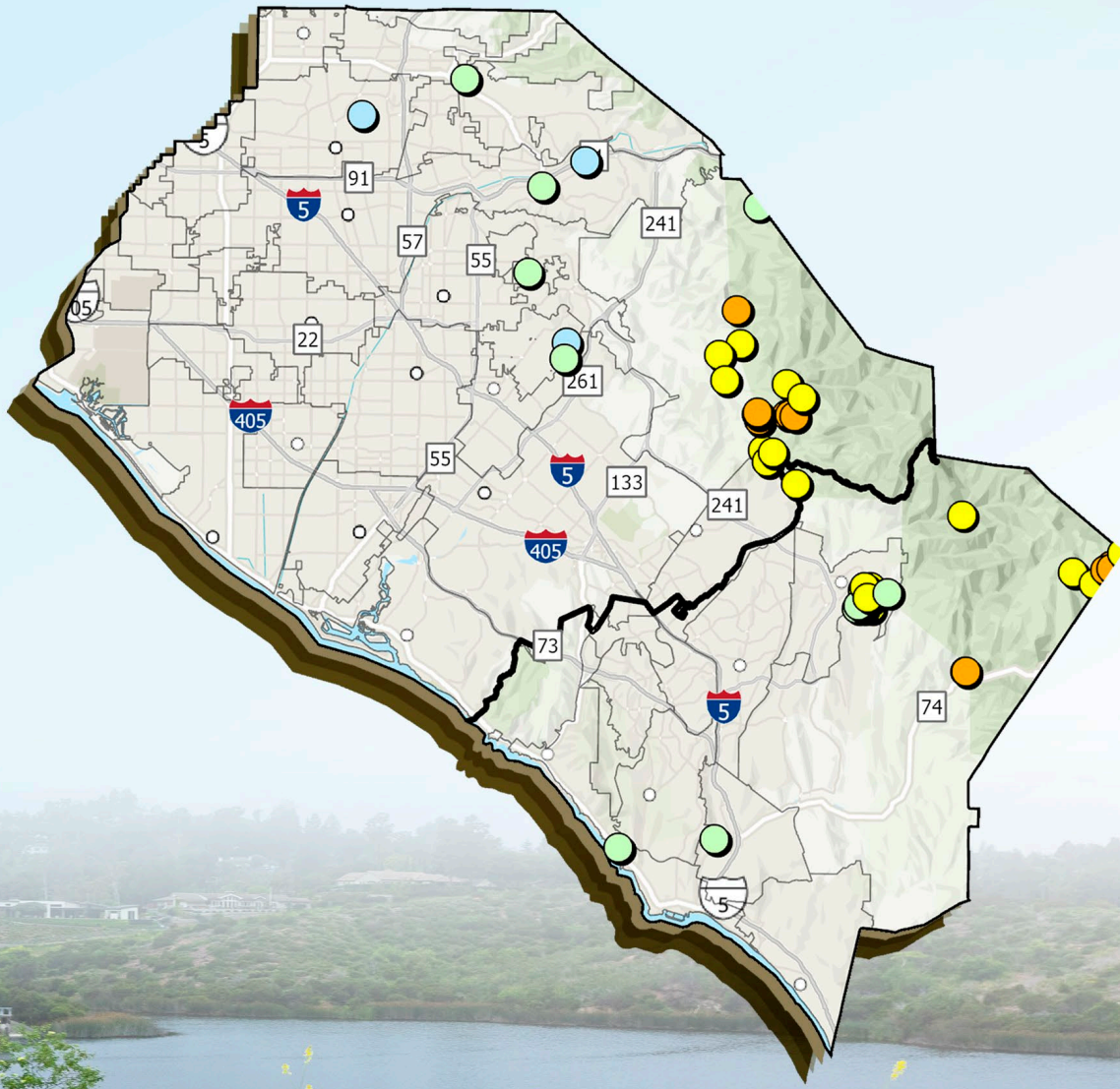
ORANGE COUNTY
Domestic Well Drought Resiliency Plan



PREPARED FOR:

601 N. Ross Street
Santa Ana, California 92701

PREPARED BY:

PACE
Advanced Water Engineering

17520 Newhope Street, Suite 200
Fountain Valley, California 92708

#C220
DECEMBER 2024
(REVISED – FEBRUARY 2025)

Table of Contents

Tables

Figures

1 Introduction

Senate Bill (SB) 552 requires each county in California to take steps to improve drought planning and preparedness for small water systems and rural communities, which have been identified as potentially vulnerable in the event of a water shortage, such as the drought that occurred in California from 2012 to 2016. Drought conditions are expected to intensify over the coming years, and small, rural communities are disproportionately affected when groundwater supplies begin to dwindle, leading to wells running dry and small water systems being compromised.

This Orange County Domestic Well Drought Resiliency Plan (DRP) has been prepared for the County of Orange (the County) in accordance with the requirements of SB 552 to identify vulnerable communities that rely on state small water systems (SSWS) or domestic wells, assess the risk of water shortage for each of these water sources, present short-term and long-term actions that can be implemented to help prevent catastrophic impacts to drinking water for these communities during an emergency and improve resiliency of local water resources.

The scope of a DRP is to address water shortage scenarios for SSWS and domestic wells. A SSWS is defined as a water system that provides piped water to the public for human consumption for at least 5, but not more than 14, service connections, and does not regularly serve drinking water to more than an average of 25 individuals daily for more than 60 days out of the year [Health and Safety Code (HSC) Section 116275(n)]. A domestic well is defined as a groundwater well used to supply water for the domestic needs of an individual residence or a water system that is not a public water system and that has no more than four service connections [HSC Section 116681(i), with equivalent definition in California Water Code (CWC) Section 1060951(k)].

The County itself is not a water supplier. Instead, multiple municipal agencies and water districts are responsible for providing drinking water to the county's residents, as described in further detail below. There are no SSWS currently operating within the County, and very few residences are dependent on domestic wells. Therefore, the scope of this plan extends to only a small fraction of County residents, and the potential emergency responses described herein are not directly managed or implemented by the County.

1.1 Plan Structure

This DRP follows the suggested organization outlined in the *County Drought Resilience Plan Guidebook* (Guidebook) developed by the California Department of Water Resources (DWR 2023). The remaining sections in this DRP are as follows:

- **Section 2** describes the County Drought Task Force or alternative process to facilitate drought and water shortage preparedness for SSWS and domestic wells.
- **Section 3** provides an overview of the approach, data used, and results of the drought and water shortage risk assessment.
- **Section 4** presents immediate actions that the County suggests to take in response to water shortage events in vulnerable communities.
- **Section 5** presents long-term actions that will be proposed for implementation to secure reliable water supplies for vulnerable communities.
- **Section 6** discusses considerations for coordinating implementation of this plan with stakeholders.

1.2 Scope of Issue

The County has minimal reliance on domestic well water, with only 59 domestic wells identified within its boundaries. While the exact number of residents depending on these wells for potable water use has not been determined, many of these wells are located near existing water distribution infrastructure, suggesting that alternative water sources are readily available. Furthermore, there are currently no SSWS within Orange County borders, reinforcing the limited role of domestic wells in the overall water supply. Given this very low dependence on domestic well systems, their impact on drought resiliency is negligible, and the County remains well-positioned to maintain water reliability even during drought conditions.

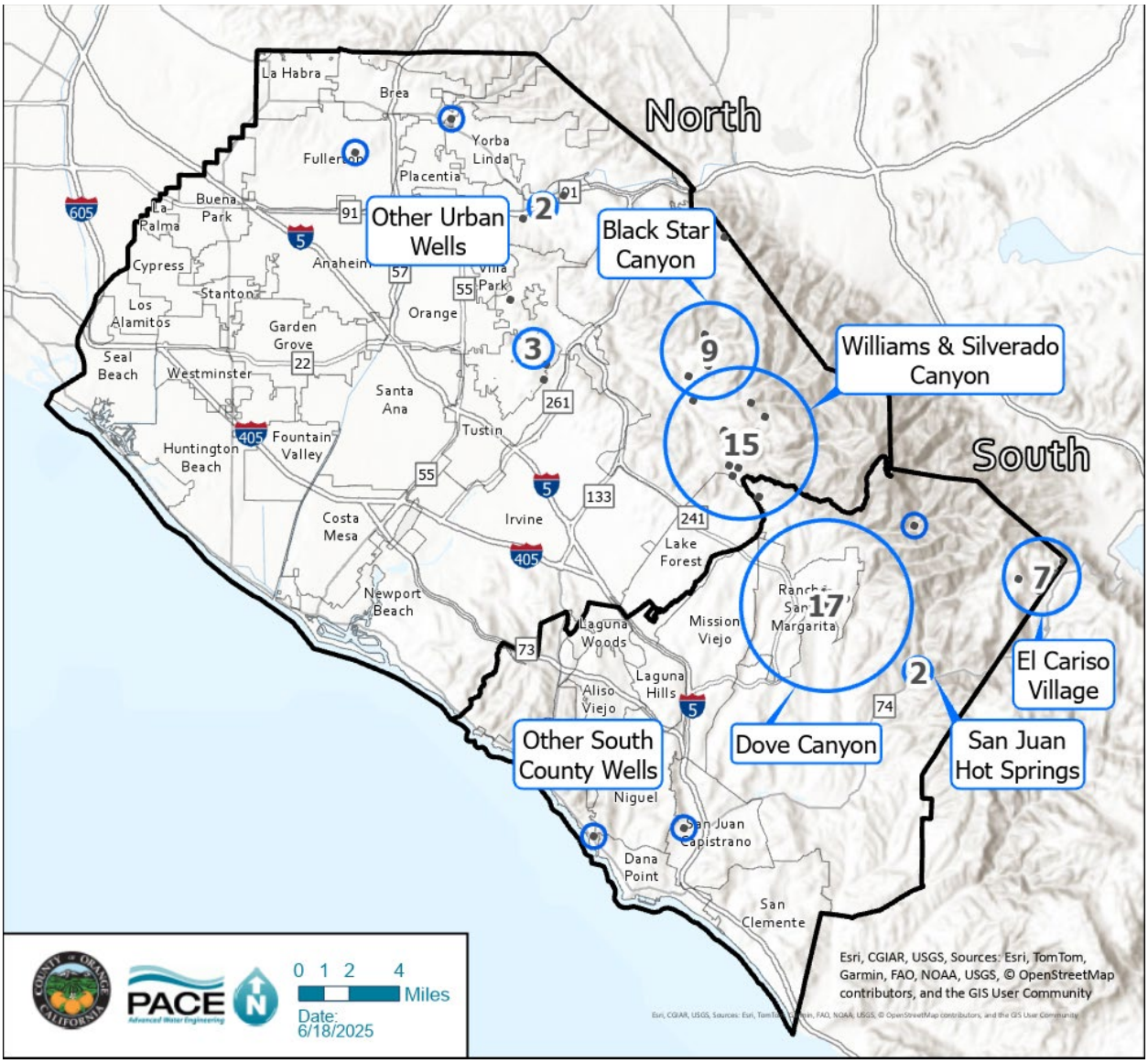


Figure 1-1: Domestic Well Distribution Throughout Orange County

1.3 County Description

1.3.1 Geography and Demographics

Orange County is in Southern California, bordered by Los Angeles County to the north, San Bernardino and Riverside Counties to the northeast, and San Diego County to the southeast. It encompasses 34 cities, including prominent areas such as Anaheim, Irvine, and Newport Beach.

As of recent estimates, the population of Orange County is approximately 3.2 million, making it the third most populous county in California. The region is diverse, with significant Hispanic, Asian, and Caucasian communities contributing to its cultural and economic fabric. The County is a hub for tourism, technology, education, and healthcare, with major attractions like Disneyland, Knott's Berry Farm, and the extensive Pacific coastline.

Figure 1-2: Orange County Vicinity Map

1.3.2 Hydrology

Orange County is divided into two primary hydrologic regions: the North Orange County Region and the South Orange County Region. The division generally follows the natural topography, with the San Joaquin Hills and other ridgelines marking the boundary between the two regions.

Figure 1-3: Orange County Hydrology

1.3.2.1 North Orange County Region

The North Orange County Region includes several waterbodies, with the largest being the Santa Ana River, which originates in the San Bernardino Mountains and flows through Riverside and San Bernardino Counties before being impounded behind Prado Dam at the border of Orange County near Yorba Linda. River flows are generally limited to managed releases from Prado Dam, which are captured for groundwater recharge, and high flow storm events that flow southwest to discharge into the Pacific Ocean in Huntington Beach. The region is highly urbanized, with an extensive storm drain and flood control system including smaller waterbodies and channels such as Coyote Creek, Carbon Creek, and Fullerton Creek which are part of the San Gabriel River watershed. A smaller hydrologic unit within the North Orange County Region is the Newport Bay watershed.

The Newport Bay Watershed encompasses an area of approximately 154 square miles with overland flows draining toward the Pacific Coast into Newport Bay. The watershed is bounded in the northeast by the Loma Ridge Foothills and the Santa Ana Mountains. The San Joaquin Hills bound the southern edge. Between the Santa Ana Mountains and the San Joaquin Hills lies the flat, alluvial Tustin Plain. The lowest area of this plain is the historical location of the “Swamp of the Frogs”. Runoff originating in the northern hills now flows south through flood control channels, into the San Diego Creek Channel, through the Tustin Plain, and then into Upper Newport Bay. On the other side of the San Joaquin Hills is the Newport Coast Watershed, which consists of a series of coastal canyons that drain directly to the ocean.

Groundwater is a significant water resource in North Orange County, supported by the Orange County Groundwater Basin, which provides a substantial portion of the region's potable water supply. The region is home to the Groundwater Replenishment System (GWRS), the world's largest indirect potable reuse project, which recycles treated wastewater to augment groundwater supplies. The GWRS is managed by Orange County Water District (OCWD) and Orange County Sanitation District (OCSD). This provides a reliable supply of water that is locally controlled, potentially reducing the impact when a drought occurs.

1.3.2.2 South Orange County Region

The South Orange County Region is characterized by a more natural hydrologic setting with smaller, more ephemeral streams and limited groundwater resources. In this region, the San Juan Hydrologic Unit (SJHU) comprises six watersheds they are San Juan Creek, Aliso Creek, Laguna Coastal Streams, San Clemente Coastal Streams, Dana Point Coastal Streams, and San Mateo Creek, which drain to the foothills and flow toward the Pacific Ocean. Though the South Orange County Region lacks a significant groundwater basin, it contains two smaller groundwater basins, the San Juan Valley Groundwater Basin and the San Mateo Groundwater Basin, making it more reliant on imported water supplies. This region experiences seasonal flows primarily occurring during winter storms.

South Orange County utilizes significant amounts of recycled water for irrigation, industrial processes, and certain environmental purposes. The recycled water primarily comes from tertiary-treated wastewater produced by regional wastewater treatment facilities.

1.3.3 Water Suppliers

Local potable water distribution systems within the County are operated and maintained by municipalities and special districts. These water suppliers and their service areas are shown in Figure 1-3.

Figure 1-4: Orange County Water Suppliers

2 County Drought and Water Shortage Task Force

Per the requirements of SB 552 and the California Water Code, the County must establish a task force or alternative process that will communicate and coordinate with representatives from state and local governments, groundwater sustainability agencies, community organizations, local water suppliers, and residents regarding the County's drought and water shortage preparedness plans. This section describes the role and operation of the Drought Task Force in Orange County.

2.1 Task Force Members

The Drought Task Force consists of several key members, each representing various agencies and organizations dedicated to addressing water scarcity issues within Orange County.

The County acts as the lead member of the Task Force, bringing together representatives from OC Public Works, which manages environmental water issues, and the OC Health Care Agency, responsible for public health and safety related to water supplies. Additionally, the Chief Executive Office provides executive oversight, while the OC Sheriff's Emergency Management Division assists in coordinating emergency responses.

Significant contributions come from the Orange County Water District (OCWD), a groundwater wholesale agency founded in 1933. OCWD plays a crucial role in managing and protecting the Orange County Groundwater Basin, which supplies about 85% of the region's drinking water to multiple cities and water districts, collectively serving over 2.5 million residents. Their focus on water reliability and quality is supported through innovative projects and a diversified supply strategy.

Next is the Municipal Water District of Orange County (MWDOC), a wholesale water supplier that focuses on planning and making proper investments in water supply development, water use efficiency, public information, legislative advocacy, water education, and emergency preparedness. Established in 1951, MWDOC now serves more than 2.3 million residents in Orange County. Its service area spans 600 square miles and includes all of Orange County except for the cities of Anaheim, Fullerton, and Santa Ana.

Other members of the Task Force include the Eastside Water Association, Inc. and Midway City Mutual Water Company, both of which serve the unincorporated Midway City area. These small water suppliers provide valuable insight and representation for smaller systems within the broader water supply landscape.

Together, these members serve on the Drought Task Force to enhance preparedness for drought and water shortages, ensuring a comprehensive approach to water resource management in the County.

2.2 Task Force Meetings

On February 8, 2022, an initial meeting was held with OCWD, Eastside Water Association, Inc., Midway City Mutual Water Company, and OC Public Works to discuss the SB 552 requirements and the development of the DRP and Task Force members. Six water agencies were identified as potentially meeting the definition of small water suppliers/non-transient, non-community water systems. These agencies were invited to participate in the SB 552 Drought Task Force. It was subsequently confirmed by OC Health Care Agency that no SSWS are currently operating in Orange County.

A second meeting was held on June 6, 2022, to discuss progress in development of a draft DRP. The OC Health Care Agency well permitting team joined the task force as new members. The discussion focused on the number of wells located in Orange County and actions that OCWD will take to address drought.

Subsequently, the County paused the meetings to apply for a grant to assist in the development of the DRP. Updates have been provided to Drought Task Force members via email on a semiannual basis. The Drought Task Force was reconvened in 2025 to review and approve the DRP.

2.3 Task Force Responsibilities

The primary role of the Task Force is to facilitate drought and water shortage preparedness by planning protective measures before a disaster, assisting with recovery measures during a disaster, and capturing lessons learned to inform future planning.

3 Drought and Water Shortage Risk Assessment

A risk assessment as outlined in the Guidebook was conducted to identify potential hazards for the 59 domestic wells, identify any specific vulnerabilities, and evaluate the impacts that could occur in a drought or water shortage event. Risk assessment is crucial for determining who may be most affected and which response actions will be most effective.

3.1 Data Collection

Data was collected and downloaded from various State and local resources to conduct the water shortage risk assessment, as detailed further in this section.

3.1.1 Data Sets and Scope of Assessment

The California Department of Water Resources (DWR) has produced an online web application, the Water Shortage Vulnerability Scoring and Tool,[1] documenting the results of the State's initial water shortage risk assessment for each SSWS and domestic well by county.

This online tool was compiled using the DWR's inventory of domestic wells and the State Water Resources Control Board (SWRCB) records of SSWS. Vulnerability scores were incorporated from additional external datasets, including 16 datasets of physical vulnerabilities and 12 datasets of social vulnerabilities. The statewide risk assessment rescaled the data to Public Land Survey System (PLSS) section grids, which average roughly 1-mile square, such that vulnerability scores are visually displayed within the tool as colored squares. This type of rescaling is appropriate for statewide exercise due to the data size and difficulty of working with granular data across a large study. However, to interpret the data at a county level, the original linework from the data source was used. Statewide datasets were updated with more recent, finer resolution, or more accurate data where possible for this County-based assessment.

Initial well location data obtained from the statewide Water Shortage Vulnerability tool showed 80 domestic wells within the County and one SSWS. A quality control procedure was conducted on the statewide well locations to define better the locations and number of domestic wells within the County. Location information, such as hand-drawn maps, latitude and longitude, and addresses were referenced from the DWR well logs, and data sources provided by the County and OCWD helped filter the active domestic wells down from 80 to 59. These 59 domestic wells represent the most accurate information available at the time of this report's production; wells may be installed, decommissioned, or better located after the publication of this report. Additionally, the OC Health Care Agency indicated that the one SSWS shown in the statewide tool is no longer operating, so the County has no SSWS within its boundaries. The locations of the domestic wells identified within the County are shown in Figure 3-1.

[1] https://experience.arcgis.com/experience/ae1b4e3e41004f07b4901a7a3fa50637/?org=DWR

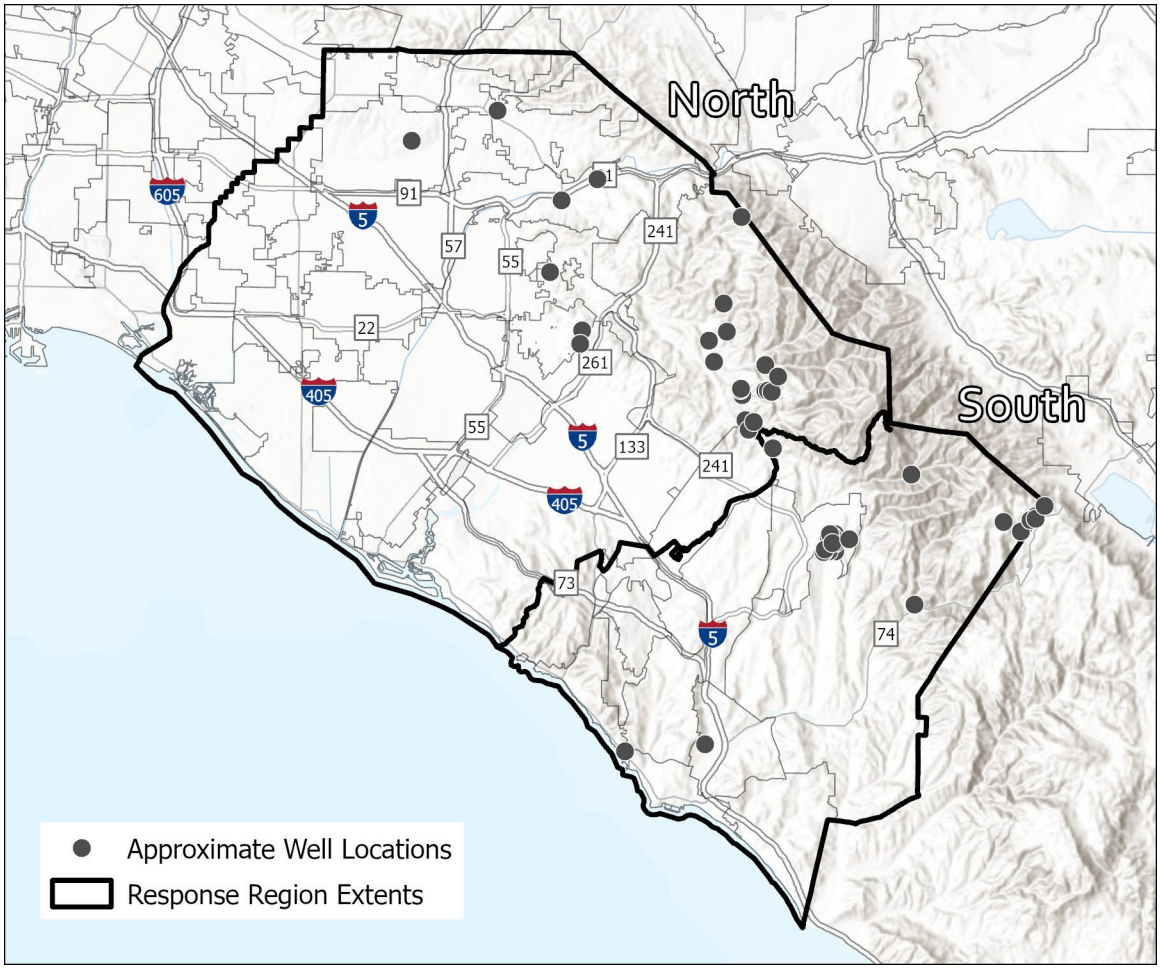


Figure 3-1: Approximated Domestic Well Locations in Orange County

3.2 Methodology and Approach

Water shortages stem from a mix of natural, human-made, and social factors that impact both water availability and demand. While Orange County benefits from a robust potable water system and limited reliance on domestic wells, climate change poses significant threats. Rising temperatures and shifting precipitation patterns increase the risk of drought, which reduces natural water supplies and hampers groundwater recharge. Groundwater depletion, already a major concern in California, further threatens domestic wells, particularly in coastal areas affected by sea level rise. Historical droughts, such as the 2012–2016 event, illustrate how natural and human-induced pressures can strain water systems, prompting costly water imports and greater reliance on local conservation, infrastructure upgrades, and recycled water systems like the GWRS.

Human activities, such as overconsumption, pollution, and the mismanagement of infrastructure, can intensify water scarcity, particularly in regions facing population growth and economic challenges in maintaining their water systems. Orange County has largely stabilized its land use, but past drought events have led to increased conservation programs and changes in water pricing to curb demand. Looking ahead, climate change and global population growth are expected to drive more frequent and intense water shortages. Although Orange County is well-positioned with advanced water management strategies and access to imported water, some degree of vulnerability remains for those dependent on domestic wells.

This DRP builds upon the methodology for assessing domestic well vulnerabilities published by DWR. The methodology outlines a structured approach for conducting a water shortage risk assessment, which has

been tailored and applied to the County's specific conditions. For this analysis, vulnerabilities are defined as "the combination of environmental, sociological, and structural factors that influence the likelihood of people or assets (i.e., domestic wells or water systems) being impacted when exposed to a hazard" (DWR 2023). The assessment categorizes vulnerabilities into two primary groups:

1. **Physical Vulnerabilities** – Factors related to environmental conditions, infrastructure, and water availability.
2. **Social Vulnerabilities** – Socioeconomic and demographic factors that influence a community's ability to respond to water shortages.

These vulnerabilities were mapped as geographic data layers and integrated using Geographic Information Systems (GIS). The vulnerability data values were then extracted for each domestic well point to assess individual risk levels. While the analysis was conducted at a County-wide scale, the results were specifically applied to the 59 domestic wells within the County.

3.2.1 Physical Vulnerabilities

Physical vulnerabilities refer to the potential natural or artificial factors that can impact the functionality or longevity of a domestic well. The following physical vulnerability datasets provided in the DWR Water Shortage Vulnerability tool were used for the County analysis:

1. **Temperature Shift**. In areas where maximum temperatures are projected to increase, there will be increased pressure on water demand and higher evapotranspiration rates. This dataset measures the change in maximum temperature from measured historical ranges to mid-century projections. This was converted to a 0-1 score by dividing the value of each cell by the maximum change in the statewide data.

2. **Saline Intrusion (Current and Projected)**. Current and future saltwater intrusion into coastal groundwater, caused by rising sea levels, can contaminate the water supply. This dataset represents whether saltwater intrusion is expected when the sea level is projected to increase by 1 meter. Wells within the saltwater intrusion footprint were given a score of 1, and those outside 0, for both present and future conditions.

3. **Wildfire Risk (Projected Climate Change)**. Increasing wildfire frequency and severity can threaten water sources. This dataset evaluates projections of average burned acres in 2035–2064.

4. **Previous Water Year's Precipitation**. A dry year with less than 70% of normal rainfall could result in reduced water supply. This dataset assesses the annual precipitation received in the most recent water year as a percentage of a normal water year. The 2022–2023 water year was used for this assessment. Water years start in October and end in September.

5. **Consecutive Dry Water Years**. When multiple consecutive years are dry years, this increases vulnerability to drought. This dataset counts the number of years within the last 5 years that have had significantly less rainfall than a normal year. This was converted to a 0-1 score by dividing the count of dry years by five.

6. **Wildfire Risk (Current Conditions)**. The severity of current wildfire risk can indicate a vulnerable water source. This dataset is based on the Fire Hazard Severity Zones determined by CalFire. CalFire severity classes were converted to numerical scores: Moderate (1) = 0.33; High (2) = 0.67; Very High (3) = 1; No Score = 0 (no or low risk).

7. **Geology**. In fractured rock areas, water availability is difficult to monitor and more uncertain for those who rely upon groundwater. This dataset identifies areas located outside of alluvial basins. Wells in fractured rock areas were scored as 1.

8. **Subsidence**. Subsidence occurs when the ground settles or sinks suddenly, which can make groundwater more difficult to access. This dataset evaluates the presence and depth of observed subsidence. Wells were given a 0-1 score by dividing the observed subsidence at each location by the maximum subsidence observed in statewide data.

9. **Over-drafted Basin**. An over-drafted groundwater basin reduces available water supply. This dataset is based on the Sustainable Groundwater Management Act (SGMA) basin prioritization. Wells in over-drafted basins were given a score of 1.

10. **Chronic Declining Water Levels**. Declining levels of groundwater may put wells at higher risk of shortage. This dataset uses data from monitoring wells to identify whether groundwater levels are declining. Wells identified as being in an area with declining water levels were given a score of 1.

11. **Surrounding Land Use**. Land uses with significant amounts of irrigated agriculture could indicate competing demands on groundwater supplies. This dataset identifies the percentage of irrigated agriculture based on land use. This was adapted to work with more specific well locations by using the percentage of irrigated agriculture land within 3,000 feet to generate the score.

12. **Groundwater Water Quality Risk**. Elevated levels of contaminants in groundwater could reduce availability of potable water. This dataset uses the SWRCB's SAFER program assessment of aquifer risk to categorize the potential for water quality problems. The risk percentile ranks from this data were converted to 0-1 scores.

13. **Dry Domestic Well Susceptibility in Basins**. Groundwater trends can be used to predict where wells may go dry in the near future. This dataset is based on information on domestic well locations, well depths, and local groundwater levels. The risk percentile ranks from this data were converted to 0-1 scores.

14. **Domestic Well Density in Fractured Rock Areas**. Fractured rock groundwater areas store far less water than do alluvial basins, and the occurrence of several domestic wells in proximity within a fractured rock area tends to create a higher susceptibility to shortages. This dataset identifies the number of wells within a single PLSS section, roughly 1 square mile. Since more specific well locations were used, this score was based on the number of wells within 3,000 feet of the well identified as being in a fractured rock area. No other wells within 3,000 feet or not in Fractured Rock Area = 0; one other well = 0.5; two other wells = 1.

15. **Reported Household Outages on Domestic Well**. Areas that have already experienced outages before have an increased risk of shortage. This dataset indicates the presence of households that have reported a dry well to the DWR.

Table 3-1: Physical Vulnerabilities

Factor	Weight	Note
Temperature Shift	1	
Saline Intrusion Projected	1	
Wildfire Risk (Projected Climate Change)	1	2022-2023 Water Year was not dry in study area
Previous Water Year	2	
Consecutive Dry Water Year	2	
Wildfire Risk (Current Conditions)	3	
Saline Intrusion (Current)	3	
Geology / Fractured Rock Area	3	
Subsidence	2	

Factor	Weight	Note
Over-drafted Basins	2	Did not apply to groundwater basins in Orange County
Chronic Declining Water Levels	3	Did not apply to groundwater basins in Orange County
Surrounding Land Use	3	
Groundwater Quality Risk	3	
Dry Domestic Well Susceptibility in Basins	5	
Domestic Well Density in Fractured Rock Areas	3	
Reported Household Outages on Domestic Well	5	None reported in Orange County

GIS spatial datasets were collected that mapped each of the physical vulnerabilities listed above. These datasets were then converted to 0-1 scores (if applicable), with the well points then being attributed with the score data. Items were weighted based on their importance in production of a domestic well vulnerability to water shortage. Table 3-1 shows how the weighting factors were applied to each score. For each vulnerability factor, the score was multiplied by the weight, and these weighted scores were added together to achieve the weighted physical vulnerability score.

Table 3-2 shows the count of wells by physical vulnerability level. There are 42 wells classified as being in highly vulnerable areas. These locations are found in the foothills of the northern and southern regions of the County, which are known to have high fire risks and are in fractured rock type aquifers. However, many of these 42 wells are also in locations adjacent to water distribution pipelines, which provide a realistic long-term solution to mitigate these risks.

Table 3-2: Count of Wells by Physical Vulnerability Level

Physical Vulnerability Level	Number of Wells
High	42
Elevated	7
Moderate	4
Low	1
Very Low	5

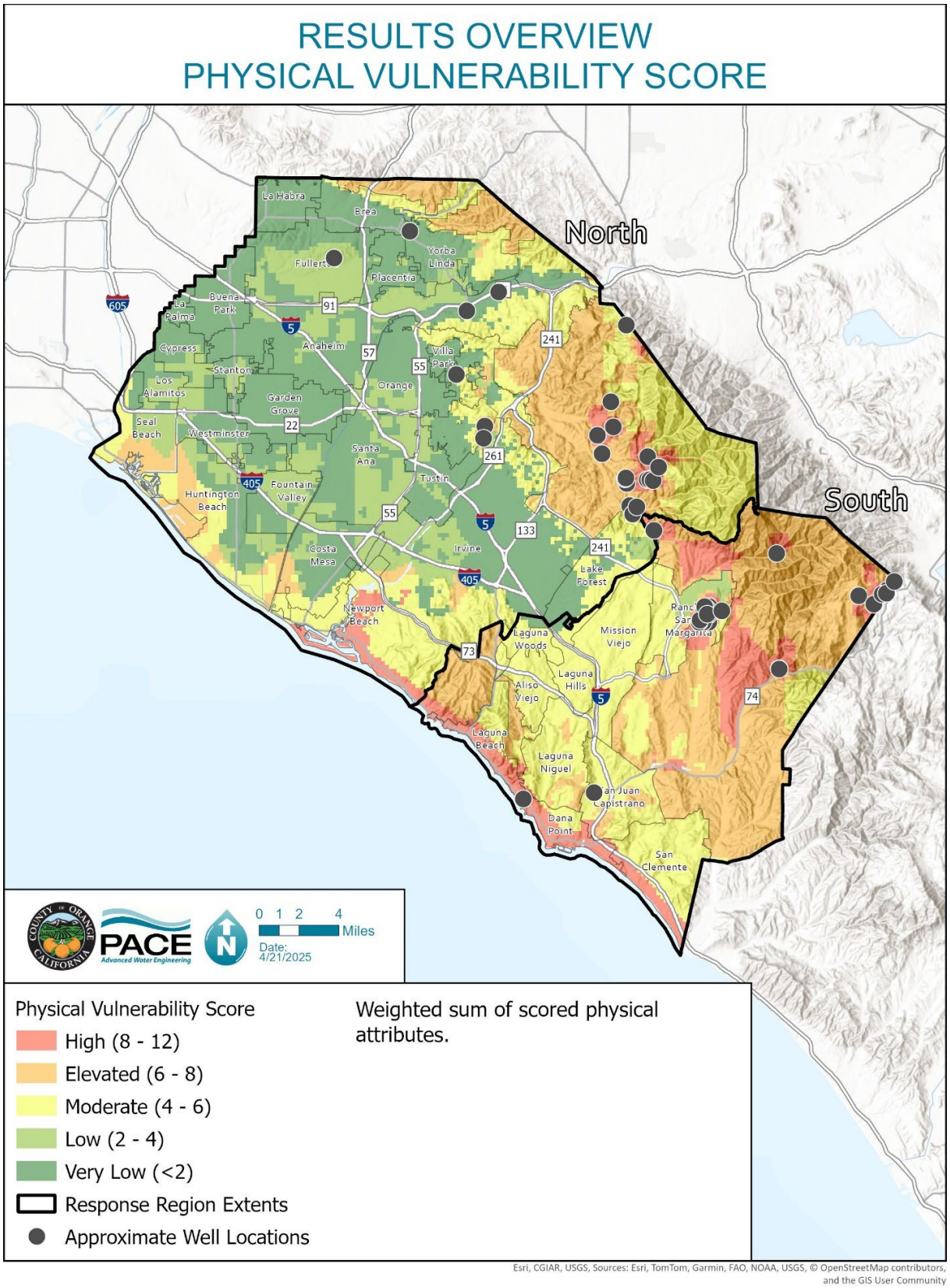


Figure 3-2: Physical Vulnerability Score

3.2.2 Social Vulnerabilities

Social vulnerabilities include the socioeconomic factors that can impact a household's ability to respond to a water shortage event. For example, a water shortage places a financial burden on a person or household due to the expense and time needed to source water. Sourcing water could compete with child or elder care obligations, and older persons affected by a shortage may have trouble physically transporting water.

The social vulnerability datasets provided in the DWR Water Shortage Vulnerability and used in this analysis were sourced from the U.S. Census Bureau's 2022 American Community Survey (ACS) and for this project were analyzed at the census tract level. In this dataset, a housing unit is defined per the U.S. Census Bureau as "a house, an apartment, a mobile home or trailer, a group of rooms, or a single room occupied as separate living quarters, or if vacant, intended for occupancy as separate living quarters." A household consists of all people who reside in the housing unit.

The following social vulnerability datasets were selected for the County analysis:

1. **Median Household Income**. Divides all household incomes in half, with half of all households earning more and half earning less than that amount.

2. **Per Capita Income**. Total income within the census tract is divided by the total count of the census tract.

3. **Percent Population Living in Poverty**. Percentage of population living under 200% of the 2022 federal poverty level. The specific threshold increases based on household size: for a single-person household the threshold is $27,180 per year, while for a family of four it is $55,500 per year.[2]

4. **Percent Persons 65 Years of Age or Older**. Total count of persons within a census tract of age 65 years or older divided by the total population of the census tract.

5. **Percent Persons 5 Years of Age or Younger**. Total number of persons 5 years of age or younger divided by total persons in the census tract.

6. **Percent Single Parent Households.** Total number of households with either a male or female householder but with no spouse present, divided by total number of households.

7. **Percent Persons with No High School Diploma**. Total number of people over 25 years of age with no high school diploma divided by the total number of persons.

8. **Percent of Population Unemployed**. Total number of civilian population unemployed is divided by the total persons in the census tract.

9. **Percent of Households that Speak English Less than Well.** The number of households with at least one member over 14 that has difficulty with speaking English divided by total households.

10. **Percent Mobile Homes.** Total number of housing units that are mobile or manufactured homes are divided by the total number of homes.

11. **No Vehicle Available**. Total number of households with no vehicles is divided by the total number of households.

12. **Percent Living in Group Quarters.** Total number of people living in a group arrangement that is not a housing unit, where an entity or organization owns or manages the housing and/or services. This may include facilities such as prisons, dormitories, military barracks, and nursing homes. This number is divided by the total number of people in the tract.

[2] https://aspe.hhs.gov/sites/default/files/documents/4b515876c4674466423975826ac57583/Guidelines-2022.pdf.

13. **Percent Renters**. Total number of housing units that are renter-occupied divided by the total number of housing units.

Table 3-3: Social Vulnerabilities

Group	Factor
Socioeconomic Status	Median Household Income
	Per Capita Income
	Percent Population Living in Poverty
Household Composition & Language	Percent Persons 65 Years of Age or Older
	Percent Persons 5 Years of Age or Younger
	Percent Single Parent Households
	Percent Persons with No High School Diploma
	Percent of Population Unemployed
	Percent of Households that Speak English Less than Well
Housing & Transportation	Percent Mobile Homes
	No Vehicle Available
	Percent Living in Group Quarters
	Percent Renters

For each social vulnerability factor, each tract was given a 0-1 score based on its percentile ranking compared to statewide data. In most cases a higher rank resulted in a higher score, though for median household income and per capita income the rankings were inverted. Within each group outlined in Table 3-3, the component scores were totaled, and this group total was converted into a 0-1 percentile score, compared to statewide data. These group scores were combined to calculate the social vulnerability score. Table 3-4 shows the count of wells by social vulnerability level; of the 59 wells, none are within high risk, only one is considered elevated risk, and the rest are moderate or lower.

Table 3-4: Count of Wells by Social Vulnerability Level

Social Vulnerability Level	Number of Wells
High	0
Elevated	1
Moderate	20
Low	18
Very Low	20

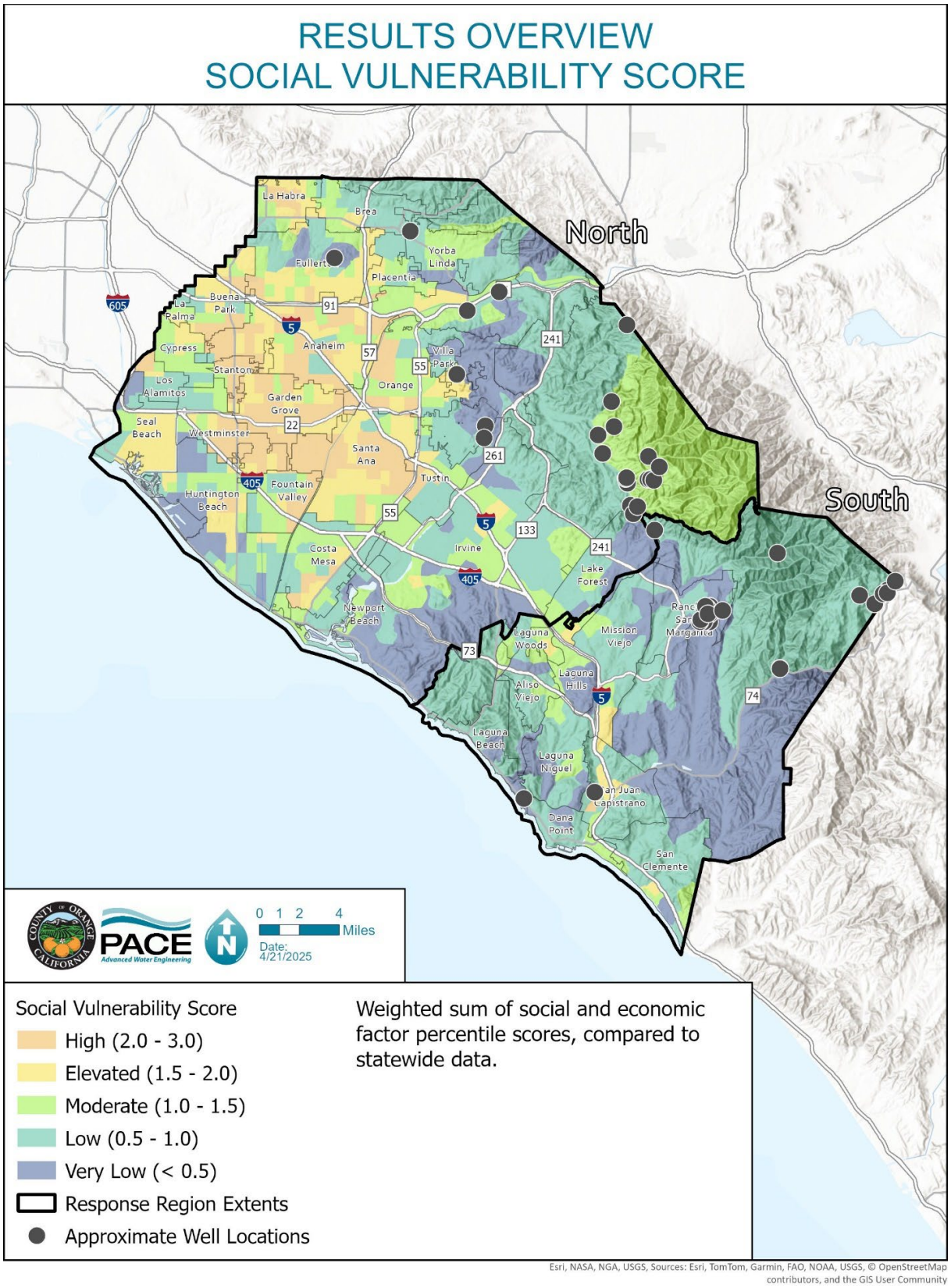


Figure 3-3: Social Vulnerability Score

3.3 Assessment Results

To generate the overall vulnerability score, the physical and social risk scores were combined. The weighted physical scores were converted to a 0-1 score by dividing the score of each well by the highest score in the County. The social vulnerability scores were reclassified by converting them to a 0-1 score by percentile rankings, compared to the statewide vulnerability score range. The reclassified physical and social vulnerability scores were then averaged to obtain the final vulnerability score. The well count by category is broken down in Table 3-5.

No wells in Orange County were determined to have a high overall level of vulnerability, which would include both high physical and high social risk factors. Even though several wells are in high physically vulnerable areas, they do not coincide with locations that have high social vulnerability. Thus, it can be assumed that these areas would have the means to implement short-term solutions that mitigate risk during a shortage event. High social vulnerabilities did not coincide with high physical risks either, meaning these wells are not vulnerable to water shortage.

Table 3-5: Count of Wells by Overall Vulnerability Level

Vulnerability Level	Number of Wells
High	0
Elevated	17
Moderate	25
Low	14
Very Low	3

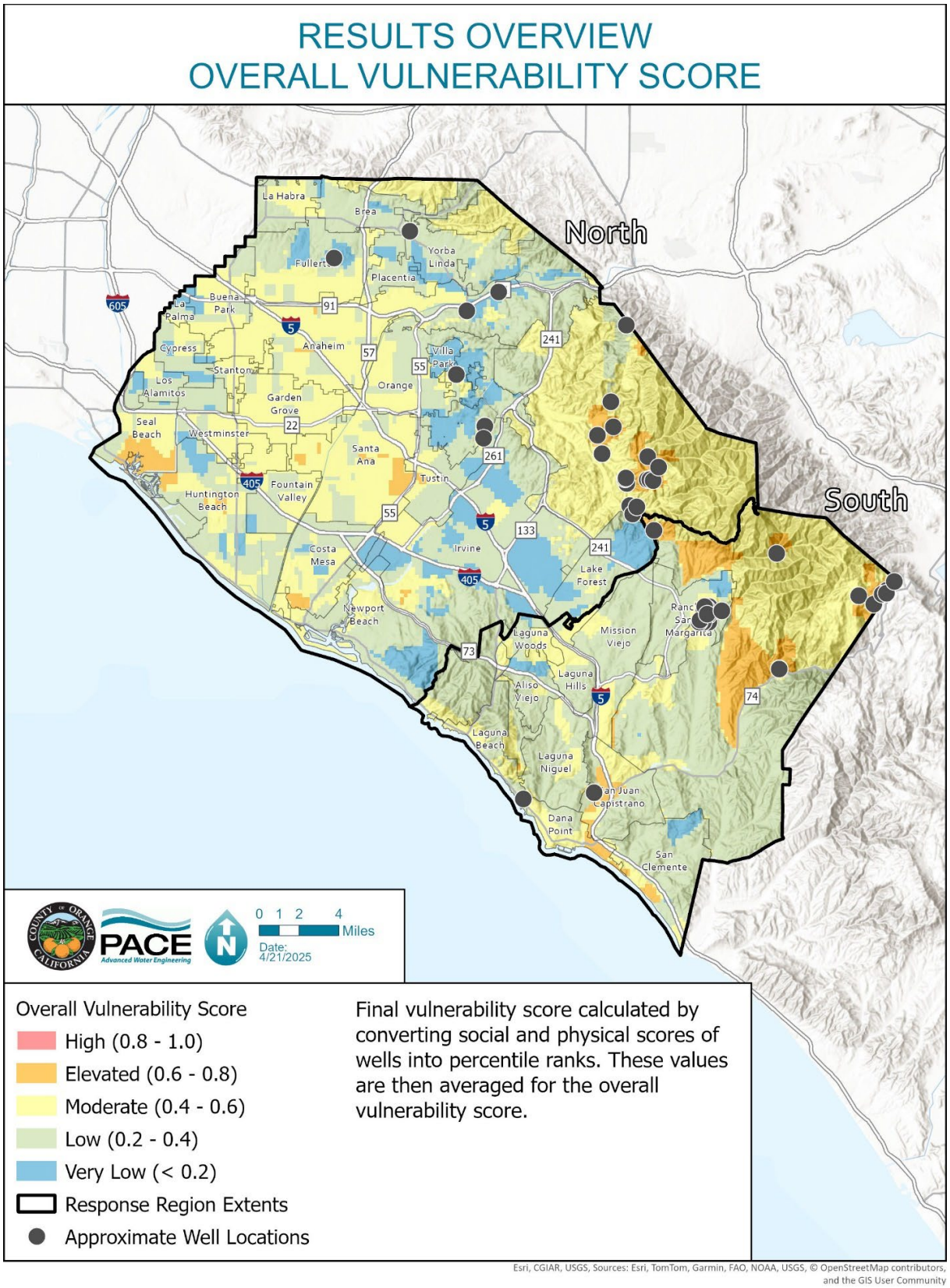


Figure 3-4: Overall Vulnerability Score

3.3.1 North Orange County Region Risks and Potential Impacts

To evaluate the risks of water shortage across the County, the North and South County regions were used with minor adjustments to match water district boundaries. The physical vulnerabilities in the north region are primarily located in the foothills east of Irvine, where a disproportionately large number of domestic wells are present. The coastal region also has some high risks due to sea water intrusion, but fortunately does not have any domestic wells. The primary physical vulnerabilities in the foothills are attributed to a higher fire risk, fractured rock aquifers, and the high density of wells.

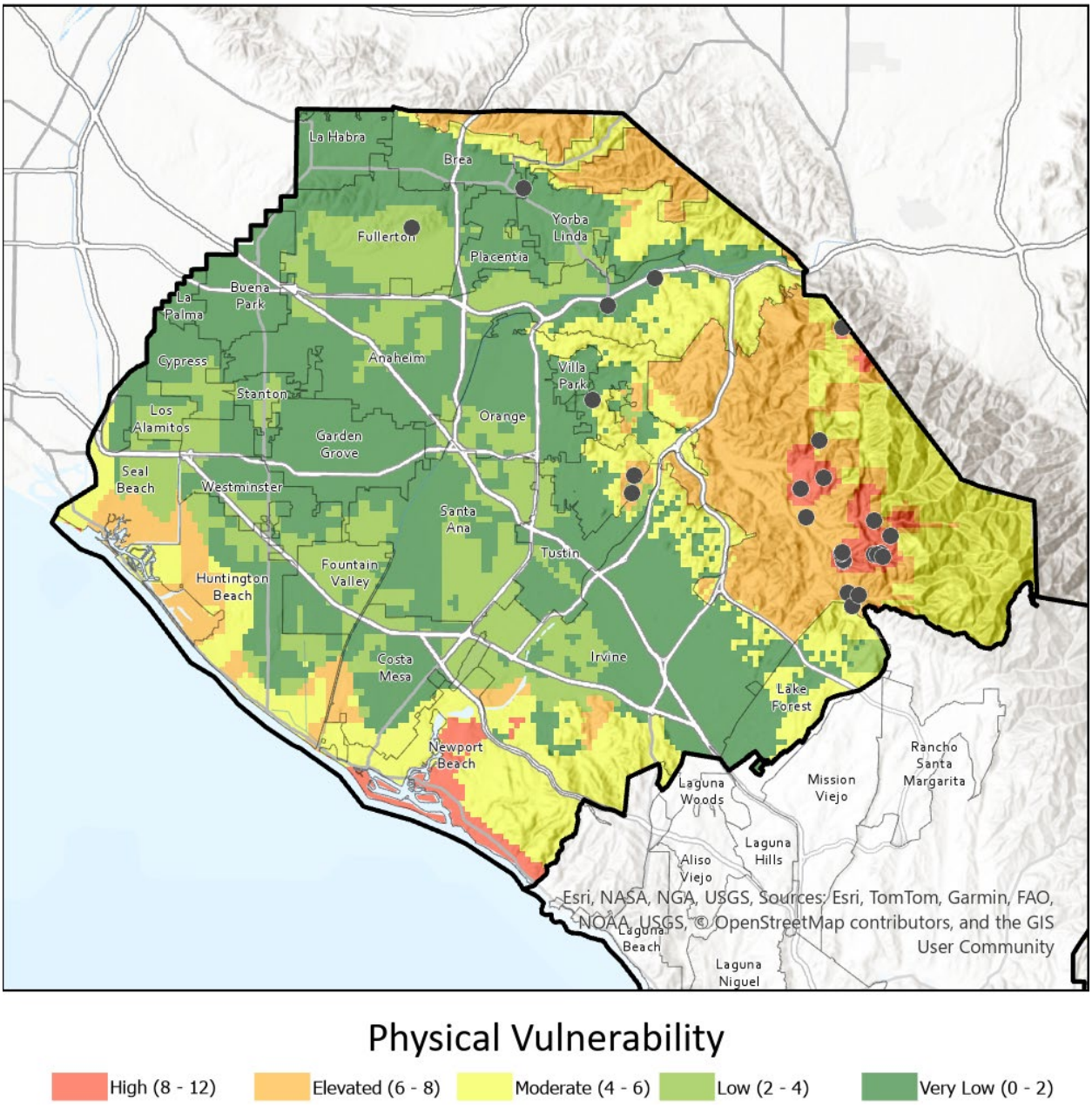


Figure 3-5: North Region Physical Vulnerability Scores

The north region's social vulnerabilities have a geographically inverse relationship with the region's physical vulnerabilities. Locations with social vulnerabilities are found in populated cities, which fortunately have very little reliance on domestic well supply and participate in the robust water distribution systems available throughout these cities. The foothill areas, which contain many of the north region's domestic wells, exhibit a moderate level of social vulnerability, primarily due to the census tracts having a larger aging population and an increased occurrence of group quarters living spaces. These factors are of concern because these populations have limited physical ability to acquire large supplies of potable water in the event of a shortage.

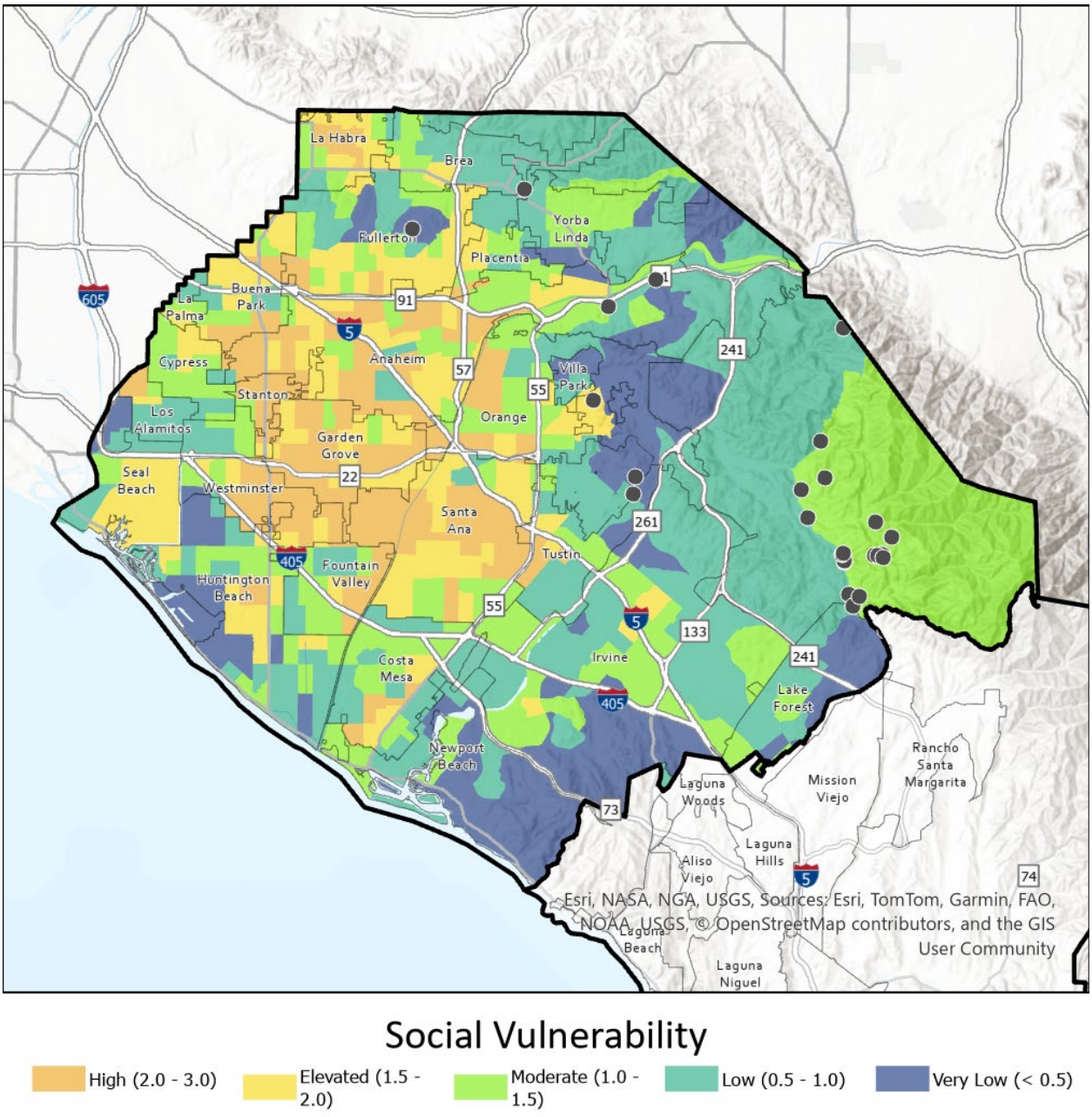


Figure 3-6: North Region Social Vulnerability Scores

The overall vulnerability of the north region is a source of elevated concern in the foothills, where many domestic wells are located. This area has high physical vulnerabilities overlapping with moderate social vulnerability. The remaining domestic wells, west of State Routes 241 and 261, have an overall low vulnerability score.

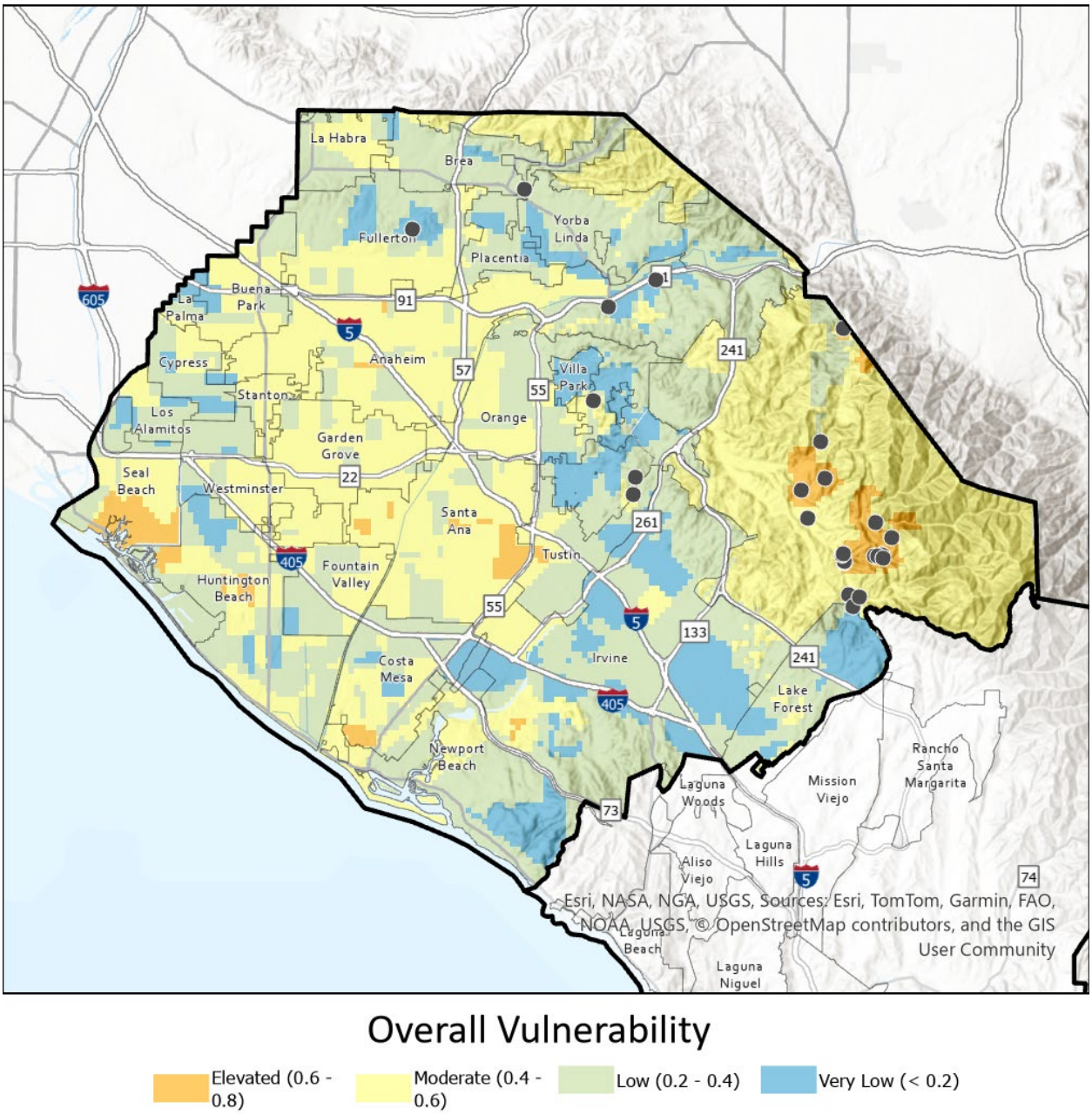


Figure 3-7: North Region Overall Vulnerability Scores

3.3.2 South Orange County Region Risks and Potential Impacts

The South Orange County Region contains several areas with elevated to very high physical vulnerability scores. Much of this region is classified as very high risk from the Fire Hazard Severity Zone by CalFire. Well water quality concerns are a potential vulnerability toward the east and up into the Santa Ana Mountains, while along the coast, high vulnerability scores are due to the presence of saltwater mixing with groundwater. Most of the domestic wells access fractured rock aquifers, which also have a greater risk of issues. Other risks in this region consist of wildfires and other environmental effects that render a well inaccessible or unusable.

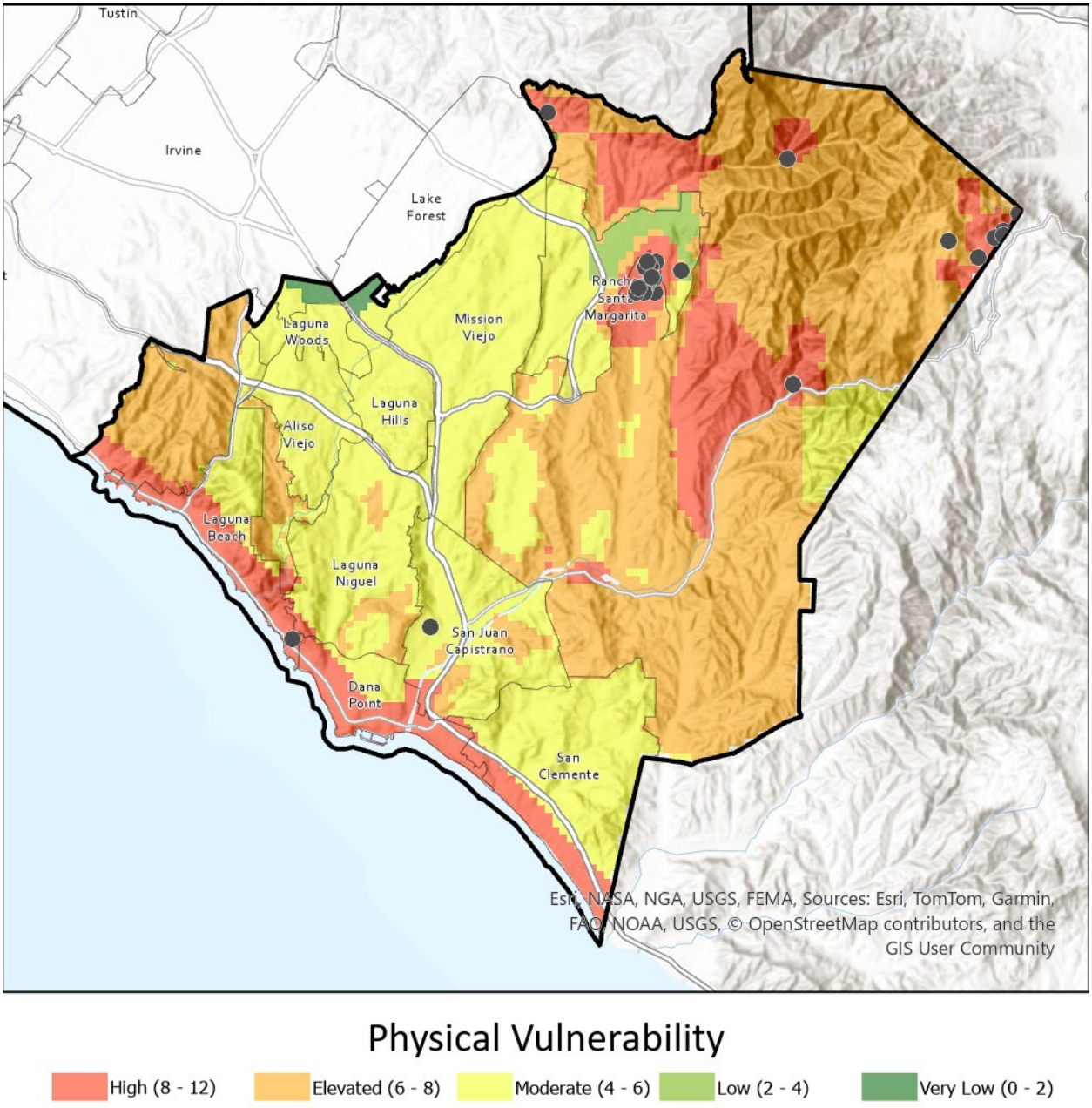


Figure 3-8: South Region Physical Vulnerability Scores

The social vulnerabilities for this region that cover the domestic well areas are mostly classified as low to very low. This suggests these areas most likely have the financial capability and physical means to address water costs and acquisition in the event of a shortage.

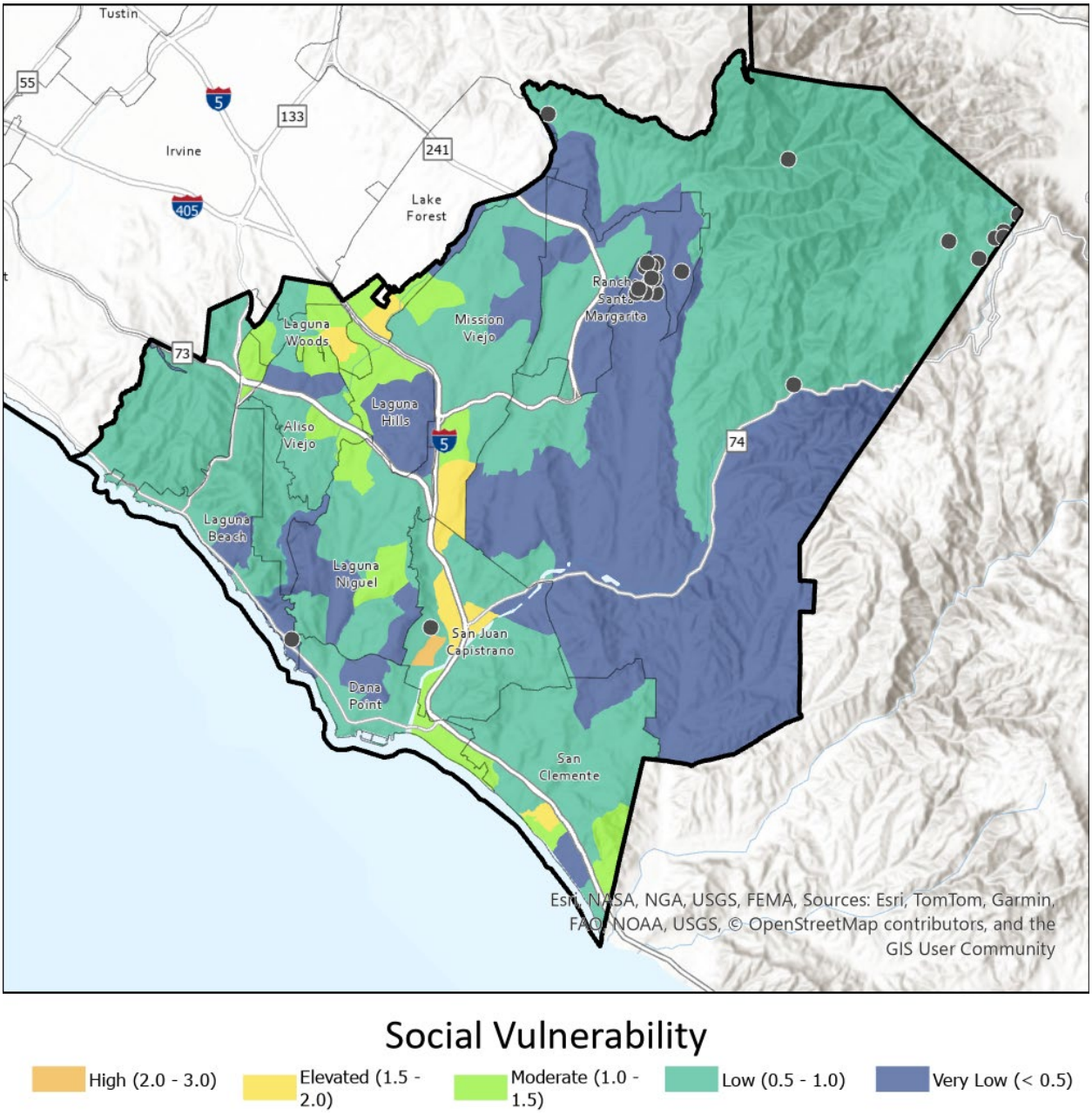


Figure 3-9: South Region Social Vulnerability Scores

Combining the physical and social vulnerabilities in the south region, the resultant overall score shows moderate with some elevated classifications in the areas with domestic wells, primarily due to physical vulnerabilities.

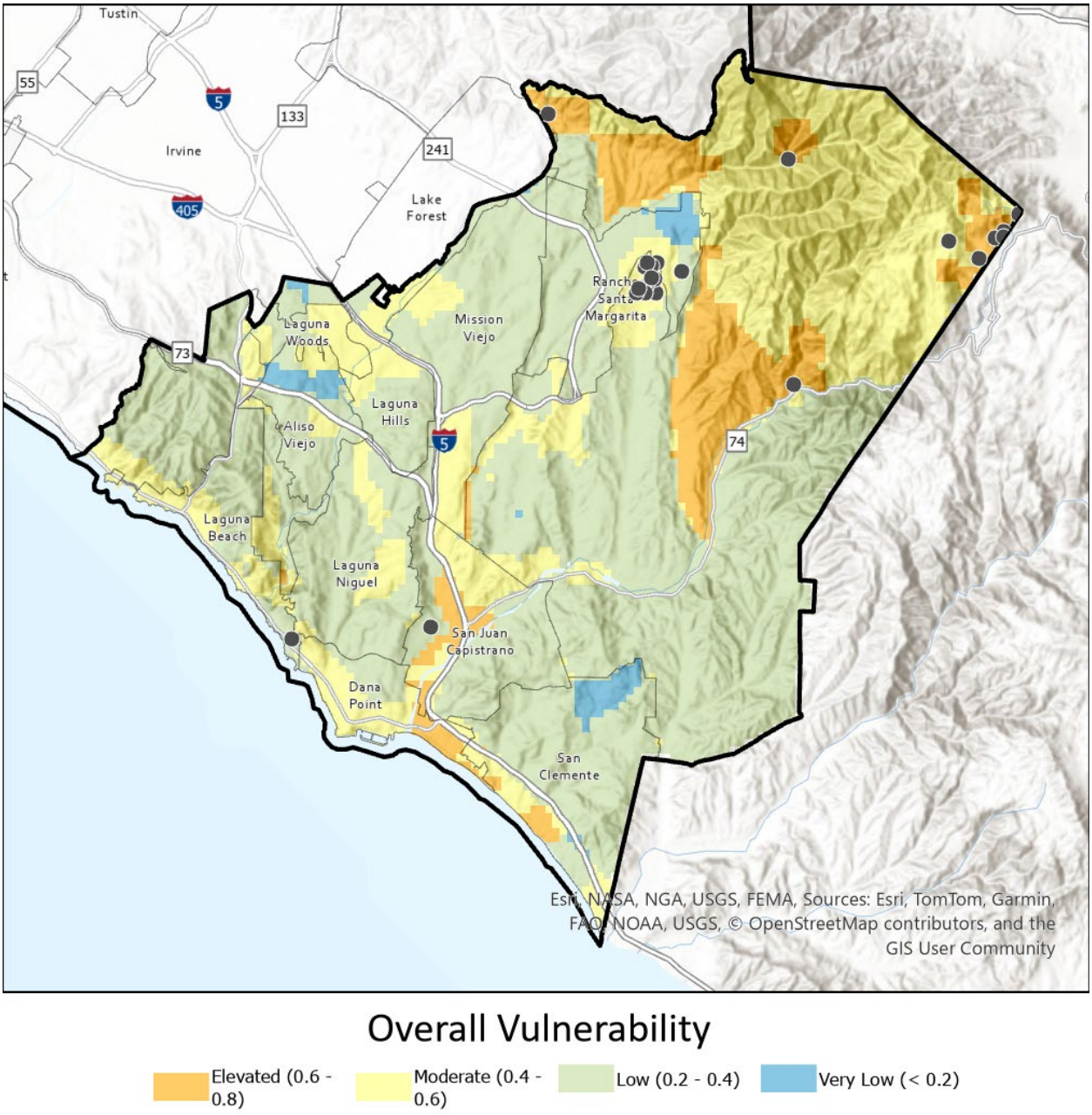


Figure 3-10:South Region Overall Vulnerability Scores

3.3.3 County Capacity

Orange County is a largely urban region serviced by established water retailers, including Irvine Ranch Water District, Santa Margarita Water District, Moulton Niguel Water District, and several others. The County expects that in the event of a water shortage, alternative sources of potable water will be provided by the respective water retailer.

3.4 Identified Data Gaps

While there is a plethora of water quality, groundwater, and census data available for Orange County, it was difficult to ascertain an accurate list of domestic wells that are currently in use. Data on well locations from the California DWR was filtered, double-checked, and supplemented using satellite imagery, information provided by water districts, and other internet resources, but these data sources were sometimes conflicting and difficult to corroborate. Well construction permits were mentioned without indicating whether these wells had since been decommissioned. There is also the possibility that some residences supplied by domestic wells concurrently have service connections for potable water and would not be impacted by the water shortage risks discussed in this DRP.

The data used in this assessment was based on the latest available information at the time of writing this plan. The physical datasets were obtained from a variety of sources with dates ranging from 2015-2022. The socioeconomic data was based on the 2022 American Community Survey, which incorporates a series of projections from the 2020 census and other sources. If an updated assessment is needed in the future, the datasets used in this assessment may need to be updated with more current information.

4 Short-Term Response Actions

Short-term response actions are immediate actions that can be taken in the event of a drought or water shortage to reduce impacts and ensure that affected residents have access to an adequate supply of drinking water. The provision of emergency and interim drinking water solutions may require some advance planning to build relationships and establish contracts and infrastructure.

Best practices for short-term response actions include the following:

- Coordinate with local water providers early
- Leverage existing emergency/response plans
- Develop a distribution plan for emergency and interim drinking water
- Evaluate actions needed to support acquisition and distribution
- Evaluate quantity and locations needed
- Determine preferred distribution method
- Identify and coordinate staging areas
- Identify staff resources and equipment needed
- Monitor the process
- Share clear directions for where/how to get water supplies
- Provide a hotline for residents

4.1 Water Use per Capita

The first step in determining the appropriate responses for a water shortage scenario is to determine how much water should be provided. In general, people typically use between 100 and 150 gallons per capita per day (gpcd) in the United States; however, this includes a significant quantity of water for outdoor irrigation and is highly dependent upon the climate in which a person lives.

For the purposes of this DRP, only indoor water usage is assessed. Table 4-1 provides an example of a person's daily indoor water consumption by determining the potable water flow per fixture multiplied by the daily usage of that fixture.

Table 4-1: Typical Indoor Potable Water Usage

Potable Water Use	Flow per Use	Daily Usage	Gallons per Capita per Day
Toilets	1.3 gal / flush	5.0 flush / day	6.5
Showers	2.0 gal / min	12.0 min / day	24.0
Kitchen Faucets	1.5 gal / min	4.0 min / day	6.0
Bathroom Faucets	1.5 gal / min	2.0 min / day	3.0
Clothes Washer	18.0 gal / load	0.5 loads / day	9.0
Dishwasher	4.3 gal / load	0.3 loads / day	1.3
Indoor Potable Water Usage (gpcd)			**50.0**

Daily indoor usage per person was estimated to be 50 gallons per day (gpd) for regular indoor usage using typical water fixtures for recent construction. Older construction homes typically have less efficient water fixtures. Senate Bill 1157, signed by Governor Gavin Newsom in 2022, reduces indoor water usage to 47 gpcd starting in 2025, and further lowers the indoor water usage to 42 gpcd in 2030. The reductions stated within the regulation will take time to migrate through the water fixtures throughout the County, so this plan tried to accommodate these realities by using 50 gpd.

In an emergency, water consumption could be reduced, depending upon whether water is used strictly for drinking or if non-drinking purposes are also considered (e.g., food preparation and minimal hygiene). An

emergency water supply that would only be used for drinking could plausibly be planned with a value of 1 gpcd (EPA 2011), which coincides with the recommended daily water intake. If the emergency water supply is to be used for food preparation and minimal hygiene, 5 gpcd is a more appropriate planning number.

For the purposes of this report, the daily water use values in Table 4-2 will be used for the three different evaluated scenarios. The long-term daily water usage has been increased from 50 gpcd to 75 gpcd to account for the possibility of older homes in the area having less efficient water fixtures installed.

Table 4-2: Response Category Daily Water Usage

Response Category	Duration	Daily Water Usage (gpcd)
Short Term – Immediate	5–10 Days	1 gpcd
Short Term – Intermediate	1–4 Weeks	5 gpcd
Long Term	Indefinitely	75 gpcd

Domestic wells, as defined by the State, are private wells that can have up to four connections. For this analysis, a conservative approach assumed that each well has the maximum number of connections. Each connection can serve a household of five people [HSC Section 116681(i),California Water Code (CWC) Section 1060951(k)], meaning each well can serve up to 20 people. Table 4-3 estimates the amount of water that will need to be provided for each well under the three response categories.

Table 4-3: Amount of Water Required per Well for Response Categories

Response Category	Short Term – Immediate	Short Term – Intermediate	Long Term
Per Person Water Usage (gpcd)	1 gpcd	5 gpcd	75 gpcd
Max Connections per Well	4		
People per Connection	5		
People per Well	20		
Daily Water Required per Well	20 gpd	100 gpd	1,500 gpd

This plan divides the wells into two regions of Orange County: North and South. Each region has a number of clusters of wells. Figure 4-1 shows the locations and quantity of the clusters of wells. Table 4-4 calculates the amount of water needed for each response category for each cluster of wells.

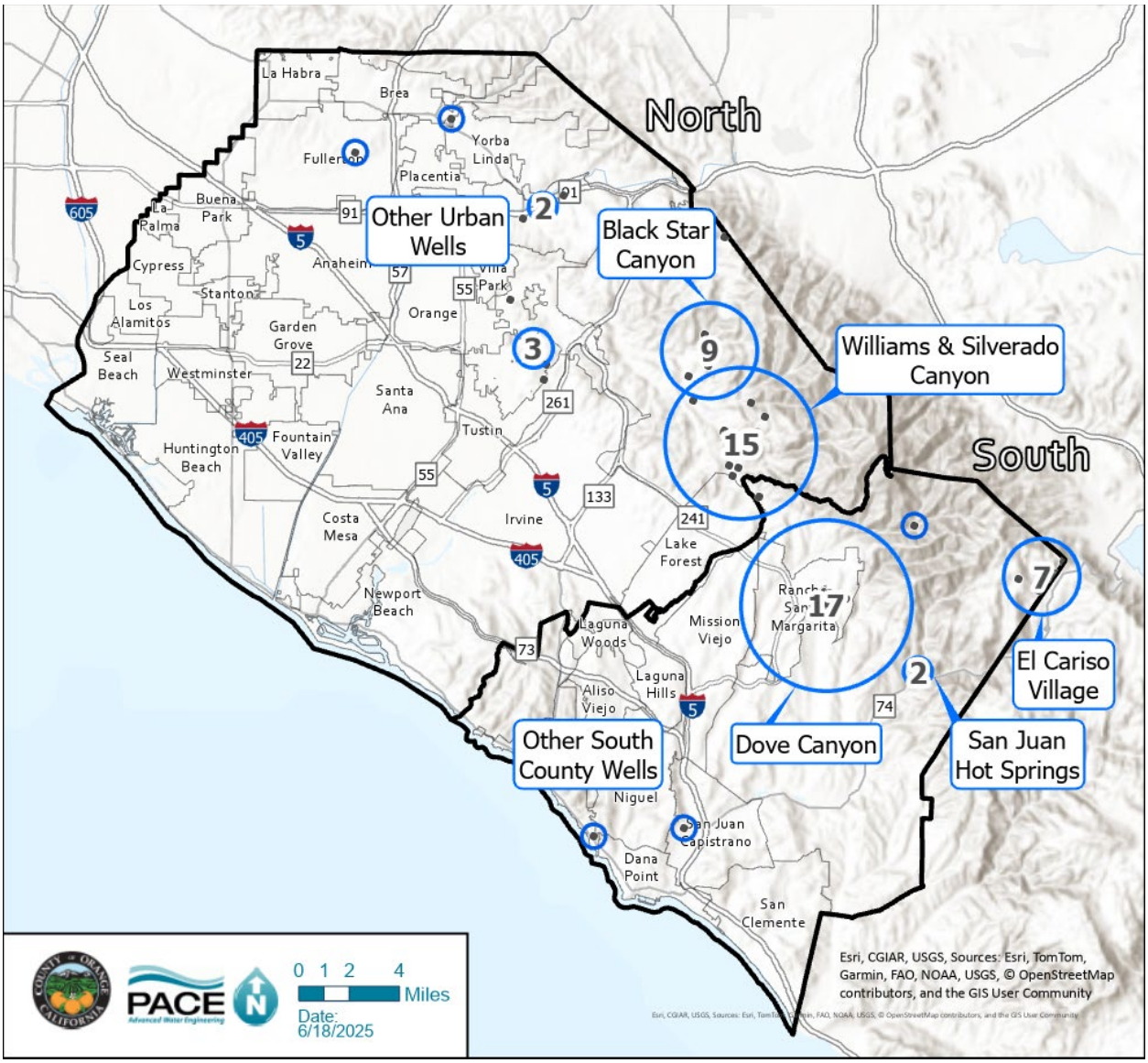


Figure 4-1: Well Clusters Locations and Quantities

Table 4-4: Daily Water Required per Well Cluster for Each Response Category

Well Cluster	# of Wells	Short Term – Immediate (gpd)	Short Term – Intermediate (gpd)	Long Term (gpd)
Black Star Canyon	9	180	900	13,500
Williams and Silverado Canyons	15	300	1,500	22,500
Dove Canyon	17	340	1,700	25,500
San Juan Springs	2	40	200	3,000
El Cariso Village	7	140	700	10,500
Other South County Wells	2	40	200	3,000
Other Urban Wells	7	140	700	10,500

4.2 Immediate Short-Term Response

The immediate short-term response comprises actions to be taken to provide enough water for each resident to have 1 gallon per day of water for drinking purposes. The intent of the immediate response is to provide this volume of water for approximately 1 week while local municipalities set up longer lasting plans.

4.2.1 North Orange County Region – Foothill Well Cluster

The Foothill Well Cluster in the North Region is home to many of the domestic wells in the County. The wells in this area have been assessed as elevated and moderate vulnerability levels; see Figure 4-2. The risks in this region are the higher fire risk, water quality and quantity concerns with fractured aquifers, density of the wells, and higher-than-average senior living and an aging population within the census tracts. The area's potable water distribution is provided by IRWD using established infrastructure, including distribution lines and water tanks throughout this area.

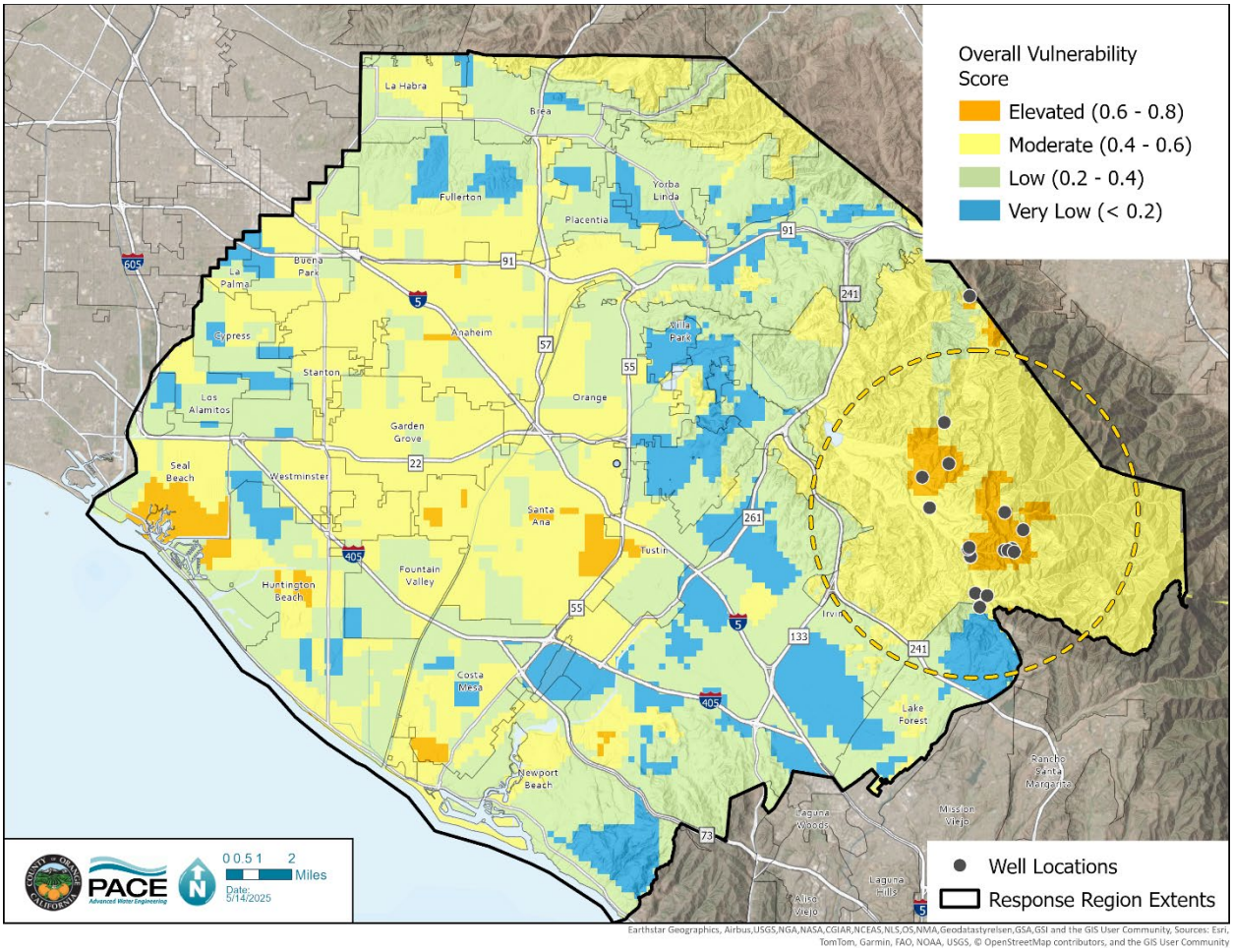


Figure 4-2: North Orange County Region – North Foothill Well Cluster

Owners of domestic wells should have their wells tested annually and report any major changes to the well's water quality or performance to their local water district. Residents should prepare for water shortage by having a week's supply of water readily available. Use 1 gallon per day per person as a guide for estimating the household's needs. Additionally, it is suggested to keep water truck company contact information available, a list is provided of water haulers current at the time of this report.

Planning for water shortage in the northern foothill region should begin with ensuring residents address their immediate safety, and all residents should find safe havens if natural disasters have caused the water shortage. Once public safety is addressed, it is understood that locations reliant on domestic water supply in this region could have limited mobility, so trucked water deliveries might best serve this cluster of wells.

Water providers can organize distribution at locations identified on Figure 4-2, showing potential staging centers in the area. These staging areas were identified by using a 5-mile radius from the mean center of the well cluster. Staging locations were selected that had large enough parking facilities for a staging center and appropriate land use, such as commercial centers, high schools, city facilities, and other large parking areas. The staging locations for the foothill well cluster are as follows:

- St. Michaels Abbey
- Library of the Canyons
- Irvine Lake Parking Area

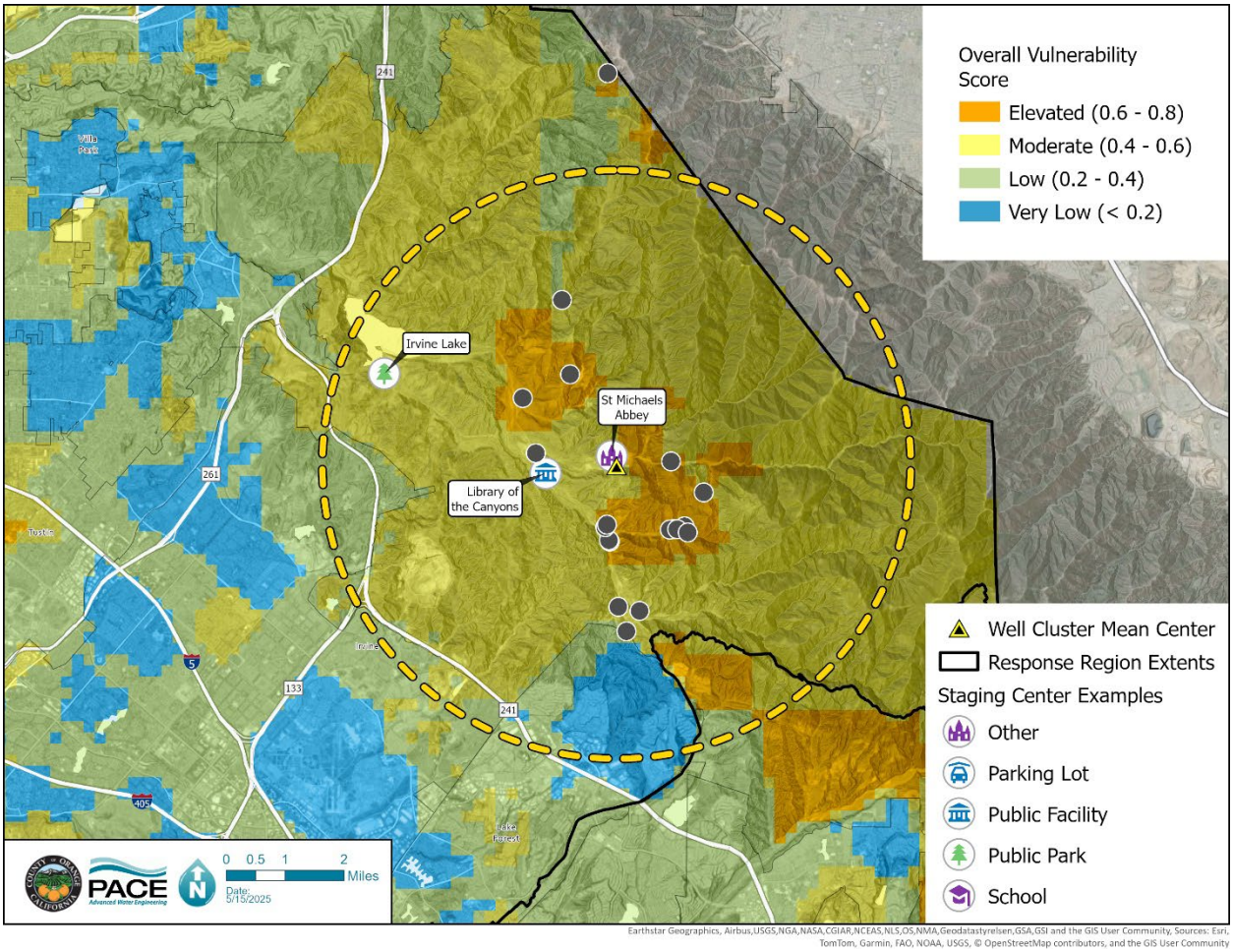


Figure 4-3: North Orange County Region – Foothill Well Cluster Response Area

The population in this area has a higher proportion of elderly and group quarters living, where residents may have difficulty reaching distribution centers. Residents or owners should consider placing temporary tanks onsite, and water haulers can fill the tank for individual resident use. These tanks will be temporary until a long-term solution is decided by the resident or owner. Residents can use the list of water haulers at the end of this chapter to help provide water in the event of water shortage.

4.2.2 North Region – East Well Cluster

The East Well Cluster in the North Region is centered at Villa Park and has domestic wells within the cities of Orange, Anaheim, and Tustin, as shown in Figure 4-4. The overall vulnerability levels of the wells are considered low and very low, and it is assumed residents have the physical and financial ability to acquire water on a temporary basis in the event of a shortage. There is an extensive water distribution system in this area with many wells adjacent to water lines. The distribution system is managed by three water districts: City of Anaheim, City of Orange, and Golden State Water Company. These wells intersect the groundwater basin actively being managed by OCWD. Hazards in this area would consist of a long-term devastating drought that would impact OCWD's management of the groundwater basin levels.

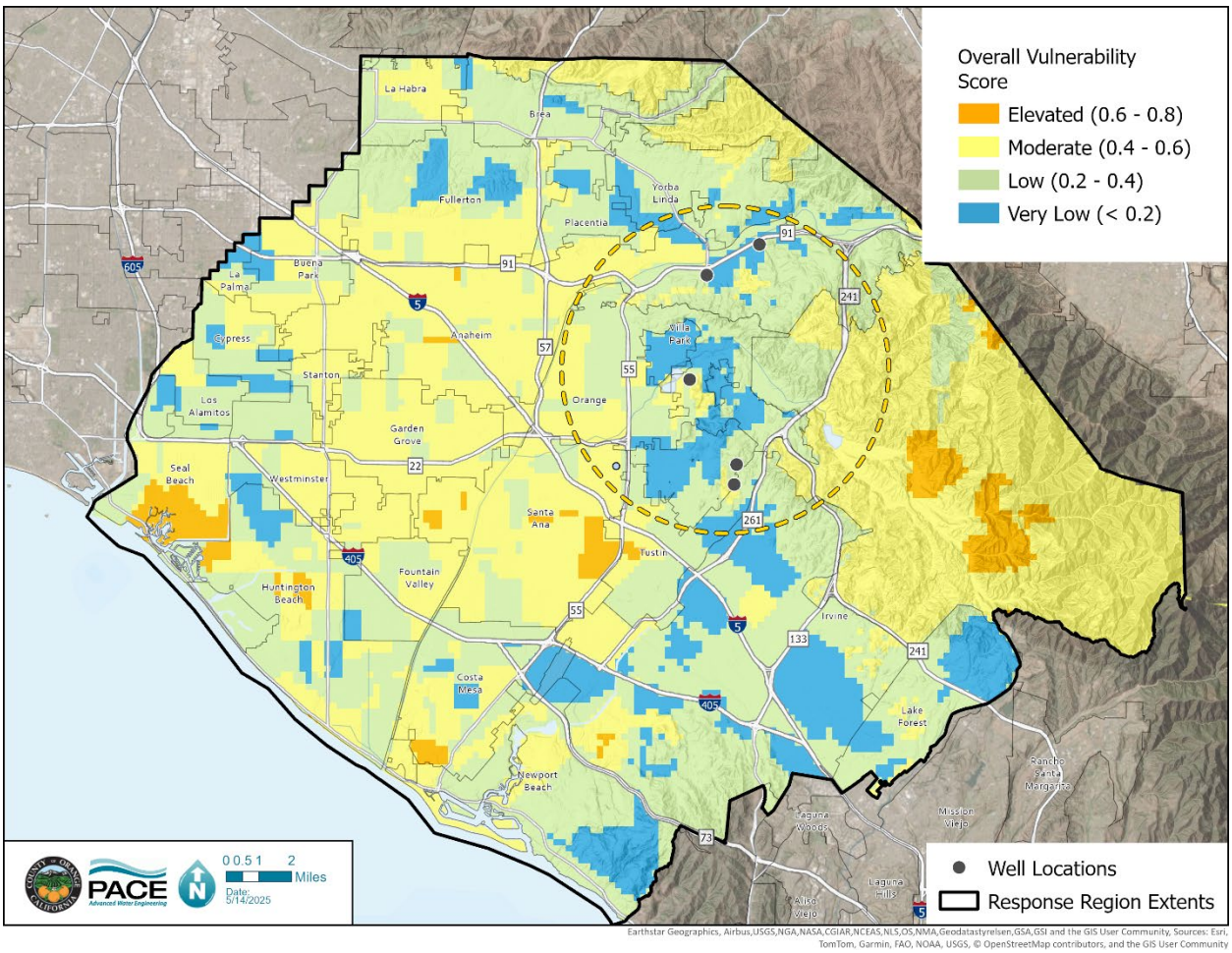


Figure 4-4: North Orange County Region – East Well Cluster

Owners of domestic wells should have their wells tested annually and report any major changes to the well's water quality or performance to their local water district. Residents should prepare for water shortage by having a week's supply of water readily available. Use 1 gallon per day per person as a guide for estimating the household's needs. Additionally, domestic well users should know where local water is available for purchase, such as large retail water dispensing machines and large bulk supply stores.

If a natural disaster has caused water shortage in this area, safety and shelter should be the number one immediate goal for residents.

This East Well Cluster has an extensive local distribution system surrounding the domestic wells, and connections to the distribution system should be considered a long-term goal. Domestic well owners should contact the local water provider to inquire about the potential for connecting to the distribution system.

Three staging areas have been identified that local water retailers could use for water distribution in cases where wells are experiencing a water shortage. These areas are located within the 5-mile mean-center analysis of the well cluster and have appropriate space for staging. The staging locations for this well cluster are as follows:

- Santiago Canyon College
- El Modena High School
- The Village at Orange

The staging locations will need coordination with the County, a water retailer, and the staging site owner for organization and cooperation.

Residents can use the list of water haulers at the end of this chapter to help provide water in the event of water shortage.

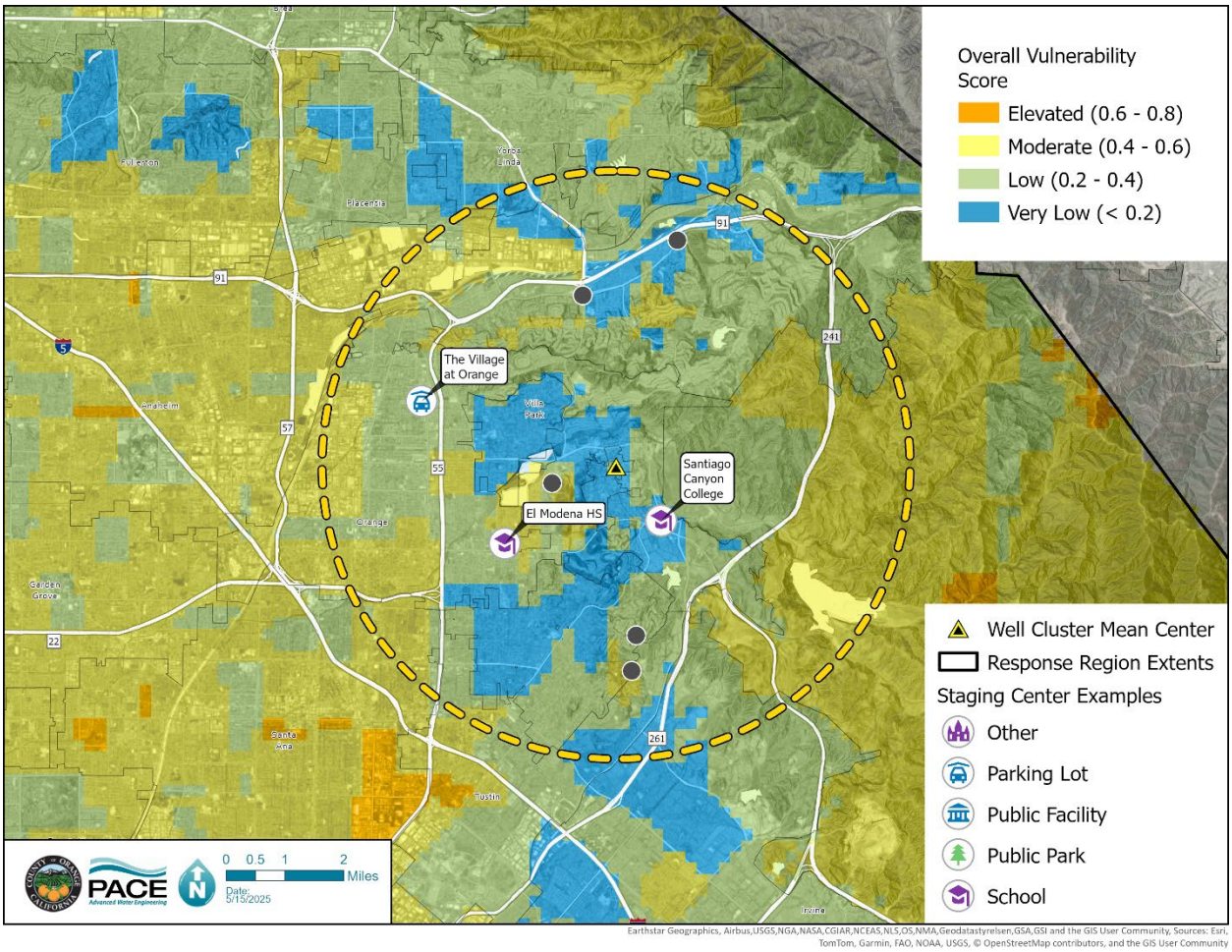


Figure 4-5: North Orange County Region – East Well Cluster Response Area

4.2.3 North Region – Northeast Well Cluster

The Northeast Well Cluster in the North Region is centered near Placentia, and the two domestic wells are found in the cities of Fullerton and Yorba Linda. The overall vulnerability levels of the two wells in this cluster

are assessed as low and very low, and it is assumed the domestic well owners have the physical and financial ability to acquire temporary water supply in the event of a shortage.

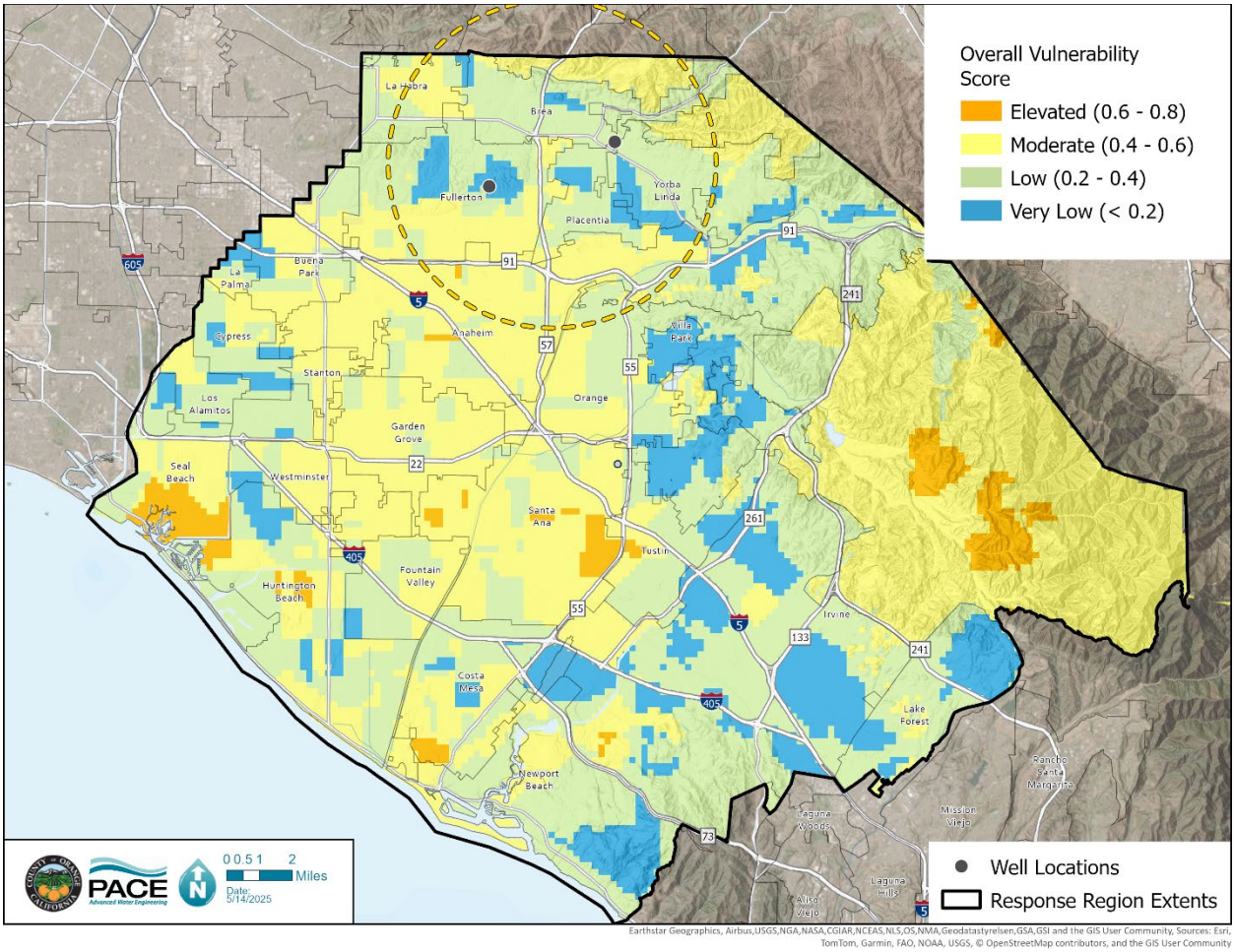


Figure 4-6: North Orange County Region – Northeastern Well Cluster

Like the East Well Cluster, there is an extensive water distribution system adjacent to the domestic well locations. The distribution system is managed by two water districts: the City of Fullerton and Yorba Linda Water District. OCWD manages the groundwater basin. Hazards in this area would consist of long-term devastating drought conditions that would impact OCWD's management of the groundwater basin levels, which is considered a very low threat.

Owners of domestic wells should have their wells tested annually and report any major changes to the well's water quality or performance to their local water district. Residents should prepare for water shortage by having a week's supply of water readily available. Use 1 gallon per day per person as a guide for estimating the household's immediate emergency needs. Additionally, domestic well users should know where local water is available for purchase such as large retail water dispensing machines, and large bulk supply stores to acquire water for the short-term.

If a natural disaster has caused a water shortage in this area, safety and shelter should be the number one immediate goal for residents.
This northeastern well cluster has an extensive local distribution system surrounding the domestic wells, and connections to the distribution system should be considered a long-term goal. Domestic well owners should contact the local water provider to inquire about the potential for connecting to the distribution system.

In a case where emergency water is needed by both domestic well owners and a single water staging center is needed, Brookhaven Elementary School, shown in Figure 4-7, is near equal distance to each well.

Residents can use the list of water haulers at the end of this chapter to help provide water in the event of water shortage.

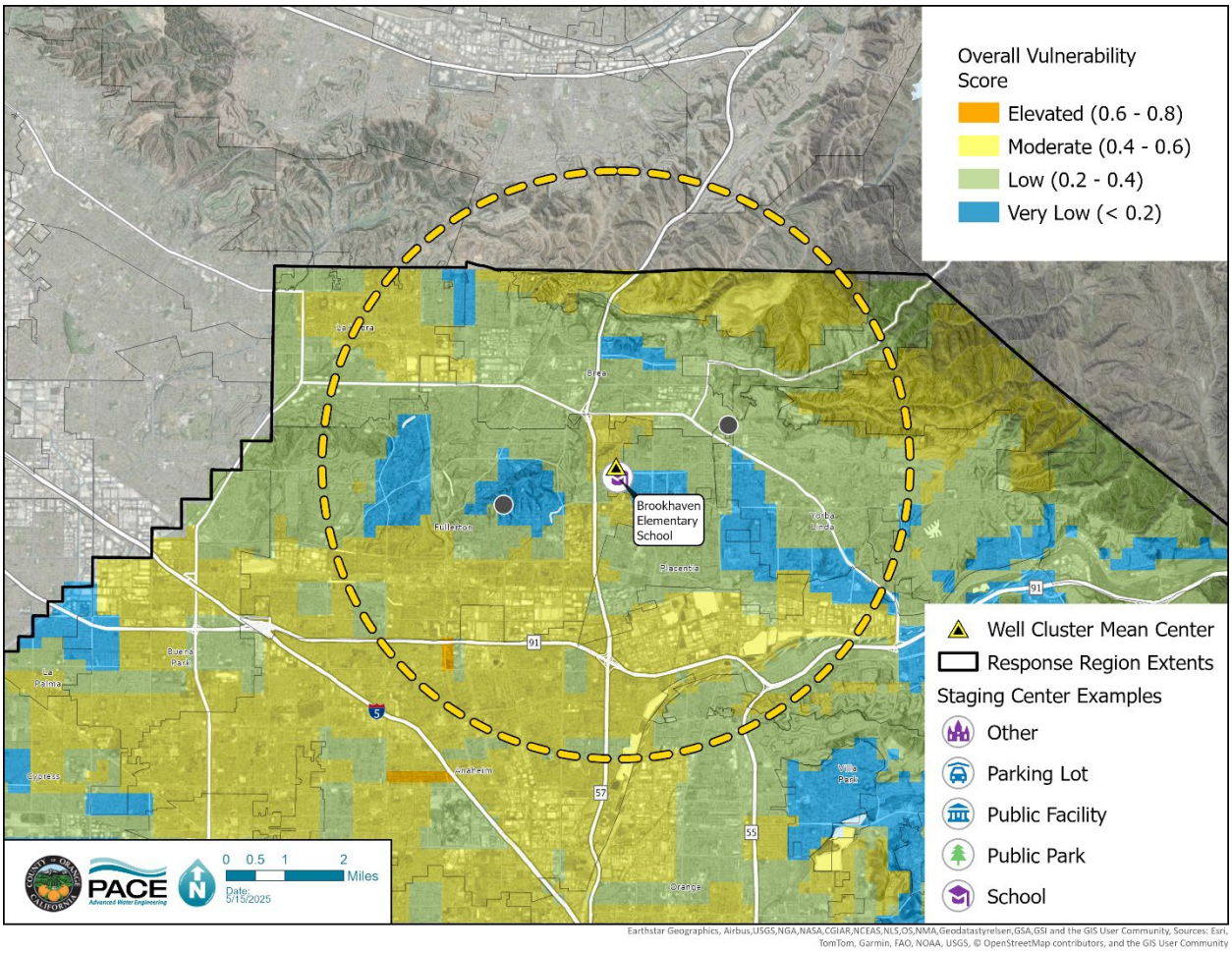


Figure 4-7: North Orange County Region – Northeastern Well Cluster Response Area

4.2.4 South Region – South Foothills Well Cluster

The south region was evaluated at three different cluster areas: south foothills, east foothills, and south coastal. The south foothills well cluster is within a high fire risk area so access could be of concern. The domestic wells fall within the moderate and elevated vulnerability zones. The social vulnerabilities are low to very low; it is assumed residents have the financial and physical ability to acquire retail water but are in a highly vulnerable location due to wildfire risk.

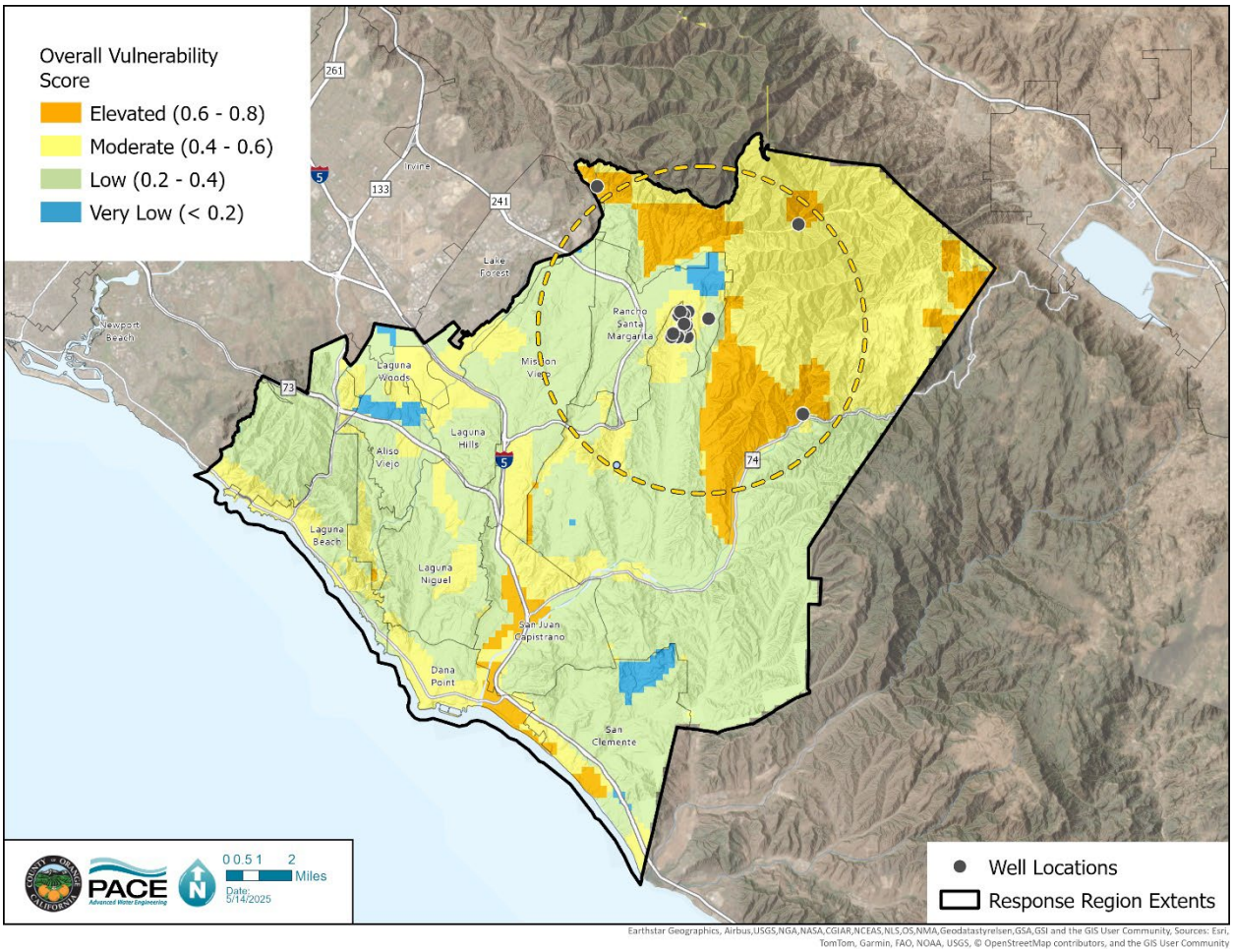


Figure 4-8: South Orange County Region – South Foothills Well Cluster

Owners of domestic wells should have their wells tested annually and report any major changes to the well's water quality or performance to their local water district. Residents should prepare for water shortage by having a week's supply of water readily available. Use 1 gallon per day per person as a guide for estimating the household's needs. Additionally, domestic well users should know where local water is available for purchase such as large retail water dispensing machines, and large bulk supply stores to acquire water for the short-term.

Planning for this region should first address immediate public safety, stressing to residents to find shelter if a natural disaster has occurred. Water shortage planning should keep in mind the high physical risk in this area. Residents in this region are likely to have the means to acquire water at local retailers or water purveyors in the short term, provided access is available.

In locations where water distribution lines are adjacent to the domestic well owners, the residents should inquire about the possibility of connecting to the water distribution system.

Four locations have been identified within the 5-mile mean center area as possible staging locations should more than one well owner need emergency water or should access to reach homes be limited during a water shortage event. These locations are as follows and are shown in Figure 4-9:

- Rancho Santa Margarita City Hall
- Santa Margarita Catholic High School
- Trabuco Canyon Water District Office
- US Forest Service Fire Station (Domestic well on Highway 74)

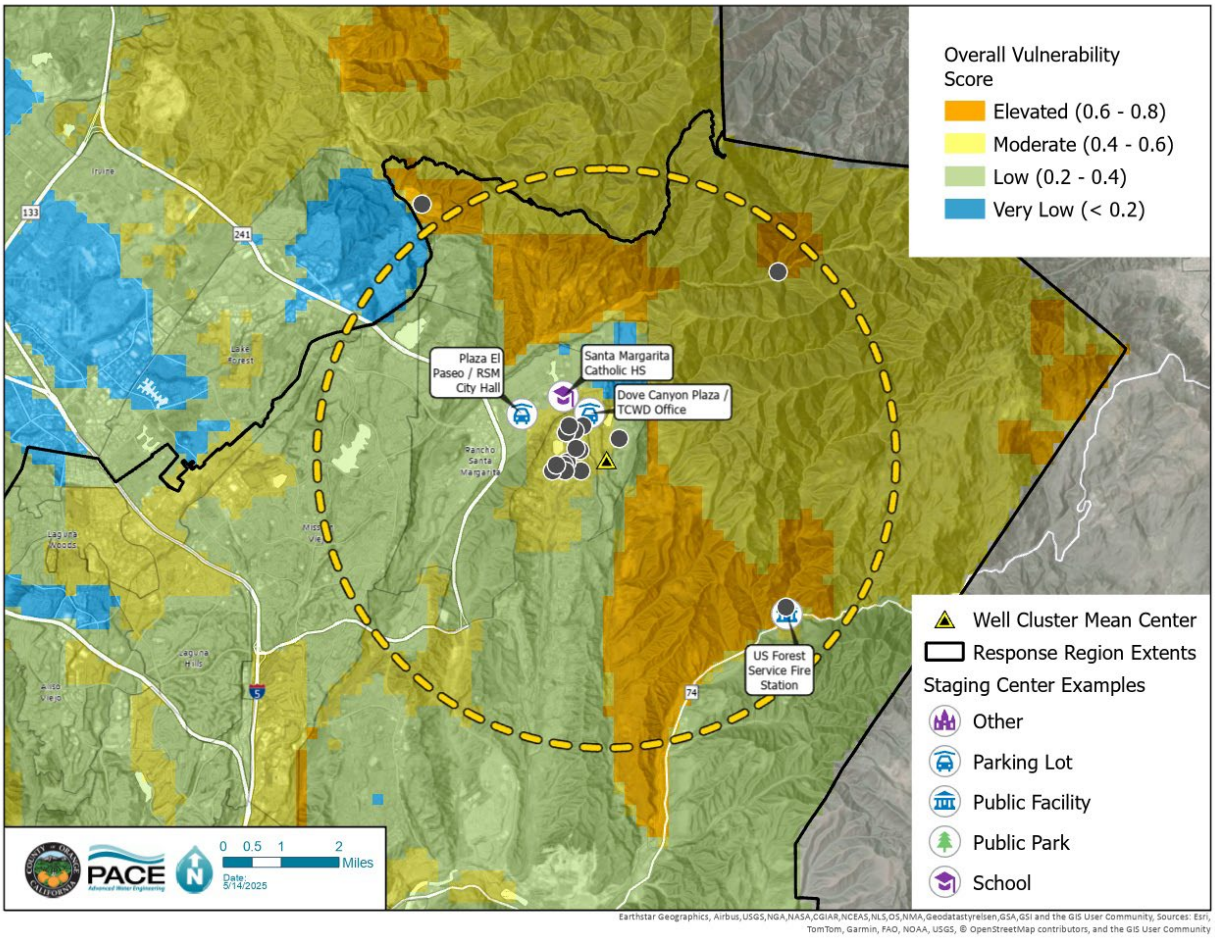


Figure 4-9: South Orange County Region – South Foothills Well Cluster Response Area

Residents can use the list of water haulers at the end of this chapter to help provide water in the event of water shortage. Short-term solutions for distant wells may require temporary storage tanks to be filled by water haulers on a routine basis.

4.2.5 South Region – East Foothills Well Cluster

The east foothills well cluster, shown on Figure 4-10, is within an unincorporated County area known as El Cariso Village. There is one major thoroughfare, Ortega Highway (Hwy 74), that connects the area to Orange County and Riverside County. This area is on the east side of the Cleveland National Forest, and water distribution is managed by Elsinore Valley Municipal Water District (EVMWD) of Riverside County. The area has a high fire risk so access could be of concern. The domestic wells fall within mostly elevated and moderate overall vulnerability zones due to the high wildfire risk and fractured aquifers. The social vulnerabilities are low, and it is assumed residents here have the financial and physical ability to acquire retail water if access is available.

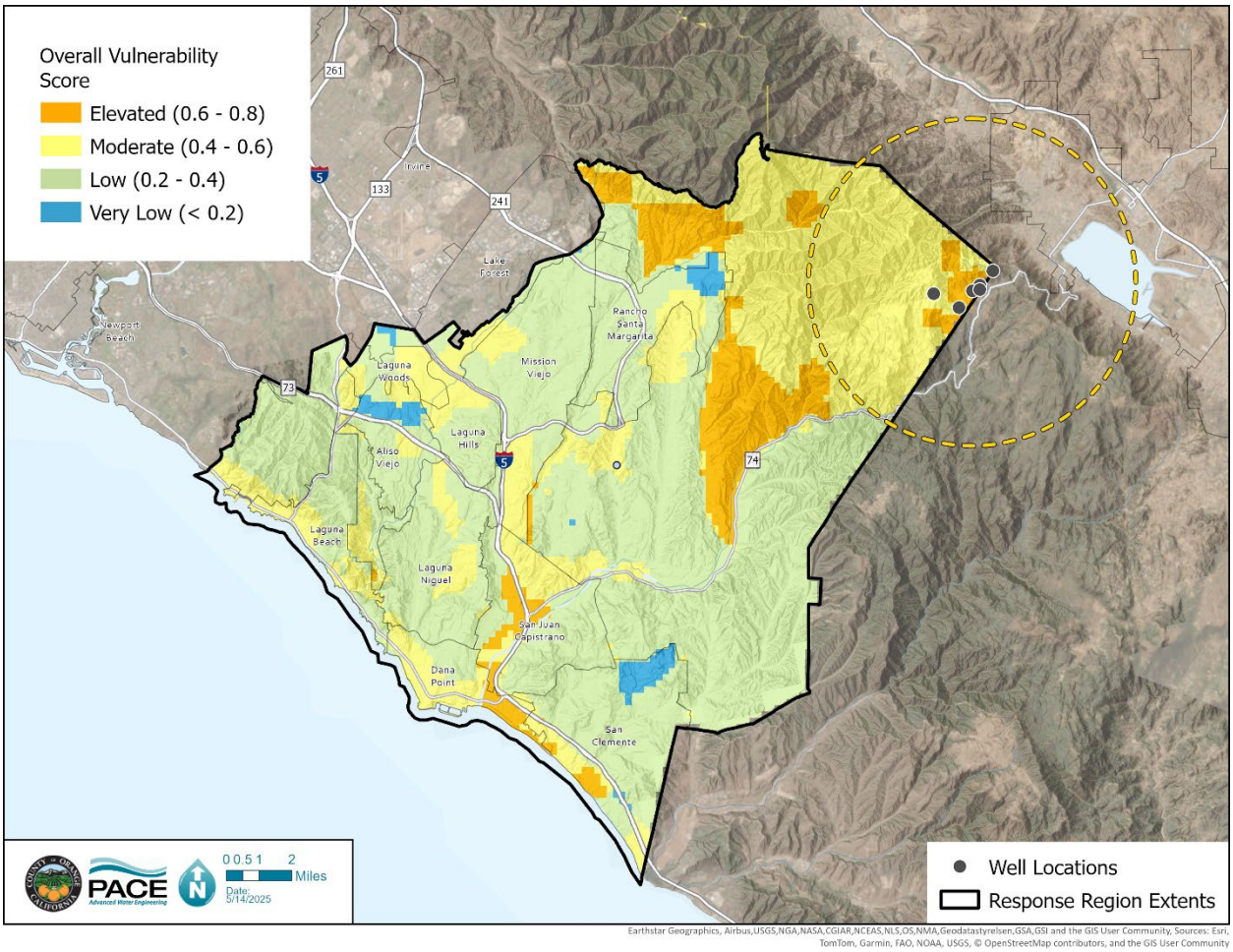


Figure 4-10: South Orange County Region – East Foothills Well Cluster

Owners of domestic wells should have their wells tested annually and report any major changes to the well's water quality or performance to their local water district. Residents should prepare for water shortage by having a week's supply of water readily available. Use 1 gallon per day per person as a guide for estimating the household's needs. Additionally, domestic well users should know where local water is available for purchase such as large retail water dispensing machines, and large bulk supply stores to acquire water for the short-term.

Planning for this region should first address immediate public safety, stressing to residents to find shelter if a natural disaster has occurred. Water shortage planning should keep in mind the high physical risk in this area. Residents in this region are likely to have the means to acquire water at local retailers or water purveyors in the short term, provided access is available.

Short-term solutions may require temporary storage tanks to be filled by water haulers on a routine basis. Due to its proximity to Lake Elsinore, water purchases should be sourced from the Lake Elsinore area and other Riverside County locations. If needed, the Riverside Fire Station could serve as a staging location, as shown in Figure 4-11.

Residents are encouraged to use the list of water haulers to coordinate water supply needs in the event of a water shortage.

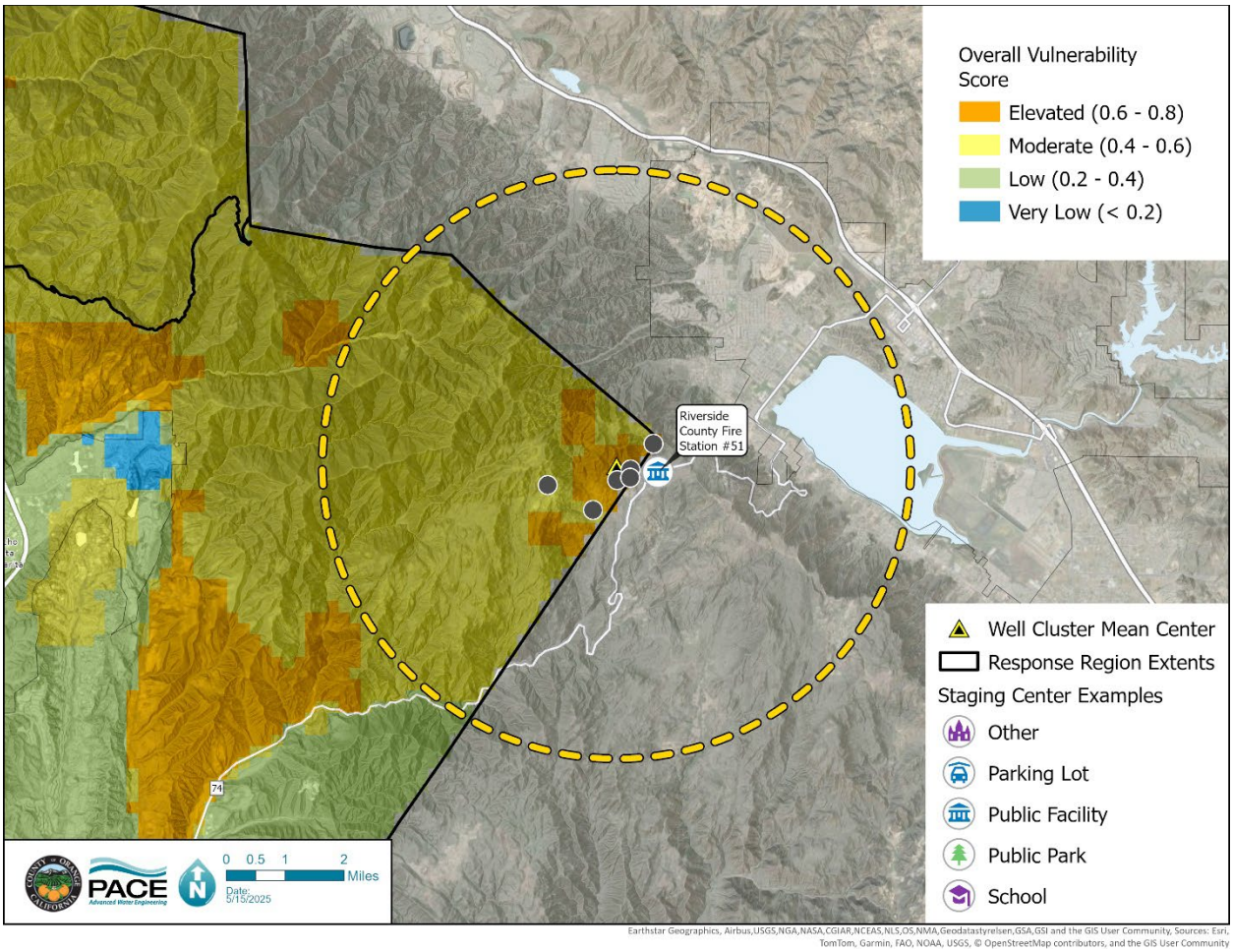


Figure 4-11: South Orange County Region – East Foothills Well Cluster Response Area

4.2.6 South Region – South Coastal Well Cluster

The south coastal well cluster has domestic wells found in South Laguna Beach and San Juan Capistrano. The overall vulnerability at the well locations is classified as low. The area has few social vulnerabilities due to the community being of higher affluence, but the area does have a high sea water intrusion risk. It is assumed the residents have the financial and physical ability to acquire water for short-term purposes. The region is served by two water districts: South Coast Water District and Santa Margarita Water District.

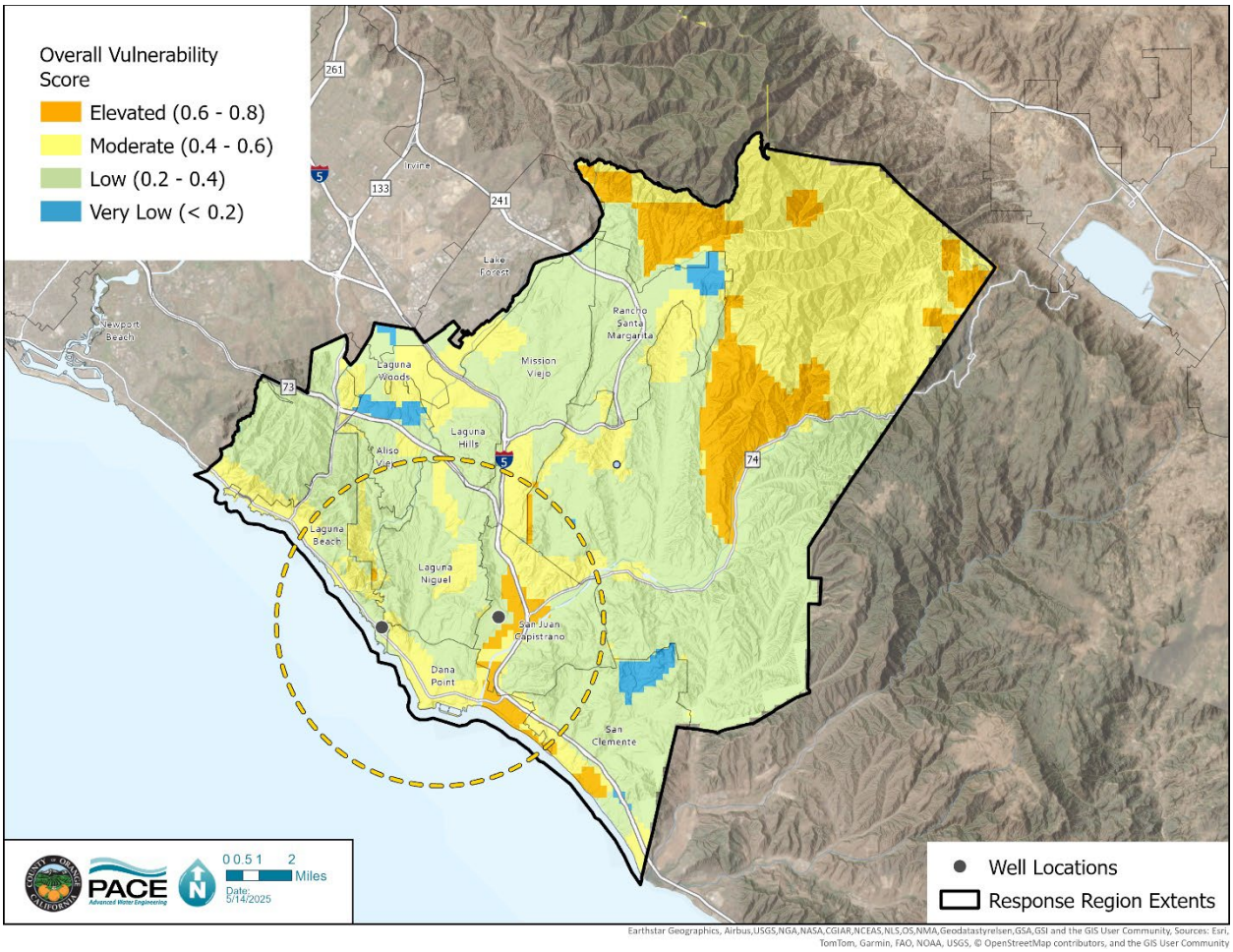


Figure 4-12: South Orange County Region – South Coastal Well Cluster

Owners of domestic wells should have their wells tested annually and report any major changes to the well's water quality or performance to their local water district. Residents should prepare for water shortage by having a week's supply of water readily available. Use 1 gallon per day per person as a guide for estimating the household's needs. Additionally, domestic well users should know where local water is available for purchase such as large retail water dispensing machines, and large bulk supply stores to acquire water for the short-term.

Planning for this region should first address immediate public safety, stressing to residents to find shelter if a natural disaster has occurred. Water shortage planning should keep in mind the high physical risk in this area. Residents in this region are likely to have the means to acquire water at local retailers or water purveyors in the short term, provided access is available.

The south coastal well cluster has an extensive local distribution system surrounding the domestic wells, and connections to the distribution system should be considered a long-term goal. Domestic well owners should contact the local water provider to inquire about the potential for connecting to the distribution system.

Two locations were identified as potential staging areas for water distribution needs in an emergency if both wells are experiencing water shortage:

- Dana Hills High School
- Ocean Ranch Parking Lot

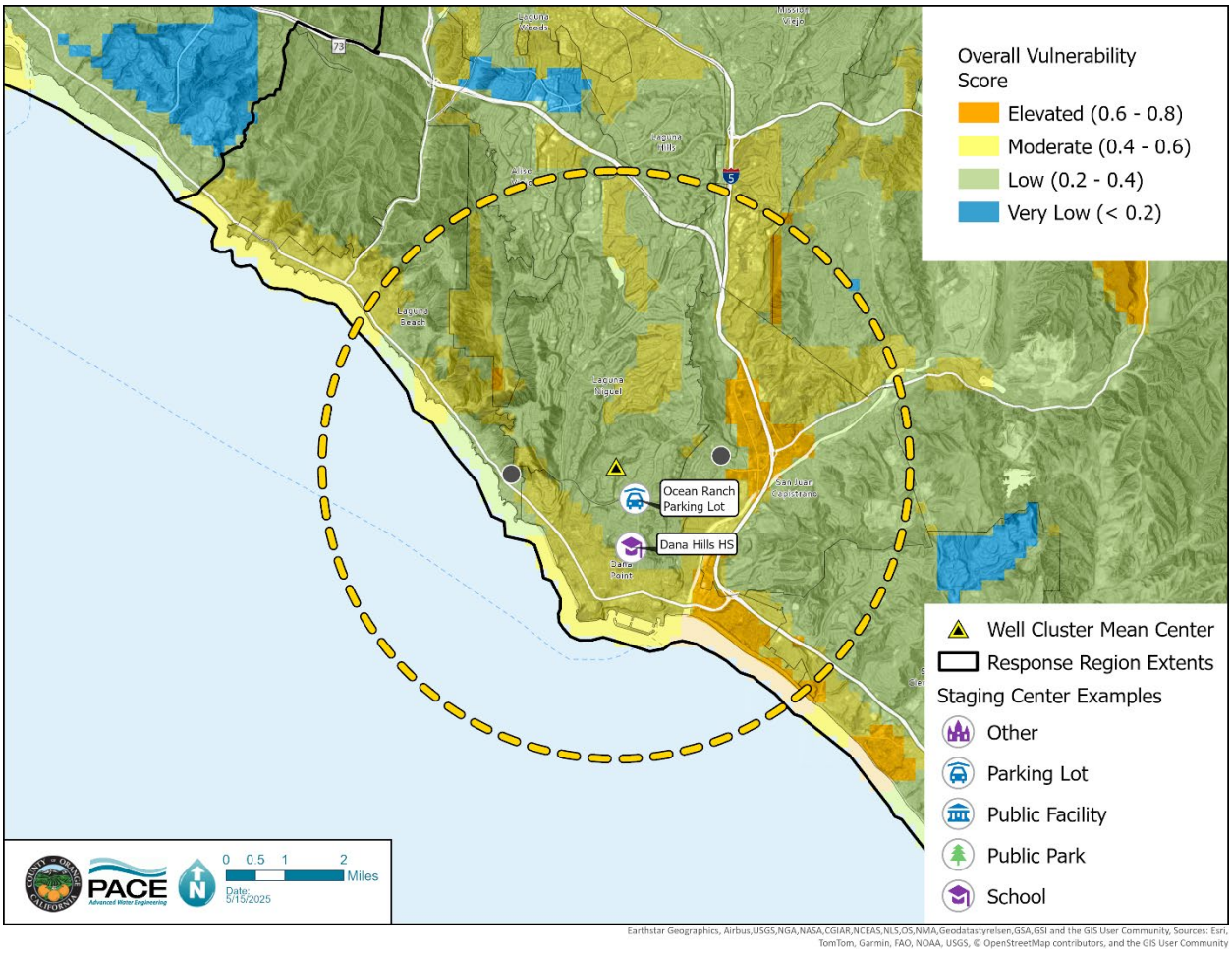


Figure 4-13: South Orange County Region – South Coastal Well Cluster Response Area

4.3 Intermediate Short-Term Response

The intermediate short-term response is an action that is to be taken to provide enough water for each resident to have 5 gallons per day for drinking, food preparation, and minimal hygiene purposes. The intent of the intermediate response is to supplement the immediate response and bridge the gap until long-term plans can be enacted.

Municipalities may consider procuring plastic storage tanks approximately 2,000–3,000 gallons in size that can be installed near the well clusters. The municipality should contract with a local water hauler that can be filled with potable water that the residents may utilize.

If the well can no longer be used due to potable water quality issues, there is a possibility that water filters or other treatment systems may be provided to the residents to treat water at the source. This response action will be case-specific dependent upon the contaminants present and will need to be addressed on an individual basis should the need arise.

If a well cannot be used due to a power outage in the area, the municipality may consider providing temporary generators to run the well while awaiting restoration of power to the area.

4.4 Drought Preparedness

It is important for domestic well users and owners to be prepared for a potential water shortage, so they are not caught off guard. Water shortage issues occur for a variety of reasons, and users and owners should plan ahead to stay safe. Below are some steps for domestic well users and owners to take:

- Determine the condition of your well by knowing the well depth, pump or bowl depth, and water levels.
- Stockpile enough bottled water for a minimum 7-day household supply.
- Develop a family plan to address potential outages.
- Have the number of a local well repair company handy.
- Identify a company that sells or rents water tanks.
- Identify a source of trucked-in water.
- Develop a plan to supply water for pets and livestock in case of a well outage.
- Communicate your drought preparedness plans with your neighbors and work together.

4.4.1 Domestic Well Loan Program

The Rural Community Assistance Corporation (RCAC) is a nonprofit organization that operates in the western states, including California, that serves rural communities. The RCAC has a program called the Clean Drinking Water Well Replacement Program that provides loans to qualified applicants. More information can be found at https://www.rcac.org/lending-2/household-water-well-septic-loans.

4.4.2 Rental Property Domestic Well Testing

Landlords that supply tenant's potable water with domestic well water have certain obligations under California Assembly Bill 2454, Rental Property Domestic Well Testing Requirements. AB 2454 requires landlords to have the well water tested with a state-run testing program. The results must be shared with the residents within 10 days of receiving the results. Lastly, the landlord is to provide safe drinking water if the test results show an exceedance of safe drinking water standards. The program offers free replacement drinking water solutions (bottled water, hauled water, filling stations, etc.).

4.4.3 Water Hauling Contacts

The water hauler list below consists of companies that provide resident or larger scale potable water delivery services. This list should not be considered comprehensive, but at the time of this report the providers were active.

Table 4-5 Local Water Hauling Companies

Water Hauling Companies	Phone Number
A Rees Water Truck Services	(714) 534-0266
Allstar Water Trucks	(714) 970-3647
Jensen Water Trucks	(310) 455-2463
Liege Water Trucking	(714) 273-1348
Orange County Water Delivery Service	(714) 662-5333
Paradise Drinking Water	(714) 729-3752
Phresh Waters – Alkaline Water Delivery	(800) 330-0120
Polar Springs Water	(714) 906-0664
The Better Water Co.	(714) 890-7282

5 Long-Term Mitigation Strategy and Actions

Long-term mitigation strategies are long-term solutions or even preventive measures that can be implemented before a drought or water shortage event occurs to reduce potential impacts. While these actions may require more time and budget to implement, they will reduce reliance upon short-term actions and can minimize the costs associated with any short-term actions that are needed.

5.1 Consolidations for Existing Water Systems and Domestic Wells

Consolidation of existing domestic well clusters into a single small water system that can be supplied by an existing larger water system nearby would provide long-term reliability for water delivery to the residents. The County has identified the following potential opportunities to consolidate the domestic wells by connecting these homes to nearby existing distribution systems.

5.1.1 Connection to Existing Distribution Systems

The most sustainable long-term response is to connect the existing locations served by domestic wells to local potable water distribution systems that are operated and maintained by a municipality or special district. These distribution systems typically have built-in redundancy that provides additional reliability in the event of a drought. The homes would require a pipeline between the distribution system and the current well piping system. Table 5-1 lists the well clusters and the municipality service area the well clusters are located within. Following the table there are three figures showing the well cluster locations and the municipality service areas.

Table 5-1: Nearest Distribution Systems to Clusters of Domestic Wells

Well Cluster	Nearest Distribution System
Black Star Canyon	Irvine Ranch Water District
Williams and Silverado Canyons	Irvine Ranch Water District
Dove Canyon	Trabuco Canyon Water District Santa Margarita Water District
San Juan Springs	Santa Margarita Water District
El Cariso Village	Elsinore Valley Municipal Water District
Other South County Wells	Santa Margarita Water District South Coast Water District
Other Urban Wells	City of Anaheim City of Fullerton City of Orange

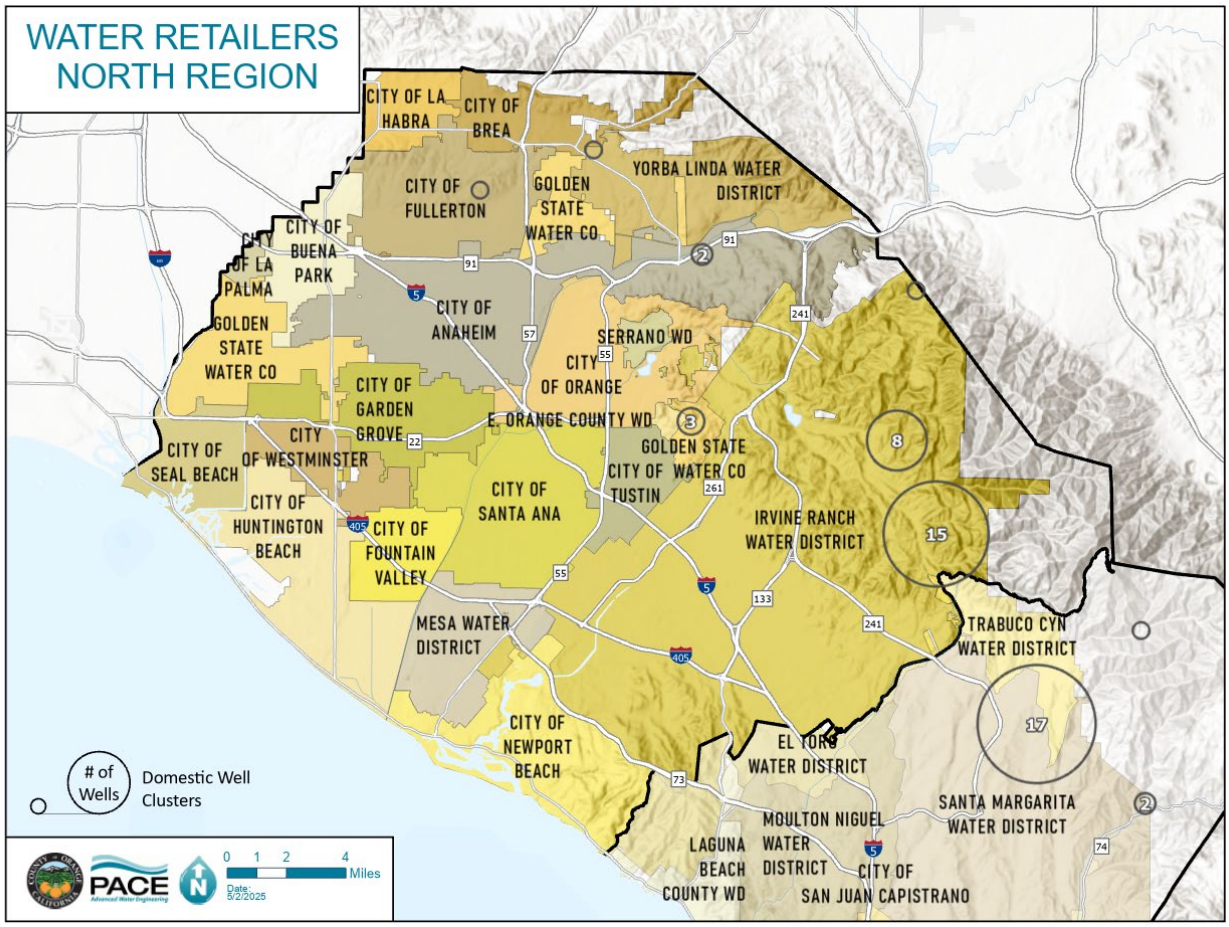


Figure 5-1: North Orange County Region Well Clusters and Service Areas

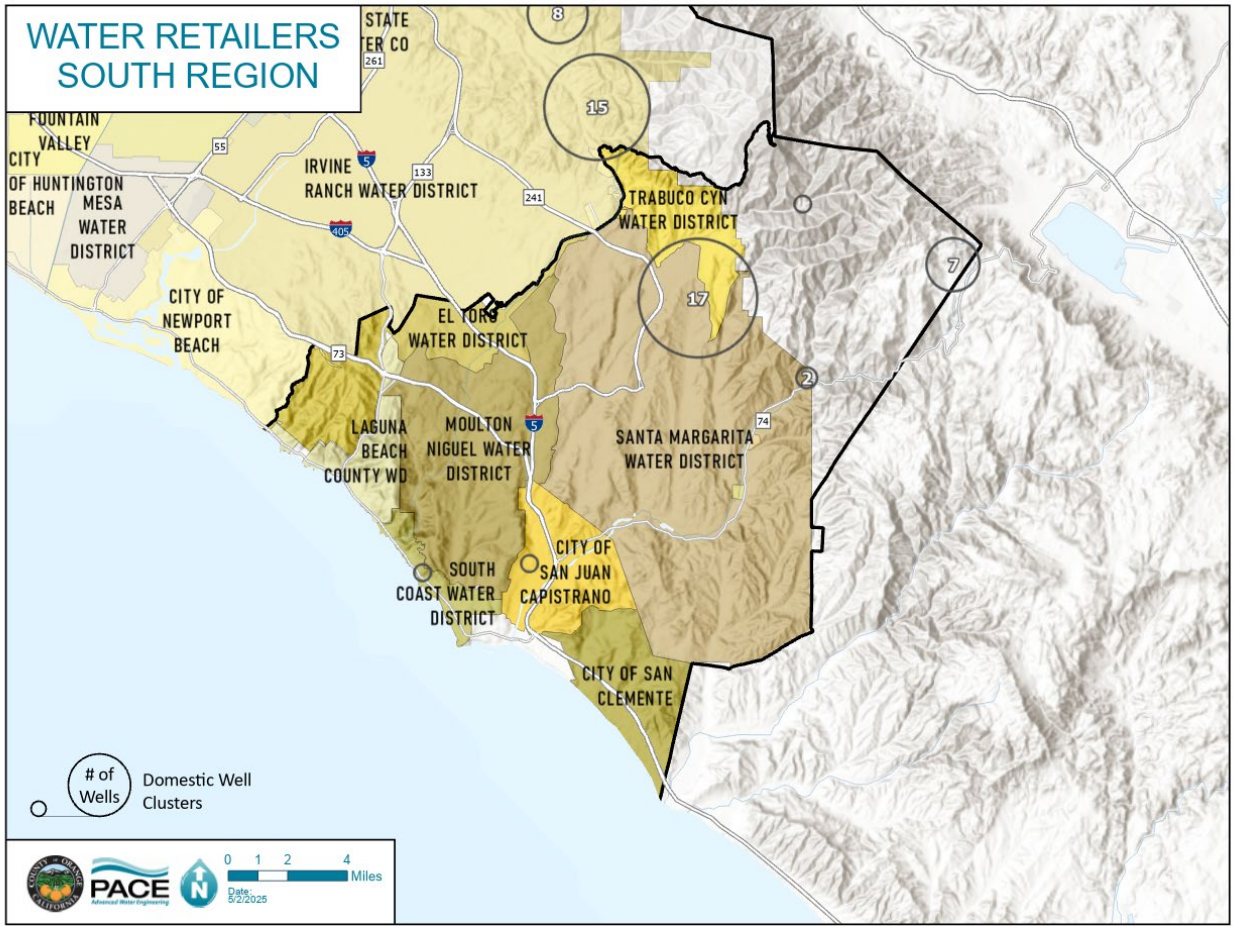


Figure 5-2: South Orange County Region Well Clusters and Service Areas

5.1.2 Existing Distribution System Near Domestic Wells

Based on GIS information obtained from Irvine Ranch Water District, Williams and Silverado Canyons are being served by the District with existing distribution pipelines and storage tanks throughout this region, as shown in Figure 5-3. Many wells in this area are directly adjacent to the distribution system. The farthest well location from the distribution system is just over 0.5 mile.

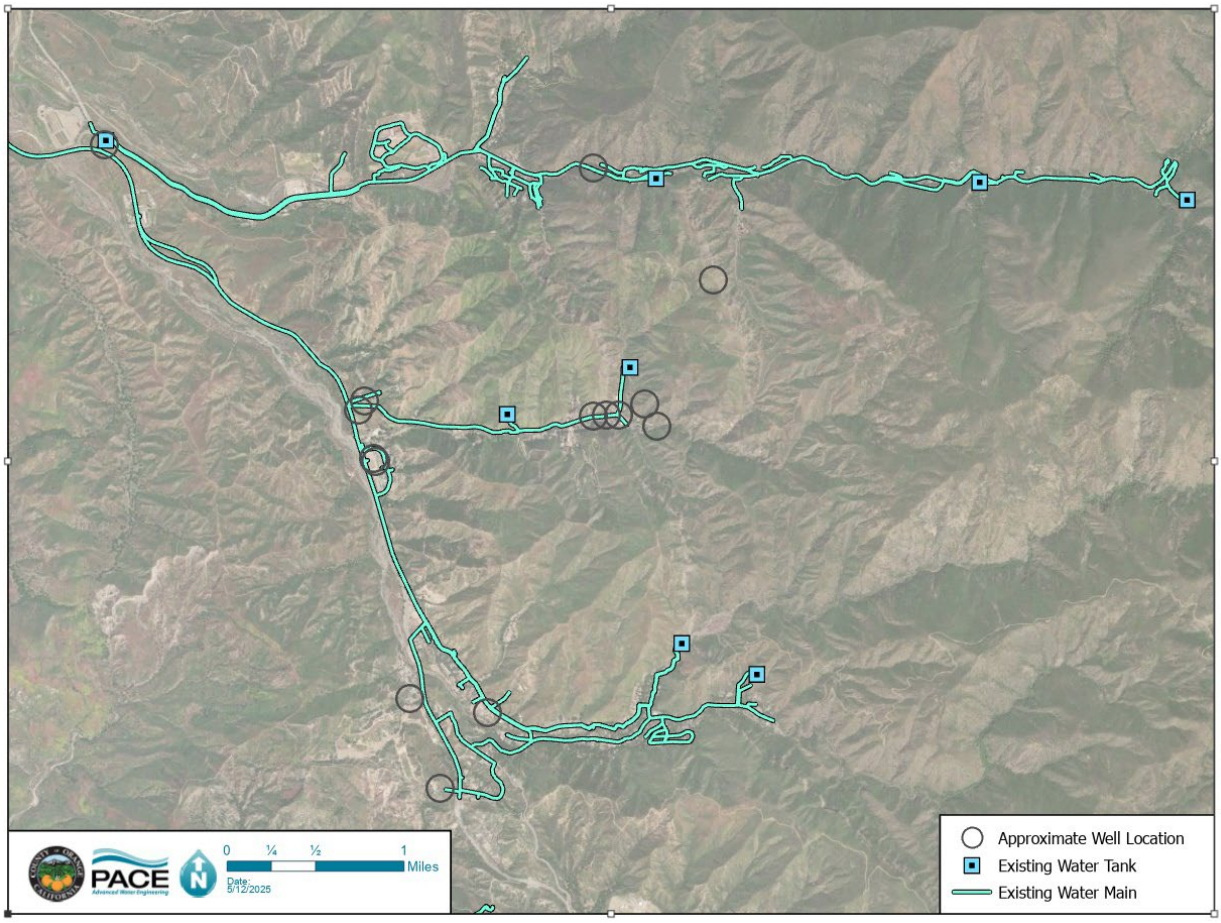


Figure 5-3: IRWD Distribution System Near Williams and Silverado Canyons

El Cariso Village is within Orange County, but the closest distribution pipeline is owned and operated by EVMWD and runs along the east side of the mountain, just outside the County line. Figure 5-6 shows the approximate locations of the El Cariso Village wells relative to the existing water infrastructure.

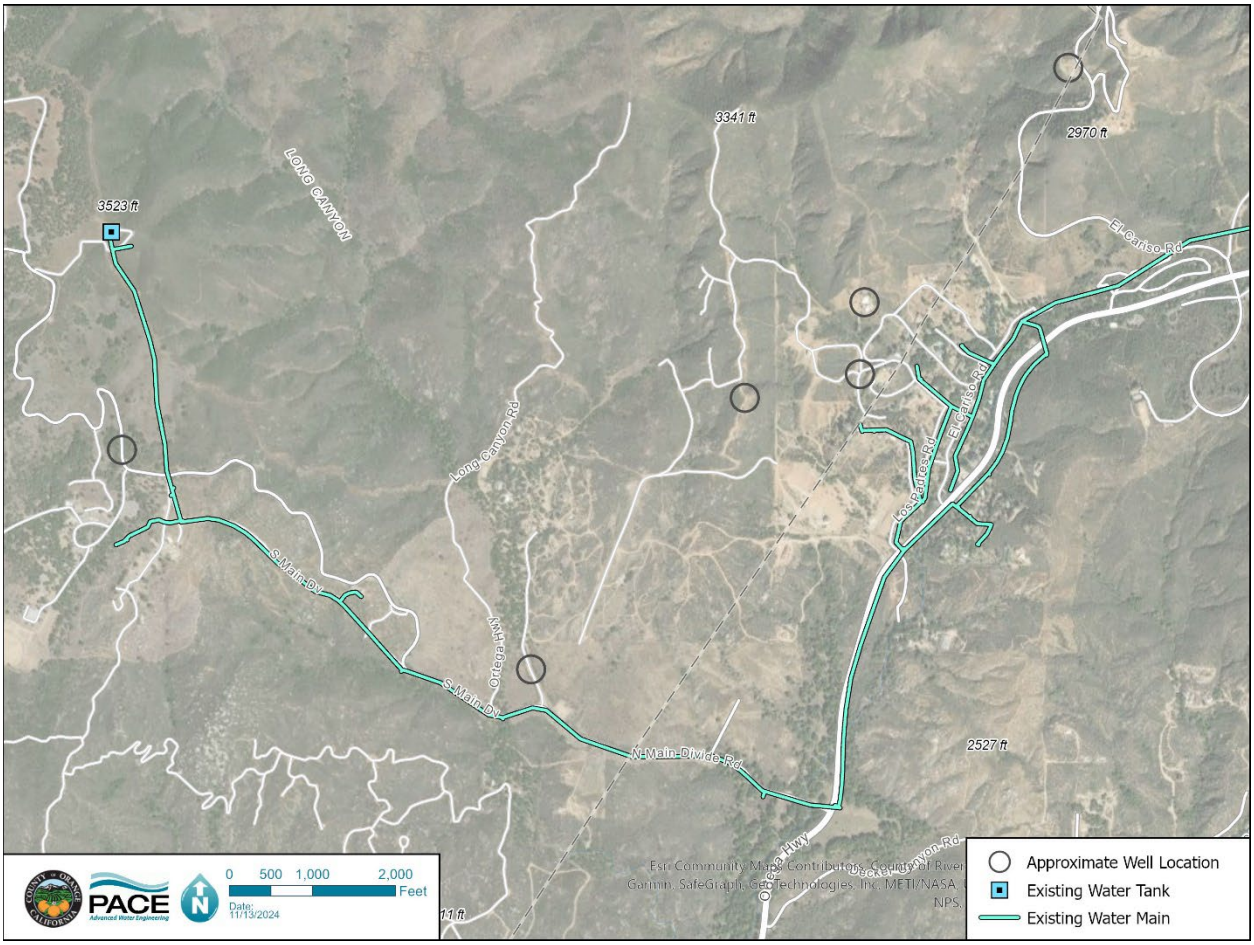


Figure 5-4: EVMWD Distribution System Near El Cariso Village

There are several wells that are not near any known water distribution system and not in an urbanized enough area to assume a distribution system is nearby. These wells are in the Northern Foothills Region and South Region, within the Santa Ana Mountains area, making the terrain difficult to navigate with infrastructure. In this case, connecting to an existing distribution system is likely not a viable option and will require water conservation measures, water treatment, and trucking in of water to supplement well production dependent upon the cause of the drought scenario.

5.2 Domestic Well Drinking Water Mitigation Programs

A domestic well drinking water mitigation program will support the operation of domestic wells in the County by identifying wells that may be impacted by drought conditions, developing options for well deepening, repairing, and implementing community-supported solutions in collaboration with other agencies.

5.2.1 Well Deepening and Repair

Well deepening can be considered if the well is relatively shallow compared to the overall depth of the groundwater aquifer, especially when the upper layers are not producing enough water to meet the needs of the well's dependents. In such cases, the well could be deepened to tap into lower levels of the aquifer. However, this approach does not address the underlying issue: the aquifer is in an overdraft state, meaning that water is being extracted faster than it can naturally recharge. If this overdraft continues, the aquifer may eventually draw down to the newly extended well depth, potentially recreating the same water shortage issues. Over time, this could also lead to ground subsidence and a reduction in available aquifer storage.

Well repair may be preferable if the issue stems from poor potable water quality at certain depths within the aquifer. In this scenario, water samples are taken at various depths to develop a water quality profile, identifying depths with poor water quality. Problematic sections of the aquifer can then be sealed off within the well-casing to prevent extraction of low-quality water, allowing for continued well operation. However, this solution depends on whether poor water quality remains isolated; if it migrates to other depths, further intervention may be necessary.

Regardless of the implemented option, all requirements of the Authority Having Jurisdiction shall be followed along with all pertinent permits attained.

5.3 Water Conservation

If the well is still capable of producing water, but at reduced flow rates or unable to sustain constant high flow, water conservation is a potential solution. The local authority having jurisdiction can assist the at-risk residents to replace existing water fixtures with highly efficient water fixtures. In accordance with SB 1157, the current target for California indoor use is 55 gpcd, which will reduce to a target of 47 gpcd in 2025. A typical home built with current water fixtures requires about 50 gpcd meeting the upcoming target, while older homes with less efficient water fixtures require about 75 gpcd. The following table shows that through the installation of highly efficient water fixtures, the daily use can drop to 35 gpcd, assuming the same daily usage of these fixtures.

5.3.1 Groundwater Basin Conservation Procedures

OCWD continuously monitors the groundwater level in the underlying groundwater basin to ensure the basin is not in an overdraft condition. During extended drought periods, where the groundwater basin is showing lower than normal groundwater levels, OCWD will decrease the amount of water that may be pumped from the groundwater basin, known as the Basin Production Percentage (BPP) in order for the groundwater basin to rebound while waiting for a wet year.

5.3.2 Local Conservation Procedures

By working with residents to replace their water fixtures, the required indoor water usage can drop by 30% to 53% in the long term, depending upon the efficiency of existing water fixtures. Based on the flow capacity of the well and aquifer, this may serve as a long-term solution by reducing the demand on the aquifer to manageable levels. The following tables demonstrate how high efficiency fixtures can be a long-term strategy.

Table 5-2: Indoor Potable Water Usage with High Efficiency Fixtures

Potable Water Use	Flow per Use	Daily Usage	Gallons per Capita per Day
Toilets	0.8 gal / flush	5 flush / day	4
Showers	1.5 gal / min	12 min / day	18
Kitchen Faucets	1.0 gal / min	4 min / day	4
Bathroom Faucets	1.0 gal / min	2 min / day	2
Clothes Washer	13 gal / load	0.5 loads / day	6.5
Dishwasher	2.95 gal / load	0.3 loads / day	0.9
Indoor Potable Water Usage (gpcd)			**35**

By working with residents to replace their water fixtures, the required indoor water usage can drop by 30% to 53% in the long term, depending upon the efficiency of existing water fixtures. Based on the flow capacity of the well and aquifer, this may serve as a long-term solution by reducing the demand on the aquifer to manageable levels. Table 5-3 compares the estimated water usage of each cluster of wells with original fixtures or high efficiency fixtures, assuming 75 gpcd required.

Table 5-3: Water Reduction with High Efficiency Fixtures

Well Cluster	# of Wells	Original Fixtures Long Term (gpd)	HE Fixtures Long Term (gpd)
Black Star Canyon	9	13,500	6,300
Williams and Silverado Canyons	15	22,500	10,500
Dove Canyon	17	25,500	11,900
San Juan Springs	2	3,000	1,400
El Cariso Village	7	10,500	4,900
Other South County Wells	2	3,000	1,400
Other Urban Wells	7	10,500	4,900

6 Implementation Considerations

The assessment within this DRP has identified vulnerabilities and potential risks to domestic wells in the event of an emergency. However, at the time of this report it is believed the wells are currently operating normally to provide adequate water supply to residents since no well shortage has been reported to the County. Although no immediate action is needed, the response actions outlined herein are provided as recommendations that can be implemented if they are determined to be necessary.

The County has identified and recommended short-term and long-term response actions as required by SB 552, selected measures will be implemented through collaboration and coordination with the Task Force, local municipalities, special districts, and other stakeholders as needed.

6.1 Short-Term Response Action Implementation

Immediate and intermediate short-term responses should be coordinated by local water retailers to provide an adequate supply of potable water through temporary distribution centers. With publication of this DRP, the County is providing estimated water demand and locations of nearby domestic wells to these distributors to ensure a timely and sufficient response in the event of an emergency.

6.1.1 Inter-Agency Implementation Considerations

The water retailers within the County are listed below and can be contacted at the phone numbers provided for more information.

Table 6-1: Water Retailer Contact Information

WATER RETAILERS	ADDRESS	PHONE
City of Anaheim	201 S. Anaheim Blvd, Anaheim, CA 92805	(714) 765-3300, ext. 311
City of Brea	1 Civic Center Circle, Brea, CA 92821	(714) 990-7600
City of Buena Park	6650 Beach Blvd, Buena Park, CA 90621	(714) 562-3721
City of Fountain Valley	10200 Slater Ave., Fountain Valley, CA 92708	(714) 593-4600
City of Fullerton	303 W. Commonwealth Ave., Fullerton, CA 92832	(714) 738-6890
City of Garden Grove	13802 Newhope St., Garden Grove, CA 92843	(714) 741-5395
City of Huntington Beach	2000 Main St., Huntington Beach, CA 92648	(714) 536-5921
City of La Habra	110 E. La Habra Blvd, La Habra, CA 90631	(562) 905-9731
City of Orange	189 S. Water St., Orange, CA 92866	(714) 288-2475
City of San Juan Capistrano	32400 Paseo Adelanto, San Juan Capistrano, CA 92675	(949) 493-1171
Golden State WC – West Orange County	2281 E. Via Burton, Anaheim, CA 92806	(909) 394-2272
Irvine Ranch Water District	15600 Sand Canyon Ave., Irvine, CA 92618	(949) 453-5300
Santa Margarita Water District	26111 Antonio Pkwy, Las Flores, CA 92688	(949) 459-6420
South Coast Water District	31592 West St., Laguna Beach, CA 92651	(949) 499-4555
Trabuco Canyon Water District	32003 Dove Canyon Dr., Trabuco Canyon, CA 92679	(949) 858-0277
Yorba Linda Water District	1717 E. Miraloma Ave., Placentia, CA 92870	(714) 701-3000

6.2 Long-Term Response Action Implementation

The recommended long-term response actions consist of well system consolidation/connection to retail water distribution systems, well rehabilitation, and water conservation. The potential to connect homes served by domestic wells to existing water distribution systems will be discussed with residents and the relevant agencies to gauge interest before developing implementation plans.

Well rehabilitation opportunities can be evaluated on a case-by-case basis to determine feasibility and will be the responsibility of the well owner to implement.

To encourage water conservation during an emergency, the County will develop public outreach materials and communication routes that will educate the public on effective conservation measures, such as installing efficient fixtures, reducing irrigation, and testing for leaks.

6.3 Policy Alignment

This DRP will be added as an appendix to the County's Emergency Operations Plan.

6.4 DRP Review Schedule

This DRP will be reviewed and approved by multiple subcommittes and committees involved in emergency management operations in the County of Orange. It will start with the Emergency Management council subcommittee consisting of County agency Emergency Management representatives. Next it would go to the Orange County Emergency Management organization which includes emergency managers for all jurisdictions including local government and the county. Next it would go to the disabilities access and functional needs working group, comprised of representative of the community. Next the DRP will go to the Orange County Emergency Management Council, Operational Area Executive Board these are the policy leaders for the county agencies that include the discipline specific representatives. Finally, it would go to the Orange County Board of Supervisors for their approval. Subsequently their would be a review by the County every 5 years to determine if the Plan needs to be updated. This review may include, but is not limited to, updating vulnerability score datasets, revising well locations with new information, and determining if additional response actions need to be implemented.

References

California Department of Water Resources (DWR). 2022. "DWR's Groundwater Program Key to Long-Term Water Resilience." Accessed at: https://water.ca.gov/News/Blog/2022/Oct-22/DWRs-Groundwater-Program-Key-to-Long-Term-Water-Resilience.

California Department of Water Resources (DWR). 2023. *Technical Methods for the Drought and Water Shortage Vulnerability Assessment Update 2023: California's Domestic Wells and State Small Water Systems.* DWR Water Use Efficiency Branch.

California Department of Water Resources (DWR). 2024. "Water Shortage Vulnerability (State Smalls and Domestic Wells Analysis)." Accessed at: https://experience.arcgis.com/experience/ae1b4e3e41004f07b4901a7a3fa50637/page/Overview/.

California Office of Environmental Health Hazard Assessment (OEHHA). 2024. "Air Temperatures." Accessed at: https://oehha.ca.gov/climate-change/epic-2022/changes-climate/air-temperatures.

National Oceanic and Atmospheric Administration (NOAA). 2022. "State Climate Summaries 2022: California." Accessed at: https://statesummaries.ncics.org/chapter/ca/.

National Oceanic and Atmospheric Administration (NOAA). 2024. "October 2024 Global Climate Report." Accessed at: https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202410.

Riordan, Erin C., Thomas W. Gillespie, Lincoln Pitcher, Stephanie S Pincetl, G. Darrel Jenerette, and Diane E. Pataki. "Threats of Future Climate Change and Land Use to Vulnerable Tree Species Native to Southern California." *Environmental Conservation* 42, no. 2 (2015): 127–38. Accessed at: https://doi.org/10.1017/S0376892914000265.

United Nations. 2021. "Progress on Level of Water Stress." UN-Water SDG 6 Data Portal. Accessed at: https://sdg6data.org/en/indicator/6.4.2.

United States Census Bureau. 2022. "American Community Survey (ACS)." Accessed at: https://www.census.gov/programs-surveys/acs.

United States Census Bureau. 2023. "QuickFacts: Orange County, California." Accessed at: https://www.census.gov/quickfacts/orangecountycalifornia.

United States Department of Health and Human Services (HHS). 2022. "2022 Poverty Guidelines." Accessed at: https://aspe.hhs.gov/sites/default/files/documents/4b515876c4674466423975826ac57583/Guidelines-2022.pdf.

United States Environmental Protection Agency (EPA). 2011. "Planning for an Emergency Drinking Water Supply." Office of Research and Development. Accessed at: https://www.epa.gov/sites/default/files/2015-03/documents/planning_for_an_emergency_drinking_water_supply.pdf.