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# VULNERABILITY ASSESSMENT REPORT FOR THE ONTARIO PLAN 2050 UPDATE

City of Ontario

*Prepared for:*

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# INTRODUCTION

The City of Ontario (City) prepared a Climate Change Vulnerability Assessment in conformance with State of California requirements to assess climate change vulnerability and address climate change adaptation and resilience as part of The Ontario Plan 2050 Update (TOP 2050). California Government Code Section 65302(g) requires communities to address climate adaptation and resilience in their general plans. The goal of this requirement is to enable the community to prepare for, respond to, withstand, and recover from disruptions created or caused by climate change. The vulnerability assessment acts as a foundation for integrating adaptation and resilience policies into the Safety Element and The Ontario Plan by identifying a set of priority vulnerabilities in the City of Ontario. This report presents the results of the City's Climate Change Vulnerability Assessment and includes an overview of the regulatory framework and method for preparing a vulnerability assessment and incorporating adaptation and resilience into TOP 2050, a summary of the climate change hazards affecting the resilience of Ontario, and characterizes specific populations and assets included in the assessment

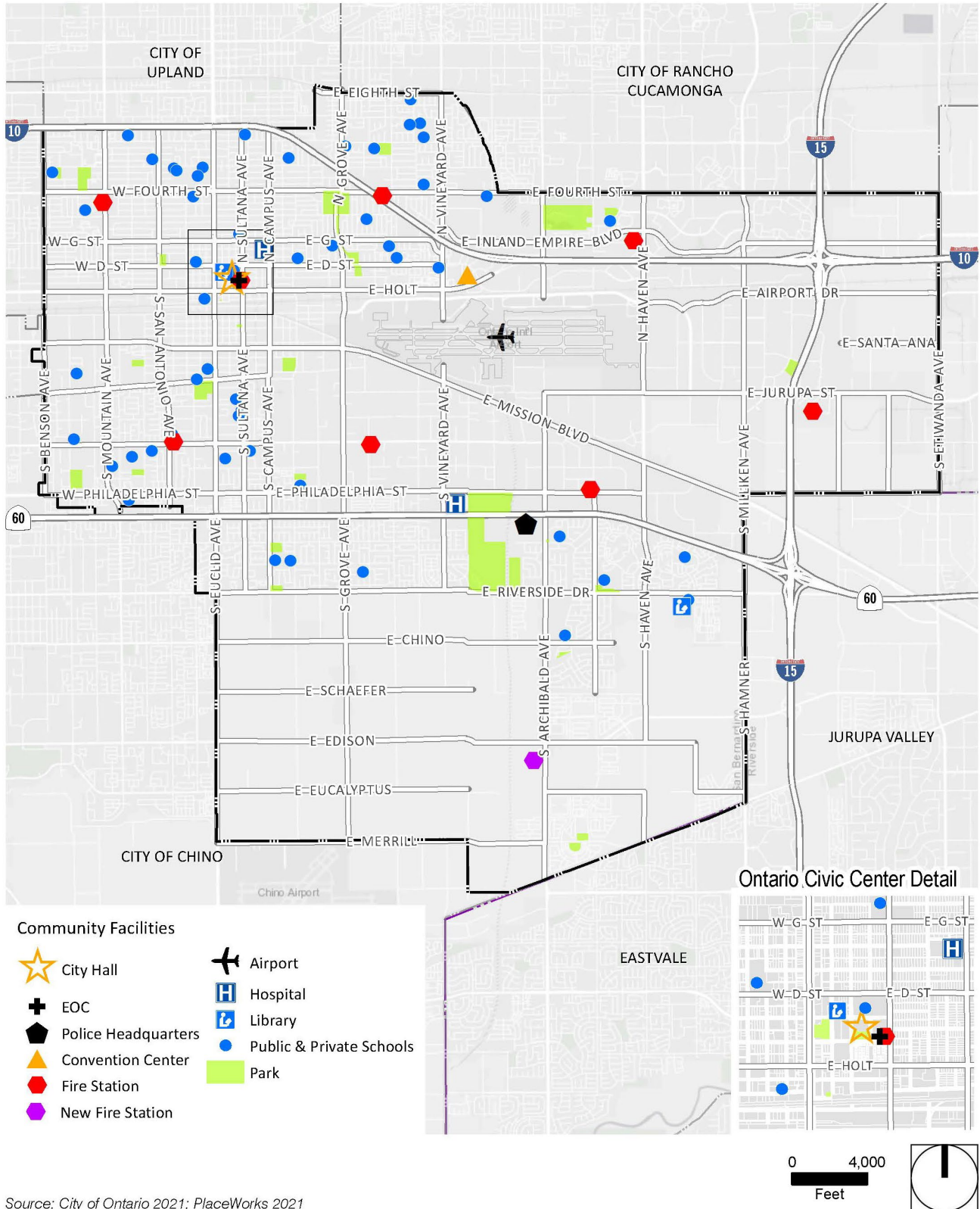
## Community Profile

The City of Ontario is in the valley portion of San Bernardino County, surrounded by the cities of Rancho Cucamonga and Upland to the north, the cities of Fontana and Jurupa Valley to the east, the City of Eastvale to the south, and City of Chino to the west. The Los Angeles National Forest in the San Gabriel Mountains rise nearly 10,064 feet above sea level, and the city sits just south of this mountain range at 1,004 feet above sea level. According to American Community Survey 2019, 5-year estimates, Ontario is home to approximately 176,760 residents, over 37 percent of which are 24 years old or younger and 31 percent of which are between 25 and 44 years old.

The City of Ontario covers approximately 50 square miles, as shown in **Figure 1**, which was originally home to the Tongva (Gabrielino) and Kizh (Gabrielino) tribal nations. The city is developed with residential, commercial, office, public facility, industrial, and agricultural land uses. Residential, commercial, public facility, and office land uses are distributed throughout the city. Industrial land uses are concentrated in the central portion of the city, surrounding the Ontario International Airport, as well as in the eastern and southern portions of the city. Agricultural land uses comprise most of the land use in the southern portion of Ontario; however, this use will likely transition to residential, mixed-use, and commercial land uses by 2050. Major economic sectors include education services, Ontario International Airport, retail centers, and warehouses and logistics centers.

The city has a Mediterranean climate, with hot summers and mild winters with rain. On average, annual high temperatures in Ontario range from 65 degrees Fahrenheit (°F) in January to 94 in August. Low temperatures range from 43 °F in December to 65°F in August. The city receives an average of approximately 15.04 inches of precipitation per year, with all precipitation falling as rain. Most precipitation falls during the winter months with rare occurrences of summer storms. The Southern California inland valley climate was historically famous for growing citrus because of the hot summers and winters without frost. The Santa Ana winds flow through this area of San Bernardino County from October to April, with the strongest Santa Anas occurring in December and January.

Figure 1. Community Overview Map



Source: City of Ontario 2021; PlaceWorks 2021

Ontario's primary transportation access is from Interstate (I-) 10, I-15, State Route (SR-) 60, and SR-83. I-10 runs west through San Bernardino County to downtown Los Angeles and east through the southern United States to the east coast. I-15 runs south through San Bernardino County to downtown San Diego and north through the western United States to Canada. SR-60 runs east to west, and SR-83 runs north to south through Ontario, connecting the valley region of San Bernardino County to the mountains to the north and San Gabriel Valley to the east. Other major roadways include Mission Boulevard, 4th Street, Airport Drive, Haven Avenue, and Miliken Avenue. Ontario International Airport is in the north-central portion of the city. Omnitrans operates six public bus routes, including one express route, through Ontario, which residents can use to travel to key destinations in Ontario and other areas of San Bernardino County. Metrolink, via the Union Pacific Railroad, provides long-distance train service via Ontario to Los Angeles, which connects with other train services to major cities such as Seattle, Chicago, and New Orleans. The City also maintains bike routes along Riverside Drive, Deer Creek Loop, Lytle Creek Loop, and Inland Empire Boulevard.

## **Regulatory Framework**

In 2015, the State adopted Senate Bill (SB) 379, amending Section 65302(g) of the California Government Code to require cities and counties to update the Safety Element of their general plan to include more information about wildfire hazards, flooding risks, and other short-term and long-term threats posed by climate change. SB 379 is the foundation for adaptation and resiliency in general plan safety elements, as it requires local governments to conduct vulnerability assessments as part of their long-range public safety planning efforts and to prepare adaptation and resilience goals, policies, and implementation measures that respond to the findings of the vulnerability assessment and protect against harm caused by climate change.

Other important updates to Section 65302(g) of the California Government Code related to Safety Elements include SB 1035, SB 99, and Assembly Bill (AB) 747/1409. SB 1035, which established Section 65302(g)(6) of the California Government Code, builds on previous legislation and requires local governments to review and update as needed their Safety Element during an update to their Housing Element or Local Hazard Mitigation Plan (LHMP) (or no less than every eight years). Any revisions should include updated information related to flood hazards, fire hazards, and climate adaptation and resilience. SB 99 established Section 65302(g)(5) of the California Government Code and requires jurisdictions to review and update the Safety Element to include information identifying residential developments in hazard areas that do not have at least two emergency evacuation routes. AB 747 added Section 65302.15 to the California Government Code (amended by AB 1409), which became effective in January 2022, requires local governments to identify the capacity, safety, and viability of evacuation routes and locations in the Safety Element or LHMP on or before the next update of their LHMP. This Vulnerability Assessment, along with the update to the Safety Element of TOP 2050, supports the City of Ontario to meet these requirements.

The State of California prepared a guidance document, the [California Adaptation Planning Guide](#), to assist communities in addressing climate adaptation and resilience, and complying with Section 65302(g) of the California Government Code. This guide presents a step-by-step process for gathering the best-available climate change science, completing a climate change vulnerability assessment, creating adaptation strategies, and integrating those strategies into general plans and other policy documents. The City's

vulnerability assessment is consistent with the guidance and recommended methods provided in the *California Adaptation Planning Guide* and the *Resilient IE*.

## Climate Science Overview

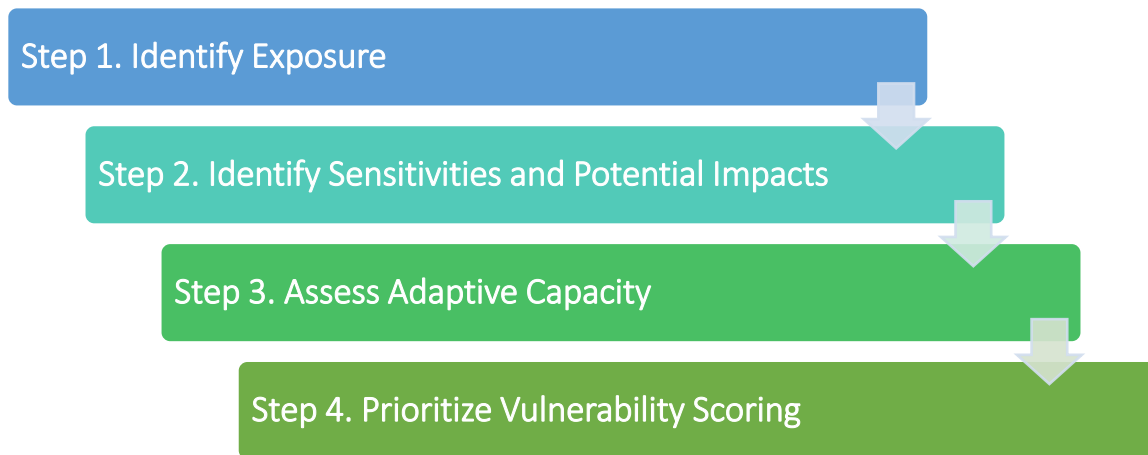
Climate change is a long-term change in the average meteorological conditions in an area. Currently, the global climate is changing due to an increase in greenhouse gas (GHG) emissions that trap heat near the Earth's surface. While some levels of these gases are necessary to maintain a comfortable temperature on Earth, an increased concentration of these gases due to human activity traps additional heat, changing Earth's climate system in several ways. According to the *California Fourth Climate Change Assessment*, these effects cause primary climate stressors, which include warmer temperatures and changes in precipitation patterns, which can cause and exacerbate secondary climate stressors. These secondary climate stressors, also known as climate change hazards, can include flooding, severe weather, poor air quality, and drought conditions, among others. According to the *California Adaptation Planning Guide*, these hazards have the potential to cause fatalities, injuries, property and infrastructure damage, interruption of business, and other types of harm or loss. This Vulnerability Assessment Report presents the local and regional impacts created by climate change hazards and the ability of Ontario's populations and community to resist these hazards, to assess which aspects of the community are most vulnerable to climate change.



## VULNERABILITY ASSESSMENT METHOD

The Vulnerability Assessment analyzes how a changing climate may harm the City of Ontario, and which aspects of the community – including people, buildings and infrastructure, services, and economic drivers – are most vulnerable to its effects. The vulnerability assessment primarily follows the recommended process published in the *California Adaptation Planning Guide* in 2020 by the California Governor’s Office of Emergency Services. This includes a four-step process: (1) characterizing the community’s exposure to current and projected climate hazards; (2) identifying potential sensitivities and potential impacts to community populations and assets; (3) evaluating the current ability of the populations and assets to cope with climate impacts, also referred to as its adaptive capacity; and (4) identifying priority vulnerabilities based on systematic scoring. **Figure 2** shows these steps.

Figure 2. California Adaptation Planning Guide Recommended Method



### Step 1: Identify Exposure

The goal of this step is to characterize the community’s exposure to current and projected climate change hazards. Many projections of climate change hazards rely on multiple scenarios that reflect different levels of how global GHG emissions and atmospheric GHG concentrations may change over time. The Intergovernmental Panel on Climate Change (IPCC), an organization that represents the global scientific consensus about climate change, has identified four climate scenarios, also called Representative Concentration Pathways (RCPs), that can be used to project future conditions. RCPs are labeled with different numbers (e.g., RCP 2.6, RCP 6) that refer to the increase in the amount of energy that reaches each square meter of Earth’s surface under that scenario. The four RCPs are:

- **RCP 2.6:** Under this scenario, global GHG emissions peak around 2020 and then decline quickly.
- **RCP 4.5:** Under this scenario, global GHG emissions peak around 2040 and then decline.
- **RCP 6:** Global emissions continue to rise until the middle of the century.
- **RCP 8.5:** Global emissions continue to increase at least until the end of the century.

The [Cal-Adapt](#) database, which provides California-specific climate change hazard projections, uses RCP 4.5 for a low emissions scenario and RCP 8.5 for a high emissions scenario. The Governor’s Office of Planning and Research *Planning and Investing for a Resilient California* document and the *Adaptation Planning Guide* recommend using RCP 8.5 for analyses considering impacts through 2050, as there are minimal differences between emission scenarios for the first half of the century. This guide also recommends using RCP 8.5 for late-century projections, for a more conservative and risk-adverse approach. The City used the RCP 8.5 GHG emission scenario to input into global climate models on the Cal-Adapt database and other resources.<sup>i</sup>

**Exposure:** The presence of people, infrastructure, natural systems, and economic, cultural, and social resources in areas that are subject to harm.

*Source: California Adaptation Planning Guide*

The first step of this vulnerability assessment was to confirm which climate change hazards are expected to affect Ontario. The City identified eight climate change hazards for this assessment, listed here and discussed in more detail in the Climate Change Hazards section.

1. Agriculture Pests and Diseases
2. Air Quality
3. Drought
4. Extreme Heat and Warm Nights
5. Flooding
6. Human Health Hazards
7. Severe Weather
8. Wildfire and Smoke

The City derived the climate change hazard data from up-to-date information, including the state Cal-Adapt database, the *California Adaptation Planning Guide*, the *California 4th Climate Change Assessment*, the National Weather Service, the Federal Emergency Management Agency (FEMA), the *San Bernardino County Multi-Jurisdictional Hazard Mitigation Plan*, and the *San Bernardino County Vulnerability Assessment* conducted as part of Resilient Inland Empire (IE).

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<sup>i</sup> The IPCC recently released “The Physical Science Basis” of the Sixth Assessment Report that updates global climate change projections for the near-term, mid-term, and long-term based on greenhouse gas emission trends from the past decade. It moves away from using RCPs, instead using five different scenarios called “shared socioeconomic pathways”, which consider socioeconomic trends underlying each scenario. This Vulnerability Assessment does not use these updated projections because at time of writing they are not available at a local scale. However, the IPCC report does reaffirm the use of projections comparable to RCP 8.5 as the suggested emission scenario to use for Cal-Adapt data.

## Step 2. Identify Sensitivities and Potential Impacts

This step included evaluating past and potential future climate change impacts to community populations and assets. The City first identified a list of populations and assets to include in the assessment with the following five categories:

1. **Populations:** People that experience a heightened risk or increased sensitivity to climate change or have a lower capacity or fewer resources to adapt to or recover from climate impacts.
2. **Infrastructure:** Structures that provide essential services to Ontario community members and visitors.
3. **Buildings:** Homes, nonresidential buildings, and other building types.
4. **Important Economic Assets:** Properties and activities that make significant contributions to the Ontario economy.
5. **Key Community Services:** Important and essential functions to community members provided by government agencies and private companies.

**Sensitivity:** The level to which a species, natural system, or community, government, etc., would be affected by changing climate conditions.

**Impact:** The effects (especially the negative effects) of a hazard or other conditions associated with climate change.

*Source: California Adaptation Planning Guide*

This list included 17 populations, 17 infrastructure types, 9 building types, 7 economic drivers, and 9 key community services. After confirmation of this list, the City looked at which hazards are applicable in Ontario, or likely to affect which populations and assets, because not all hazards affect all populations or assets. For example, human health hazards are likely to impact most populations, but would not physically affect community parks or school buildings.

The outcome of this step was a matrix that identified whether a population or asset is likely to be exposed to a hazard. If a population or asset has the potential to be affected directly or indirectly by a hazard, a “yes” was indicated in the appropriate box. Direct impacts affect buildings and infrastructure, health or populations, or immediate operations of economic drivers or community services, and they can lead to indirect impacts on the broader system or community, including populations or asset types in a different category. For example, severe weather can *directly* damage electrical transmission lines causing power outages, which can *indirectly* impact persons with chronic illnesses who depend on the electricity for life support systems. Therefore, the City marked both electrical transmission lines and persons with chronic illnesses as “yes” for being affected by severe weather and would be evaluated in the assessment.

After the applicability review, the City evaluated potential impacts to the applicable populations and community assets. To identify how great the impacts of each relevant hazard are on the populations and community assets, the City considered a number of different questions that helped ensure the assessment broadly covered a range of potential harm. Examples of these questions include:

- Could the hazards cause injury or damage? Is there a risk of behavioral or mental harm, loss of economic activity, or other nonphysical effects?
- How many people or community assets could be harmed both directly and indirectly?
- How long would the impacts persist?
- Is there a substantial chance of death or widespread destruction?

Based on the results of the impact assessment, the City ranked each sensitivity as low, medium, or high impact for each relevant exposure. Impact is considered a negative quality, and therefore a higher impact score means that there is a higher potential for harm to a population or asset. A lower impact score means that there is a lower potential for harm to a population or asset. **Table 1** provides more detail about what each score means.

**Table 1. Rubric for Impact Scoring**

Impact Score	Meaning (People and Ecosystems)	Meaning (Buildings, Infrastructure, Services, and Economic Drivers)
Low Impact	Community members may not notice any change. If noticed, effect would be minor with only occasional disruptions.	Damage, interruption in service, or impacts on the local economy is small or intermittent enough to mostly go unnoticed. If noticed, effects are only minor.
Medium Impact	There is a marked impact to the community. Quality of life may decline. Impacts may be chronic, and at times substantial.	Damage, service interruptions, and other impacts are clearly evident. Impacts may be chronic and occasionally substantial.
High Impact	The well-being of the community declines significantly. The community’s current lifestyle and behavior may no longer be possible. There is a severe risk of widespread injury or death to people, or of significant or total ecosystem loss.	Buildings, infrastructure, and services may be often or always cannot function as intended or needed to meet community demand. Large sections of the economy experience major hardships or are not feasible.

### Step 3. Assess Adaptive Capacity

Adaptive capacity is the ability of populations and community assets to prepare for, respond to, and recover from the impacts of climate change. The City evaluated each population and assets for adaptive capacity by considering the following questions:

1. Are there existing programs, policies, or funding to provide assistance?
2. Are there barriers that limit response or recovery? Are these barriers, financial limitations, political challenges, lack of access to technology or other resources, or others?
3. Do alternatives exist in or near Ontario that community members can use?

**Adaptive Capacity:** The “combination of the strengths, attributes, and resources available to an individual, community, society, or organization that can be used to prepare for and undertake actions to reduce adverse impacts, moderate harm, or exploit beneficial opportunities”.

*Source: California Adaptation Planning Guide*

Based on the results of the adaptive capacity assessment, the City ranked each population or asset as low, medium, or high adaptive capacity. Adaptive capacity is considered a positive attribute, so a higher adaptive capacity score will mean that a population or asset may be more adaptable to the hazard. A lower adaptive capacity score means that a population or asset may have a harder time adjusting to the changing conditions. **Table 2** provides more detail about what each score means.

Table 2. Rubric for Adaptive Capacity Scoring

Adaptive Capacity Score	Meaning
<b>Low Adaptive Capacity</b>	Adaptive solutions are available, but they are expensive, technologically difficult, and/or politically unpopular. Alternatives may not exist that can provide similar services. Some assets may not have feasible means to adapt.
<b>Medium Adaptive Capacity</b>	Some adaptation methods are available, but not always feasible. Adapting may create significant challenges for some sensitivities. Some alternatives exist within the jurisdiction area that can provide similar services.
<b>High Adaptive Capacity</b>	Adaptation solutions are feasible for most or all sensitivities. There may be occasional or small-scale challenges to implementing adaptation methods, but populations and assets can adapt with little or no effort. Many alternatives exist in the area that can provide similar services.

### Step 4. Prioritize Vulnerability Scoring

The City used the impact and adaptive capacity scores for each population and asset for each relevant hazard to determine the vulnerability score. The vulnerability (V) score reflects how susceptible the population or asset is to harm from a particular hazard. Vulnerability is assessed on a scale as low, medium, or high. The Vulnerability Scoring Matrix (**Figure 3**) shows how impact and adaptive capacity scores combine and translate into a vulnerability score. For example, extreme heat would create a high impact on energy delivery because mechanical failures, heat damage, and high demand for electricity from cooling equipment can disrupt this service. Adaptive capacity is low because many community members need to use more electricity on extreme heat days to keep cool, especially since over half of homes were built prior to 1980 and may not be well insulated and retrofitting electrical equipment can be expensive. Therefore, energy delivery services are highly vulnerable to extreme heat.

**Vulnerability:** The degree to which natural, built, and human systems are susceptible “...to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt”.

*Source: California Adaptation Planning Guide*

Figure 3. Vulnerability Scoring Matrix

		Impact Score		
		Low	Medium	High
Adaptive Capacity Score	Low	Medium	High	High
	Medium	Low	Medium	High
	High	Low	Low	Medium

## HAZARDS OF CONCERN

As described in the *California Adaptation Planning Guide*, hazards are events or physical conditions that have the potential to cause fatalities, injuries, property and infrastructure damage, interruption of business, and other types of harm or loss. Some natural hazards, such as earthquakes, do not have a known connection with climate change, but have been included in this report to provide an overview of those hazards for TOP 2050.

### Climate Change Hazards

Climate change hazards focus on natural hazards that can change in frequency and intensity due to climate change. The Vulnerability Assessment assesses the climate change hazards that are most relevant to the City of Ontario, as stated previously. This section discusses the climate change hazards based on projections provided by Cal-Adapt, the *California Fourth Climate Change Assessment*, the Resilient IE Toolkit, the *San Bernardino County Multi-Jurisdictional Hazard Mitigation Plan*, FEMA, and scholarly research.

### AGRICULTURE PESTS AND DISEASES

According to the *2020 San Bernardino County Crop Report*, agriculture and livestock had total gross production of over \$420 billion in 2020, with milk, milk products, and cattle being the largest-grossing crop. Agricultural pests and diseases can affect livestock and crops supporting the livestock in the Ontario Ranch area of the city. This hazard is measured by the number of pests and disease incidents, which are likely to increase as higher temperatures allow insects to reproduce more rapidly. In 2020, the San Bernardino County Agriculture/Weights & Measures inspected 406 samples of incoming plant materials from other states and countries, of which, 44 samples contained pests or diseases and 69 samples were rejected.

These pests and diseases, such as the scales, mealybugs, whitefly, Asian Citrus Psyllid, and European Pine Shoot Moth, can slow the growth of plants and animals, damage them so that their products are less appealing and harder to sell, or even kill them. Though there are treatment options for many agricultural pests and diseases, some have no cure. Many pests and organisms that carry diseases are most active during warmer months, so the threat of infection or infestation is higher during that time of year. Projection trends show temperatures getting warmer earlier in the year and remaining warmer until later in the year due to increases in air temperature, which creates a wider activity window for pests and diseases. However, agriculture production within the City of Ontario is projected to transition to residential, mixed-use, and commercial land uses by 2050.

### AIR QUALITY

The dominant sources of air pollution in the City of Ontario are ozone pollution from vehicle exhaust and agricultural soils, fine particulate matter and diesel particulate matter from vehicles and stationary sources, and smoke from wildfires in the region. According to the California Office of Health Hazard Assessment, in 2016, ozone levels in Ontario were higher than 83 percent of census tracts in California and fine particulate matter concentrations were higher than 97 percent of census tracts in California. Higher future temperatures will likely increase the production of ground-level ozone, especially in

Southern California valley cities like Ontario, which are already experiencing high levels of this pollutant. Ground-level ozone is associated with a variety of negative health outcomes, including reduced lung function, pneumonia, asthma, cardiovascular diseases, and premature death. Smoke from wildfires in the region can also increase air pollution levels and create a significant health risk in the region.

## **DROUGHT**

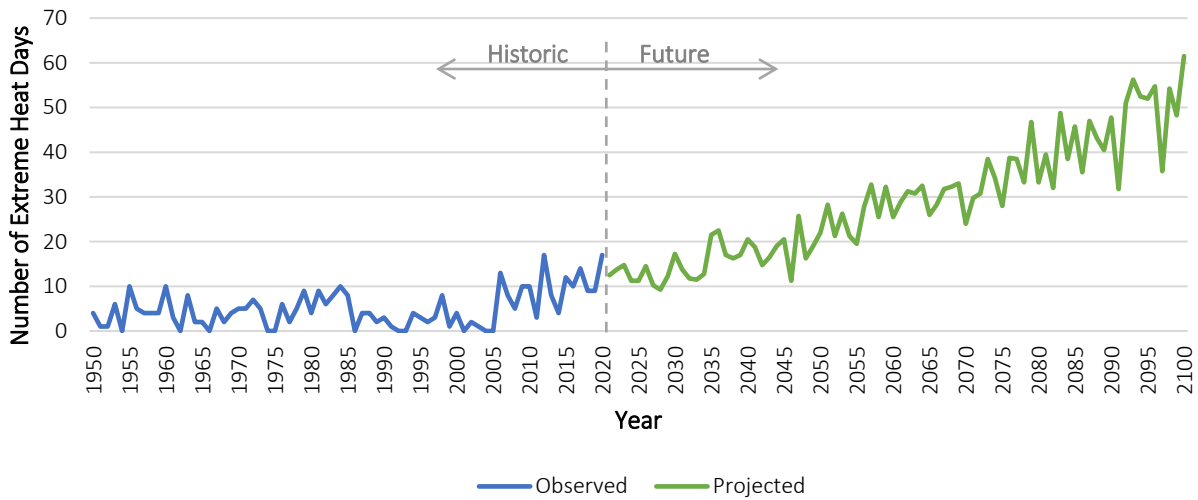
A drought occurs when conditions are drier than normal for an extended period, making less water available for people and ecosystems. Droughts are a regular occurrence in California; however, according to the *California Fourth Climate Change Assessment*, it is expected that climate change will lead to more frequent and more intense droughts statewide. According to the U.S. Drought Monitor, San Bernardino County and Ontario are in severe drought conditions and much of California is in Extreme or Exceptional Drought conditions. Based on the *Infrastructure Report for Hydrology, Sewer, Water, and Water Quality* prepared for TOP 2050, the City of Ontario receives water from three primary sources: (1) local groundwater sources; (2) imported water, primarily from the State Water Project, treated and distributed by the Water Facilities Authority, Chino Basin Desalter Authority, and the San Antonio Water Company; and (3) recycled water from the Inland Empire Utility Agency. Of these sources, most of the community's water supply is from the Chino Groundwater Basin (52 percent) and the State Water Project via the Rialto feeder and Agua de Lejos Treatment Plant in Upland (28 percent).

Snowpack levels in the Sierra Nevada, which feed the State Water Project, dropped by 25 percent during the 2011 to 2016 drought, and average springtime snowpack is expected to drop 64 percent by 2100. In 2021, the snowpack in the Northern Sierra was 70 percent of the average, but the rain was less than 50 percent of the annual average, making it the third-driest year on record. During drought conditions, water stored in the State Water Project's primary reservoirs could decrease due to lack of rainfall and reduction in snowpack due to higher temperatures. This can cause water shortages for water agencies relying on the State Water Project and heavier reliance on groundwater supplies to meet the needs of Ontario residents and businesses. The City of Ontario and Cucamonga Valley Water District directly provide water to residents and businesses, and both agencies have Water Shortage Contingency Plans as part of their 2020 Urban Water Management Plans. The Water Shortage Contingency Plans provide specific demand reduction actions to conserve water and ensure reliable supplies, including water restrictions for non-essential uses, increased use of recycled water, and penalties for violating water shortage provisions.

## **EXTREME HEAT AND WARM NIGHTS**

Extreme heat occurs when temperatures rise significantly above normal levels. In Ontario, an extreme heat day occurs when temperatures reach above 103.2 °F. As shown in **Figure 4**, the number of extreme heat days in Ontario is projected to increase from a historic annual average (1961 to 1990) of 4 days per year to an average of 25 extreme heat days per year by mid-century and an average of 41 extreme heat days per year by end of century.

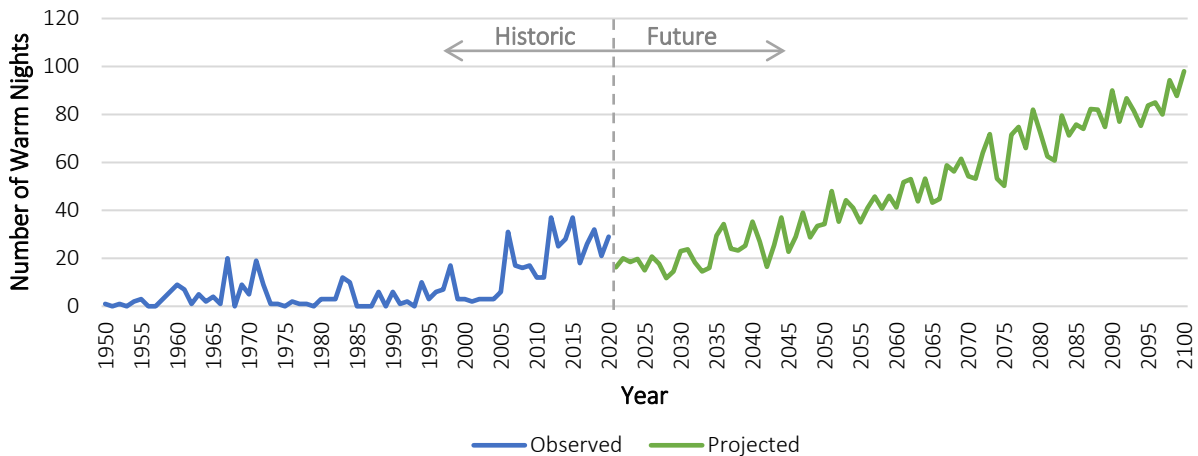
**Figure 4. Projected Extreme Heat Days in Ontario**



Sources: Cal-Adapt, 2021; National Weather Service, 2021

Extreme heat can also occur in the form of warmer nights, as temperatures do not cool down overnight and provide relief from the heat. In Ontario, a warm night occurs when the temperature remains above 68.6 °F. As shown in **Figure 5**<sup>ii</sup>, the number of warm nights in Ontario is projected to increase from a historic annual average (1961 to 1990) of 5 days per year to an average of 41 warm nights per year by mid-century and an average of 74 warm nights per year by the end of the century.

**Figure 5. Project Warm Nights in Ontario**



Sources: Cal-Adapt, 2021; National Weather Service, 2021

<sup>ii</sup> The visual change from 2020 and 2021 is due to using a combination of sources to fill in gaps from 2005 to 2020. The data from 1950 to 2005 and 2020 to 2100 is derived from Cal-Adapt. The data from 2006 to 2020 is from the National Weather Service. Therefore, the observed extreme heat days/warm nights differ slightly from the projections. This is showing that the observations exceed what the average projections are showing.



Extreme heat can cause heat-related illnesses, such as heat cramps, heat exhaustion, and heat stroke, in addition to exacerbating respiratory and cardiovascular conditions. Some homes in Ontario may lack air conditioning, and as a result, people living in these homes may be more susceptible to harm from extreme heat events. If homes have air conditioning, residents may find increased use cost prohibitive, especially for older or less-efficient systems, typically found in buildings built prior to 1990. Some types of infrastructure, including power lines and roadways, face greater stresses during high temperatures that make failure more likely.

## FLOODING

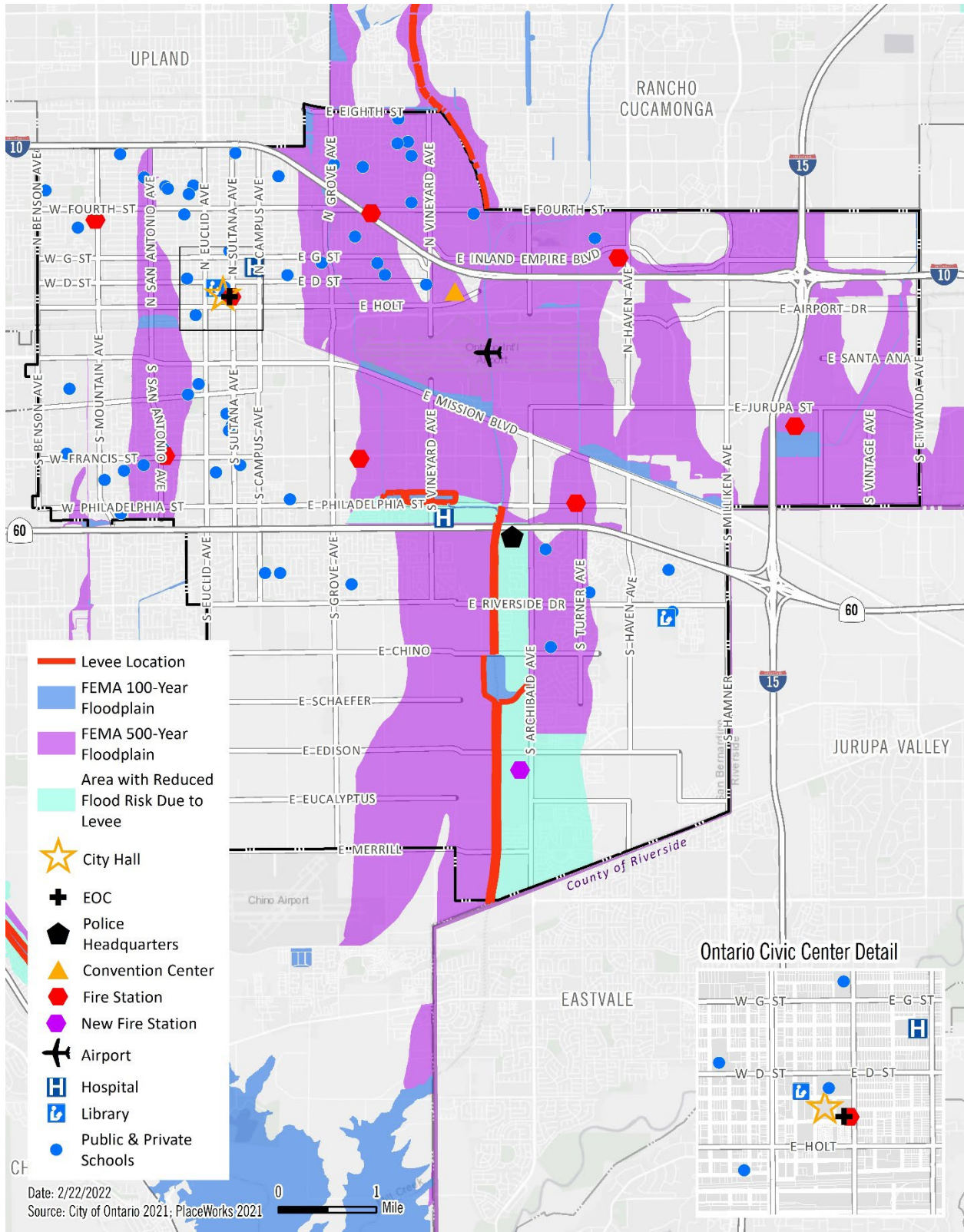
Flooding can cause significant harm to buildings, people, and infrastructure. Floodwater can be deep enough to drown people and may move fast enough to carry people or heavy objects (such as cars) away. Flooding can be caused by heavy rainfall, extended periods of moderate rainfall, or clogged drains during periods of rainfall. In rare instances, a break in a dam, water pipe, or water tank can also cause flooding. Flash floods are floods that develop very quickly, and they can be especially dangerous because they give little or no warning. Persons experiencing homelessness and others who may be outdoors in the path of a flood can face particularly high risks from these events.

**Figure 6** shows the current 100-year and 500-year flood hazard areas within Ontario. FEMA defines a 100-year floodplain as areas with a one in 100-year chance, or 1 percent, annual chance of flooding in any given year and a 500-year floodplain as an area with a one in 500-year, or 0.2 percent, annual chance of flooding in any given year. According to the *City of Ontario 2018 Hazard Mitigation Plan*, approximately 580 acres, or 1.8 percent, of land within the city is within the FEMA-designated 100-year flood zone, and 26,526 acres, or 83 percent, of land is within the FEMA-designated 500-year flood zone, with 2,260 acres, or 7 percent, of land within the FEMA 500-year floodplain protected by a levee.

According to the *City of Ontario 2018 Hazard Mitigation Plan*, historic flooding has occurred periodically within Ontario, primarily consisting of urban street flooding due to the storm drain system exceeding capacity. According to the *California Fourth Climate Change Assessment, Los Angeles Regional Report*, storm drainage systems throughout the city collect stormwater runoff and convey water to prevent flooding, although these systems are typically designed based on winter storms recorded in the past and may not be designed to accommodate more extreme storms.

According to the *California Fourth Climate Change Assessment*, climate change will likely increase the frequency and intensity of floods within Ontario, although total annual precipitation levels are only expected to increase slightly. Up to half of California's precipitation comes from a relatively small number of intense winter storms, which are expected to become more intense with climate change. For example, what is currently a 100-year flood, or a flood that has a 1-percent chance of occurring annually, may occur every 20 or 50 years.

Figure 6. FEMA Flood Hazard Zones



## **HUMAN HEALTH HAZARDS**

There are several diseases, such as hantavirus pulmonary syndrome, Lyme disease, West Nile virus, and influenza, which are linked to climate change and can be debilitating or fatal for some of the population. Pests, such as mice, rats, ticks, and mosquitos carry these diseases. Climate change can increase the rates of infections because many of the animals that carry diseases are more active during warmer weather and may expand in population size due to higher levels of rainfall during storm events and stagnant water after flooding, increasing the time for disease transmittal.

Some diseases and illnesses have the potential to become epidemics or pandemics if they spread within communities, regions, or over multiple countries. Epidemics and pandemics, such as the COVID-19 pandemic, can worsen existing health conditions as well as cause economic disruptions within the city and region. Additionally, following natural disasters, such as flooding or severe weather events, mental health and stress-related disorders can make people even more vulnerable. The City evaluated health hazards from air pollutants as part of the air quality hazard discussion.

## **SEVERE WEATHER**

Severe weather can include high winds, hail, and lightning, which are usually caused by intense storm systems, although types of high winds and sandstorms can occur without a storm. Severe winds, such as the Santa Ana winds, tend to be most frequent during October to April and can have average speeds of 40 miles per hour. These winds can destroy buildings, knock over trees, damage power lines and electrical equipment, and fan small sparks into large wildfires in the region. Severe weather can also include heavy rainfall, which can cause flash floods and ponding in areas not protected by a levee in the city. While less common in the city, hail and lightning can damage the buildings and infrastructure supporting economic sectors and key services within the city. As described in the *Los Angeles Summary Report* from the *California Fourth Climate Change Assessment*, the connection between climate change and severe weather is not as well established as other hazards, but new evidence suggests that these forms of severe weather may occur more often than in the past.

## **WILDFIRE AND SMOKE**

Wildfires are a regular feature of the landscape in much of California. They can be sparked by lightning, malfunctioning equipment, vehicle crashes, or many other causes. Warmer temperatures, an increase in drought conditions, and extreme wind events, are likely to create more fuel for fires in natural and rural areas, leading to a greater chance that a spark will grow into a potentially dangerous blaze. Climate change is also expected to extend the fire season throughout much (or even all) of the year.

According to the California Department of Forestry and Fire Protection, there are no fire hazard severity zones within or surrounding the City of Ontario and the city is not located within the Wildland-Urban Interface. The nearest Very High Fire Hazard Severity Zones are located in Upland and Rancho Cucamonga to the north, Fontana and Jurupa Valley to the east, and Norco and Chino Hills the south. According to the *City of Ontario 2018 Hazard Mitigation Plan*, there have been two major wildfires in the City of Ontario, including the 1958 Pole Line Fire in northeast Ontario, and the 2007 Walker Fire in southern Ontario.

While there are no fire hazard severity zones within the city limits, the smoke from wildfires increases air pollution levels, creating a significant health risk in the region. Most of the populations within Ontario have a high or medium vulnerability to wildfire and smoke conditions. In addition, planned Public Safety Power Shutoffs, which occur during red flag days when wind speeds are high and humidity is low, to prevent wildfires in the region have already impacted persons who depend on electricity for air conditioning or their medically necessary equipment. Public Safety Power Shutoffs can last for hours or days depending on the severity of the wind event and the wildfire conditions.

## **Natural Hazards Not Evaluated in the Vulnerability Assessment**

Seismic and geologic hazards are caused by the movement of different parts of the Earth's crust, or surface. Seismic hazards include earthquakes and hazardous events caused by them. Geologic hazards are other hazards involving land movements that are not linked to seismic activity and are capable of inflicting harm to people or property. While climate change is unlikely to increase earthquake frequency or strength, the threats from seismic and geologic hazards are expected to continue in the future. The Safety Element of TOP 2050 contains mapping related to seismic and geologic hazards. However, these hazards were not included in the Vulnerability Assessment evaluation.

### **SEISMIC HAZARDS**

Seismic activity occurs along boundaries in the Earth's crust, called faults. Pressure along the faults builds over time and is ultimately released, resulting in ground shaking that we refer to as an earthquake. Earthquakes can also trigger other hazards in Ontario, including surface rupture (cracks in the ground surface) and liquefaction (causing loose soil to lose its integrity). Earthquakes and other seismic hazards often damage or destroy property and public infrastructure, including roadways and utility lines. Additionally, falling objects or structures due to earthquakes pose a risk of injury or death. In Southern California, earthquakes have the greatest potential for loss of life and/or property and economic damage compared to other hazards, especially when they trigger secondary effects that overwhelm the ability of local jurisdictions to respond. Earthquakes can also cause human-caused hazards, such as urban fires, dam failures, and toxic chemical releases.

Earthquake risk is very high in Ontario due to the presence of several active faults in the region. Major fault zones in the region include the San Andreas Fault approximately 14 miles northeast of the city, the San Jacinto Fault approximately 7 miles northeast of the city, the Elsinore Fault approximately 3 miles southeast of the city, and the Sierra Madre Fault approximately 5 miles north of the city. These faults are all capable of producing earthquakes of magnitude 6.7 or greater. A major earthquake along any of these four faults could result in substantial casualties and damage resulting from collapsed buildings, damaged roads and bridges, fires, flooding, and other threats to life and property.

In the event of an earthquake, the location of the epicenter, as well as the time of day and season of the year, would have a profound effect on the number of deaths, injuries, and property damage. There are a number of small-scale earthquakes that happen weekly, but larger scale or catastrophic shaking is less likely. Property and human life in Ontario are at risk from a significant earthquake causing catastrophic damage and strains on response and recovery resources. Most of the loss of life and injuries from earthquakes are from damage and collapse of buildings and structures. The California Building Standards Code, adopted by reference into Ontario Municipal Code Title 8, *Building Regulations*, provides more

stringent requirements for new construction intended to protect life safety and prevent collapse of structures. However, in Ontario, structures built prior to the enactment of these improved building codes may not have been upgraded to current standards and could be vulnerable to earthquakes. Comprehensive hazard mitigation programs that include the identification and mapping of hazards, prudent planning and enforcement of building codes, and expedient retrofitting and rehabilitation of weak structures can significantly reduce the scope of an earthquake disaster.

Liquefaction is a potentially destructive secondary effect of strong seismic shaking. Liquefaction occurs when the force of an earthquake causes loosely packed sediment and saturated layers to lose strength and integrity and behave like a fluid. In addition to the composition of the soil—sand and gravel are more porous and hold more water—the liquefaction risk also depends on the height of the groundwater table. Areas with a shallow groundwater table, such as areas near water bodies, are at more risk of liquefaction. During an earthquake, highly saturated soil can lose much or all its stability, which can damage any structure built on it. In some cases of liquefaction, structures built on the soil may collapse completely. Liquefied soils may also damage or destroy underground utility lines. This can cause flooding if water lines are broken or create a risk of fire if there is damage to natural gas lines.

Liquefaction-related effects include loss of bearing strength, ground oscillations, lateral spreading, and flow failures or slumping. Site-specific geotechnical studies are the only practical and reliable way of determining the specific liquefaction potential of a site; however, a determination of general risk potential can be provided based on soil type and depth of groundwater. Ontario has delineated areas of known and potential liquefaction hazards in the New Model Colony in the Policy Plan of TOP 2050. Areas that contain loosely packed sandy or silty materials saturated with water, includes areas with a high groundwater table, are also vulnerable to liquefaction.

In most cases, proper design and construction of subgrade soils and building foundations provide a mechanism to mitigate the risk of seismic hazards to an acceptable level in conformance with the California Building Code. The representation of areas having a liquefaction potential is only intended as notification to seek further site-specific information and analysis of this potential hazard as part of future site development. It should not be solely relied upon, without site-specific information and analysis, for design or decision-making purposes.

## **GEOLOGIC HAZARDS**

Subsidence is the major geologic hazard in Ontario. Subsidence refers to the sudden sinking or gradual downward settling and compaction of soil and other surface material with little or no horizontal motion. It may be caused by a variety of human and natural activities, including underground mining, groundwater extraction, sinkholes, or drainage and decomposition of organic soils. Most of the early documented cases of subsidence affected only agricultural land or open space. As urban areas have expanded, so too have the impacts of subsidence on structures for human occupancy. Although there is no data currently available documenting the precise areas where subsidence could occur, it is most likely to occur near active groundwater wells as a result of seismic shaking or changes in subsurface conditions.

## POPULATIONS AND ASSETS

Populations and assets are the people, infrastructure, services, and economic drivers in the City of Ontario that can be affected by climate change. The Vulnerability Assessment looks at how each population and community asset may be affected by each of the climate change hazards discussed previously. The *California Adaptation Planning Guide* provides a general list of populations and assets, which the City of Ontario refined and used to develop five distinct asset categories: (1) populations, (2) buildings, (3) infrastructure, (4) economic drivers, and (5) key services. In total, Ontario identified 59 distinct populations and assets, as shown in **Table 3**. Appendix A provides additional details on the populations and assets selected for the Vulnerability Assessment. **Figure 1** shows the location of key community and critical facilities for the Vulnerability Assessment.

**Table 3. Populations and Assets Included in the Vulnerability Assessment**

CATEGORY	POPULATION OR ASSET
Populations	Children (under 10)
	Cost-burdened households
	Households in poverty
	Immigrants and refugees
	Linguistically isolated populations
	Low-income households
	Outdoor workers
	Overcrowded households
	Persons experiencing homelessness
	Person living in mobile homes
	Persons with chronic illnesses
	Persons with disabilities
	Persons without access to lifelines
	Renters
	Seniors (65+)
	Seniors living alone
Undocumented persons	
Infrastructure	Airports
	Bike routes
	Bridges
	Communication facilities
	Electrical substations and transmission lines
	Electric vehicle charging stations
	Evacuation routes
	Flood control infrastructure
	Hazardous materials sites
	Major roads and highways
	Natural gas pipelines
	Parks and open space
	Power plants

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CATEGORY	POPULATION OR ASSET
	Railways
	Solid waste facilities and landfills
	Transit stops
	Water and wastewater infrastructure
<b>Buildings</b>	Community centers
	Commercial business, shopping, and entertainment centers
	Homeless shelters
	Government buildings
	Homes and residential structures
	Libraries
	Medical and care facilities
	Public safety buildings
Schools	
<b>Economic Drivers</b>	Agriculture
	Education services
	Major employers
	Ontario International Airport
	Outdoor recreation
	Retail centers
	Warehouses and logistics centers
<b>Key Services</b>	Communication services
	Emergency medical response
	Energy delivery
	Freight and shipping
	Government administration & community services
	Public safety response
	Public transit access
	Solid waste removal
Water and wastewater treatment, delivery, and collection	

## VULNERABILITY ASSESSMENT RESULTS

The Vulnerability Assessment evaluates the impact and adaptive capacity of each population and asset for each relevant hazard to assess vulnerability. As discussed in Section 2, Vulnerability Assessment Method, the City assigned vulnerability scores of low, medium, or high to reflect how susceptible the population or asset is to harm posed by the hazard. Out of the 472 possible hazard and asset pairing, the City assessed 302 different pairings for vulnerability. This section provides a summary of the key vulnerabilities within the city. For a complete list of vulnerability scores for all populations and assets, refer to Appendix B.

### Population and Asset Considerations

While selecting and assessing various populations and assets to include in the Vulnerability Assessment, the City considered the differences in the population sample pool between datasets and how some populations and asset categories may appear to refer to the same thing.

Statistics, especially statistics related to population, use the concept of a “sample pool”. In the context of this Vulnerability Assessment, the sample pool draws from the overall group of people that are being measured or studied. For example, in a political poll among registered voters, the sample pool only includes registered voters, since unregistered voters do not fall into this category.

This concept is important because some of the demographics used in the Vulnerability Assessment have different sample pools. Most of the demographic data come from the U.S. Census Bureau’s American Community Survey (ACS), and most of these data have a sample pool of either all residents or all households in the city. However, a few are different, such as:

- Data on linguistically isolated populations only count people who are at least 14 years old instead of the total population, since young children generally are not proficient in any language.
- Statistics that only count the noninstitutionalized population (e.g., people not in prisons or long-term care homes).

This does not affect the outcome of the Vulnerability Assessment, but it creates slight differences in the number of people counted as part of each population.

Of the 59 populations and assets in the Vulnerability Assessment, a few may appear redundant. For example, the Vulnerability Assessment looked at both public safety buildings (as a Buildings asset) and at public safety response (as a Key Service asset). In the same way, the Vulnerability Assessment looks at frontline or underserved populations separately from the homes they live in or the industries where they work.

To be as comprehensive as possible, the Vulnerability Assessment looks at physical structures separately from the services or benefits they provide. This is because the effects of climate change on one type of population or asset can be different from the effects on related populations and assets. For example, if a flood damaged or blocked a major highway, such as I-10, it would have a significant impact on public safety services in and around the city. However, the loss of I-10 would not cause physical damage to public safety facilities, such as police or fire stations. Similarly, a drought can have a major effect on water and wastewater services by reducing the amount of water available for water supply and wastewater conveyance, but droughts have little or no physical effect on water and wastewater infrastructure, such as pipelines or pumps.



## Populations

Of the 17 populations evaluated in the vulnerability assessment, 13 are highly vulnerable to at least one hazard type. Populations in Ontario are most vulnerable to extreme heat and flooding. The most vulnerable populations include households in poverty and undocumented persons. The list below summarizes the high vulnerabilities, grouping together populations where similar impacts or adaptive capacity occur.

**Households with financial instability**, which are households that may have limited incomes or be cost-burdened (paying at least a third of their gross income on housing costs), are highly vulnerable to all hazards, except agriculture pests and diseases, that will impact Ontario. These persons, especially households in poverty, are more likely to live in older homes with less insulation, less structural stability, or lack of air conditioning, increasing exposure to unsafe living conditions due to mold and mildew damage from flooding, high indoor air temperatures from extreme heat and warm nights, and poor indoor air quality from air pollution and severe weather. Households with financial instability may lack the financial means and health insurance to recover from property damage or illnesses caused by climate change hazards.

**Persons that spend an extended amount of time outdoors**, including children and outdoor workers, are highly vulnerable to air quality, extreme heat, flooding, human health hazards, severe weather, and smoke from wildfires. Children tend to spend more time outdoors than many adults and may not be aware of the onset of heat-related illnesses, such as heat exhaustion or heat stroke. Reduced air quality from smoke, ozone, or particulate matter can also decrease the ability of young children to adapt to warmer temperatures over time. Outdoor workers are directly exposed to extreme heat, human health hazards, and the poor air quality due to the outdoor nature of their occupations. Outdoor work often involves physically intense work, which can increase the risk of medical complications. Outdoor work can be halted during hazardous conditions, such as severe weather, poor air quality, or flooding, creating economic hardships for outdoor workers. This may also limit the ability of outdoor workers to seek medical attention for heat or air quality-related illnesses.

**Persons with existing health conditions or limited mobility**, such as seniors, seniors living alone, persons with chronic illnesses, persons with disabilities, and persons without access to lifelines, are highly vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire smoke. Extreme heat, pathogens from human health hazards, and smoke from wildfires can cause cardiovascular and respiratory illnesses, which may be difficult for many people, especially those with compromised immune systems or chronic illnesses, to recover from. According to the Southern California Association of Governments, Ontario's obesity rate was nearly 40 percent and asthma rate was nearly 13 percent in 2018. Seniors, especially, are usually more susceptible to heat-related illnesses, pathogens, and smoke conditions because they are more likely to have medical conditions that can worsen with extreme heat and poor air quality, and often take medicine that makes it harder for them to stay cool. These individuals may also have difficulty evacuating during emergencies caused by flooding or severe weather. Power outages can also isolate these persons and potentially cause life-support systems to fail if battery backups are not available.

**Persons with language barriers and citizenship uncertainty** are highly vulnerable to multiple hazards. Most of these populations may be hesitant to seek help or may not qualify for financial assistance programs that can help them prepare and recover from a disaster. People with citizenship or immigration concerns, such as undocumented immigrants, are highly vulnerable to nearly all climate change hazards, because this population may not live in structures that adequately shelter from these hazards and they may be required to work in extreme heat or poor air quality conditions. According to the Asian Pacific Environmental Network's *Mapping Resilience Report*, these populations may not feel welcome or safe to participate in government-provided support services or assistance programs. If employers halt work because of hazardous conditions, undocumented persons may face financial hardship. These individuals may also live in low-lying areas or in structures that are less resilient to damage, and therefore are highly vulnerable to severe weather and flooding.

**Persons experiencing homelessness** lack permanent and often temporary shelters, which can leave them directly exposed to high temperatures, poor air quality, flooding, severe weather, and smoke from wildfires. These persons may not have access to cool locations, water, sunscreen, or protective equipment to increase resiliency to poor air quality, extreme heat, and human health hazards. Persons experiencing homelessness are also severely vulnerable to severe weather and may have a challenging time recovering if high winds and intense rain events damage or destroy temporary shelters and personal property.

**Persons living in mobile homes** are located throughout the city and are highly vulnerable to extreme heat, flooding, and severe weather because mobile homes are generally not as resilient as permanent structured homes, making them more susceptible to damage from intense rain events and high winds. Mobile homes may have less insulation than permanent structures, causing indoor air temperatures to rise during extreme heat events. Mobile homes can typically be retrofitted to protect against damage from flooding and severe storms; however, persons living in mobile homes may have lower or fixed incomes that can make it more difficult to make appropriate retrofits or repairs and mobile homes may be ineligible for recovery funding due to the home type.

**Overcrowded households** are highly vulnerable to human health hazards because persons in these households may be living in conditions that increase their chances of catching vector-borne illnesses. Persons living in overcrowded households may be unable to quarantine if a contagious illness is contracted. These persons may lack financial means to acquire different housing and may not be able to install air filtration devices.

## **Built Systems and Services**

The built system includes vulnerabilities to infrastructure, buildings, and services that the City of Ontario and other organizations provide. The built systems are most vulnerable to flooding and severe weather. Of the 36 infrastructure, building, and service assets included in the assessment, 18 are highly or severely vulnerable (scored V4 or V5) for at least one hazard.

**Public Transit Services and Infrastructure** is highly vulnerable to poor air quality, extreme heat, flooding, severe weather, and wildfire, because these hazards create unhealthy conditions for those riding public transit and may disrupt public transit routes. Many of the Omnitrans bus routes and Metrolink railway are also within a flood hazard zone. Flooding and severe weather can prevent buses or other vehicles from

traveling on certain roadways in the city, causing delays or preventing people from using public transit. According to a recent survey conducted through Resilient IE, poor air quality, extreme heat, and smoke conditions can cause fewer people to use public transit, since it may be more difficult to wait outside for buses or trains. While there are some alternative roadways buses can use and shade structures can be installed to ensure people can access public transit, delays or negative health outcomes may be unavoidable.

**Energy infrastructure and delivery services** are highly or severely vulnerable to extreme heat, flooding, severe weather, and wildfire. Energy delivery services are dependent on regional and local overhead power lines and underground natural gas pipelines owned and operated by Southern California Edison (SCE) and Southern California Gas Company (SoCal Gas), which are susceptible to extreme heat, flooding, high winds, and wildfire.

Extreme heat can cause power outages due to mechanical failure of electrical equipment, heat damage to the above-ground infrastructure, and a high demand for electricity due to air conditioning units. Increased electricity usage for air conditioning during heat waves can overtax electrical transmission lines and transformers, which may disfunction or fail, causing power outages. Solar and wind energy production could also decrease due to extreme heat. According to the U.S. Department of Energy, solar photovoltaic panels experience a decrease in efficiency due to excessive heat of converting solar energy to electric energy due to an increase in current but a larger decrease in voltage. SCE and its partners incentivize reducing energy demand during peak-energy usage times of the day, which may help reduce the amount of energy demand on extreme heat days. Severe weather can also have wind speeds that cause transmission lines to sway in close proximity of each other, potentially leading to arcing. This can generate sparks, excessive heat, and damage the lines. High winds from severe weather can also cause SCE to conduct a Public Safety Power Shutoff and turn off electricity to prevent sparks, which disrupts energy delivery to the city. SCE and SoCal Gas can retrofit power lines and other equipment to insulate them against extreme heat events and severe weather, as well as underground utilities to protect them from severe winds and wildfires.

**Evacuation route and transportation infrastructure** are highly or moderately vulnerable to extreme heat, flooding, and severe weather. Extreme heat and prolonged periods of high temperatures can crack, heave, or deform roadway and railway materials, damaging major roads, transit corridors, and evacuation routes or making them difficult to drive on. Evacuation routes, such as I-10 and SR-60, have sections that are within the 100-year or 500-year floodplain. Floodwaters can cause these major routes, including bridges and underpasses, to become impassable and prevent people from evacuating during an emergency. The Ontario International Airport and Union Pacific railways are also in the 100-year or 500-year floodplain. Flooding can inundate runways, damage terminal buildings, and damage railway tracks, disrupting the regional transportation network. Roadways and railways can be retrofitted with materials with higher temperature thresholds, evacuation-designated roadways can be raised to prevent flooding, and the airport can be hardened to prevent damage to facilities. While Caltrans may have the funds for increased maintenance of roadways, it may be expensive for Ontario to increase maintenance and repairs on repetitive loss roadways.

**Public safety services and buildings** are highly vulnerable to flooding, which can cause the facilities supporting the services to be inundated and damaged. Three police stations and six fire stations are within the 100-year or 500-year floodplain. Floodwaters can damage these buildings or cause mold and mildew to grow, causing the space to become unusable and unhealthy indoor air quality. Chronic flooding may make these buildings difficult to maintain. Public safety response services rely heavily on major roads and highways, which can be blocked by floodwaters and prevent personnel from traveling through the city to respond to public safety needs. Alternative routes may be available, but not always the most efficient way to travel to important destinations.

**Flood-control infrastructure** is highly vulnerable to flooding and severe weather, which have the potential to overwhelm these systems and cause them to fail. During periods of heavy rainfall, flood-control channels and basins have a higher risk of overflowing their banks, causing flooding in residential, commercial, and industrial areas of Ontario. The flood-control systems and storm drains are maintained by the U.S. Army Corps of Engineers, California Department of Water Resources, the San Bernardino County Flood Control District, and Ontario Public Works Department; therefore, coordination would have to occur across agencies to maintain adequate flood-control structures.

**Homes and residential structures** are highly vulnerable to flooding and severe weather. Homes throughout the city are within the 100-year or 500-year floodplains and can be destroyed by large floods or flash floods. If flooding does not destroy a home, it can leave mold and mildew, making the structure uninhabitable without remediation, repair, and replacement. Homes, especially older homes, can also be damaged by high winds and other severe weather. The Community Action Partnership of San Bernardino County and La Cooperativa Campesina de California can help low-income residents and homeowners retrofit their homes and protect them from flooding and severe weather. However, some retrofits may not be economically feasible for all residents that do not qualify for this program.

**Freight and shipping** services are dependent on roadways and railways, and therefore are highly vulnerable to flooding and severe weather. Freight and shipping services can be disrupted if highways and major roadways become impassable during severe weather or flooding events. Delays in services may last days or weeks depending on the severity. Smaller freight and shipping services can use alternative roadways outside of flood zones to meet deliveries. However, large freight trucks and train cars may not be able to use alternative routes if they require designated truck routes.

**Water and wastewater treatment, delivery, and collection** are highly vulnerable to drought and flooding. Flooding can cause a wastewater treatment plant to be inundated with wet weather flows due to higher levels of stormwater, preventing the system from functioning properly. Failure of the wastewater treatment plant could cause sewer collection systems to back up and potentially overflowing raw sewage into streams and water systems. Water and wastewater systems can be retrofitted to prevent damage from flooding and ensure continuity of service. However, wastewater cannot be easily rerouted if the system is damaged or disrupted.

**Drought conditions** can stress water agencies that provide water to Ontario, as supplies from the State Water Project and groundwater may be significantly reduced due to lack of snowmelt into the system or recharge into the groundwater basins. Water agencies may apply demand-reduction actions, such as water restrictions for non-essential uses, increased use of recycled water, and penalties for violating

water shortage provisions. Water delivery agencies can also provide water rebate or retrofit programs to help businesses and residents in the area reduce overall water consumption.

**Parks and open space** are highly vulnerable to drought. Severe drought conditions would require agencies to curtail watering of parks, causing drought stress and plant damage that can limit aesthetic appeal and recreational potential. The City of Ontario has recycled water that can be used to irrigate parks and sports fields with highly treated wastewater. The installation of drought-tolerant plants and low-water use landscaping can also reduce water use and improve drought resiliency. However, these retrofits may be expensive for the city to complete.

**Homeless shelters** and supportive facilities are highly vulnerable to severe weather, which can be damaged by high winds, hail, and lightning. The services supported by these buildings may be prevented from providing adequate services if the facilities are damaged. Homeless shelters are typically managed by nonprofit or faith-based organizations that may not get financial support from local agencies and may not have the funding for repairs if their facilities are damaged. However, these facilities have the potential to obtain grant funding to be converted into multi-use resilience hubs with resilient energy options and retrofitted structures to minimize disruptions from high winds and flooding events.

**Communication services**, including phone, cable, and internet, are highly vulnerable to severe weather that includes high winds. This can cause power outages that turn off communication infrastructure, preventing businesses and residents from receiving emergency notifications and evacuation notices. Communication facilities can be retrofitted to prevent damage and keep communication capabilities on. However, there may not be many redundancies in the communication system in the city that can be brought online if others fail.

**Emergency medical response** is highly vulnerable to human health hazards, as an increase in vector-borne and other illnesses may cause the demand to outweigh the capacity of emergency medical response services. There may be shortages of health care facilities, equipment, pharmaceuticals, and personnel if health care workers become sick or if supply chains are disrupted. Local and regional medical centers and providers can strengthen medical supply chains and prepare emergency contingency plans for if or when human health hazards increase in frequency and intensity. However, this may take time and require extensive coordination with multiple agencies and companies.

## **Economic Drivers**

Economic drivers are the main contributors to the economy and employment within the City of Ontario. Important economic sectors are most vulnerable to extreme heat and flooding. Of the seven economic assets included in the assessment, five were highly vulnerable to at least one hazard.

**Outdoor recreation** is highly vulnerable to poor air quality, extreme heat, and wildfire smoke. Outdoor recreation can be curtailed due to unhealthy air quality conditions resulting from increased ozone or particulate matter or high temperatures in the region. Intense physical exertion from running or bicycling can be dangerous during poor air quality conditions and extreme heat, and people must stay hydrated to avoid heat and respiratory illnesses. Although parks and open space are not in wildfire-prone areas, visitors and residents could be deterred from traveling to the city if smoke and extreme heat create unfavorable conditions, especially if water stations are not available at outdoor recreation sites.

Alternative locations for outdoor activities may be available in other parts of San Bernardino County, where temperatures are lower or there is better air quality, but these locations would likely not be in Ontario or nearby cities.

**Agriculture**, which consists of livestock and crops for livestock in Ontario, is highly vulnerable to drought and extreme heat. Many livestock species, especially cattle, require large amounts of water. The problem is particularly significant for animals raised on feed, as feed crops themselves require large amounts of water. Insufficient access to water can cause livestock growth to slow or stop and may increase the risk of sickness or animal mortality. Temperatures above 100 degrees can create heat stress, increasing the risk of infection, reducing milk production and fertility, and may lead to death, particularly among animals that are already stressed by illness. Livestock facility operators can purchase feed, reduce herd size, wean animals (as applicable) early, and seek assistance through government relief programs. Extreme heat is also highly harmful to livestock animals. Providing shade structures, misters, and making water available can help reduce heat stress. However, these may not be feasible options for all operations.

**Ontario International Airport** is severely vulnerable to extreme heat and flooding because airplanes may not be able to take off or land during dangerous conditions. During extreme heat events that reach 115°F to 120°F, aircraft may be unable to generate enough lift during take-off because of less dense air. This can ground airplanes and cause delays in air services that can last hours. Flooding can create unsafe conditions for planes to take off or land on the airport runways, preventing the airport from functioning properly. These events can delay air services that could last hours or days, depending on the severity. Visitors and residents that use Ontario International Airport may be able to use alternative airports, but these may not have the same commercial flights or be farther away.

**Major employers, warehouses, and logistics centers** are highly vulnerable to flooding. Several warehouses and logistics centers on the eastern portion of the city, which include many of the major employers in the city, are within the 100-year or 500-year floodplain. Warehouses can be damaged by floodwaters and impassable roadways, or freight rail, can prevent logistics centers from shipping the goods they need to. Other major employers may experience a disruption in business from flooding that blocks roadways and damages facilities, preventing the movement of goods, services, and people. Existing levee and flood channel systems prevent flooding of some facilities and roadways in the city. However, employees may not be able to get through major intersections to travel to warehouses, logistics centers, and major employers in the city until the water recedes.

## IMPLICATIONS FOR TOP 2050

### Emergency Preparedness and Response

The City is prepared to meet emergency situations, such as fire, medical, or hazardous events. The Ontario Office of Emergency Management, Fire Department, and Police Department conduct emergency preparedness and response activities in Ontario. The Office of Emergency Management leads the update and implementation of the City's Hazard Mitigation Plan and Emergency Operations Plan, which provides employee and citizen education in preparedness, or CERT programs, and trains City employees in disaster response, management, and recovery. The Ontario Fire Department provides a variety of public safety services, including fire protection, medical aid, rescue, vector control, sandbag distribution, hazardous materials response, and educational safety programs, such as CPR, first aid classes, and Fire Explorers. Other services include fire code enforcement and regulation, plan reviews, home, and business inspections, and fire code permits. The Ontario Police Department provides evacuation and traffic control during emergencies and disasters.

The Emergency Operations Center (EOC) at Ontario Fire Station No.1, provides a centralized location for emergency management in the event of a major emergency or disaster within the city. The EOC operations are directed by the Office of Emergency Management, emergency management staff (City Department heads), and representatives from organizations who are assigned emergency responsibilities (Red Cross, schools, hospitals, etc.). The EOC is equipped with essential administrative supplies to sustain operations for an extended period. In addition, all necessary forms, i.e., communications message forms, separate journals for each emergency service, shelter registration cards, volunteer registration forms, emergency requisition forms, and damage assessment survey sheets for all possible contingencies, are stocked in the EOC.

The City of Ontario uses AlertOntario, an Everbridge mass notification system, to notify the community and distribute emergency information and instructions before, during, and after a disaster. This system alerts all residents in the area about disasters, major emergencies, and other urgent information via text messages, email, phone, landline, and other means of communication. The Telephone Emergency Notification System is used by the San Bernardino County Sheriff and Fire Departments to quickly communicate information on impending dangers using telephone and text messages.

Other emergency alert systems include the Emergency Alert Systems (EAS) and the Emergency Digital Information System (EDIS). The EAS is a national public warning system commonly used by state and local authorities to deliver important emergency information, such as weather and AMBER alerts, to affected communities. EAS participants include radio and television broadcasters, cable systems, satellite radio, and television providers, and wireline video providers. FEMA, the Federal Communications System, and the National Oceanic and Atmospheric Administration's (NOAA's) National Weather Service work collaboratively to maintain the EAS and [Wireless Emergency Alerts](#), which are the two main components of the national public warning system and enable authorities at all levels of government to send urgent emergency information to the public. EDIS is a wireless emergency and disaster information service operated by the State of California Governor's Office of Emergency Services and is an enhancement to the EAS. These systems are available in multiple languages.

## MUTUAL-AID AGREEMENTS

The City of Ontario participates in the California Master Mutual-Aid Agreement. The Standardized Emergency Management System have adopted the California Master Mutual-Aid Agreement, and is designed to ensure that adequate resources, facilities, and other support are provided to jurisdictions whenever their own resources are insufficient to cope with the needs of a given emergency. The State Office of Emergency Services Southern Region (Mutual Aid Region I) serves the mutual-aid region that encompasses San Bernardino County. Automatic aid pacts with the San Bernardino County Office of Emergency Services and local fire departments or offices of emergency services in nearby cities provide additional emergency management and response services in Ontario.

## EVACUATION NEEDS

With advanced warning, evacuation can be effective in reducing injury and loss of life during a catastrophic event. Primary emergency access and evacuation routes in Ontario, as shown on Exhibit S-11 of the TOP 2050 Safety Element, include I-15, I-10, SR-83, and SR-60; Fourth Street, Holt Boulevard, Mission Boulevard, Riverside Drive, Chino Avenue, and Edison Avenue (east-west roadways); and South Mountain Avenue, Euclid Avenue, Grove Avenue, Archibald Avenue, and Haven Avenue, (north-south roadways). All evacuation routes in Ontario face a potential disruption from a flood or earthquake event, which may block roadways, damage the roadway surface, or collapse overpasses. In the event of widespread disruption to local evacuation routes, remaining evacuation routes may become congested, slowing down evacuation of the community or specific neighborhoods. This issue may be compounded since evacuation routes for Ontario will also likely serve as evacuation routes for surrounding communities, and so potential disruptions may have regional effects. An analysis of the City's roadway network and parcels conducted as part of The Ontario Plan preparation has determined that there are currently several residential parcels within the city with evacuation constraints, as shown on Exhibit S-10 of the TOP 2050 Safety Element. All parcels within an evacuation constraint are in at least one hazard-prone area and most are clustered in cul-de-sac designed neighborhoods that feed into the same roadway. The lack of multiple emergency access points in these neighborhoods limits roadway access for these properties, which may create congestion and difficulties if there is a need to evacuate.

## Equity and Uncertainty

When addressing vulnerability and adaptation through TOP 2050 and the associated implementation plan, the *Adaptation Planning Guide* and *General Plan Guidelines* recommend consideration of equity and uncertainty.

Equity means that all people are justly and fairly included in society, and that everyone can participate, prosper, and achieve their full potential. Equitable climate adaptation planning involves identifying persons who are most vulnerable to climate change hazards, and ensuring that the planning process, distribution of resources, and efforts to address systematic wrongs are all conducted in an equitable manner. This Vulnerability Assessment identifies 17 vulnerable populations and assesses climate change impacts and the ability of these populations to prepare for, respond to, and recover from climate change hazards (see list in Populations and Assets Section).

Uncertainty is the second component to consider when determining how hazardous conditions may affect Ontario. Climate change is driven by the concentration of GHGs in the atmosphere, which is



affected by how our communities use resources and how we regulate those uses through local, state, federal, and international GHG-reduction goals, regulations, plans, and programs. As more action is taken to reduce GHG emissions, the less severe the effects of climate change are expected to be. Climate change models consider the concentrations of atmospheric GHG emissions and the changes in these levels over time to project future extent or intensity of hazardous events.

Even with the extensive modeling, potential impacts are projections of more likely future conditions and are not certain. Similarly, there is also substantial uncertainty about the future state of technology, socioeconomic conditions, and other factors. According to recent studies, the best approach to uncertainty is to prepare and adapt by monitoring how the future evolves and allow for adjustments over time as new climate data and studies are completed. The State and the City have ample evidence to support science-based policy and decision-making.

## Adaptation and Resilience Opportunities

Ontario currently experiences a wide range of climate change hazards that are projected to increase in frequency and intensity in the future. While GHG reduction measures will help reduce the amount of carbon dioxide in the atmosphere, adaptation strategies will be needed to increase the resilience of residents and businesses in Ontario. The general plan is required to integrate adaptation measures into the update process that will help the community prepare for, respond to, and recover from climate change hazards.

- **Safety.** Due to the recent update of the California Government Code Section 653029(g) with the approval of SB 379, Safety Elements are required to address climate adaptation and resilience strategies. The Safety Element's goals, policies, and implementation actions can provide resilience strategies that support both reduced impacts and improved adaptive capacity of the community to climate change-related hazards, along with policies on required hazards, such as flooding, fire, and geologic hazards. Policies within this element can ensure that health, safety, and economic concerns of the community are met, even with an increase in frequency and intensity of climate change hazards. Examples of specific policies or implementation actions could include:
  - Create an extreme heat response plan that includes establishment of community cooling centers, weatherization of City buildings, and cooling strategies for persons engaged in outdoor work and persons experiencing homelessness.
  - Expand participation of programs and services that provide funding resources for economically disadvantaged households and businesses to conduct water conservation and weatherization retrofits.
  - Collaborate with Omnitrans and San Bernardino County Transportation Authority to help in evacuation efforts of seniors, persons with reduced mobility, and people without vehicles during emergency events.
  - Provide alerts about potential, developing, and ongoing emergency situations through extensive early-warning and notification systems that convey information to all residents, in multiple languages and formats to ensure it is widely accessible.

- Focus hazard mitigation planning in in evacuation constrained residential areas identified on Exhibit S-10, *Evacuation Constrained Areas*, of the TOP 2050 Safety Element.
- **Mobility.** The Mobility Element includes policies for roadway systems, public transit, airport environs, and regional transportation. Transportation and public transit infrastructure are included in the Vulnerability Assessment Results discussion above, and therefore resilience strategies for these systems would be appropriate to add to the Mobility Element goals and policies. Potential policies may include coordinating with regional transit providers to identify alternative routes and stops if normal infrastructure is damaged or closed as a result of flooding; raising or hardening roadways to protect them from flooding; ensuring heat-resistant materials are used on roadways; and implementation of other transportation-related resilience features. This element can also have evacuation related policies to improve evacuation access throughout the city, including requiring new development to have at least two ingress and egress routes.
- **Environmental Resources.** The Environmental Resources Element discusses water, wastewater, energy, and other utilities assessed as vulnerable in this Vulnerability Assessment. To address these vulnerabilities, policies can include funding efforts to underground electricity lines citywide, create redundancies in the communication infrastructure, and provide sustainable back-up power supplies. The City can also encourage or incentivize residential and on-site solar energy systems, especially when paired with battery storage to provide a resilient energy supply for homes. To protect infrastructure and services from flooding, policies can include the promotion of water conservation measures, low-impact development, and green stormwater infrastructure that can help convey stormwater. The Environmental Resources Element can also include policies to increase tree canopy cover, which can have the added benefit of reducing the urban heat island effect and filter out air pollutants.
- **Community Design.** The Community Design Element discusses the design of buildings, streets, and neighborhoods in Ontario. The design of streets, specifically for evacuation purposes, is included in the Emergency Response and Preparedness section above. To address neighborhood scale evacuation vulnerabilities, the Community Design Element can include policies for new neighborhoods to be designed to ensure at least two ingress and egress route in all new neighborhoods.
- **Social Resources.** The Social Resources Element includes goals and policies for health, education, community and leisure activities, libraries, and other community facilities. Many of these facilities, or the services they provide, are identified as vulnerable, as described earlier in this report. To address health impacts, the City can add policies to coordinate with San Bernardino County Public Health to ensure emergency and public health services can meet the needs of the population during poor air quality and extreme heat days, as well as human health hazard events.

The Social Resources Element also provides goals and policies for some public facilities, including community centers and libraries, throughout the city. [Resilient IE](#) provides a key resilience strategy for public facilities, the integration of physical and virtual resilience hubs. These can serve as centralized locations for resources about climate change, opportunities to reduce emissions, and techniques to increase resilience, showcases for sustainability, energy efficiency, and low carbon building, and to help residents obtain essential resources and information during and after a disaster. Examples of specific implementation actions could include:

- Identify equitably located existing facilities, outside of flood hazard zones, to serve as resilience hubs and cooling centers that open during emergencies or specific temperature triggers for residents to go to seek refuge from extreme heat days or emergency shelter.
- Coordinate with emergency management services to establish backup power, preferably from renewable energy sources, and water resources at emergency shelters, resilience hubs, and cooling centers in case of power outages.

## Resilience in Other Planning Mechanisms

Resilience policies and programs should not be limited to TOP 2050. Adaptation and resilience rely on a cross-department, multi-disciplinary approach to successful implementation. The City should consider how adaptation and resilience can also be incorporated into other City plans, codes, projects, and implementation programs. Addressing climate change hazard events in TOP 2050 can support other essential safety documents, such as the Ontario Annex of the *San Bernardino County Multi-Jurisdictional Hazard Mitigation Plan*. Development standards such as residential building codes for buildings in flood zones and development of adequate evacuation routes can be integrated into the Ontario Municipal Code. Policies that focus on emergency response to hazards can be included in an evacuation plan or an emergency operations plan. Adaptation measures that also reduce GHG emissions can be integrated into the *Ontario Community Climate Action Plan* and may support the *Ontario Active Transportation Master Plan*. Coordination between the City and its energy providers can incentivize energy-related GHG reduction measures. Policies related to drought and flooding may be integrated into the City of Ontario's and Cucamonga Valley Water District's Urban Water Management Plans and the Ontario Storm Drain Master Plan. Furthermore, programs such as the Ontario Municipal Code and Capital Improvement Program can help implement the resilience policies developed in the General Plan through specific projects, development codes, and budgeting.

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## APPENDIX A: LIST OF POPULATIONS AND ASSETS

### List of Items to Include in the Ontario Plan Vulnerability Assessment

PlaceWorks proposed the following populations and other assets for inclusion in the Vulnerability Assessment. Each list includes a description and source of data needed to support the Vulnerability Assessment.

#### POPULATIONS

PlaceWorks collected population data from the U.S. Census, the California Healthy Places Index, and Homeless Point-in-Time Count. These populations include:

- Children (under 10)<sup>1</sup>
- Cost-burdened households: households paying 30 percent or more of their income towards housing expenses<sup>2</sup>
- Households in poverty: households with an income below the poverty line, which is \$26,500 for a household of four in the United States.<sup>3</sup>
- Immigrants and refugees<sup>4</sup>
- Linguistically isolated populations: especially Spanish, Tagalog, and Chinese<sup>5</sup>
- Low-income households: households with an income of 80 percent or less of the median household income. The low-income threshold is approximately \$52,037 in Ontario.<sup>6</sup> The State of California identifies \$77,500 as the low-income threshold for a household of four people in San Bernardino County.<sup>7</sup>
- Outdoor workers (e.g., construction, farmworkers, outdoor recreation workers, landscapers)<sup>8</sup>
- Overcrowded households: housing units that have 1.0 persons or more per room (excluding bathrooms and kitchens).<sup>9</sup>
- Persons experiencing homelessness: 2020 point-in-time count reported 28 sheltered and 74 unsheltered (102 total) persons experiencing homelessness in the city.<sup>10</sup>
- Persons living in mobile homes
- Persons with chronic illnesses
- Persons with disabilities<sup>11</sup>
- Persons without access to lifelines: Persons without access to a car, transit, or communication systems.<sup>12</sup>
- Renters<sup>13</sup>
- Seniors (65+)<sup>14</sup>
- Seniors living alone<sup>15</sup>
- Undocumented persons



## INFRASTRUCTURE

PlaceWorks collected infrastructure data from a variety of sources. These infrastructure assets include:

- Airports: Ontario International Airport (Data source: Caltrans, Division of Aeronautics)
- Bike routes: City routes, West Cucamonga Creek Trail System (Data source: City of Ontario website: Parks and Street Maintenance)
- Bridges (Data source: Caltrans GIS)
- Communication facilities (e.g., cell phone towers, ham radio antennae, AT&T switching buildings) (Data source: TBC)
- Electrical substations and transmission lines: 11 substations and transmission lines operated by Southern California Edison. (Data source: California Energy Commission)
- Electric vehicle charging stations: 27 public stations (Data source: Alternative Fuels Data Center)
- Evacuation routes (Data source: Resilient IE, 2020)
- Flood-control infrastructure: levees along Cucamonga Creek and the City's stormwater management system (Data source: DWR Levee Protection Zones)
- Hazardous materials sites (Data source: EnviroStor)
- Major roads and highways: I-10, I-15, SR-60 (Data source: Caltrans)
- Natural gas pipelines: Southern California Gas Company (Data source: Cal OES)
- Parks and open space: 30 City parks, including Creekside Park and Golf Course, De Anza Park, Guasti Regional Park, Homer Briggs Park, John Galvin Park, Munoz Park, Ontario Soccer Complex, Westwind Park, and Whispering Lakes Golf Course (Data source: Parks Department website)
- Power plants: 8 natural gas facilities, 11 solar energy facilities, 1 landfill gas facility, 3 battery energy storage facilities, and small-scale energy generation facilities (Data source: California Energy Commission)
- Railways: Alhambra and Los Angeles railway subdivisions, Metrolink, Amtrak, Union Pacific (Data source: California Active Rail Lines, Amtrak)
- Solid waste facilities and landfills: 8 facilities including Caltrans Upland Maintenance Station, Recycled Wood Products, Ontario Agricultural Commodities, Residual Recovery Group, Beneficial Agriculture Services, Recycled Wood Products Ontario 2, Partida Fertilizer, and Chino Valley Rock, all of which are active. (Data source: CalRecycle)
- Transit stops: Ontario Metrolink Station, East Ontario Metrolink Station, Omnitrans (Data source: SBCTA)
- Water and wastewater infrastructure: Inland Empire Utilities Agency Regional Water Recycling Plant, City of Ontario

## BUILDINGS

PlaceWorks collected buildings data from Google maps, the Ontario Parks & Recreation Department, the City of Ontario land use GIS layer, and the California School Database. These assets include:

- Community centers: Armstrong Community Center, De Anza Community & Teen Center (designated cooling center), Anthony Munoz Community Center, Dorothy A. Quesada Community Center, Ontario Senior Center, Veterans Memorial Community Center, Westwind Community Center.

- Commercial business, shopping, and entertainment centers: Toyota Arena, Ontario Mills Shopping Center, Ontario Convention Center, Ontario Auto Center, Stater Bros Plaza, Archibald Ranch Town Center, Archibalds Plaza, Pacific Plaza, Ontario Airport Commerce Center, Ontario Business Center, Ontario Center, Prologis Park.
- Homeless shelters: Mercy House Ontario Access Center, House of Ruth, Foothill Family Shelter.
- Government buildings: Ontario City Hall and City facilities, San Bernardino Department of Human Services.
- Homes and residential structures
- Libraries: Ovitt Family Community Library (designated cooling center), Lewis Family Branch, South Ontario Library.
- Medical and care facilities: Healthcare Center of Bella Vista, Inland Christian Home, Kaiser Foundation Hospital, Kindred Hospital Ontario, Las Colinas Post Acute, Ontario Dialysis Center, Ontario Healthcare Center, Ontario Holt Dialysis Center, Ontario Mills Dialysis (48 total – only medical facilities with patient capacity of 20 or more listed)
- Public safety buildings: City of Ontario Police Department, Ontario Policy Department Mills Station, City of Ontario Fire Department Stations #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, and San Bernardino County – West Valley Detention Center.
- Schools: Cambridge College, American Career College, Pacific College Inland Empire, Platt Collage, SJVC Ontario, Carrington College, University of La Verne College of Law, 8 private schools, 1 unaffiliated pre-school, 5 high schools with CIUHSD, 2 elementary schools with CSD, 3 middle or elementary schools with CVUSD, 4 middle or elementary schools with MVSD, 22 middle or elementary schools with OMSD.

## **ECONOMIC DRIVERS**

PlaceWorks determined important economic assets based on the 2020 Comprehensive Annual Financial Report and land uses surrounding the City of Ontario. These assets include:

- Agriculture
- Education services
- Major employers: Ontario International Airport, United Parcel Service, Ontario Montclair School District, Niagara Bottling LLC, Chaffey Joint Union High School District, QVC Ontario LLC, Home Depot, ULINE, FedEx, Cardinal Health.<sup>16</sup>
- Ontario International Airport
- Outdoor recreation (i.e., walking, biking, and court or field sports)
- Retail centers
- Warehouses and logistics centers

## **KEY COMMUNITY SERVICES**

These assets are based on typical services provided in cities throughout California, which are supported by the infrastructure and buildings listed above. Key community services include the operation and functions needed to provide and maintain services instead of just the structures that support them. These assets include:

- Communication services
- Emergency medical response: City of Ontario Fire Department
- Energy delivery: Southern California Edison, Southern California Gas Company
- Freight and shipping
- Government administration and community services
- Public safety response: City of Ontario Police Department
- Public transit access: Metrolink, Omnitrans, SBCTA
- Solid waste removal: Ontario Integrated Waste Management
- Water and wastewater treatment, delivery, and collection: City of Ontario Municipal Utilities Company, Inland Empire Utilities Agency Regional Water Recycling Plan No. 1.

## Endnotes for Appendix A

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<sup>14</sup> American Community Survey. 2019. 2019: ACS 5-Year Estimates, Age and Sex, S0101. <https://data.census.gov/cedsci/table?q=Ontario&t=Age%20and%20Sex&tid=ACSST5Y2019.S0101&hidePreview=false>.

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<sup>16</sup> City of Ontario. June 2020. Comprehensive Annual Financial Report. <https://www.ontarioca.gov/FiscalServices/BudgetFinancialReports>.

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## APPENDIX B: VULNERABILITY ASSESSMENT RESULTS MATRIX

POPULATIONS AND ASSETS	AGRICULTURE PESTS & DISEASES	AIR QUALITY	DROUGHT	EXTREME HEAT & WARM NIGHTS	FLOODING	HUMAN HEALTH HAZARDS	SEVERE WEATHER	WILDFIRE & SMOKE
<b>Populations</b>								
Children (Under 10)	-	High	Low	High	High	Medium	Medium	High
Cost-burdened households	-	Medium	Low	Medium	Medium	Low	Low	Medium
Households in poverty	-	High	High	High	High	High	High	High
Immigrants and refugees	Low	High	Medium	High	High	High	High	High
Linguistically isolated populations	-	Medium	Low	Medium	Medium	Medium	Medium	Medium
Low-income households	-	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Outdoor workers	Medium	High	Medium	High	High	High	High	High
Overcrowded households	-	Medium	Low	Medium	Medium	High	Low	Medium
Persons experiencing homelessness	-	High	Medium	High	High	High	High	High
Persons living in mobile homes	-	Medium	Low	High	High	Medium	High	Medium
Persons with chronic illnesses	-	High	High	High	Medium	High	High	High

POPULATIONS AND ASSETS	AGRICULTURE PESTS & DISEASES	AIR QUALITY	DROUGHT	EXTREME HEAT & WARM NIGHTS	FLOODING	HUMAN HEALTH HAZARDS	SEVERE WEATHER	WILDFIRE & SMOKE
Persons with disabilities	-	Medium	Low	Medium	High	Medium	Medium	Medium
Persons without access to lifelines	-	Medium	Medium	High	High	Medium	Medium	Medium
Renters	-	Medium	Low	Medium	Medium	Low	Low	Medium
Seniors (65+)	-	High	Low	High	High	High	Medium	High
Seniors living alone	-	High	Low	High	High	High	High	High
Undocumented persons	Medium	High	High	High	High	High	High	High
<b>Infrastructure</b>								
Airports	-	-	-	Medium	High	-	Medium	-
Bike routes	-	-	-	Low	Medium	-	Low	-
Bridges	-	-	-	Medium	High	-	Medium	-
Communication facilities	-	-	-	Medium	Low	-	Low	Low
Electrical substations and transmission lines	-	-	-	High	High	-	High	Medium
Electric vehicle charging stations	-	-	-	Medium	Medium	-	Low	-

POPULATIONS AND ASSETS	AGRICULTURE PESTS & DISEASES	AIR QUALITY	DROUGHT	EXTREME HEAT & WARM NIGHTS	FLOODING	HUMAN HEALTH HAZARDS	SEVERE WEATHER	WILDFIRE & SMOKE
Evacuation routes	-	-	-	High	High	-	High	Low
Flood control infrastructure	-	-	-	-	High	-	High	-
Hazardous materials sites	-	-	-	Low	Low	-	Low	-
Major roads and highways	-	-	-	High	High	-	High	Low
Natural gas pipelines	-	-	-	-	Low	-	-	-
Parks and open space	Low	-	High	Low	Medium	-	Low	-
Power plants	-	-	-	Medium	Medium	-	Low	-
Railways	-	-	-	High	High	-	Medium	Low
Solid waste facilities and landfills	-	-	-	Low	-	-	Low	-
Transit stops	-	-	-	-	Medium	-	Low	-
Water and wastewater infrastructure	-	-	Low	-	Medium	-	-	-



POPULATIONS AND ASSETS	AGRICULTURE PESTS & DISEASES	AIR QUALITY	DROUGHT	EXTREME HEAT & WARM NIGHTS	FLOODING	HUMAN HEALTH HAZARDS	SEVERE WEATHER	WILDFIRE & SMOKE
<b>Buildings</b>								
Community centers	-	-	-	Low	Medium	-	Medium	Low
Commercial business, shopping, and entertainment centers	-	-	-	Low	Medium	-	Low	Low
Homeless shelters	-	-	-	Medium	-	-	High	Medium
Government buildings	-	-	-	Low	-	-	Low	Low
Homes and residential structures	-	-	-	Medium	High	-	High	Medium
Libraries	-	-	-	Low	-	-	Medium	Low
Medical and care facilities	-	-	-	Medium	Medium	-	Low	Low
Public safety buildings	-	-	-	Low	High	-	Low	Low
Schools	-	-	-	Medium	Medium	-	Medium	Medium

POPULATIONS AND ASSETS	AGRICULTURE PESTS & DISEASES	AIR QUALITY	DROUGHT	EXTREME HEAT & WARM NIGHTS	FLOODING	HUMAN HEALTH HAZARDS	SEVERE WEATHER	WILDFIRE & SMOKE
<b>Economic Drivers</b>								
Agriculture	Medium	Medium	High	High	Medium	Medium	Medium	Medium
Education services	-	Medium	-	Medium	Low	Medium	Low	Medium
Major employers	-	Low	Medium	Low	High	Low	Low	Low
Ontario International Airport	-	Medium	-	High	High	Low	Medium	Medium
Outdoor recreation	Low	High	-	High	Low	Medium	Medium	High
Retail centers	-	Low	-	Medium	Medium	Medium	Medium	Medium
Warehouses and logistics centers	-	Low	-	Low	High	Low	Low	Low
<b>Key Services</b>								
Communication services	-	-	-	Low	Low	-	High	Low
Emergency medical response	-	Medium	-	Medium	Medium	High	Medium	Medium
Energy delivery	-	-	Low	High	Medium	-	High	High
Freight and shipping	-	-	-	Medium	High	Low	High	Low
Government administration & community services	-	-	-	Low	Low	Low	Low	Low

POPULATIONS AND ASSETS	AGRICULTURE PESTS & DISEASES	AIR QUALITY	DROUGHT	EXTREME HEAT & WARM NIGHTS	FLOODING	HUMAN HEALTH HAZARDS	SEVERE WEATHER	WILDFIRE & SMOKE
Public safety response	-	-	-	Medium	High	Medium	Medium	Medium
Public transit access	-	High	-	High	High	Low	High	High
Solid waste removal	-	Medium	-	Medium	Medium	Low	Medium	Medium
Water and wastewater treatment, delivery, and collection	-	-	High	Medium	High	-	Medium	Medium