plan focuses primarily on outbreaks, epidemics, and pandemics affecting humans, it recognizes that the same can occur with effects limited to animals.

<u>Local Public Health Activity</u>

The Orange County Health Care Agency (OCHCA) views influenza, foodborne illnesses, and West Nile Virus (WNV) as the most plausible outbreak, epidemic, and pandemic threats in Orange County. The City in consultation with Laguna Beach Animal Services views Avian Botulism, Exotic Newcastle Disease (END), and Rabies Virus as plausible zoonoses that may impact the human population.

- *Influenza*

The California Department of Public Health characterizes influenza (also known as the flu) as a disease that attacks the respiratory tract (nose, throat, and lungs) in humans. Although mild cases may be similar to a viral "cold," influenza is typically much more severe, usually comes on suddenly, and may include fever, headache, tiredness (which may be extreme), dry cough, sore throat, nasal congestion, and body aches and more often results in complications such as pneumonia. Seasonal influenza is a yearly occurrence that kills primarily persons aged 65 and older and those with chronic health conditions and causes significant economic impact. Young children, especially under the age of two, are also at increased risk of complications and hospitalization. Persons who are exposed, but do not succumb to infection with influenza, develop immunity to the strain but are still vulnerable to other strains circulating that year. They are also vulnerable to strains in subsequent years that have changed over time. Worldwide pandemics of influenza occur when a novel virus emerges to which the population has little immunity. The 20th century saw three such pandemics, including the Spanish Influenza Pandemic in 1918 that was responsible for 20 million deaths throughout the world. CDC estimates that between 43 million and 89 million persons were infected with the 2009 pandemic H1N1 virus, 195,000-403,000 persons were hospitalized, and 8,870-18,300 persons died in the United States between April 2009 and April 2010.

The OCHCA views an influenza pandemic as "likely to affect everyone in Orange County at some point and can greatly impact 'business as usual' in any sector of society or government. A pandemic will place a great strain on existing health care resources and may exceed health care resources. Personnel, supplies, equipment, and pharmaceutical responses (e.g., vaccination and antivirals) may be in short supply and/or unavailable and non-pharmaceutical responses (e.g., strict adherence to respiratory hygiene, hand washing, self isolation, and social distancing) will be the most effective strategies to limit transmission. This will make it difficult to pre-treat potentially exposed individuals and will limit treatment options once infection sets in. If transportation is compromised in the region or country, food and other essentials may be unavailable as well. Outbreaks are expected to occur simultaneously throughout much of the County and the State, which may limit the availability of mutual aid assistance and resources from other areas."

- *Foodborne Illness*

Outbreaks from foodborne illness can occur at any time from errors in food preparation or handling, contaminated food sources, and/or contamination of food items by an infected person. Small foodborne outbreaks occur frequently at the local level. CDC estimates that every year roughly 1 in 6 Americans (or, roughly 48 million people) gets sick, 128,000 are hospitalized, and 3,000 die of foodborne illnesses. Of the foodborne illnesses for which the pathogen is known, over half are caused by norovirus, which is very contagious and easily spread from person-to-person. Other pathogens causing foodborne illness include *Salmonella* species (non-typhoidal), *Clostridium perfringens*, *Campylobacter* species, and shiga-toxin producing *E. coli*.

- *West Nile Virus (WNV)*

WNV was first reported in Orange County in 2004 and has been considered endemic in the county ever since. Human cases are expected all year, although WNV is a seasonal epidemic that generally flares up in the summer and continues into the fall.

Most often, WNV is spread by the bite of an infected mosquito. Mosquitoes become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals when they bite. In a very small number of cases, WNV also has been spread through blood transfusions and organ transplants, with case reports of transmission through breastfeeding and possibly during pregnancy from mother to baby.

About one in 150 people infected with WNV will develop severe illness called West Nile Neuroinvasive Disease (WNND). The symptoms of WNND can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis. These symptoms may last several weeks, and neurological effects may be permanent. There is no specific treatment for WNV infection, just supportive care. Up to 20 percent of those who become infected will display symptoms which can include fever, headache, body aches, nausea, vomiting, and sometimes swollen lymph glands or a skin rash on the chest, stomach and back. Symptoms can last for as short as a few days, though even healthy people have been sick for several weeks. Roughly 80 percent of those who are infected with WNV will not show any symptoms at all, but there is no way to know if they will develop an illness.

In 2004, the Orange County Vector Control District (OCVCD) began testing all deceased birds for WNV. In the beginning months, the City was found to have a significantly high ratio of West Nile Virus positive birds, including the first Orange County case of WNV in a hummingbird. Since 2004, the OCVCD has conducted deceased bird surveillance to monitor for WNV activity and tests birds meeting certain criteria for WNV infection.

- *Avian Botulism*

Avian Botulism is a paralytic disease in birds caused by ingestion of a toxin produced by the bacteria, *Clostridium botulinum*. According to the United States Geological Survey's National Wildlife Health Center, this bacteria is widespread in soil and requires warm temperatures, a protein source, and an anaerobic (no oxygen) environment in order to become active and produce toxin. Decomposing vegetation and invertebrates combined with warm temperatures can provide ideal conditions for the botulism bacteria to activate and produce toxin. There are several types of toxin produced by strains of this bacteria; birds are most commonly affected by type C and to a lesser extent type E.

Birds either ingest the toxin directly or eat invertebrates (e.g. chironomids and fly larvae) containing the toxin. A cycle develops in botulism outbreaks when fly larvae (maggots), feed on animal carcasses and ingest toxin. Ducks that consume toxin-laden maggots can develop botulism after eating as few as 3 or 4 maggots.

Botulism in humans is usually the result of Type A or Type B toxins, and to a far lesser extent, Type E toxin. People, cats, and dogs are generally thought to be resistant to type C toxin, which makes the risk posed by Avian Botulism relatively minimal.

Between September and October 2011, 17 deceased mallard ducks were retrieved from the Aliso Creek area inside the gated community of Laguna Woods Village. The ducks are believed to have been infected at a pond in Lake Forest where other cases of Avian Botulism were confirmed by laboratory testing. As Avian Botulism is an oxygen-intolerant (anaerobic) bacterium, it is unlikely to exist in a moving water body like Aliso Creek.

- *Exotic Newcastle Disease (END)*

According to the United States Department of Agriculture (USDA), END is a contagious and fatal viral disease affecting all species of birds. END is so virulent that many birds die without having developed any clinical signs. END affects the respiratory, nervous, and digestive systems of infected birds and can result in sudden death.

END poses only minimal risk to humans, primarily in the form of conjunctivitis among people who have handled or come in direct contact with infected birds. In 2002 and

2003, there was concern regarding the possible spread of an END outbreak in nearby counties (Los Angeles, Riverside, San Bernardino, and San Diego) to Orange County.

- *Rabies Virus*

The CDC describes rabies as a viral disease most often transmitted through the bite of a rabid animal. The vast majority of rabies cases reported yearly occur in wild animals like raccoons, skunks, bats, and foxes. In Orange County in recent years, the only animals that have tested positive for rabies are bats.

The rabies virus infects the central nervous system, ultimately causing disease in the brain and death. The early symptoms of rabies in humans are similar to that of many other illnesses, including fever, headache, and general weakness or discomfort. As the disease progresses, more specific symptoms appear and may include insomnia, anxiety, confusion, slight or partial paralysis, excitation, hallucinations, agitation, hypersalivation (increase in saliva), difficulty swallowing, and hydrophobia (fear of water). Death usually occurs within days of the onset of these symptoms.

3.1.8. TERRORISM

Terrorism is considered to pose an unlikely, but potentially significant risk to the City with high impact and low probability. Acts of terrorism could cause loss of life, personal injury, economic loss, and property damage.

The United States Department of Justice defines terrorism as the unlawful use of force or violence committed by a group or individual against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.

Terrorist weapons may include weapons of mass destruction (WMDs), which are defined in the Federal Government Code as any "explosive, incendiary, or poison gas, bomb, grenade, rocket having a propellant charge of more than four ounces, missile having an explosive or incendiary charge of more than one quarter ounce, mine or device similar to the above; poison gas; any weapon involving a disaster organism; or any weapon that is designed to release radiation or radioactivity at a level dangerous to human life."

Local Threat Assessment

The State of California's Terrorism Response Plan Annex to the State Emergency Plan (2001) contains the following comments on the statewide threat posed by terrorism:

> Historically, California has had a long experience combating terrorist groups, both domestic and international. Domestic terrorist groups in the state have been largely issue-oriented, while the few known internationally based incidents have mostly targeted the state's émigré communities and been related to foreign disputes. Today, however, both groups are more likely to be aligned nationally and/or internationally through electronic networking. The issues and politics of these groups remain essentially unchanged but now include increasing expressions of hatred for existing forms of government.
>
> The freedom of movement and virtually unrestricted access to government officials, buildings, and critical infrastructure afforded to California's citizens and foreign visitors, presents the terrorist with the opportunity and conditions of anonymity to deliver such devastation and its tragic consequences with only the crudest devices of nuclear, chemical, or biological content.

Throughout California and Orange County there are numerous potential terrorist targets, including government facilities; schools; religious institutions; gathering places (shopping centers, entertainment venues, etc.); medical clinics; power plants; utility infrastructure; transportation infrastructure; water storage facilities; locations of high profile individuals; and, financial institutions. Laguna Woods contains many of the aforementioned potential terrorist targets and is located near a multitude of others.

Depending on the size, scope, and nature of the attack, the City could also be affected by regional acts of terrorism (e.g., situations similar to the anthrax attacks of 2001; public health crises caused by aerial spraying; and, large-scale explosions).

3.1.9. RADIOLOGICAL ACCIDENTS

Radiological accidents are considered to pose an unlikely, but potentially significant risk to the City with high impact and low probability. Radiological accidents could cause loss of life, personal injury, economic loss, and property damage.

Basis for Risk Assessment

The Nuclear Regulatory Commission (NRC) was created as an independent agency by Congress in 1974 to ensure the safe use of radioactive materials for beneficial civilian purposes while protecting people and the environment. The NRC regulates commercial nuclear power plants and other uses of nuclear materials, such as in nuclear medicine, through licensing, inspection, and enforcement of its requirements. The City relies on the NRC's technical expertise to identify and assess the risk posed by nuclear power.

San Onofre Nuclear Generating Station

The City is located approximately 20 miles north of the San Onofre Nuclear Generating Station (SONGS), which is situated on the coast in San Diego County, approximately three miles from the southern boundary of Orange County. SONGS is located entirely within the boundaries of the United States Marine Corps Base, Camp Pendleton. As of the date of this Plan, Southern California Edison (SCE) operates SONGS under licenses valid through February 16, 2022 (Unit 2) and November 15, 2022 (Unit 3).

For purposes of emergency planning and response, three zones have been established surrounding SONGS. Of these, the City is a part of the Public Education Zone (PEZ) and Ingestion Pathway Zone (IPZ), but not the Emergency Planning Zone (EPZ). A summary of each of the zones, and the implications thereof, follows.

- **Emergency Planning Zone (EPZ)** – The NRC requires local jurisdictions within a 10-mile radius of SONGS' plume exposure pathway to develop predetermined action plans to avoid or reduce potential exposure to radioactive materials [e.g., sheltering, evacuation, and the use of potassium iodide (KI) where appropriate].

  As a result of jurisdictional boundaries and topography, the Orange County EPZ for SONGS has been expanded beyond the 10-mile requirement to include the entirety of the cities of Dana Point, San Clemente, and San Juan Capistrano, as well as San Onofre State Beach, Doheny Beach State Park, San Clemente State Park, and the San Mateo Campground. In the event of a radiological accident at SONGS, the aforementioned areas are considered to be more at risk than the area outside of the EPZ because of their proximity to SONGS. In general, the SONGS EPZ is the area within 14 miles of the Station.

  The NRC has postulated the need for protective actions, such as sheltering or evacuation, for persons within the EPZ. The EPZ is further divided into Protective Action Zones (PAZs) to assist in the implementation of protective actions.

- **Public Education Zone (PEZ)** – Jurisdictions outside, but immediately adjacent to, the EPZ are part of the PEZ. This includes the City of Laguna Woods, as well as the cities of Aliso Viejo, Laguna Beach, Laguna Hills, Laguna Niguel, Lake

Forest, and Mission Viejo. The PEZ exists to ensure that affected members of the public are informed of how they would be notified of an emergency and what protective actions, if any, should be taken. Evacuation and the use of potassium iodide (KI) are not considered necessary protective actions for the PEZ because of the distance from SONGS. The protective action that individuals in the PEZ will most likely be asked to take during major emergencies is sheltering.

- **Ingestion Pathway Zone (IPZ)** – The IPZ is the area within 50 miles of SONGS where individuals could potentially ingest radioactive materials released into the environment. The primary exposure would be from the ingestion of contaminated food and water. The IPZ includes all of Orange County, as well as portions of Los Angeles County, San Bernardino County, and Riverside County. The California Department of Public Health has the primary responsibility to protect the public from ingestion exposure; however, the Orange County Health Care Agency will initiate monitoring, sampling, and surveying of the probable and actual route of radioactive materials until the State assumes said role.

Map 3-11: San Onofre Nuclear Generating Station Emergency Planning and Public Education Zones

Implications of the Japanese Earthquake and Tsunami

In the aftermath of the March 11, 2011 Japanese Earthquake and Tsunami, the United States Department of State issued recommendations to US citizens residing in the area surrounding the damaged Fukushima Dai-ichi Nuclear Power Plant site that differed from the policies in place for domestic nuclear emergencies. The following is excerpted from the NRC's "Expanded NRC Questions and Answers related to the March 11, 2011 Japanese Earthquake and Tsunami (February 15, 2012)":

> *Q: Why are US plants safe to operate considering the events in Japan?*
>
> A: The NRC has been very closely monitoring the activities in Japan and reviewing all available information to allow us to conclude that the U.S. plants continue to operate safely. There has been no reduction in the licensing or oversight function of the NRC as it relates to any of the NRC licensees. Contributors to the conclusion that the current fleet of reactors and materials licensees continue to protect the public health and safety are based on a number of principles, including defense in depth.
>
> Every U.S. reactor is designed for natural events, based on the specific site where the reactor is located. Every U.S. reactor has multiple fission product barriers, as well as a wide range of diverse and redundant safety features. All these factors support the NRC's conclusion that public health and safety can be assured. The NRC has a long regulatory history of conservative decisionmaking. The NRC has been intelligently using risk insights to help inform the regulatory process and has required improvements to the plant designs as we learn from operating experience. Some of these include severe accident management guidelines, revisions to the emergency operating procedures, procedures and processes for dealing with large fires and explosions regardless of the cause, and requirements for coping with station blackout.
>
> The NRC's task force examining the accident at Fukushima Dai-ichi and its impact on U.S. plants ("Recommendations for the Enhancing Reactor Safety in the 21st Century: The Near-term Task Force Review of Insights from the Fukushima Dai-ichi Accident," July 12, 2011, Nuclear Regulatory Commission) has concluded that continued operation and continued licensing activities do not pose an imminent risk to public health and safety.
>
> *Q: Why does the NRC not establish a 50-mile EPZ in the U.S. if this was the NRC's recommendation for the accident in Japan?*
>
> A: The United States government cannot intervene in the management of events internal to another sovereign nation. The US government can only make recommendations to its citizens in that country on actions for their safety. The State Department routinely issues such recommendations (known as travelers warning and advisories) for many different types of events; civil unrest, terrorism, natural disasters and technological accidents. It is within this context that the Nuclear Regulatory Commission made a recommendation to the US Ambassador in Japan for protective actions for US citizens residing in the regions surrounding the damaged Fukushima Dai-ichi Nuclear Power Plant site.
>
> The decision-making environment that existed at the time in which the NRC decision was made was one in which: there was limited and often conflicting information about the exact conditions of the reactors and spent fuel pools at the Fukushima nuclear facility immediately following the earthquake and tsunami; radiation monitors showed significantly elevated readings in some areas of the plant site which would challenge plant crews attempting to stabilize the plant; analysis results

from offsite samples indicated that some fuel damage had occurred; there was a level of uncertainty about whether or not efforts to stabilize the plant in the very near term were going to be successful, and; changing meteorological conditions resulted in the winds shifting rapidly from blowing out to sea to blowing back onto land.

In its evaluation of the rapidly changing and unprecedented event, the NRC performed a series of dose calculations to assess a "worst case" scenario. This was a conservative calculation which considered the rapidly changing course of the events and the very real possibility that these events were going to continue to degrade. As a result of these calculations, the progression of events and the uncertainty regarding the plans to bring the situation under control, the decision was made to recommend the evacuation of US citizens out to 50 miles from the facility.

In the United States, the NRC has direct access to the plant site including the control room and any and all vital plant areas. The NRC maintains two resident inspectors at each plant who have unfettered access to the site. In addition, the NRC has required that direct communications links between the NRC Operations Center and the plant be installed, tested, and routinely exercised. These links provide NRC staff and the Executive team with up-to-date and reliable information about the ongoing events at the plant. In addition, the Chairman can order the plant to take actions to mitigate the event if the NRC does not believe that the appropriate actions are being taken by the plant operators.

In the U.S., there are two emergency planning zones (EPZ) established around a nuclear power plant. The first zone, the 10-mile EPZ, is where exposure from a radiological release event would likely be from the radioactive plume and it is in this EPZ where protective actions such as sheltering and/or evacuation would be appropriate. Beyond the 10-mile EPZ and out to the 50-mile EPZ is the ingestion exposure pathway where exposure to radionuclides would likely be from ingestion of contaminated food/milk and surface water. Comprehensive planning is performed for these zones and is routinely tested and evaluated by way of the full participation exercises. These zones are not limits but rather provide for a comprehensive emergency planning framework that would allow expansion of the response efforts beyond the zones should radiological conditions warrant such expansion. Nuclear power plant licensees are required to have an emergency plan for both the onsite and offsite response that has been evaluated and tested prior to obtaining an operating license and must conduct such exercises on a biennial cycle. The NRC remains confident that its current regulatory framework for emergency preparedness, including the establishment of an EPZ, and the flexibility to respond to emergent radiological conditions, as necessary, provides adequate protection for the health and safety of the public.

The NRC's Near-Term Task Force issued its report on July 12 and it is available to the public (ADAMS Accession No. ML111861807). On July 19, 2011, the Task Force presented its findings to the Commission and proposed improvements in multiple areas including emergency preparedness. The Task Force considered the existing planning structure, including the 10-mile plume exposure pathway and 50-mile ingestion pathway emergency planning zones, and found no basis to recommend a change. The development of protective action recommendations by the Japanese government, including expansion of evacuations out to 20 km (~12 miles) from the plant supported effective and timely evacuation to minimize the impact of the radiological releases on public health and safety. Subsequent decisions by the Government of Japan to evacuate selected areas based on potential long-term exposures are consistent with the U.S. strategy to expand protective actions during an event consistent with developments at the time and provided timely and effective actions to protect the public in those areas. Therefore, the Task Force found no basis to recommend changes to the emergency planning zones.

3.1.10. HAZARD PROFILE – FLOODS AND STORMS

Floods and storms are considered to pose a moderate risk to the City with high probability and medium impacts. Floods and storms could cause loss of life, personal injury, and property damage. Economic processes may be disrupted due to impassable roads.

The Federal Emergency Management Agency (FEMA) defines a flood as a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from:

(i) Overflow of inland or tidal waters;
(ii) Unusual or rapid accumulation or runoff of surface waters from any source;
(iii) Mudflow; or
(iv) Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above.

Floods can be caused by a number of factors, including heavy rains, El Niño conditions, La Niña conditions, urbanization, inadequate flood control facilities, and obstructed water bodies (including from the presence of invasive plants). As discussed in Section 3.1.4, the devastation caused by wildfires can also cause flooding.

The severity of a flood, including the amount of time and land area over which flooding persists, is dependent on a number of factors including climate and hydrology.

Although this Plan focuses primarily on floods consistent with the FEMA definition, it also considers the effects of severe storms, which frequently occur in connection with floods. This Plan further recognizes that smaller accumulations of water can occur with effects that are substantially similar, in all regards except size, to FEMA-defined floods.

<u>Secondary Environmental Effects</u>

Flooding can affect water quality, as large volumes of water can transport contaminants into water bodies and also overload storm and wastewater systems. Additionally, large increases in water volume can cause water body erosion and loss of aquatic habitat.

<u>Secondary Health Effects</u>

According to the World Health Organization's Flooding and Communicable Diseases Fact Sheet (2012), flooding can increase the transmission of diseases as follows:

Flooding is associated with an increased risk of infection, however this risk is low unless there is significant population displacement and/or water sources are compromised. Of the 14 major floods which occurred globally between 1970 and 1994, only one led to a major diarrheal disease outbreak - in Sudan, 1980.

The major risk factor for outbreaks associated with flooding is the contamination of drinking-water facilities, and even when this happens, as in Iowa and Missouri in 1993, the risk of outbreaks can be minimized if risk is well recognized and disaster-response addresses the provision of clean water as a priority.

There is an increased risk of infection of water-borne diseases contracted through direct contact with polluted waters, such as wound infections, dermatitis, conjunctivitis, and ear, nose and throat infections. However, these diseases are not epidemic-prone.

The only epidemic-prone infection which can be transmitted directly from contaminated water is leptospirosis, a zoonotic bacterial disease. Transmission occurs through contact of the skin and mucous membranes with water, damp soil, vegetation (e.g., sugarcane), or mud contaminated with rodent urine. The occurrence of flooding after heavy rainfall facilitates the spread of the organism due to the proliferation of rodents which shed large amounts of leptospires in their urine.

Floods may indirectly lead to an increase in vector-borne diseases through expansion in the number and range of vector habitats. Standing water caused by heavy rainfall or overflow of rivers can act as breeding sites for mosquitoes, and therefore enhance the potential for exposure of the disaster-affected population and emergency workers to infections such as dengue, malaria and West Nile fever. Flooding may initially flush out mosquito breeding, but it comes back when the waters recede. The lag time is usually around 6-8 weeks before the onset of a malaria epidemic.

The risk of outbreaks is greatly increased by complicating factors, such as changes in human behavior (increased exposure to mosquitoes while sleeping outside, a temporary pause in disease control activities, overcrowding), or changes in habitats that promote mosquito breeding (landslide, deforestation, river damming, and rerouting).

Hypothermia may also be a problem, particularly in children, if trapped in floodwaters for lengthy periods. There may also be an increased risk of respiratory tract infections due to exposure (loss of shelter, exposure to flood waters and rain).

[Energy shortages] related to floods may disrupt water treatment and supply plants, thereby increasing the risk of water-borne diseases.

<u>Local Flood Activity</u>

According to the National Flood Insurance Program (NFIP), the west coast rainy season usually lasts from November to April, bringing heavy flooding and increased flood risks with it; however, floods can happen at any time. Many of the most significant floods and storms have been associated with unusually warm temperatures in the equatorial Pacific known as El Niño. Table 3-12 summarizes El Niño periods since 1900.

Table 3-25: El Niño Periods Since 1900

El Niño Periods Since 1900				
1902-1903	1905-1906	1911-1912	1914-1915	1918-1919
1923-1924	1925-1926	1930-1931	1932-1933	1939-1940
1941-1942	1951-1952	1953-1954	1957-1958	1965-1966
1969-1970	1972-1973	1976-1977	1982-1983	1986-1987
1991-1992	1994-1995	1997-1998		

In February 1969, the Laguna Woods area was affected by one-half inch of rain one day, over five inches of rain the next day, and over six inches of rain the next day. The local newspaper at the time (the *Leisure World News*, 2/20/1967), wrote that "Aliso Creek, normally a placid stream, is hurtling through its channels, causing erosion damage to the sides of the creek bed. The debris caught in its tide, plus the accompanying roar, has attracted residents to view its course along the way."

In December 1997, an El Niño storm brought eight inches of rain to the Laguna Woods area. Dozens of residents were displaced from their homes until repairs could be made. The *Los Angeles Times* (12/17/1997) described the damage as primarily affecting walls, floors, kitchen cabinets, and personal property. Total damage to the gated community of Laguna Woods Village (formerly Leisure World Laguna Hills) was estimated at $700,000 according to an article that appeared in the *Leisure World News* (1/15/1998). 364 residents reported wet carpeting, of which 96 were considered by the property manager to have "major" damage. The most significant private property damage appears to have been in the vicinity of Laguna Woods Village cul-de-sacs 67 and 204 (Building 2014, in particular). Flooding also occurred on El Toro Road and Moulton Parkway.

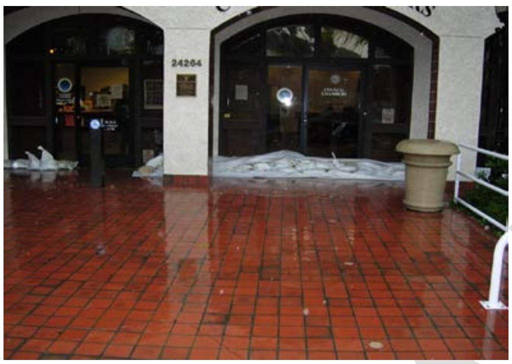
In January 2010, the City was affected by a series of severe storms (California Disaster Assistance Act #2010-02) that caused approximately $50,000 worth of damage to City property and resulted in substantial flooding. The following is an account of City impacts:

> The storms that hit Southern California starting on Tuesday, January 19 and continuing through Friday, January 22, caused some damage in the City's public rights of way. On El Toro Road, just east of the St. Nicholas Catholic Church, flooding started with the intense rains midday on Tuesday, causing water levels to rise four feet above grade between Laguna Woods Village walls in this area. Five vehicles were caught in the flood and later had to be towed. At the same time, the intersection of El Toro Road and Moulton Parkway partially flooded and two vehicles stalled and were towed from that area. The heavy rains overwhelmed the storm drains in the area and El Toro Road eastbound was closed for several hours with the help of the Sheriff's Department. County of Orange maintenance crews started working Tuesday evening to clear debris and silt from the road to allow one, and later all three, eastbound lanes to reopen.
>
> Rain continued Tuesday night and all day Wednesday, causing less severe flooding on El Toro Road eastbound. It was discovered that water, seeking an escape, had swept away soil above and just north and east of the boxed culvert tunnel under El Toro Road that serves as a flood control channel and golf cart path. An area fifty feet in length and eight to ten feet under the roadway became void; there was no support under the road, which was held in place due to the structural integrity of the boxed culvert tunnel. Once identified, the two westbound lanes closest to the curb were closed using traffic control set up by County of Orange crews. As the rains continued, sometimes intensively, the potential for further flooding eastbound and the possibility of more instability of the roadway became a concern and El Toro Road, from Moulton Parkway to Paseo de Valencia Wednesday night, was closed starting at approximately 7 p.m. Staff used Blackboard Connect mass notification system to provide notice of the closure.
>
> Staff, the City Engineer and County of Orange engineers met on Thursday morning and devised a fix for the El Toro Road void. Later the same day, County of Orange crews created a sandbag wall outside and around the voided area and started layering in slurry, a mixture of cement and sand, to replace the soil. The work was completed around 8:30 p.m. and set overnight. After an

inspection by staff and the City Engineer, as well as roadbed density tests by the County of Orange using a sonar-type device, El Toro Road eastbound and westbound was reopened at 11 a.m. on Friday. Another Blackboard Connect call notified residents/businesses of the reopening.

Additional testing found a similar six foot by three foot void in front of the Lutheran Church of the Cross, adjacent to the curb. This void did not present an immediate danger of collapse and was filled by County of Orange crews.

Throughout the storm, City Hall experienced water intrusion and flooding, particularly in the parking lot area and along the western side of the building.



Sandbags were used to hold back rising water in front of the entrances to City Hall and the City Council Chambers

Water intrusion affected the emergency communications room at City Hall (located on the other side of this wall)

The December 2010 storms also caused severe flooding on private property in the vicinity of Laguna Woods Village Clubhouse 3 and cul-de-sac 67, as well as in certain buildings off of Via Mariposa West. Laguna Woods Village called for evacuations of certain affected buildings and encouraged residents not to use carports prone to flooding.

Photographs courtesy of the Laguna Woods Village

Looking north across Calle Aragon toward the Laguna Woods Village Clubhouse 3 parking lot

A carport in Laguna Woods Village cul-de-sac 67 flooded during the December 2010 storms

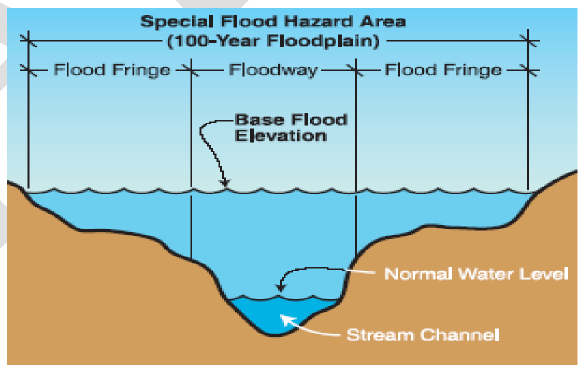
Water levels in Aliso Creek rose during the December 2010 storms. Downstream of the City, Laguna Beach suffered extensive losses with more than 90 homes and 70 businesses damaged and 25 people requiring rescue from their homes or vehicles.

Between December 17, 2010 and January 4, 2011, the City was affected by a series of severe storms (California Disaster Assistance Act #2010-17) that caused approximately $5,000 worth of damage to City property and resulted in substantial flooding. All City-owned properties were affected. City Hall experienced water intrusion and flooding. The State of California's Laguna Woods Damage Survey Report notes the following:

> As a result of severe winter storms... flooding, debris and mudflows during the heavy rains saturated City streets and the underlying road base, which resulted in street surface asphalt failures. The flooding also eroded slopes adjacent to the streets and required sandbagging to prevent further erosion. The storm event caused the need for safety inspections to be made for damage assessment. These conditions created an immediate threat to public health, life and safety for the reason that public and emergency vehicles were unable to navigate these portions of the roadway.

National Flood Insurance Program

The City joined the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP) in 2004. In exchange for adopting, updating, and enforcing certain ordinances designed to reduce the risk of flooding, federally backed NFIP flood insurance policies are offered to the City's homeowners, renters, and business owners. NFIP policies protect against flood-related losses not covered by standard homeowners insurance. As of April 11, 2012, there were 13 active NFIP policies in the City. No NFIP insured structures within the City have been repetitively damaged by floods.



Flood Rate Insurance Maps (FIRMs) are used to show the areas in the City that are subject to flooding and the risk associated with these flood hazards.

Special Flood Hazard Areas (SFHAs) are areas shown on FIRMs with a 1-percent or greater chance of flooding in a given year. SFHAs are sometimes referred to as the 1-percent annual chance floodplain, 100-year floodplain, or base floodplain. SFHAs are further organized by zones reflecting additional hazards, protections, or base flood elevation information. The City has both Zone A and Zone AE SFHAs.

Base flood elevations are the computed elevations to which floodwater is anticipated to rise during the 1-percent annual chance flood event. The relationship between the base flood elevation and a structure's elevation determines the NFIP insurance premium.

Zone A SFHAs are areas subject to inundation by the 1-percent annual chance flood event determined using approximate methodologies. Base flood elevations and flood depths are not shown because detailed hydraulic analyses have not been performed. Flood insurance – either NFIP or otherwise – is mandatory.

Zone AE SFHAs are areas subject to inundation by the 1-percent annual chance flood event determined by detailed methods. Base flood elevations derived from detailed hydraulic analyses are shown at selected intervals in Zone AE with areas subdivided into elevation zones. Flood insurance – either NFIP or otherwise – is mandatory.

Map 3-12: Special Flood Hazard Areas

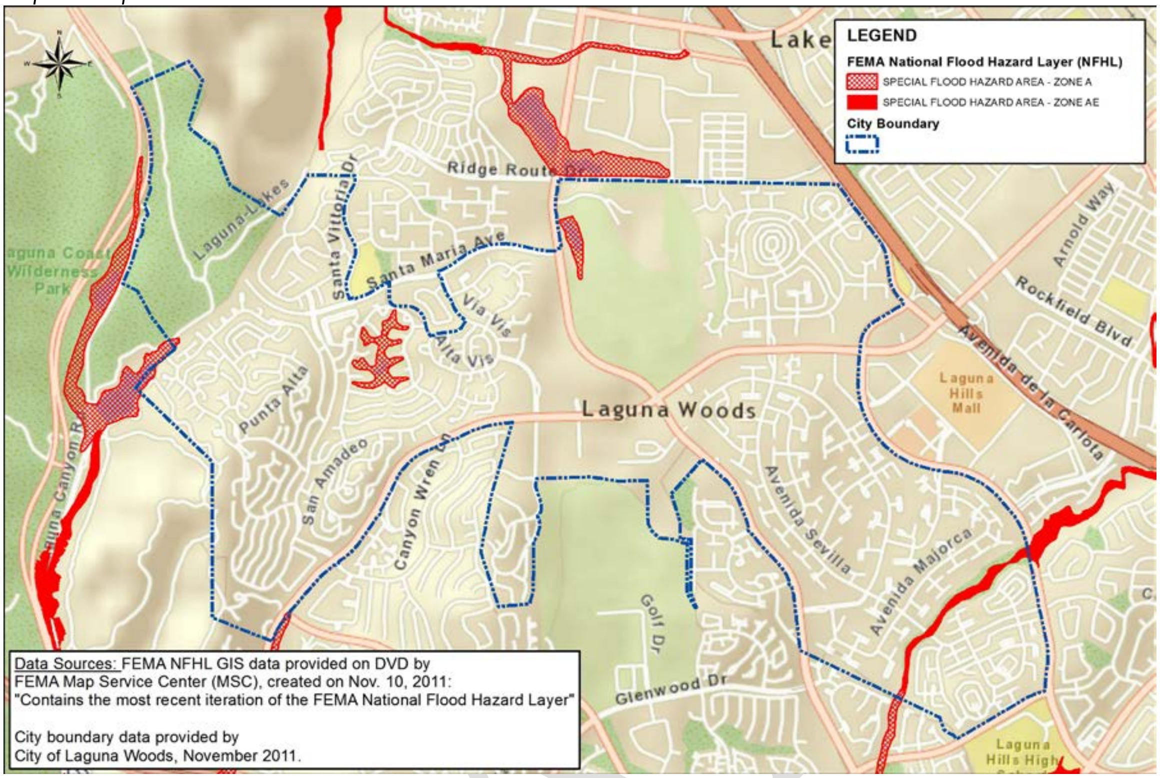


Table 3-26: Known Special Flood Hazard Area Susceptibility

Affected	*Estimate*	*Affected*	*Estimate*
Zone A	18.32		
Zone AE	10.82		
Inclusion of General Plan Land Use Categories			
Residential	Yes	Commercial	No
Community Facilities	No	Open Space	Yes
Urban Activities Center	No		
Inclusion of City-owned Infrastructure			
City Hall	No	El Toro Road	No
Moulton Parkway	No	Santa Maria Avenue	No
Traffic Signals	No	Storm Drain System	No
City Centre Park	No	Ridge Route Park	No
Woods End Park	No	Laguna Laurel	No

In addition to SFHAs, FIRMs also include other areas determined to be at lesser risk for flooding. All areas in the City, with the exception of SFHAs, are currently designated as Zone X (shaded) or Zone X (unshaded). Shaded areas are areas of moderate risk, while unshaded areas face minimal risk of flooding typically above the 500-year flood level. Flood insurance – either NFIP or otherwise – is voluntary in Zone X.

Map 3-13: Zone X Flood Risk Areas

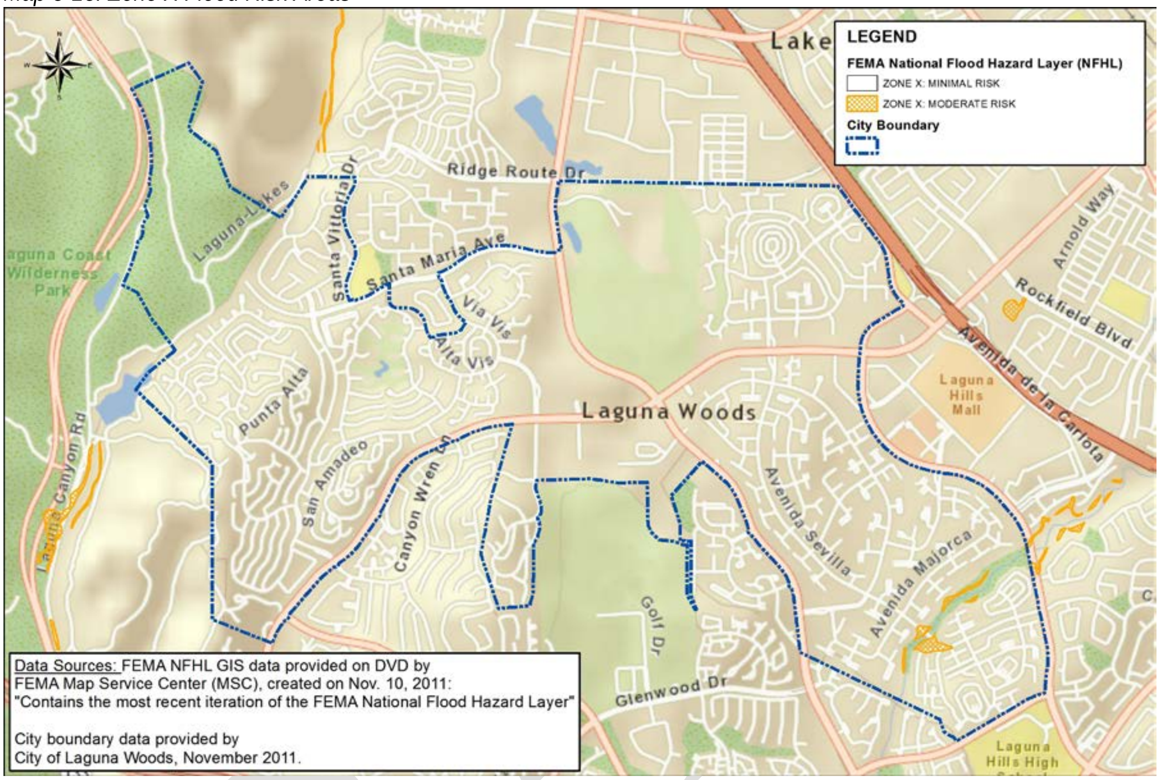


Table 3-27: Zone X Flood Risk Area Susceptibility

Affected	*Estimate*	*Affected*	*Estimate*
Zone X (Minimal)	2,110.24		
Zone X (Moderate)	4.76		
Inclusion of General Plan Land Use Categories			
Residential	Minimal/Moderate	Commercial	Minimal
Community Facilities	Minimal	Open Space	Minimal/Moderate
Urban Activities Center	Minimal		
Inclusion of City-owned Infrastructure			
City Hall	Minimal	El Toro Road	Minimal
Moulton Parkway	Minimal	Santa Maria Avenue	Minimal
Traffic Signals	Minimal	Storm Drain System	Minimal
City Centre Park	Minimal	Ridge Route Park	Minimal
Woods End Park	Minimal	Laguna Laurel	Minimal

The flood hazard and risk information presented on FIRMs is the result of engineering studies performed by engineering companies, other Federal agencies, or communities, which are reviewed for compliance with FEMA guidelines and approved by FEMA. While FEMA uses the most known and accurate flood hazard information available, there are often unavoidable limitations of scale or topographic definition in the source maps used to prepare FIRMs. As a result, there may be “inadvertent inclusions” in SFHAs [e.g., in 2011, the City identified an area off of Bahia Blanca West as having been inadvertently included in a SFHA. City staff worked with FEMA to complete a Letter of Map Revision (11-09-2148P) that removed the area from the SFHA based on new topographical data.].

Although most local governments rely exclusively on FIRMs to characterize their risk of flooding, there are some flood-prone areas that are not mapped but remain susceptible to flooding. The City recognizes that those areas include the areas of historic flooding described earlier in this Section, as well as of yet unidentified areas.

El Toro Water District Facilities

The failure of any of the following El Toro Water District (ETWD) facilities could cause localized flooding within the City. ETWD provides water and wastewater services for the entirety of the City, as well as portions of surrounding cities.

- Four reservoirs (water tanks) with a total maximum capacity of 10 million gallons of potable water. Two of the reservoirs (R-1 and R-2) are located northwest of the intersection of El Toro Road and Moulton Parkway and two of the reservoirs (R-3 and R-4) are located in the gated community of Laguna Woods Village.
- Rossmoor #2 (Effluent Holding Pond), a dam/reservoir located southeast of the interesection of Moulton Parkway and Ridge Route Drive. Rossmoor #2 is in a Zone A SFHA and not subject to State dam inundation mapping regulations.
- Veeh Reservoir, which is located in the City of Laguna Hills immediately north of the City and Rossmoor #2. Veeh Resevoir is in a Zone A SFHA.

Moulton Niguel Water District Facilities

The Moulton Niguel Water District (MNWD) owns and operates a reservoir (water tank) in the City of Aliso Viejo just south of the intersection of El Toro Road and Aliso Creek Road. It is conceivable that failure of the reservoir could cause flooding on El Toro Road and in the lower portions of Woods End Wilderness Park.

Hazus-MH for Flood Modeling

Hazus-MH is the Federal Emergency Management Agency’s (FEMA) methodology for estimating potential losses from disasters. It is a nationally applicable and standardized software modeling program that estimates the physical, economic, and social impacts of earthquakes, floods, and hurricanes based on scientific and engineering knowledge.

This Plan uses Hazus-MH as both a means of estimating loss and visualizing the spatial impacts of floods. In total, two planning scenarios were analyzed, one for the 100-year flood event and one for the 500-year flood event.

- *STEP 1: Identification of Hazus Analysis Level*

Hazus-MH provides three levels of analysis based on the amount of locally available information. This Plan uses a Level 1 Analysis Level, which is a basic estimate of losses produced with national databases and expert-based analysis parameters included in the Hazus-MH software. This is commonly referred to as an "out-of-the-box" or "default" loss estimate. The following local datasets were added to enhance loss estimation:

- ServiceSoil Survey Geographic database for Orange & Western Part of Riverside Counties, California. United States Department of Agriculture, Natural Resources Conservation. Beginning Date: 1999-04-29, Ending Date: 2008-01-03.
- Topographic map with 25-foot contour lines provided by the City Engineer. Based on aerial mapping conducted in 2002.
- National Flood Hazard Layer. Federal Emergency Management Agency. Issued October 18, 2011 and reflecting a Letter of Map Revision effective May 31, 2011 (Case No. 11-09-2148P) updating topographical data in the Bahia Blanca area.

Hazus-MH Level 1 Analysis is limited by its predominant reliance on national databases, as opposed to more specific local datasets. Recognizing these limitations, STEP 4 below details the estimations selected for inclusion in this Plan.

Hazus-MH analysis was performed using ESRI ArcGIS software version 9.3, Build 1850, ArcInfo license level. ESRI ArcGIS Spatial Analyst Extension was used to process the United States Geological Survey's Digital Elevation Models (DEMs).

- *STEP 2: Identification of Flood Planning Scenarios*

Hazus-MH allows for flood planning scenarios based on 100-year return intervals. 100-year and 500-year probabilistic flood events were analyzed in relation to the City.

Please note that both planning scenarios are based on the Federal Emergency Management Agency's Flood Rate Insurance Maps (FIRMs) and are limited to modeling within established floodplains. The City recognizes that other areas of the City may be flood-prone, but not included on FIRMs. At this point, use of the FIRMs for Hazus-MH modeling represents the best available information.

- *STEP 3: Production of Building Damage Maps*

Building damage maps were developed for both of the flood planning scenarios. Due to the aforementioned limitations of Hazus-MH Level 1 Analysis, the information has been generalized to reflect areas of the City likely to be subject to some level of damage as a result of flooding. Within those areas, the exact level of damage is unknown.

- *STEP 4: Inventory of Estimated Losses*

An inventory of estimated losses was compiled for both of the flood planning scenarios. The use of Census block level data could cause the estimates contained in this Plan to overestimate potential impacts; however, for the planning purposes for which they are used, there are no significantly negative or detrimental implications.

- Debris Generation and Removal – For planning purposes, Hazus-MH estimates for debris generation and removal are viewed as the best available data as little research has been done on the national or state levels to develop more exact methodologies. The following estimates are provided in this Plan:
  - Total amount of debris generated in tons
  - Finishes (drywall, insulation, etc.) as a percent of the debris generated
  - Structures (wood, brick, etc.) as a percent of the debris generated
  - Foundations (concrete, rebar, etc.) as a percent of the debris generated
  - Total truckloads required to remove the debris generated (a truckload is calculated as having an individual carrying capacity of 25 tons)
- Shelter Requirements – Estimates of the number of households displaced from their homes are included in this Plan. A non-Hazus-MH calculation based on the 2010 Census figure of 1.42 for the average household size is also included.

Hazus-MH Flood Planning Scenario #1: 100-Year Flood within FEMA Floodplains

Map 3-14: 100-Year Flood Planning Scenario Building Damage

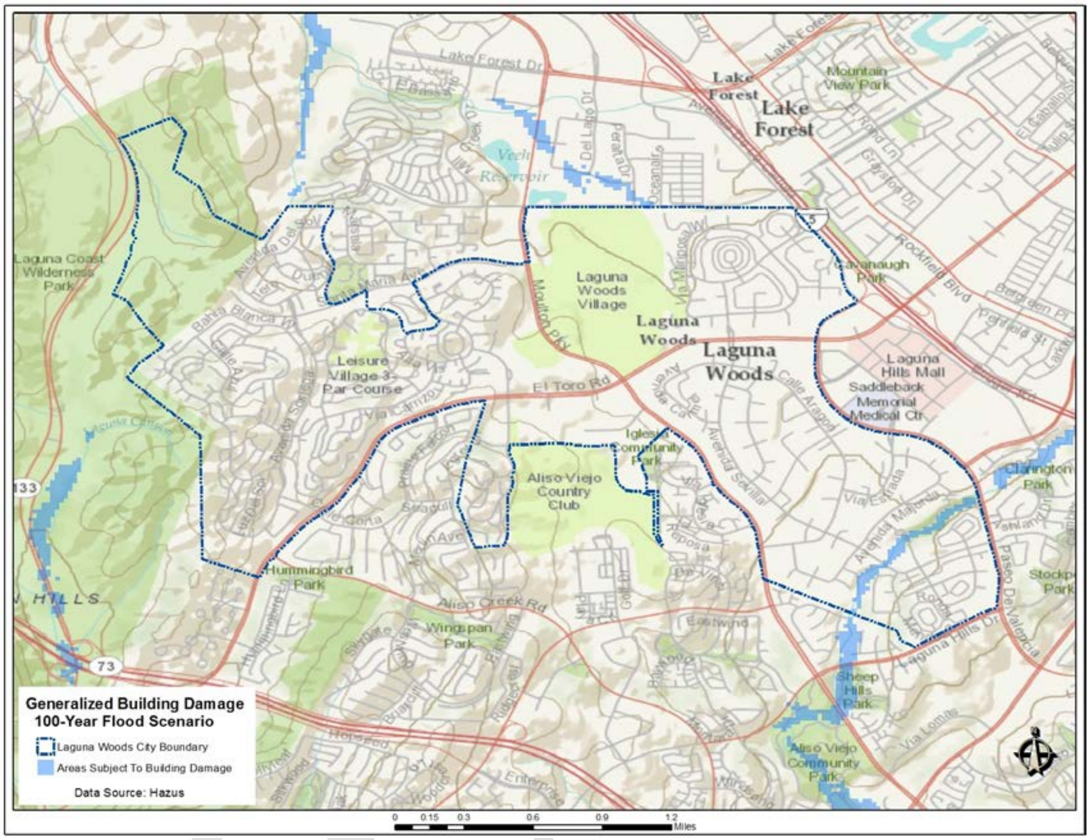


Table 3-28: 100-Year Flood Planning Scenario Debris and Shelter Estimates

Measure	*Estimate*
Debris Generation and Removal	
Total Amount of Debris Generated	661 tons
Finishes (dry wall, insulation, etc.) as a Percent of the Debris Generated	100
Structures (wood, brick, etc.) as a Percent of the Debris Generated	0
Foundations (concrete, rebar, etc.) as a Percent of the Debris Generated	0
Truckloads Required to Remove the Debris Generated	26 (@ 25 tons/truck)
Shelter Requirements	
Total Number of Displaced Households	64
Total Number of Displaced Residents	91

Hazus-MH Flood Planning Scenario #2: 500-Year Flood within FEMA Floodplains

Map 3-15: 500-Year Flood Planning Scenario Building Damage

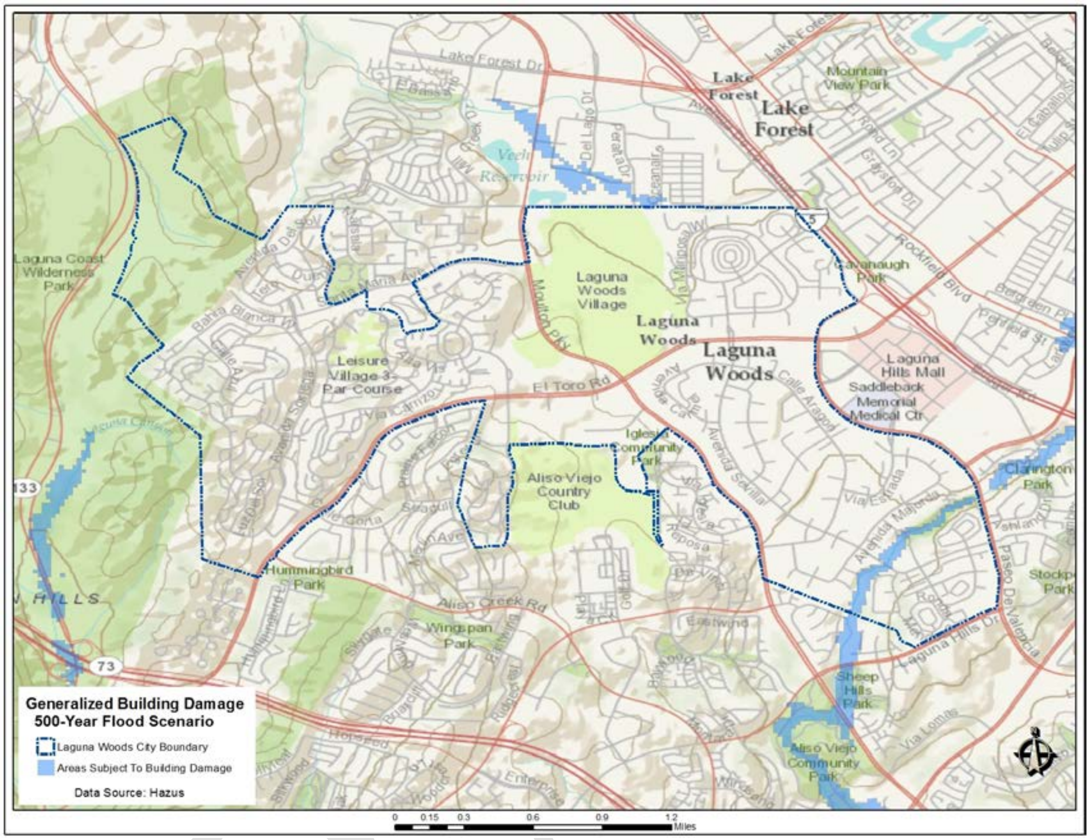


Table 3-29: 500-Year Flood Planning Scenario Debris and Shelter Estimates

Measure	*Estimate*
Debris Generation and Removal	
Total Amount of Debris Generated	1,205 tons
Finishes (dry wall, insulation, etc.) as a Percent of the Debris Generated	72
Structures (wood, brick, etc.) as a Percent of the Debris Generated	16
Foundations (concrete, rebar, etc.) as a Percent of the Debris Generated	0
Truckloads Required to Remove the Debris Generated	48 (@ 25 tons/truck)
Shelter Requirements	
Total Number of Displaced Households	72
Total Number of Displaced Residents	103

3.1.11. EXTREME HEAT

Extreme heat is considered to pose a moderate risk to the City with medium impact and medium probability. Extreme heat could result in loss of life, personal injury, economic loss, and property damage.

According to the California Climate Change Strategy (2009), climate change is expected to lead to increases in the frequency, intensity, and duration of extreme heat events and heat waves in California. There is no universal definition of an extreme heat event (i.e., heat wave) since it depends on the locale, but in most parts of the U.S. [including Laguna Woods], three days over 90° Fahrenheit is considered a heat wave. Extreme heat events can also be defined as temperatures that rise to the highest 10 percent of all temperatures that were recorded during the summer months from 1961- 90 in a given locale. Heat waves can be characterized by above-normal averages, or maximum daily temperatures, which may be accompanied by higher nighttime minimum temperatures.

There is evidence of a trend in heat waves in California toward higher nighttime (i.e., higher minimum) temperatures as compared with the historical record, with daytime maximum temperatures being more similar to past heat waves. Higher nighttime temperatures mean there is less chance for people to physiologically recover and cool off, and for the built environment to cool; this contributes to continued heat stress overnight and compounds the effects of high temperatures the following day. In 2006, a ten-day heat wave set multiple records, including maximum daily and minimum overnight temperatures, leading to 140 deaths from heat exposure according to county coroners. A more accurate analysis estimated 655 excess deaths during the heat wave. More heat waves of similar length and intensity are expected to occur on an annual basis by the end of the century if the world follows a higher GHG emissions (A2) pathway.

The anticipated increase in heat waves is expected to increase mortality in California, although further modeling is required to more accurately estimate the magnitude of likely increased deaths. Over the past 15 years, heat waves have claimed more lives in the state than all other declared disaster events combined. This trend is likely to continue as the number of heat waves increase, and thereby lead to potentially hundreds of climate-related fatalities every year. Even though coastal areas will not see the greatest increases in average temperature, the largest increases in mortality rates are expected to occur in coastal cities such as Los Angeles and San Francisco, since these populations are relatively unaccustomed to extreme heat and thus less acclimatized when such events occur (e.g., less adequate access to air conditioning).

Heat waves can exacerbate higher occurrence of chronic disease or heat related illness. Compared to baseline conditions, there were 16,166 excess emergency room visits and 1,182 extra hospitalizations linked to the July 2006 heat wave throughout California. As record breaking heat waves occur more frequently in California, excess morbidity will also increase during the summer months. This will require greater preparedness by health care providers and facilities, and will place a strain on California's health care system. Heat waves also necessitate an increase in energy use for cooling and air conditioning, which can lead to electricity shortages and blackouts. A reduction in energy availability can further impact public health by limiting access to air conditioning and refrigeration which can increase the risk of food-borne illnesses.

3.1.12. WATER SHORTAGES

Water shortages are considered to pose a moderate risk to the City with medium impact and medium probability. Water shortages could result in loss of life, personal injury, economic loss, and property damage.

Water shortages (or, "droughts") are a gradual phenomenon, occurring slowly over multi-year periods and increasing with the length of dry conditions. The severity of the drought depends upon the degree of moisture deficiency, as well as the duration and size of the affected area. In an article titled *Understanding the Drought Phenomenon: The Role of Definitions* (1985), researchers from the University of Nebraska and National Center for Atmospheric Research categorized droughts in the following manner:

- **Meteorological** – Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some "normal" or average amount) and the duration of the dry period.

- **Agricultural** – Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced groundwater or reservoir levels, and so forth.

- **Hydrological** – Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (i.e., streamflow, reservoir and lake levels, groundwater).

- **Socioeconomic** – Socioeconomic definitions of drought associate the supply and demand of an economic good with elements of meteorological, hydrological, and agricultural drought.

Droughts may also occur as a result of regulatory conditions that reduce the availability of water through legislative or judicial restrictions on diversion and export.

<u>Local Water Shortage Conditions</u>

The El Toro Water District, which provides potable water for the City of Laguna Woods, and Southern California, in general, relies extensively on imported water. A significant percentage of water in Southern California is imported from other regions (e.g., Colorado River and Northern California) via aqueducts. Correspondingly, droughts can be caused or made worse by conditions in the regions at which the water originates.

In February 2009, Governor Schwarzenegger issued a proclamation declaring a state of emergency because California was experiencing its "third consecutive critically dry year, and severe drought is ravaging the State's physical, social, and economic landscape." That proclamation followed a declaration of a statewide drought in 2008 and lasted for more than two years until statewide water supplies stabilized in March 2011.

3.1.13. HAZARDOUS MATERIALS INCIDENTS

Hazardous materials incidents are considered to pose a low to moderate risk to the City with low impact and medium probability. Incidents could result in loss of life, personal injury, economic loss, and property damage.

Section 25501(p) of the California Health & Safety Code defines a "hazardous material" as "any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment."

Local Hazardous Material Conditions

Hazardous materials are generated, used, and stored by facilities throughout California and Orange County. According to the Orange County Fire Authority's HMSS Business Chemicals Inventory (8/27/2012), 27 such facilities are located in the City.

The majority of the hazardous materials in the City are associated with relatively low risk, small scale operations, including vehicle fueling and service stations, power generators, pools, garment cleaners, and maintenance yards. Common materials include diesel fuel, chlorine, flammable waste, fuel waste, radiator coolant, ethylene glycol, pesticides, paint thinner, non-halogenated solvents, slop oil, toxics, and petroleum distillant solvents. The City does not contain the types of industrial uses that typically result in larger amounts of hazardous materials, nor is heavy industry located in adjoining areas of other cities.

Hazardous materials are also transported throughout California and Orange County, with the largest amount of transportation occurring along the State's interstate highway under the regulatory authority of the California Highway Patrol. Interstate 5 and State Route 73 (Toll Road) are located a short distance from the City and pose some level of risk in the event of traffic collisions or other conditions that result in a release.

Comprehensive Environmental Response, Compensations, and Liability Act (CERCLA), Emergency Planning and Community Right-to-Know Act (EPCRA), and California law require responsible parties to report hazardous material releases if certain criteria is met. Historical spills in the City are summarized in Table 3-30.

Table 3-30: Cal EMA Historical HazMat Spill Notifications in 2010 and 2011

Date	*Responsible Party*	*Location*	*Description*	*Quantity (gal)*
2/1/2010	El Toro Water District	Moulton Parkway	Reclaimed water	28,000
8/30/2010	Southern California Edison	Bahia Blanca	Mineral oil	2
8/30/2010	Southern California Edison	Bahia Blanca	Mineral oil	2
9/1/2010	Southern California Edison	Bahia Blanca	Mineral oil	2
9/1/2010	Southern California Edison	Bahia Blanca	Mineral oil	2
12/22/2010	El Toro Water District	Ridge Route Drive	Sewage	4,600
1/5/2011	Irvine Ranch Water District	El Toro Road	Secondary treated water	6,000

3.1.14. LANDSLIDES

Landslides are considered to pose a low to moderate risk to the City with low impact and medium probability. Landslides could result in loss of life, personal injury, economic loss, and property damage.

According to the State of California's Hazard Mitigation Plan (2010), a landslide is the breaking away and gravity-driven downward movement of hill slope materials, which can travel at speeds ranging from fractions of an inch per year to tens of miles per hour depending on the slope steepness and water content of the rock/soil mass. Landslides range from the size of an automobile to a mile or more in length and width.

Local Landslide Activity

The City is prone to landslides, particularly in the areas identified on Map 3-4 (Section 3.1.5 of this Plan) as susceptible to earthquake-induced landslides. Those areas include public and private property, roadways, and commercial and residential zoning districts.

The most significant landslide in the recorded history of the City occurred in 2004 when a slope between Calle Sonora and the Home Depot Shopping Center failed. The slide resulted in substantial property damage, including temporary disconnection of vehicle and pedestrian traffic into the Laguna Woods Village Gate 14 neighborhood (Calle Sonora). An estimated 588 residents were impacted (based on 414 residential units and the 2010 Census figure of 1.42 for the average household size).

Photographs courtesy of the Historical Society of Laguna Woods

Looking north along Calle Sonora toward El Toro Road with the roadway damage visible at center-left (2004)

Looking southeast from the Home Depot Shopping Center with parking lot and slope damage visible (2004)

Present day. Looking southwest from the Home Depot Shopping Center (2012)

3.1.15. OTHER HAZARDS

The following hazards (airplane accidents, civil disturbances, and natural gas pipeline failures) are considered to pose low risk to the City with low impacts and probabilities. Each could result in loss of life, personal injury, economic loss, and property damage.

Airplane Accidents

On Saturday, January 22, 1967, two Marine Corps Skyhawk attack jets en route to the former Marine Corps Air Station - El Toro, just north of the City, collided and crashed into what is today Laguna Woods Village Buildings 272 and 281. One of the two pilots and five residents were killed in the crash, which left many others injured and frightened.

Photographs courtesy of the Historical Society of Laguna Woods

Looking between Laguna Woods Village Buildings 272 and 281 toward the location of the crash

Looking down at the location of the crash from a balcony on Laguna Woods Village Building 280 (one day after)

Marine Corps Air Station - El Toro was decommissioned in 1999 and has since been converted to housing and recreational uses, including the Orange County Great Park. The City is not a part of any regular commercial flight paths and, as such, the only risk posed by airplane accidents comes from occasional commercial flight path diversions and aircraft operated for personal use. The 1967 incident was the first and only airplane accident in the recorded history of the City, both pre- and post-incorporation.

Civil Disturbances

The spontaneous disruption of normal, orderly conduct and activities in urban areas, or the outbreak of rioting or violence of a large nature, is referred to as a civil disturbance. Civil disturbances can be spurred by specific events or result from long-term displeasure with authority. While the motivation behind civil disturbances may be known, the exact extent and type of activities that will occur is less certain. During civil disturbances, the potential for multiple incidents of varying scope is very high.

While there is no history of civil disturbance in the City, the City concurs with the Orange County Operational Area that the entire County is potentially vulnerable to the effects of civil disturbance. Government facilities, schools, religious institutions, gathering places (shopping centers, entertainment venues, etc.), medical clinics, power plants; utility infrastructure; and, financial institutions may be the location or motivating factor behind civil disturbances. Laguna Woods contains many of the aforementioned facilities and is located nearby a multitude of others.

Natural Gas Pipeline Failures

Map 3-16 shows the approximate locations of the natural gas transmission and high pressure distribution lines closest to the City. Transmission lines (shown in red) are large diameter pipelines that operate at pressures above 200 pounds per square inch (psi) and transport gas from supply points to the gas distribution system. High pressure distribution lines (shown in blue) are pipelines that operate at pressures above 60 psi and deliver gas in smaller volumes to the lower pressure distribution system. As a point of reference, the 2010 San Bruno Pipeline Explosion that killed eight and destroyed 38 homes in Northern California occurred on a pipeline operating at roughly 375 psi. The Southern California Gas Company operates no such lines in the vicinity of the City.

Map 3-16: Southern California Gas Company High Pressure and Transmission System