



City of Antioch

Environmental Hazards Element Update



Prepared for:
City of Antioch

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URBAN
PLANNING
PARTNERS
INC.

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11.0 Environmental Hazards

11.1 INTRODUCTION

The Environmental Hazards Element contains an evaluation of natural and human-caused conditions which may pose certain health and safety hazards to life and property in Antioch and includes a comprehensive program to mitigate identified hazards. This Element identifies “acceptable risk.” This determination is based on defining how “safe” is “safe enough”, i.e., balancing the severity of hazards, costs, and feasibility of hazard mitigation, as well as expected benefits. In most cases, the level of acceptable risk is widely shared throughout the State and nation. For example, the standard for protection from flooding is a national standard. Standards for the protection of structures from earthquake damage are based on the provisions of the California Building Code. This Element addresses constraints to development from environmental hazards including geologic and seismic conditions, flooding, wildfire, noise, and hazardous materials. To ensure compliance with new requirements, the Element also addresses concerns associated with climate change adaptation and disaster response.

The Environmental Hazards Element includes the following sections:

- **Section 11.2 - Goals of the Environmental Hazards Element.**
- **Section 11.3 - Regulatory Framework** presents the applicable requirements relating to safety elements.
- **Section 11.4 - Geology and Seismicity Hazards** presents information on seismically induced surface rupture, ground shaking, ground failure, tsunamis, seiche, slope instability leading to mudslides and landslides, subsidence liquefaction, and other seismic hazards. This section also provides goals, policies, and implementation programs to minimize property damage and personal injury posed by seismic and geologic hazards.
- **Section 11.5 - Flood Protection** includes information on flood hazards, flood hazard zones, flood insurance rate maps, levees, historical flooding, dam failure, identification of state, local and federal agencies with responsibility for flood protection, identification of goals, policies, objectives, and implementation measures for the protection of the community from the unreasonable risk of flooding.
- **Section 11.6 - Fire Hazards** provides information regarding fire hazards, including wildland fire, fire hazard severity zones, identification of local state and federal agencies with responsibility for fire protection, and identification of goals, policies, objectives, and implementation measures for the protection of the community from unreasonable risk of wildland fire and wildfire hazards.
- **Section 11.7 - Climate Change Adaptation and Resilience** describes the impacts of a warming climate on Antioch, including increased risk of extreme heat events, more frequent and intense storms, sea level rise, wildfire, and includes goals, policies, and programs to reduce and adapt to the impacts from climate change.
- **Section 11.8 - Noise** describes auditory impacts and sounds that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.
- **Section 11.9 - Hazardous Materials** includes information relating to risks associated with hazardous materials, transportation and storage, and goals, policies, and implementation programs to reduce risks to life, property and the environment resulting from the use, storage, transportation, and disposal of these materials.

- **Section 11.10 - Disaster Response** presents information on the city's Emergency Operations Plan (EOP), including goals, policies, and implementation programs to provide effective emergency response.
- **Section 11.11 - Evacuation** analyzes evacuation routes throughout and around the city which are utilized in the movement of people that are at risk of being impacted by a disaster to a safer location.

11.2 GOALS OF THE ENVIRONMENTAL HAZARDS ELEMENT

To provide for a sustained high quality of life, it is the goal of the Environmental Hazards Element to accomplish the following:

- Minimize the potential for loss of life injury, property damage, and economic and social disruption resulting from natural and human-caused hazards in the community.

While there is a practical limit to the level of protection that can be provided in a community, Antioch is committed to minimizing the community's vulnerability to natural and human-caused hazards. In accomplishing this goal, the city seeks to offer assurance to those who wish to invest in Antioch, whether as a resident or business owner, that their protection and that of their property is prioritized by the city. This priority is encompassed in the Safety Element by:

- Incorporating safety considerations into the land use planning and development review process.
- Identifying and mitigating hazards faced by existing and new development.
- Facilitating the strengthening of existing codes, project review, and permitting processes; and
- Strengthening disaster planning and post-disaster response policies.

11.3 REGULATORY FRAMEWORK

The Environmental Hazards Element must be consistent with the relevant portions of the California Government Code. The following apply to this element:

California Government Code 65302(g)(1). California Government Code Section 65302(g)(1) establishes the legislative framework for California's safety elements. This framework consolidates the requirements from relevant federal and state agencies, ensuring that all jurisdictions are compliant with the numerous statutory mandates. These mandates include:

- Protecting against significant risks related to earthquakes, tsunamis, seiches, dam failure, landslides, subsidence, flooding, and fires as applicable.
- Including maps of known seismic and other geologic hazards.
- Addressing evacuation routes, military installations, peak-load water supply requirements, and minimum road widths and clearances around structures as related to fire and geologic hazards, where applicable.
- Identifying areas subject to flooding and wildfires.
- Avoiding locating critical facilities within areas of high risk.
- Assessing the community's vulnerability to climate change.
- Including adaptation and resilience goals, policies, objectives, and implementation measures.

California Government Code Sections 8685.9 and 65302.6. California Government Code Section 8685.9 (also known as Assembly Bill 2140 or AB 2140) limits California's share of disaster relief funds paid out to local governments to 75 percent of the funds not paid for by federal disaster relief efforts. However, if the jurisdiction has adopted a valid hazard mitigation plan consistent with Disaster Mitigation Act (2000) and has incorporated the hazard mitigation plan into the jurisdiction's General Plan, the State may cover more than 75 percent of the remaining disaster relief costs. California Government Code Section 65302.6 indicates that a community may adopt a Local Hazard Mitigation Plan (LHMP) into its safety element if the LHMP meets applicable state requirements.

Contra Costa County Hazard Mitigation Plan. The Contra Costa County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) was developed in accordance with the Disaster Mitigation Act of 2000 and followed FEMA's Local Hazard Mitigation Plan guidance. The MJHMP incorporates a process where hazards are identified and profiled, the people and facilities at risk are analyzed, and mitigation actions are developed to reduce or eliminate hazard risk. The implementation of these mitigation actions, which include both short and long-term strategies, involve planning, policy changes, programs, projects, and other activities. The plan covers the unincorporated county, 25 special purpose districts, and 10 municipalities, including the city of Antioch. The City adopted Volume 1 and the Antioch portion of Volume 2 of the 2018 MJHMP on February 27, 2018, which is referenced pursuant to the requirements of Government Code 65302.6.

California Government Code 65302 (G) 3 Adopted Through SB 1241 (Effective 2014/ Adopted 2012). California Government Code Section 65302 (g) 3 requires the Safety Element to identify and update mapping, information, and goals and policies to address wildfire hazards. As part of this requirement, any jurisdiction that includes State Responsibility Areas or Very High Fire Hazard Severity Zones in the Local Responsibility Areas (LRA), as defined by the California Board of Forestry and Fire Protection (Board), is required to transmit the updated element to the Board for review and approval. The city does not have Very High Fire Hazard Severity Zones within the Local Responsibility Area, therefore compliance with 65302 (g)3 is not required

California Government Code 65302 (G) 4 Adopted Through SB 379 (Effective 2017/ Adopted 2015). California Government Code Section 65302 (g) 4 requires the Safety Element to address potential impacts of climate change and develop potential strategies to adapt/mitigate these hazards. Analysis of these potential effects should rely on a jurisdiction's LHMP or an analysis that includes data and analysis from the State of California's Cal-Adapt website. This Section, 11.0, Environmental Hazards Element of the city's General Plan provides an overview of climate change risks to Antioch and goals, policies, and programs to address these vulnerabilities. The incorporation of the city's Hazard Mitigation Plan into this element fully addresses the requirements of Government Code section 65302(g)(4).

California Government Code 65302 (G) 5 Adopted Through SB 99 (Effective 2020/ Adopted 2019). California Government Code Section 65302 (g) 5 requires the Safety Element to identify evacuation constraints associated with residential developments, specifically focused on areas served by a single roadway.

11.4 GEOLOGY AND SEISMICITY HAZARDS

Seismicity. Eastern Contra Costa County, as well as the San Francisco Bay Area as a whole, is in one of the most seismically active regions in the United States. Major earthquakes have occurred in the vicinity of Antioch in the past and can be expected to occur again in the near future. The 1999 Working Group on California Earthquake Probabilities estimated that there is a 70 percent probability of at least one magnitude 6.7 or greater earthquake to occur on one of the major faults within the San Francisco Bay region before 2030. Furthermore, they determined that there is a 30 percent chance of one or more magnitude 6.7 or greater earthquakes occurring somewhere along the Calaveras, Concord-Green Valley, Mount Diablo Thrust, and Greenville Faults before 2030.

Although no known active faults are located within the Planning Area, several major faults are located within a few miles. Historically active faults (exhibiting evidence of movement in the last 200 years) in Contra Costa County include the Hayward, Calaveras, Concord-Green Valley, and Marsh Creek-Greenville faults. The San Andreas Fault is the largest regional fault and is located approximately 45 miles west of Antioch. Figure 11-1 shows the locations of these faults.

The intensity of ground shaking that could occur in Antioch as a result of an earthquake in the surrounding Bay Area is partly related to the size of the earthquake, its distance from the city, and the response of the geologic materials within the Planning Area. As a general rule, the earthquake magnitude and proximity to the fault rupture to the site, increase the intensity of ground shaking. The Association of Bay Area Governments (ABAG) has mapped the distribution of ground shaking intensity. Ground shaking intensity is described using the Modified Mercalli Intensity (MMI) Scale, which ranges from I (not felt) to XII (widespread devastation). When various earthquake scenarios are considered, ground shaking intensities will reflect both the effects of strong ground accelerations and the consequences of ground failure.

A large earthquake on the Concord-Green Valley Fault is projected to produce ground shaking intensities in Antioch of IX on the MMI Scale, which translates to damage to buried pipelines and partial collapse of poorly built structures. The most intense shaking is expected in Bay Mud deposits along the Suisun Bay, north of SR 4. Aside from some isolated areas along drainages within the city, the majority of the Planning Area is projected to experience ground shaking intensity VII on the MMI Scale. This intensity is often associated with non-structural damage. A large earthquake on the Hayward Fault is projected to produce less intense shaking, due to the distance from the fault.

Since the 1970s, the Uniform Building Code (UBC) in California has incorporated standard response spectra as a basis for structural design. The response spectra establish the minimum standards for which a building must be designed. The UBC considers primary lateral seismic forces and general soil type; incorporation of vertical forces into code design requirements is currently being considered. The objective of the UBC is to protect the life safety of building occupants and the public. For large earthquakes, the UBC primarily ensures that the building will not collapse, but some structural and non-structural damage may be expected.

Buildings constructed prior to code revisions in the 1970s generally would not meet current design provisions for earthquake forces. Expected damage to different types of buildings may include:

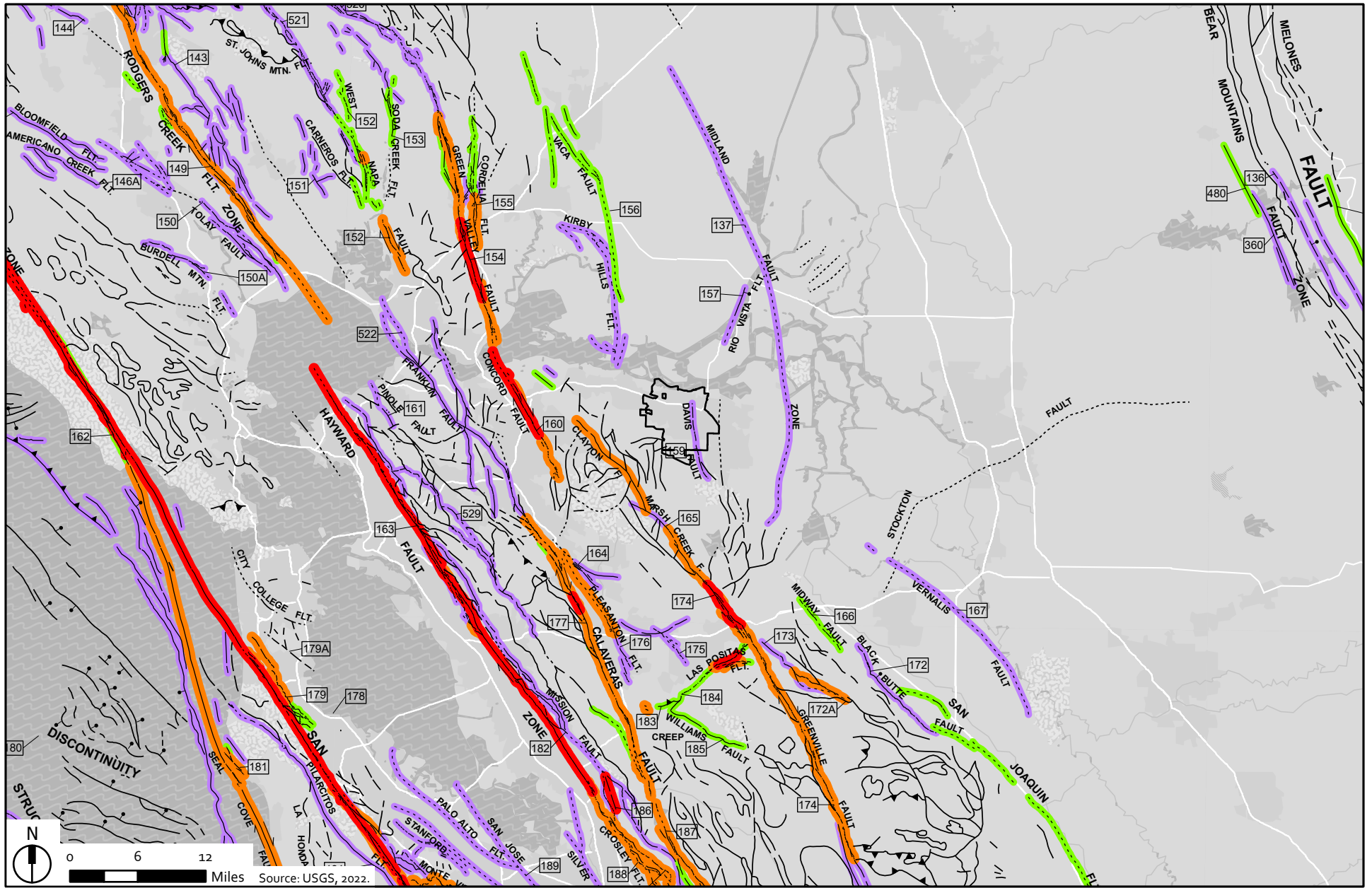
- **Unreinforced Masonry.** Unreinforced masonry buildings constructed of brick or concrete block present the most severe hazards. Under strong intensity ground shaking, many of these structures may be expected to collapse or require demolition. The city has developed a list of unreinforced masonry buildings.

- **Older Steel/Concrete Frame Buildings.** Other types of buildings that may also be severely damaged are older buildings of steel and concrete framing that were not designed to resist earthquake vibrations and older reinforced brick and masonry structures.
- **Light Wood-Frame/Sheet Metal.** Light wood-frame, such as most residential structures, and sheet metal buildings would be expected to have moderate damage in most conditions.

New construction in Antioch is required to meet the requirements of the California Building Code (CBC), which incorporates the UBC. Buildings of special occupancy are required by the State to meet more stringent design requirements than the CBC. Special occupancy buildings include hospitals, schools, and other structures that are important to protecting health and safety in the community.

Liquefaction. Liquefaction is the rapid transformation of saturated, loose, fine-grained sediment to a fluid-like state because of earthquake ground shaking. Liquefaction has resulted in substantial loss of life, injury, and damage to property. In addition, liquefaction increases the hazard of fires because of explosions induced due to underground gas line breaks, and f water line ruptures which can reduce fire suppression capacity. Figure 11-2 illustrates the locations within Antioch that have the potential for liquefaction to occur. Lowland areas directly adjacent to the San Joaquin River and tributaries have a high to very high potential for liquefaction, while upland areas exhibit very low to moderate liquefaction potential.

Landslides. The strong ground motions that occur during earthquakes are capable of inducing landslides, generally where unstable slope conditions already exist. Figure 11-2 illustrates the locations within Antioch prone to earthquake induced landslides. The United States Department of the Interior Geologic Survey Regional Slope Stability Map of the Northeastern San Francisco Bay Region California indicates that landslide hazards exist primarily in the hilly portions of the southwestern part of the Planning Area. This Planning Area is susceptible to landslides with the majority of slopes considered to be moderately unstable. To the east, the Lone Tree Valley has little susceptibility of landslides with stable to generally stable slopes. However, the area south of Lone Tree Valley is prone to landslides with moderately unstable and unstable slopes. The area to the north of Lone Tree Valley is generally not prone to landslides with slopes that are generally stable to marginally stable. However, a few small areas have unstable slopes susceptible to landslides, including an area to the north of Contra Loma Reservoir, and an area to the west of the intersection of the Contra Costa Canal and SR 4.



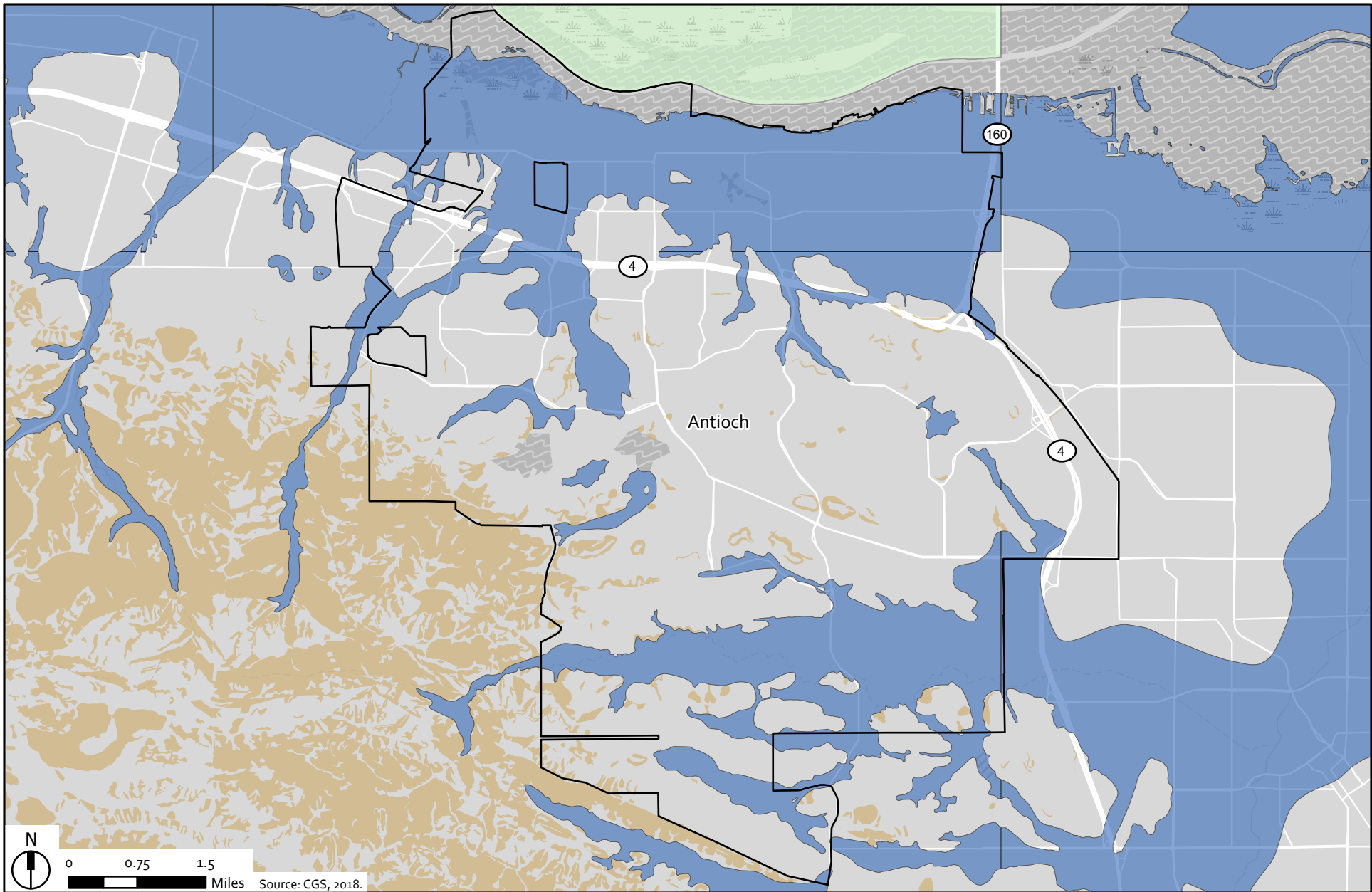
- City Boundary
- Fault Classification**
- Historic
- Holocene
- Late Quaternary
- Quaternary

Figure 11-1
Regional Faults

Inundation From Seiche and Tsunami. Earthquakes can cause tsunamis (“tidal waves”) and seiches (oscillating waves in enclosed water bodies). There are no enclosed bodies of water in the vicinity of the Planning Area that would be affected by seiches. Low-lying portions of the city adjacent to the San Joaquin River could be affected by a tsunami. However, projected wave height and tsunami run-up is expected to be small and limited to the interior portions of the San Francisco Bay and the Delta. Some coastal inundation and damage could occur in Antioch if a tsunami coincided with very high tides or an extreme storm.

Historic Mineral Extraction. Coal mining in the southwestern portion of the General Plan study area resulted in the excavation of mining tunnels over a relatively large area, including the Sand Creek Focus Area and the Black Diamond Mines Regional Preserve. These mines, abandoned in the late 1800s, present a possible risk of collapse and surface subsidence that could compromise the integrity of buildings developed overlying the mine tunnels. Ultimately, the potential for mine collapse is dependent upon the type of mining that was conducted, the size and dimensions of the mined area, the bearing strength of the materials bounding the mined area, depth of mining, and the length of time since the mining was discontinued. The U.S. Bureau of Mines closed six ventilation shafts in the southwestern portion of the Sand Creek Focus Area in 1981 and 1982.

The southeast portion of the General Plan study area is within the outer, western, margin of the Brentwood Oil Field. The California Geologic Energy Management Division (CalGEM) online database of production wells indicates that there are currently three active oil/gas wells, and approximately 70 plugged wells that are considered inactive. Most of these wells are located outside of the city limits.



- City Boundary
- Liquefaction Zone
- Landslide Zone
- No Evaluation of Seismic Hazards

Figure 11-2
CGS Seismic Hazard Zones

City of Antioch Environmental Hazards Element

11.4.1 Geology and Seismicity Objective

Ensure Antioch residents and businesses are better prepared and protected from the threat of seismic ground shaking and other geologic events.

11.4.2 Geology and Seismicity Policies

Seismicity

- a. Require geologic and soils reports to be prepared for proposed development sites and incorporate the findings and recommendations of these studies into project development requirements. As determined by the City of Antioch Building Division, a site-specific assessment shall be prepared to determine potential ground shaking impacts on new development. The site-specific ground shaking assessment shall incorporate up-to-date data from government and non-government sources and may be included as part of any site-specific geotechnical investigation. The site-specific ground shaking assessment shall include specific measures to reduce the significance of potential ground shaking hazards. This site-specific ground shaking assessment shall be prepared by a licensed geologist and shall be submitted to the City of Antioch Building Division for review and approval prior to the issuance of building permits. For purposes of this policy, "development" applies to new structures and existing structures or facilities that undergo expansion, remodeling, renovation, refurbishment, or other modification. This policy does not apply to accessory dwelling units or accessory buildings.
- b. Provide information and establish incentives for property owners to rehabilitate existing buildings using updated construction techniques to protect against seismic hazards.
- c. Encourage the purchase of earthquake insurance by residents and businesses.
- d. Encourage continued investigation by State agencies of geologic conditions within the Bay Area to update knowledge of seismic hazards and promote public awareness.
- e. Provide expedited review of any seismic-related revisions to the California Building Code/Uniform Building Code proposed by the State.
- f. Work with PG&E, pipeline companies, and industrial uses to implement measures to safeguard the public from seismic hazards associated with high voltage transmission lines, caustic and toxic gas and fuel lines, and flammable storage facilities.
- g. Require that engineered slopes be designed to resist seismically induced failure.
- h. Require that parcels overlying both cut and fill areas within a grading operation be over-excavated to mitigate the potential for seismically induced differential settlement.

Other Geologic Conditions

- i. Limit development in those areas, which, due to adverse geological conditions, will be hazardous to the overall community and those who will inhabit the area.
 - j. Require evaluations of potential slope stability for developments proposed within hillside areas and incorporate the recommendations of these studies into project development requirements.
-

- k. Require specialized soils reports in areas suspected of having problems with potential bearing strength, expansion, settlement, or subsidence, including implementation of the recommendations of these reports into the project development, such that structures designed for human occupancy are not in danger of collapse or significant structural damage with corresponding hazards to human occupants. Where structural damage can be mitigated through structural design, ensure that potential soils hazards do not pose risks of human injury or loss of life in outdoor areas of a development site.
- l. Where development is proposed within an identified or potential liquefaction hazard area (as determined by the city), adequate and appropriate measures such as (but not limited to) designing foundations in a manner that limits the effects of liquefaction, the placement of an engineered fill with low liquefaction potential, and the alternative siting of structures in areas with a lower liquefaction risk, shall be implemented to reduce potential liquefaction hazards. Any such measures shall be submitted to the City of Antioch Building Division for review prior to the approval of the building permits.

Historic Mineral Extraction

- m. As appropriate and necessary to protect public health and safety, abandoned mines shall be placed in natural open space areas, with appropriate buffer areas to prevent unauthorized entry.
- n. Within areas of known historic mining activities, site-specific investigations shall be undertaken prior to approval of development to determine the location of any remaining mine openings, the potential for subsidence or collapse, and necessary measures to protect public health and safety, and prevent the collapse or structural damage to structures intended for human occupancy due to mine-related ground failure or subsidence. Such measures shall be incorporated into project approvals.
- o. All identified mine openings shall be effectively sealed.
- p. Construction of structures for human occupancy shall be prohibited within areas found to have a high probability of surface collapse or subsidence, unless foundations are designed that would not be affected by such surface collapse or subsidence, as determined by site-specific investigations, and engineered structural design.
- q. The locations of all oil or gas wells on proposed development sites shall be identified in development plans. Project sponsors of development containing existing or former oil or gas wells shall submit documentation demonstrating that all abandoned wells have been properly abandoned pursuant to the requirements of the CalGEM.

11.5 FLOOD PROTECTION

The National Flood Insurance Act of 1968 called for the identification and mapping of flood plain hazard areas prone to flooding in major storm events. These flood hazard maps, known as Flood Insurance Maps (FIRMS), are used by the Federal Emergency Management Agency (FEMA) to determine eligibility areas for inclusion in the federal flood insurance program. Portions of the city are located within the 100-year and 500-year flood hazards zones as mapped by FEMA and are defined by FEMA as “flood prone.” Except for small areas located within the 100- and 500-year flood hazard zones, the majority of Antioch is outside of a FEMA flood zone and subject to minimal or no flooding. Antioch’s FEMA flood hazard areas are shown in Figure 11-3 and reflect the most recent FEMA Flood Insurance Rate Maps (FIRM)as of September 2015 for portions along the San Joaquin River and June 2009 for inland portions of the city.

Areas subject to flooding are mainly found adjacent to the San Joaquin River and tributary creeks. Within the City of Antioch Planning Area, a 100-year flood hazard zone runs adjacent to the San Joaquin River. In the western portion of the Planning Area, a 100-year flood hazard zone begins at the San Joaquin River and encompasses the area bounded by the Planning Area border to the west; the BNSF Railroad to the south; and the area to the east of the mouth of West Antioch Creek. A 100-year flood hazard zone also is located adjacent to West Antioch Creek and has its widest point at the Creek’s mouth. Near B Street, the 100-year flood hazard zone extends from the San Joaquin River south across the BNSF railroad, and then spans East Antioch Creek until the Creek reaches SR 4. This flood zone is widest, spanning a width of approximately 1,600 feet, just south of the railroad. Just north of Lake Alhambra, the flood hazard zone spans an area of similar width. In the southern portion of the Planning Area, flood hazard zones are intermittently located adjacent to East Antioch Creek on its west and main branch. A 100-year flood zone also is located adjacent to Markley Creek, Los Medanos Wasteway, and Sand Creek. Many of these drainages also include 500-year flood zone areas in low lying areas adjacent to the 100-year flood zone.

Dams. Three dams are located within the city and surrounding areas that could impact the city, which includes:

- **Contra Loma Dam** – owned by the US Bureau of Reclamation, is a 2,500 AF reservoir with a safety classification of satisfactory by the US Bureau of Reclamation. The Bureau of Reclamation Division of Dam Safety conducted a safety analysis of the Contra Loma Reservoir in 1983 and determined that “safe” performance of the dam can be expected under all anticipated loading conditions, including the maximum credible earthquake and probable maximum flood events.”
- **Sand Creek Dam** – owned by the Contra Costa County Flood Control and Water Conservation District, is an 895 AF detention basin that has an extremely high downstream hazard potential and is considered to be in satisfactory condition by the California Division of Safety of Dams.
- **Antioch Reservoir** – owned by the City of Antioch this 722 AF reservoir has an extremely high downstream hazard potential and is considered to be in satisfactory conditions by the California Division of Safety of Dams.

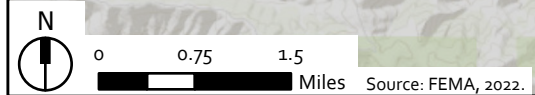
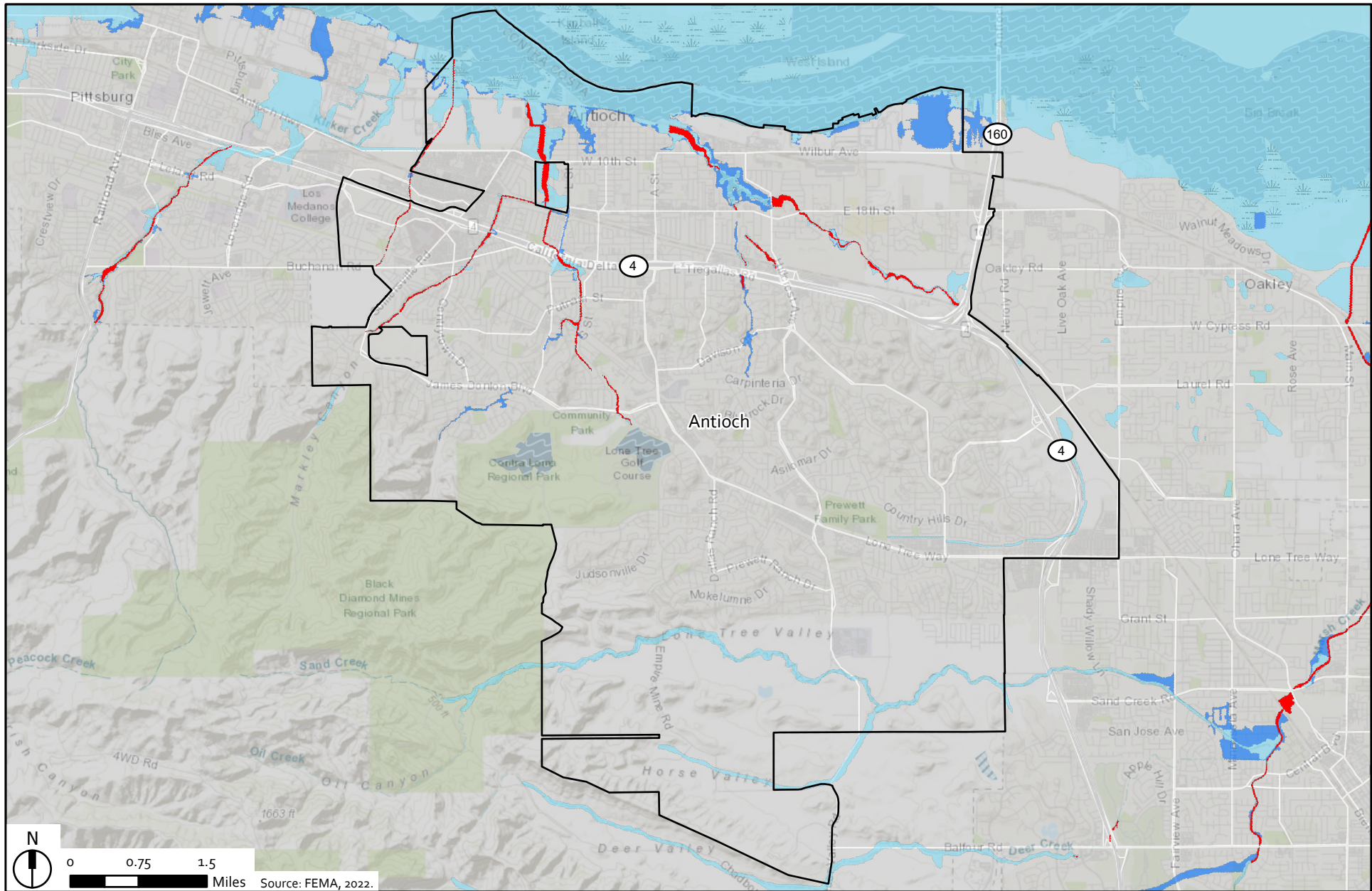
Potential dam failure inundation areas for these facilities are shown in Figure 11-4.

11.5.1 Flood Protection Objective

Ensure flooding impacts in Antioch are minimized or eliminated wherever possible.

11.5.2 Flood Protection Policies

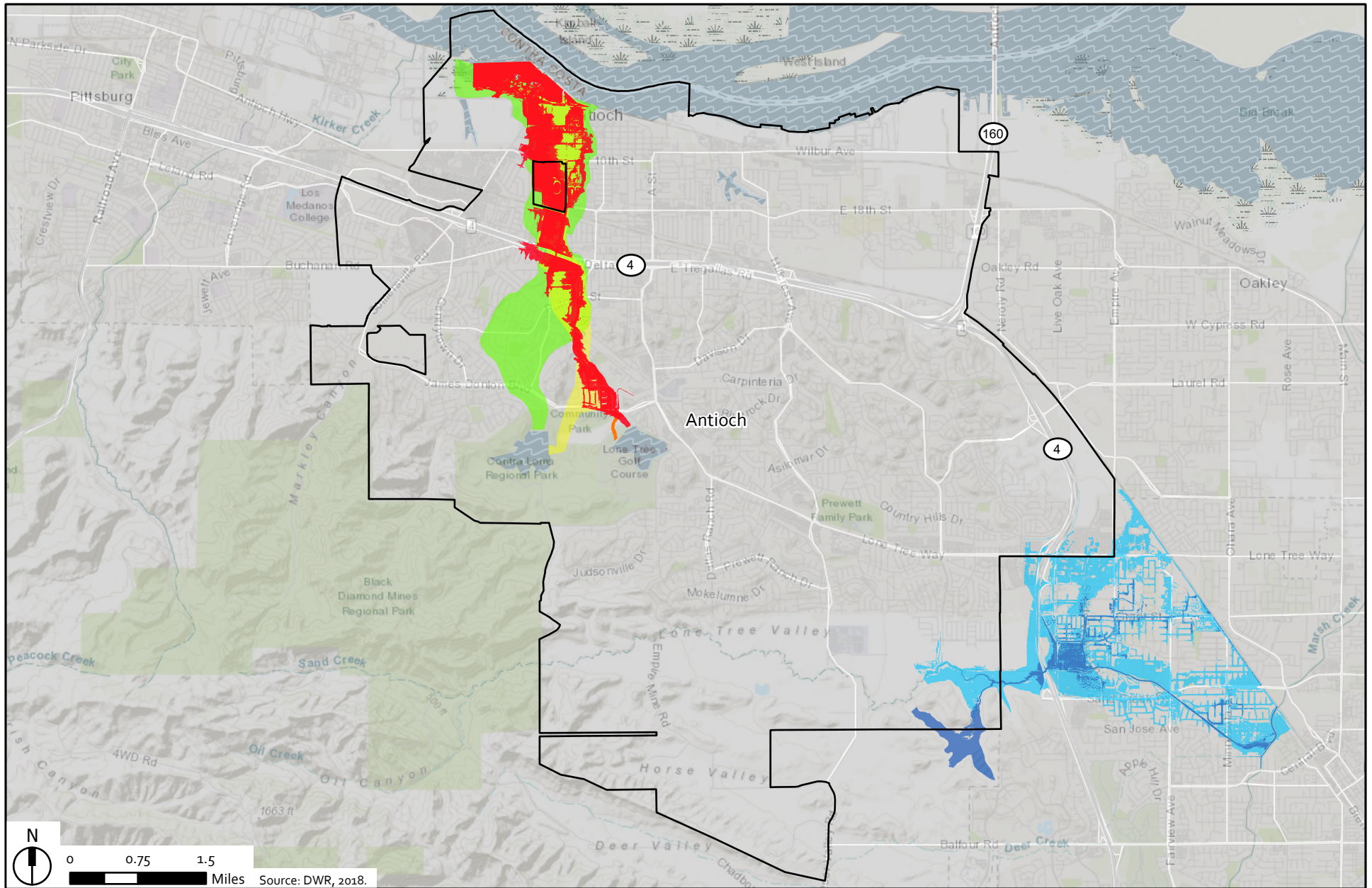
- a. Prohibit all development within the 100-year floodplain unless mitigation measures consistent with the National Flood Insurance Program are provided.
- b. Minimize encroachment of development adjacent to the floodway to convey flood flows without property damage and risk to public safety. Require such development to be capable of withstanding flooding and minimize the use of fill.
- c. Prohibit alteration of floodways and channelization of natural creeks if alternative methods of flood control are technically and financially feasible.
- d. Ensure flooding solutions balance the need for protection devices with land use solutions, recreation needs, and habitat preservation.
- e. Require new development to prepare drainage studies to assess storm runoff impacts on the local and regional storm drain and flood control system, along with implementation of appropriate detention and drainage facilities to ensure that the community's storm drainage system capacity will be maintained, and peak flow limitations will not be exceeded.
- f. Where construction of a retention basin is needed to support new development, require the development to provide for the perpetual funding and ongoing maintenance of the basin.
- g. Eliminate hazards caused by local flooding through improvements to the area's storm drain system or creek corridors as resources allow.



- City Boundary
- 100-Year Flood Zone
- 500-Year Flood Zone
- Regulatory Floodway

Figure 11-3
FEMA Flood Hazard Zones

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- Antioch Main Dam
- Antioch Spillway
- Contra Loma Dike
- Contra Loma Dam
- Sand Creek Main Dam
- Sand Creek Saddle Dam
- City Boundary

Figure 11-4
Dam Failure Inundation

City of Antioch Environmental Hazards Element

11.6 FIRE HAZARDS

The risk of both urban and wildland fires exists within the Antioch Planning Area. The level of fire risk results from a variety of factors, including type and amount of vegetation and groundcover, combustibility of building materials, adequacy of access for firefighting equipment and staffing, water supply and pressure, and weather conditions. The most common source of urban fires is home heating systems and electrical appliances.

As Antioch expands into hillside areas, urban development will begin to encroach into areas of more rugged topography with flammable indigenous vegetation. Over time, all of California's wildlands will burn, as they are naturally prone to do. However, various human factors (recreation activities, encroachment, expanded use) increase risks for fire occurrence, and wildland fires will be larger, more intense and damaging, cost more to fight, and will take a larger toll (in economic and non-economic terms) than would otherwise occur naturally. According to the 2018 Contra Costa County MJHMP over 51 wildfires have occurred in Contra Costa County since the 1950s resulting in loss of lives, property, and natural resources. This equates to an average of three fires every four years, with the most recent fire was the SCU Lightning Complex Fire that burned in the Diablo Range in August and September 2020. This fire impacted Contra Costa County as well as surrounding counties burning over 393,000 acres. Prior to this, the largest recent fire in Contra Costa County was the 3,111-acre Morgan Fire in Mt. Diablo State Park in 2013. The last fire that occurred close to the City of Antioch was the 2015 Loma Fire Incident which burned 533 acres of the Contra Loma Regional Park.

In the event of a fire emergency, the Contra Costa County Fire Protection District (CCCFPD) provides fire and emergency services to the residents of the City of Antioch and the adjacent unincorporated areas. Contra Costa County fire stations 81, 82, 83, and 88 are in Antioch.

Prevention through implementation of ordinances and standards is the best way to minimize Antioch area fire hazards. CCCFPD's ordinances and standards cover topics such as location of fire hydrants, provision of sprinklers, roadway widths, and provide the basis for both the rural fire prevention capital facilities standards and response time performance standards specified in the city's Environmental Hazards Update. The city has ratified the CCCFPD Fire Code, which adopts by reference the 2019 California Fire Code (California Code of Regulations, Title 24, Part 9) as amended by the changes, additions, and deletions set forth in the ordinance adopting the CCCFPD Fire Code.

The Contra Costa Fire Protection District has entered into mutual aid agreements with other fire departments through the California State Master Mutual Aid Agreement that is administered by the State Office of Emergency Services as well as through the Contra Costa County Fire Chiefs' Mutual Aid Plan. The District is also party to multiple automatic aid agreements with fire agencies that are generally in close proximity.

Figure 11-5 illustrates the CalFire fire hazard severity zones for Antioch. As shown in Figure 11-5 no portion of the city's Local Responsibility Area is located within the Very High Fire Hazard Severity Zone, however a small portion of the city's Planning Area (south of Empire Mine Road and Starmine Trail) is located within the Moderate and High Fire Hazard Severity Zones within the State Responsibility Area. The Contra Loma Reservoir Contra Loma regional Park in Antioch is within a Federal Responsibility Area. According to the Contra Costa County MJHMP, no buildings or people are located within a wildfire hazard zone within the city.

The Contra Costa County Wildfire Protection Plan (WPP), first adopted by the Diablo Fire Safe Council (DFSC) in 2009, provides an analysis of wildfire hazards and risk in the wildland-urban interface (WUI) in Contra Costa County. In 2019, the DFSC and project partners worked with residents, representatives

of federal, regional, state, and local agencies, and community organizations to update the Plan. Updates to the WPP were approved in May 2020. The goal of the WPP is to reduce hazard related to wildfires through increased information and education about wildfires, hazardous fuels reduction, actions to reduce structure ignitability, and other recommendations to assist emergency preparedness and fire suppression efforts. The plan also facilitates a coordinated effort between stakeholders to reduce the threats and vulnerabilities associated with wildfire hazards.

Development and growth facilitated by the General Plan will result in additional residents and businesses in the city, including new residential, commercial office, and industrial uses. This additional growth will result in increased demand for public service, including fire protection and emergency services. As demand for service increases, there will likely be a need to increase staffing and equipment to maintain acceptable service ratios, response times, and other performance standards. New or expanded structures may be required to accommodate adequate staffing, equipment, and services. The Growth Management Element includes Goal GM-6 for the compliance with applicable levels of service. Policies GM-P-6.1 and GM-P-6.2 support this goal by requiring new development to contribute to and maintain adopted performance standards for police, fire and emergency medical response and services, and by requiring new growth to pay its share of the costs associated with that growth.

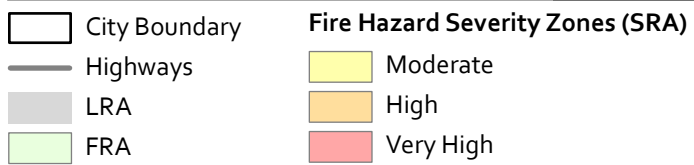
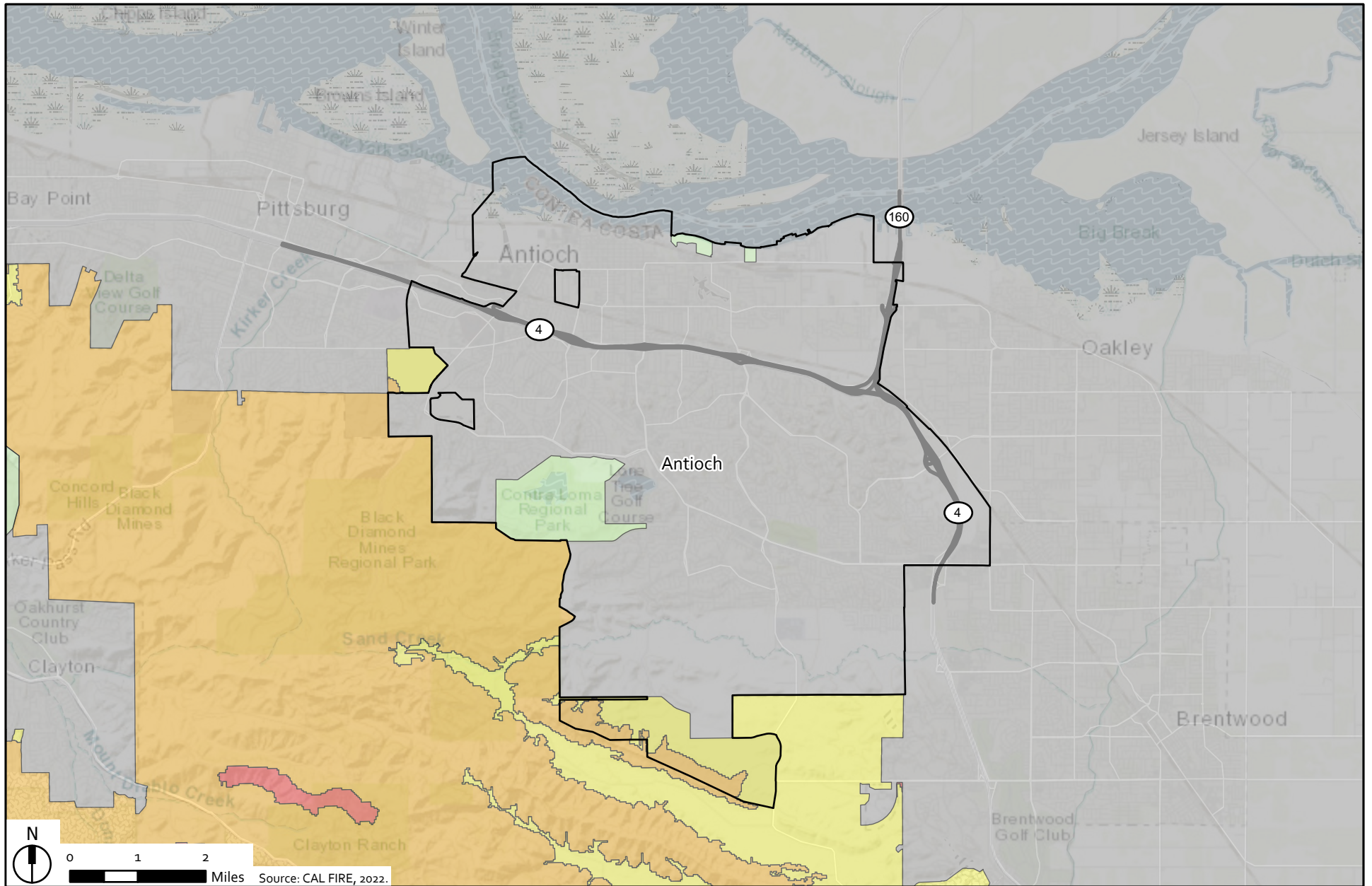


Figure 11-5
Fire Hazard Severity Zones

11.6.1 Fire Hazards Objective

Meet anticipated needs and demands that address hazards associated with wildland and urban fire.

11.6.2 Fire Hazards Policies

- a. Perform necessary maintenance on open space brush areas that are susceptible to burning.
 - b. Prevent the invasion of grassland by Baccharis (a genus of perennials and shrubs that are highly flammable) by retaining grazing on publicly owned rangelands and integrating grazing practices within developed areas.
 - c. Coordinate with Contra Costa County Fire Protection District on projects that make Antioch more resilient to fire hazards.
 - d. Work with Contra Costa County Fire Protection District to promote public awareness of fire hazards and safety measures, including outreach to at-risk populations, and identification of low-risk areas for temporary shelter and refuge during wildfire events
 - e. Review, amend and update, at regular intervals, relevant city codes and ordinances to incorporate the most current knowledge and highest standards for fire safety.
 - f. Encourage the use of fire-retardant vegetation for landscaping, especially in high fire hazard areas.
 - g. Require fire safe construction practices, such as fire preventive site design, landscaping and building materials, and installation of sprinklers on new development and redevelopment projects.
 - h. Encourage landscaping maintenance programs to reduce potential fire hazards in the hills, wildland areas, and urban interface.
 - i. Reduce fire hazard risks in existing developments by ensuring that private property is maintained to minimize vulnerability.
 - j. Work with the Contra Costa Fire Protection District to ensure adequate fire suppression resources in the local responsibility areas, and coordination with CALFIRE for state responsibility areas where wildfires may affect both areas.
 - k. Require new development to incorporate design measures that enhance fire protection in Fire Hazard Severity Zones as identified in Figure 11-5. This shall include but is not limited to incorporation of fire-resistant structural design, use of fire-resistant landscaping, and fuel modification around the perimeter of structures.
 - l. Prioritize development in areas with sufficient water supply infrastructure and road networks that provide adequate fire equipment access and multiple evacuation routes.
 - m. Maintain existing water supply infrastructure for firefighting and plan for adequate future water supplies.
 - n. Establish mitigations for properties in Fire Hazard Severity Zones with restricted and single points of access including parking restrictions and investigating the feasibility of establishing special assessment districts to improve road capacity, and adequate water supply.
 - o. Where new development borders wildland areas, require appropriate fuel modification and use of fire-retardant building materials per the requirements of the Contra Costa County Fire Protection District. Fuel modification may be permitted to extend beyond the boundaries of the site for which
-

wildland fire protection is being provided only if the adjacent owner provides written permission, the proposed fuel modification is consistent with the management practices of the agency controlling such land (if it is in permanent open space), and the off-site fuel modification activity will not significantly impact sensitive habitat areas.

- p. Require that adequate fire protection be available at initial project occupancy, whenever feasible. Thus, stations should be constructed and manned at the outset of new development. If the Contra Costa Fire Protection District finds that a lag time between initial occupancy and operation of new stations cannot be avoided. Alternative strategies acceptable to the fire code official may be proposed.

11.7 CLIMATE CHANGE ADAPTATION

The Earth's climate is warming, mostly due to human activities such as changes in land cover and emissions of certain pollutants. Greenhouse gases (GHGs) are the major human-induced drivers of climate change. These gases warm the Earth's surface by trapping heat in the atmosphere.

Global surface temperatures have increased approximately 1.6 °F relative to average temperatures from 1951-1980. In addition, 17 of the 18 warmest years in the 136-year record have occurred since 2001. Consistent with global observations, annual average air temperatures have increased by approximately 1.8 °F in California, with temperatures rising at a faster rate beginning in the 1980s.

As temperatures continue to rise, California will face serious climate impacts, including:

- More intense and frequent heat waves.
- More intense and frequent drought.
- More severe and frequent wildfires.
- More severe storms and extreme weather events.
- Greater riverine flows.
- Shrinking snowpack and less overall precipitation.
- Accelerating sea level rise.
- Ocean acidification, hypoxia, and warming.

The State of California Cal Adapt has developed modeling software that is used to make predictive projections for weather scenarios, such as extreme heat days and extreme precipitation events. These are created by using emission scenarios. An emissions scenario is a representation of future GHG emissions and resulting atmospheric concentrations through time. These emission scenarios are projected using what are called representative concentration pathways (RCPs). Each RCP represents a standardized set of assumptions about the human influenced GHG emissions and the trajectory in the coming years. Relying on the Cal Adapt tool, the following climate projections and RCPs were used:

- RCP 4.5 - GHG emissions peak around 2040 and then decline.
- RCP 8.5 GHG emissions continue to rise strongly through 2050 and plateau around 2100.

Both projections are considered possible depending on how successful the world is at reducing atmospheric carbon dioxide emissions. The following are potential effects that may impact the city.

Average Maximum Temperatures. Overall temperatures are projected to rise substantially throughout this century. According to the CAL-Adapt snapshot tool, the historical (1961-1990) annual maximum mean temperature for Antioch is 72.7 °F. Under the RCP 4.5 scenario, the

maximum mean temperature in Antioch is expected to rise 4 °F by 2064 and 5.4 °F by 2099. Under the RCP 8.5 scenario, the maximum mean temperature is projected to rise nearly 8.3 °F to 81 °F by 2099.

Warmer temperatures will increase the demand for air conditioning and cooling systems. A common proxy used to understand the demand for energy needed to cool buildings is Cooling Degree Days (CDD). A CDD is defined as the number of degrees by which a daily average temperature exceeds a reference temperature over a given period of time. Using 65 °F over a period of 30 years, which loosely represents the average daily temperature above which space cooling is needed, the average number of CDD, under the RCP 4.5 scenario, increases from a historical annual average of 35.1 to 58.1 between 2035-2064 and 66.5 between 2070-2099. Under the RCP 8.5 scenario this figure increases to 88.1 by the end of the century.

Average Minimum Temperatures. The historical annual minimum mean temperature for Antioch is 48.5°F. Under the RCP 4.5 scenario, the minimum mean temperature could increase 3.6 °F by 2064 and 4.9 °F by 2099. Under the RCP 8.5 scenario, the minimum mean temperature is projected to rise 8.1 °F by the end of the century.

Warmer temperatures should reduce the demand for energy for space heating. Using the Cal-Adapt Heating Degree Days (HDD) tool, the city is expected to see a reduction in HDD. An HDD is defined as the number of degrees by which a daily average temperature is below the reference temperature over a given period of time, the same parameters as the CDD's. The historical annual average number of HDD in Antioch is 88.3. Under the RCP 4.5 scenario, the annual average number is projected to decrease to 65 by 2064 and 57.5 by 2099. Under the RCP 8.5 scenario, the number of annual average HDD declines to 41.5 by the end of the century.

Overall, the models project an increase in the annual average by about 31.4 CDD and an annual average decrease of approximately 20 HDD by mid-century under the RCP 4.5 scenario.

Extreme Heat Days¹. As the climate changes, some of the more serious threats to public health may stem from more frequent and intense extreme heat days and longer heat waves. Extreme heat events are likely to increase the risk of mortality and morbidity due to heat-related illness, such as heat stroke and dehydration, and exacerbation of existing chronic health conditions.

In Antioch, the extreme heat threshold is 100.8 °F. Between 1961-1990, there was an average of 4 days above 100.8 °F. By 2064 this average is projected to increase to 16 days under the RCP 4.5 scenario. By the end of the century, the average number of extreme heat days is expected to increase to 21 days under the RCP 4.5 scenario and as many as 36 days under the RCP 8.5 scenario.

¹ An extreme heat day is defined as a day in April through October where the maximum temperature exceeds the 98th historical percentile of maximum temperatures based on daily temperature data between 1961-1990.

Those most at risk and vulnerable to heat-related illness are the elderly, individuals with chronic conditions such as heart and lung disease, diabetes, and mental illnesses, infants, the socially or economically disadvantaged, and those who work outdoors. This increased risk and vulnerability comes from a lack of adaptive capacity by these groups to endure extreme heat conditions or the need for reliance on outside assistance (cooling centers, healthcare services, mental health services) during times of elevated stress. In Antioch, approximately 12 percent of the city's population is age 65 and older, which is expected to increase to 22 percent by 2040 (ABAG 2018 Projections). Additionally, approximately 15 percent of the city's population identifies as having a disability per U.S. Census Bureau, American Community Survey 5-Year Data (2015-2019); and approximately 31% of households are considered "low-income" considered their household incomes are at or less than 50% of Area Median Income (AMI)².

Rainfall. The historical annual mean rainfall for Antioch is 15.1 inches. Under the RCP 4.5 scenario, annual mean rainfall is expected to increase and peak at 16.4 inches by 2064 before leveling off towards the end of the century. at 16.2 inches by 2099. Under the RCP 8.5 scenario annual mean rainfall is anticipated to increase to 16.5 inches by 2064 and 18.1 inches by 2099. Based on these projections, the city anticipates an increase in the frequency and intensity of extreme storms brought on by atmospheric river storms in northern California. These storms will have the tendency to produce more frequent and severe flooding, along with prolonged periods of drought. The expected increase in rainfall and storm activity may exacerbate local flooding and could create flooding in areas where it has not previously occurred. While the projected increase in rainfall may mean that local water resources will not be negatively impacted over the long run, prolonged periods of drought may require greater short-term water-saving efforts.

Sea Level Rise. The San Francisco Bay is vulnerable to a range of natural hazards, including storms, extreme high tides, and rising sea levels resulting from global climate change. Flooding already poses a threat to communities along the Bay and there is compelling evidence that these risks will increase in the future. As temperatures rise globally, sea levels are rising mainly because ocean water expands as it warms, and water from melting of major stores of land ice and glaciers flow into the ocean. In the past century, average global sea level has increased by 7 to 8 inches. Sea level at the San Francisco tide gauge has risen by about 7 inches since 1900.

Rising seas put new areas at risk of flooding and increase the likelihood and intensity of floods in areas that are already at risk. The State's Sea Level Rise Guidance Document (2018) projects a "likely" (66 percent probability) increase in sea level at the San Francisco tide gauge of 10 inches by 2040. By the end of the century, sea levels are likely to rise by 2.4 feet under the RCP 4.5 scenario and 3.4 feet under the RCP 8.5 scenario. Flooding will be more severe when combined with storm events.

² U.S. Department of Housing and Urban Development (HUD), Comprehensive Housing Affordability Strategy (CHAS) ACS tabulation, 2013-2017 release

In 2014 the Adapting to Rising Tides (ART) program conducted a sea-level rise vulnerability, assessment and adaptation project along the west and central Contra Costa County shoreline extending from Richmond to Bay Point. This project analyzed and modeled a series of sea level rise scenarios in order to build a comprehensive understanding of climate vulnerability and develop effective and equitable responses. In 2017, the Delta Stewardship Council (DSC) engaged ART to complete a study extending from Pittsburg to the eastern border of Contra Costa County. This effort included preparing different flood modeling scenarios for the Delta, apart from what was modeled for the Bay. Between 2018 and 2020 the City participated in the East Contra Costa County ART Project by providing information, and assisting with the identification of relevant vulnerabilities, consequences and issues pertinent to the study area. The objectives of the program include understanding how current and future coastal and riverine flooding may impact transportation and utility networks, industrial facilities, employment sites, residential neighborhoods, community facilities, levees protecting Delta islands, and shoreline park and recreation facilities.

The final report evaluated both current and future flooding that is either temporary or permanent. Temporary flooding usually occurs when there are storms over the Pacific Ocean during the winter, when high tide coincides with strong winds, or when significant rainfall occurs over short durations causing creeks and rivers to rise over their banks. Permanent inundation occurs if an area is exposed to regular daily flooding. As sea level rises, higher water levels will become more frequent, increasing the extent, depth, and duration of temporary flooding and expanding the area that is permanently inundated. However, sea level rise affects the Delta Shoreline differently than the Bay. The Delta is influenced by both daily tides coming through the Golden Gate and freshwater flowing into the Delta from the Sacramento and San Joaquin Rivers. Modeling of sea level rise in the Delta suggests increased water heights at the Golden Gate Bridge may not translate into the same increases in water heights everywhere within the estuary (e.g., one foot of sea level rise at the Golden Gate may not mean one foot of sea level rise in the Delta). This is especially true east of the Benicia Bridge where freshwater inflows from rivers interact with tides in complex ways. As sea levels rise, the tidal creeks and the Delta are also impacted. As the Bay rises, water levels in tidal creeks and in the Delta will also rise, pushing the extent of tidal influence further upstream, potentially making riverine flooding that already occurs worse. As a result, the report considers a range of possible futures that modeled both temporary and permanent flooding for ten climate scenarios summarized in Table 11-1.

Table 11-1 ART East Contra Costa Ten Climate Scenarios

| Permanent Flooding Scenarios | Permanent + Temporary Flooding Scenarios |
|-------------------------------------|---|
| MHHW* | MHHW* + 100-year storm** |
| 12 inches | 12 inches + 100-year storm |
| 24 inches | 24 inches + 100-year storm |
| 36 inches | 36 inches + 100-year storm |
| 83 inches | 83 inches + 100-year storm |

* MHHW = Mean Higher High Water. This is the average water height of the highest tides. All other sea level rise scenarios are added to the MHHW. For example, 12inches of sea level rise is 12inches + MHHW.

** Current Temporary flooding is modeled through the 100-year storm event on top of today's high tide.

For each scenario, the report included an exposure analysis for flood risks and detailed vulnerability assessment of how these flood risks will affect 34 asset categories across 11 sectors including business and industry, communities, critical facilities and services, and people. In addition to identifying areas that could flood in each scenario, the report also identifies where specific vulnerabilities in current flood protection are located.

Some key areas and assets of concern include downtown Antioch, and piers along the Antioch Bridge that are at risk at 83 inches sea level rise (SLR) or the 100-year storm event plus 12 inches of SLR. One hazardous waste facility is located within the current 100-year storm floodplain. Combined flooding from a 100-year storm event with 83 inches SLR could impact up to 10 hazardous waste facilities across the city. The Antioch Police Department and Antioch Detention Facility are exposed to flood risk at 83 inches of SLR and/or 36 inches SLR plus a 100-year storm event. Prospects High School becomes exposed to flood risk at 83 inches SLR plus a 100-year storm. The Antioch City Marina is currently located in a 100-year storm event area and is exposed to future sea level rise starting at 12 inches SLR. There are six census tracts on or near the coast, with a total population of 30,203 persons according to the 2020 census, that are exposed to flooding with a current 100-year storm event, or at 24 inches of SLR. Within these eight census blocks, there is a specifically high number (90th percentile of Bay-Delta area residents) of children under 5, very low-income households, people with disability, single-parent households, people with limited English proficiency, people without a high school degree, severely housing cost burdened households, renters, and people over 65 living alone. Overall, of the 36,149 residential units in Antioch³, a 100-year storm affects 107 households currently, 156 households at 12 inches of SLR, 499 at 24 inches of SLR, 728 at 36 inches of SLR, and 1,217 at 83 inches of SLR. Sea level rise alone impacts 96 households at 24 inches of SLR, 102 households at 36 inches of SLR, and 786 households at 83 inches of SLR.

The ART report provides extensive analyses and maps and a comprehensive set of adaptation responses that will help the city to build resilience and adapt to rising sea level. Figure 11-6 shows areas that could be impacted by a 100-year storm event currently, and at 12 inches, 24 inches, 36 inches, and 83 inches of sea level rise. Figure 11-6 shows the areas that would be impacted by sea level rise alone at 12 inches, 24 inches, 36 inches, and 83 inches of sea level rise.

The Antioch City Council adopted the Climate Action and Resilience Plan in May 2020 and began preparing the community for hazards shocks that are expected to intensify in the future and to reduce the City's reliance on carbon-based energy sources. The document provides another resource for the community to understand climate risks and explores policies and programs that can help the community prepare for more natural hazards.

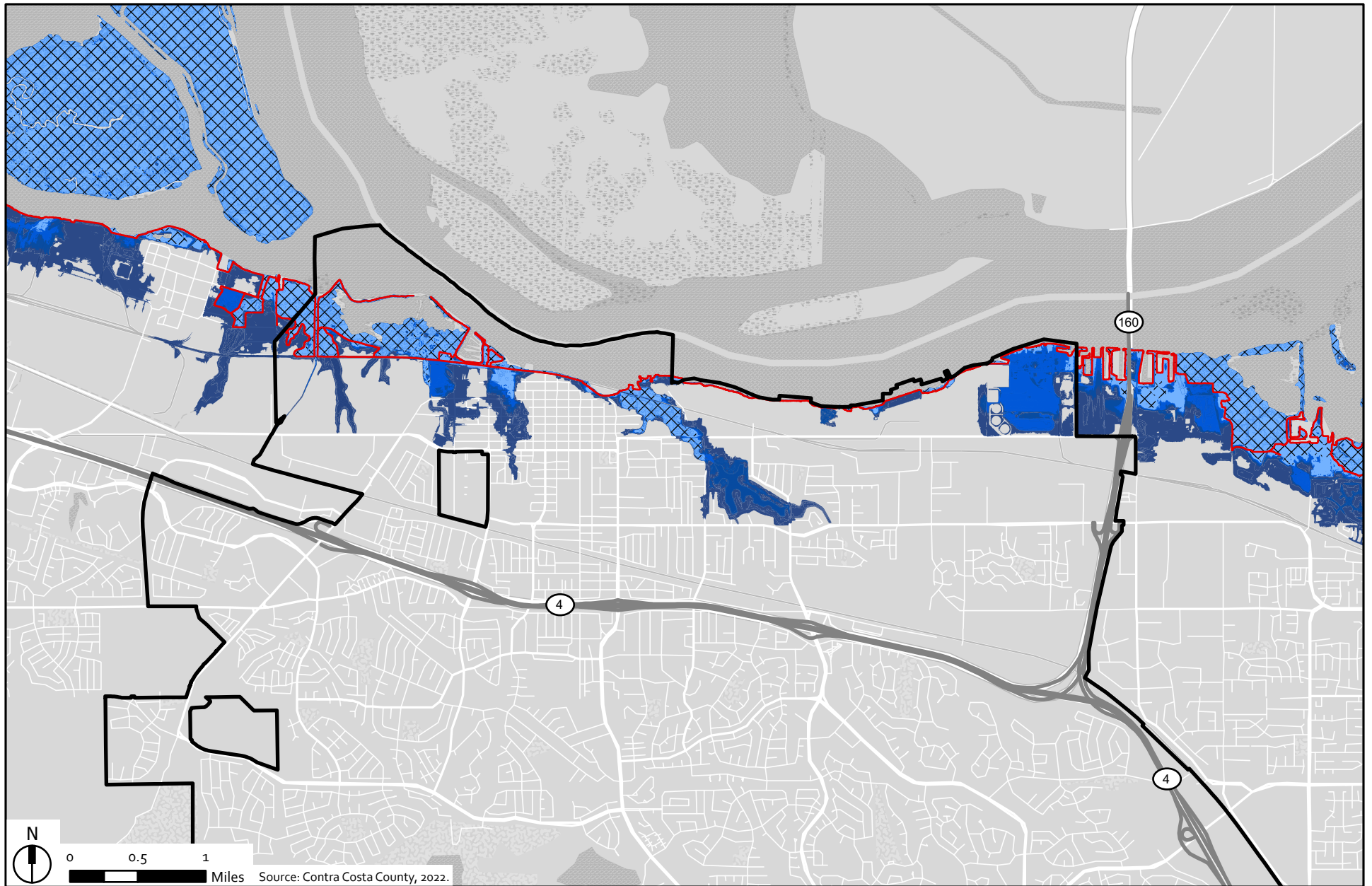
³ State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties and the State — January 1, 2021-2022. Sacramento, California, May 2022.

Wildfire. Wildfire is a serious hazard in California. Several studies have indicated that the risk of wildfire will increase with climate change. According to Cal-Adapt, the historical annual average area burned by wildfire in Antioch is over 283.7 acres. That amount is expected to increase to 297 acres by mid-century and then decrease to 273.8 acres by the end of the century. Cal-Adapt projections show the risk for wildfire in Contra Costa County increasing by approximately 10 percent under both the RCP 4.5 and RCP 8.5 scenarios. Although Contra Costa residents may not experience increased risk from wildfire directly, secondary impacts, such as poor air quality, may increase.

Prolonged and more severe drought may exacerbate wildfire conditions by increasing the potential for ignitions and spread of wildfire. An expected increase in wildfire intensity and extent will increase public safety risks, property damage, fire suppression and emergency response costs, watershed and water quality impacts, vegetation conversions, and habitat fragmentation throughout California.

Adaptive Capacity. Adaptive capacity is the current ability of a community to address the potential impacts of climate change. The Contra Costa County MJHMP (Volume 1) and City of Antioch Annex (Volume II) serves as the city's local hazard mitigation plan. This plan analyzes the city's adaptive capacity for climate change and contains actions for adapting to climate change, including flooding and sea level rise.

Antioch has existing policies, plans, programs, resources, and institutions already in place to adapt to climate change and reduce potential impacts. The city's Climate Action Resilience Plan (CARP), adopted in 2020, contains actions to reduce GHG emissions and mitigate the likely impacts of climate change. In addition, the 2018 ART Project provides information and strategies for adapting to sea level rise and building resiliency. Resources to address flooding and storm events are provided in Section 11.5 of this Environmental Hazards Element, and resources for fire prevention and protection are covered in Section 11.6. In addition, the City has adopted an Emergency Operations Plan, described in Section 11.10, which can be activated for a variety of emergency situations, including flooding, wildfires, and extreme weather events.



- City Boundary
- Highways
- Shoreline
- Current 100-year flood Inundation
- 12" SLR and 100-Year Flood Inundation
- 24" SLR and 100-Year Flood Inundation
- 36" SLR and 100-Year Flood Inundation
- 83" SLR and 100-Year Flood Inundation

Figure 11-6
Sea Level Rise

11.7.1 Climate Change Adaptation Objective

Incorporate the changing risks associated with climate change into the protection of life, property, the economy, and the environment.

11.7.2 Climate Adaptation Policies

- a. Prepare for and respond to the expected impacts of climate change.
 - b. Consider climate change implications, including sea level rise, when approving new projects and planning for growth, facilities, and infrastructure improvements in areas potentially affected by climate change.
 - c. Develop incentive programs to encourage property owners to retrofit their homes/businesses against climate-related hazards such as extreme weather, flooding, wildfire (New) Improve city staff understanding of how climate change may disproportionately affect vulnerable community members, including senior citizens, low-income persons, and persons with disabilities.
 - d. Coordinate with regional, state, and federal agencies to monitor the indicators and impacts of climate change.
 - e. Climate Action Design Elements. Require new residential, commercial, and retail land use developments to demonstrate compliance with the Bay Area Air Quality Management District's (BAAQMD) recommended design elements to support long-term climate action goals, as feasible or modify the city's climate action plans to meet the criteria under State CEQA Guidelines Section 15183.5(b) and identify community-wide measures that can be implemented to achieve the statewide GHG emissions targets of 40 percent below 1990 levels by 2030 and support the State's goal of achieving carbon neutrality by 2045. The updated climate action plans should include a checklist to help future development projects demonstrate how they will support long-term climate action goals. The GHG reduction measures identified in the updated climate action plans would supersede the Bay Area Air Management District's recommended design elements described below:
 - The project will not include natural gas appliances or natural gas plumbing (in both residential and nonresidential development).
 - The project will not result in any wasteful, inefficient, or unnecessary energy usage as determined by the analysis required under CEQA Section 21100(b)(3) and Section 15126.2(b) of the State CEQA Guidelines.
 - Achieve a reduction in project-generated vehicle miles travelled (VMT) below the regional average consistent with the current version of the California Climate Change Scoping Plan (currently 15 percent) or meet a locally adopted Senate Bill 743 VMT target, reflecting the recommendations provided in the Governor's Office of Planning and Research's Technical Advisory on Evaluating Transportation Impacts in CEQA:
 - Residential projects: 15 percent below the existing VMT per capita.
-

- Office projects: 15 percent below the existing VMT per employee.
 - Retail projects: no net increase in existing VMT.
 - Achieve compliance with off-street electric vehicle requirements in the most recently adopted version of CALGreen Tier 2.
 - f. Develop incentive programs to encourage property owners to retrofit their homes/businesses against climate-related hazards such as extreme weather, flooding, and wildfire.
 - g. Climate Action and Resilience Plan. Require new development to incorporate strategies identified in the city's current Climate Action and Resilience Plan to ensure increased community resilience from anticipated natural hazard events associated with climate change, such as flooding, drought, and extreme heat.
 - h. The city shall support solutions to ensure the sustainability of community water supplies.
 - a. Participate in the implementation and update of Groundwater Sustainability Plans to ensure the future water resources are available to support city growth and development
 - i. Encourage the development and maintenance of innovative water treatment systems to clean and disinfect water.
 - j. Continue to enhance and modify Section 6-5.10 of the City's Municipal Code, which outlines and defines waste of water and Section 6-10.05 which outlines and defines excessive use of water, and the subsequent penalties for violations.
 - a. Implement a leak detection inspection program to aid in water conservation and encourage retrofits, where feasible.
 - b. Develop incentive programs to encourage the use of water saving devices, such as high efficiency toilets, high efficiency appliances, low flow shower heads, drip irrigation systems, etc.
 - k. Water resources shall be planned and managed in a way that relies on sound science, data, and public participation.
 - l. Current climate change data shall be taken into consideration when the expansion of water infrastructure and water source location is considered for new development.
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11.8 NOISE

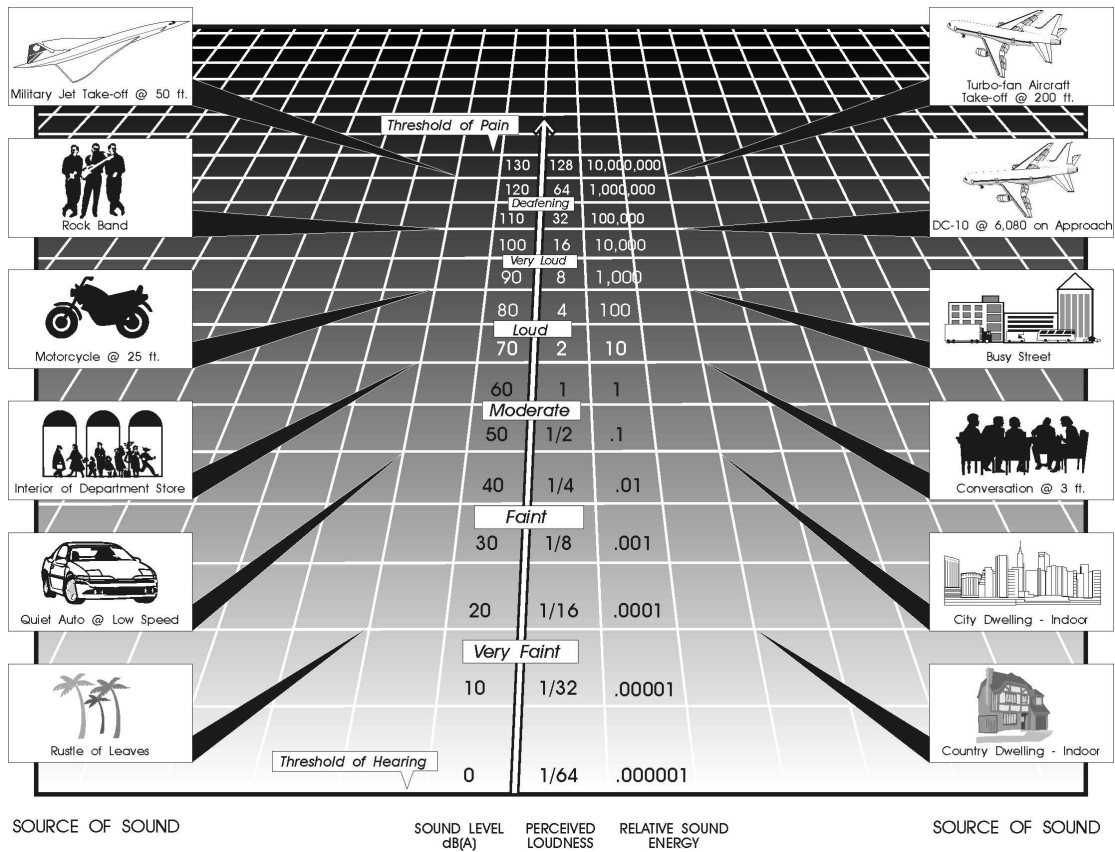
Noise is usually defined as “unwanted sound,” and consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

Sound levels are measured in decibels (dB), typically through an “A-weighted” scale, which emulates human hearing.⁴ Unlike linear units such as inches or pounds, decibels (dBA) are measured on a logarithmic scale, representing points on a sharply rising curve. In this scale, an increase of 10 dBA represents 10 times increase in sound energy and is perceived by the human ear as a doubling of loudness (see Figure 11-7). Thus, a noise at 70 dBA has 10 times the sound energy as a 60 dBA noise and will be perceived as being twice as loud.

Except under special conditions, changes in sound levels of less than 1.0 dBA cannot be perceived by the human ear. Audible increases in noise levels generally refer to a change of 3.0 dBA or more since this level has been found to be barely perceptible in typical exterior environments. A 5.0 dBA change in noise levels is generally the threshold at which a noticeable change in community response occurs.

⁴ All sound levels in the General Plan are A-weighted, unless specified otherwise.

Figure 11-7 Measurement of Noise



For environmental and land use planning purposes, several methods of expressing the average noise level over a given period of time have been developed. The predominant average noise measurement scale in California are the Equivalent-Continuous Sound Level (L_{eq}) and the Community Noise Equivalent Level (CNEL), both of which are based on A-weighted decibels (dBA). L_{eq} is the total sound energy of time-varying noise over a given sample period. CNEL is the average sound level occurring over a 24-hour period, with a weighting factor of 5.0 dBA applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours), and 10 dBA adjustment for events occurring between 10:00 p.m. and 7:00 a.m. (defined as sleeping hours). The noise adjustments are added to the noise events occurring during the quieter evening and nighttime hours to compensate for the added intrusiveness that noise has during these hours.

Other noise rating scales of importance when assessing annoyance factor include the maximum noise level (L_{max}), which is the highest exponential-time-averaged sound level that occurs during a stated time period, and noise standard in terms of percentile exceedance noise levels (L_n). L_{max} reflects peak operating conditions and addresses the annoying aspects of intermittent noise. The percentile exceedance noise levels are the levels exceeded during a stated period of time. For example, an L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level (exceeded 50 percent of the time). The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the lowest noise level experienced during a monitoring period. It is normally referred to as the background or ambient noise level.

Physical damage to human hearing occurs with prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects the entire human body, with prolonged noise exposure in excess of 75 dBA increasing tension, and thereby affecting blood pressure, functions of the heart, and the nervous system. In comparison, extended periods of noise exposure above 90 dBA result in permanent cell damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear even with short-term exposure. This level of noise is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by the feeling of pain in the ear. This is called the threshold of pain. A sound level of 190 dBA will rupture the eardrum and permanently damage the inner ear. Figure 11-7 above lists acoustical term definitions and identifies common sound levels and their sources. Major noise sources within Antioch include “mobile sources” such as traffic along SR 4 and SR 160 freeways, rail lines, and major arterial roadways. Significant “stationary” sources of noise within Antioch include heavier industrial development in the northern portion of the Planning Area, commercial development, where it backs up against residential neighborhoods and construction activities.

Traffic noise depends primarily on the speed of traffic and percentage of trucks along the route. Traffic volume has a lesser influence on highway noise levels.

11.8.1 Noise Objective

Achieve and maintain exterior noise levels appropriate to planned land uses throughout Antioch, as described below:

- Residential
 - Single Family: 60 dBA CNEL within rear yards*
 - Multi-Family: 60 dBA CNEL within interior open space*
- Schools
 - Classrooms: 65 dBA CNEL*
 - Play and sports areas: 70 dBA CNEL*
- Hospitals, Libraries: 60 dBA CNEL
- Commercial/Industrial: 70 dBA CNEL at the front setback.

11.8.2 Noise Policies

Noise Compatible Land Use and Circulation Patterns

- a. Implementation of the noise objective contained in Section 11.8.1 and the policies contained in Section 11.8.2 of this Environmental Hazards Element shall be based on noise data contained in Section 4.9 of the General Plan EIR, unless a noise analysis conducted pursuant to the city's development and environmental review process provides more up-to-date and accurate noise projections, as determined by the city.
- b. Maintain a pattern of land uses that separates noise-sensitive land uses from major noise sources to the extent possible, and guide noise-tolerant land uses into the noisier portions of the Planning Area.
- c. Minimize motor vehicle noise in residential areas through proper route location and sensitive roadway design.
- d. Provide planned industrial areas with truck access routes separated from residential areas to the maximum feasible extent.
- e. Where needed, provide traffic calming devices to slow traffic speed within residential neighborhoods.

Noise Analysis and Mitigation

- f. Where new development (including construction and improvement of roadways) is proposed in areas exceeding the noise levels identified in the General Plan Noise Objective, or where the development of proposed uses could result in a significant increase in noise, require a detailed noise attenuation study to be prepared by a qualified acoustical engineer to determine appropriate mitigation and ways to incorporate such mitigation into project design and implementation.

- g. When new development incorporating a potentially significant noise generator is proposed, require noise analyses to be prepared by a qualified acoustical engineer. Require the implementation of appropriate noise mitigation when the proposed project will cause new exceedances of General Plan noise objectives, or an audible (3.0 dBA) increase in noise in areas where General Plan noise objectives are already exceeded as the result of existing development.
- h. In reviewing noise impacts, utilize site design and architectural design features to the extent feasible to mitigate impacts on residential neighborhoods and other uses that are sensitive to noise. In addition to sound barriers, design techniques to mitigate noise impacts may include, but are not limited to:
- Increased building setbacks to increase the distance between the noise source and sensitive receptor.
 - Orient buildings which are compatible with higher noise levels adjacent to noise generators or in clusters to shield more noise sensitive areas and uses.
 - Orient delivery, loading docks, and outdoor work areas away from noise-sensitive uses.
 - Place noise tolerant use, such as parking areas, and noise tolerant structures, such as garages, between the noise source and sensitive receptor.
 - Cluster office, commercial, or multi-family residential structures to reduce noise levels within interior open space areas.
 - Provide double glazed and double paned windows on the side of the structure facing a major noise source, and place entries away from the noise source to the extent possible.
- i. Where feasible, require the use of noise barriers (walls, berms, or a combination thereof) to reduce significant noise impacts.
- Noise barriers must have sufficient mass to reduce noise transmission and high enough to shield the receptor from the noise source.
 - To be effective, the barrier needs to be constructed without cracks or openings.
 - The barrier must interrupt the line of sight between the noise source and noise receptor.
 - The effects of noise “flanking” the noise barrier should be minimized by bending the end of the barrier back from the noise source.
 - Require appropriate landscaping treatment to be provided in conjunction with noise barriers to mitigate their potential aesthetic impacts.
- j. Continue enforcement of California Noise Insulation Standards (Title 25, Section 1092, California Administrative Code).
-

Temporary Construction

- k. Damage Due to Construction Vibration. Where new development is proposed in areas adjacent to any vibration-sensitive land uses or adjacent to vibration-sensitive activities, require a screening level vibration analysis. If a screening level analysis shows that the project has the potential to result in damage to structures or where vibration could substantially interfere with normal operations, require a detailed vibration impact assessment prepared by a structural engineer or other appropriate professional to determine appropriate design means and methods of construction to avoid the potential damage, if feasible.
 - l. Ensure that construction activities and permitted hours of operation are regulated in order to avoid or mitigate noise impacts on adjacent noise-sensitive land uses.
 - m. Require proposed development projects adjacent to occupied noise sensitive land uses to implement a construction-related noise mitigation plan. This plan would depict the location of construction equipment storage and maintenance areas, and document methods to be employed to minimize noise impacts on adjacent noise sensitive land uses.
 - n. Require that all construction equipment utilize noise reduction features (e.g., mufflers and engine shrouds) that are no less effective than those originally installed by the manufacturer.
 - o. Prior to the issuance of any grading plans, the city shall include a Condition of Approval for subdivisions and non-residential development adjacent to any developed/occupied noise-sensitive land uses requiring applicants to submit a construction-related noise mitigation plan to the city for review and approval. The plan should depict the location of construction equipment and how the noise from this equipment will be mitigated during construction of the project through the use of such methods as:
 - The construction contractor shall use temporary noise-attenuation fences, where feasible, to reduce construction noise impacts on adjacent noise sensitive land uses.
 - During all project site excavation and grading on-site, the construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturers' standards. The construction contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.
 - The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.
 - The construction contractor shall limit all construction-related activities that would result in high noise levels to between the hours of 7:00 a.m. and 7:00 p.m. Monday through Saturday. No construction shall be allowed on Sundays and public holidays.
 - p. The construction-related noise mitigation plan required shall also specify that haul truck deliveries be subject to the same hours specified for construction equipment. Additionally, the plan shall denote any construction traffic haul routes where heavy trucks would exceed
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100 daily trips (counting those both to and from the construction site). To the extent feasible, the plan shall denote haul routes that do not pass sensitive land uses or residential dwellings. Lastly, the construction-related noise mitigation plan shall incorporate any other restrictions imposed by the city.

11.9 HAZARDOUS MATERIALS

The term “hazardous materials” includes a full spectrum of substances from pre-product materials to waste. Pre-product materials are considered to have value, and are used in, or represent the purpose of the manufacturing process. These materials solvents, paints, acids, and other chemicals, which, because they have value, are subject to proper transportation, storage, and use procedures. “Hazardous waste” refers to the valueless by-products of manufacturing processes and other use of materials. Hazardous waste requires proper disposal.

The California Department of Toxic Substances Control identifies two (2) sites within Antioch where surface and/or sub-surface contamination has occurred due to the potential release of hazardous materials or wastes. Those sites include the GBF/Pittsburg Dumps, located at the intersection of Somersville Road and James Donlon Boulevard, and the former Hickmott Cannery site at the intersection of 6th and “A” streets.

Pursuant to State law, Antioch has adopted by reference Contra Costa County’s Hazardous Waste Management Plan. This Plan establishes a comprehensive approach to management of hazardous wastes in the County, including siting criteria for new waste management facilities, educational and enforcement efforts to minimize and control the hazardous waste stream in the County, and policies to maintain a unified data base on businesses generating hazardous wastes.

11.9.1 Hazardous Materials Objective

Minimize the negative impacts associated with the storage, use, generation, transport, and disposal of hazardous materials.

11.9.2 Hazardous Materials Policies

- a. Promote the reduction, recycling, and safe disposal of household hazardous wastes through public education and awareness.
- b. Implement the provisions of the Contra Costa County Hazardous Waste Management Plan, including, but not limited to, provisions for pretreatment and disposal, storage, handling, and emergency response.
- c. Require businesses generating hazardous wastes to pay necessary costs for local implementation of programs specified in the Contra Costa County Hazardous Waste Management Plan, as well as costs associated with emergency response services for a hazardous materials release.

Source Reduction

- d. Require new and expanding hazardous materials users to reduce the amount of hazardous waste generated.

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- Require submittal of a waste minimization plan with any use permit application for a large new facility or expansion of an existing large facility creating additional hazardous wastes.⁵
 - Encourage existing large facilities to prepare waste minimization plans.
 - Require new large hazardous waste-producing facilities to provide on-site treatment or recycling of wastes generated to the maximum extent feasible. This will minimize the amount of hazardous waste being transferred off-site for treatment or disposal.
 - Require all hazardous waste generators to recycle wastes to the maximum extent feasible.
- e. Encourage reductions in the amount of hazardous wastes being generated within Antioch through incentives and other methods.
- Provide educational and technical assistance to all hazardous materials users and waste generators to aid in their source reduction efforts (e.g., substitution of less hazardous products and modifications to operating procedures). These services will primarily be provided by through the County.
 - Provide public recognition to hazardous materials users and waste generators who meet or exceed source reduction goals.
 - Provide penalties for facilities failing to meet minimization objectives, and place funds from these penalties in a revolving account for use in educational and emergency services efforts.

Facilities Siting

- f. Locate hazardous materials facilities in areas reserved for compatible uses.
- Permit large hazardous waste users and processors only in areas designated for “heavy industrial” use. Smaller generators and medical facilities (e.g., service stations) may be sited in other industrial and commercial areas, consistent with applicable General Plan policies and zoning regulations. The compatibility of small facilities will be determined by the types and amounts of hazardous materials involved and the nature of the surrounding area.
 - Require use permits for all operations handling hazardous materials to ensure compatibility with the surrounding area.
- g. Maintain adequate siting criteria to determine appropriate locations for hazardous material facilities.

⁵ Large facilities are those routinely generating more than 1,000 kilograms of solid hazardous waste month or 275 gallons of liquid hazardous waste per month.

- Maintain a “Hazardous Materials” section in the Antioch zoning ordinance to define siting criteria to be used for various types of facilities, requirements for application submittal, and required findings for approval.
 - The siting criteria shall prohibit locating hazardous materials facilities in 100-year Flood Hazard Zones and areas susceptible to flooding from storm surge and/or sea level rise unless the proposed design accounts for potential flooding by appropriately elevating and/or floodproofing all areas, including exterior areas, where hazardous materials would be stored and handled.
- h. Locate hazardous materials facilities at a sufficient distance from populated areas to reduce potential health and safety impacts.
- Require risk assessment studies to determine potential health impacts for all proposed hazardous waste processors and large generators as part of permit application submittals.
 - Require a 2,000-foot buffer zone around all new hazardous waste processors within which no residences, schools, hospitals, or other immobile populations, existing proposed, or otherwise, would be located, unless evidence is presented in the risk assessment study that a larger buffer is needed.
- i. Permit hazardous waste processors based on their relative need in conjunction with the “fair share” approach to facilities siting contained in the Contra Costa County Hazardous Waste Management Plan.
- Require a needs assessment as part of use permit applications for a waste processor, demonstrating the proposed facility will serve a need that cannot be better met in any other manner (e.g., source reduction) or at any other location.
 - Discourage proposed hazardous waste facilities processing materials similar to those treated or stored at existing facilities within the County unless the need for the new facility can be adequately demonstrated.
- j. Carefully review and require appropriate mitigation for pipelines and other channels for hazardous materials.

Facilities Management

- k. Ensure adequate provision is made for emergency response to all crises involving hazardous materials.
- Require emergency response plans for all hazardous waste processors and large generators to be submitted as part of Use Permit applications. The emergency response plans shall include procedures for minimizing the potential release of hazardous materials due to flooding such as shutting down operations, securing hazardous materials containers and other objects to prevent them from floating, closing valves/sealing openings on containers/pipelines/tanks, and moving hazardous materials away from flood prone areas ahead of predicted flooding events.
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- As a standard condition of approval, require training of employees of all facilities in emergency procedures, and that they be acquainted with the properties and health effects of the hazardous materials involved in the facilities' operations.
- I. Promote the safest possible transport of hazardous materials through Antioch.
- Maintain formally designated hazardous material carrier routes to direct hazardous materials away from populated and other sensitive areas.
 - Restrict all processors and new large generators to access only along established hazardous material carrier routes.
 - Locate hazardous waste processors as near to waste generators as possible, in order to minimize the need for transport.
 - Require transportation analyses for all large new generators and processors to determine the effect of each facility on Antioch's transportation system and assess and provide mitigation for potential safety impacts associated with hazardous materials transported to and from the site.
 - Prohibit the parking of vehicles transporting hazardous materials on city streets.
 - Require that new pipelines and other channels carrying hazardous materials avoid residential areas and other immobile populations to the greatest extent possible.
- m. Require that hazardous materials facilities within Antioch operate in a safe manner.
- As a Condition of Approval for new hazardous materials facilities, require access for vehicles carrying hazardous materials to be restricted to hazardous materials carrier routes.
 - Undertake inspections of hazardous materials facilities as needed (e.g., when an unauthorized discharge into city sewers is made) and assist Contra Costa Health Services in their inspections as requested.
 - Require that water, sewer, and emergency services be available consistent with the level of service standards set forth in the Growth Management Element. Work with LAFCO to require that that sites for proposed hazardous materials facilities annex into the city before necessary municipal services are provided.
- n. Require appropriate design features be incorporated into each facility's layout to increase safety and minimize potential adverse effects on public health.
- Require the provision of spill containment facilities and monitoring devices in all facilities.
 - Ensure that pipelines and other hazardous waste channels are properly designed to minimize leakage and require above ground pipelines to be surrounded by spill containment basins.
 - Give priority to underground storage of hazardous materials unless this method is shown to be infeasible.
 - Require hazardous materials storage areas to be located as far from existing pipelines and electrical transmission lines as possible.
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- o. Maintain a high priority on clean-up of the GBF landfill, Hickmott Cannery, and other contaminated sites.
 - Maintain communication with the Department of Toxic Substances Control, Contra Costa Health Services, and other responsible agencies to complete clean-up of the GBF landfill and Hickmott Cannery sites as rapidly and thoroughly as possible.
 - Participate in task forces with County and State agencies for remediation of the GBF landfill and Hickmott Cannery sites.

Public Education/Outreach

- p. Require that new large hazardous materials users and/or processors maintain communication lines within the community by establishing a Communication and Information Panel. Encourage existing large users and processors to form similar panels.
- q. Facilitate public awareness of hazardous materials by preparing and distributing in conjunction with Contra Costa Health Services public information regarding uniform symbols used to identify hazardous wastes, Antioch's household hazardous waste collection programs, and hazardous waste source reduction programs.

Monitoring

- r. Monitor the progress and success of hazardous materials efforts, and modify these efforts as needed.
- s. Maintain data regarding the use and generation of hazardous materials within Antioch and its Planning Area.

Hazardous Building Materials

- t. Prior to the city issuing demolition permits for existing structures, a comprehensive Hazardous Building Materials Survey (HBMS) for the structure shall be prepared and signed by a qualified environmental professional, documenting the presence or lack thereof of asbestos-containing materials, lead containing paint, lead based paint, polychlorinated biphenyls (PCBs)-containing equipment and materials, and any other hazardous building materials. The HBMS shall include abatement specifications for the stabilization and/or removal of the identified hazardous building materials in accordance with all applicable laws and regulations. The demolition contractor shall implement the abatement specifications and submit to the city evidence of completion of abatement activities prior to demolition of the existing structures.

Hazardous Materials Contamination

- u. The following requirements related to potential hazardous materials contamination would not apply to properties where past land uses have included only residential or undeveloped open space (i.e., no previous agricultural, industrial, commercial, or transportation related use) and where placement of undocumented fill material has not
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occurred. Evidence of such past land use must be demonstrated to the city through historic aerial photos, maps, and/or building department records.

- Prior to the city issuing demolition, grading, or building permits for a proposed redevelopment or development project that would disturb soil (except for residential renovations/additions), the project applicant shall prepare a Phase I Environmental Site Assessment (ESA) for the project site and shall submit the Phase I ESA to the City for review. If any Recognized Environmental Conditions (RECs) or other environmental concerns are identified in the Phase I ESA, the project applicant shall prepare a Phase II ESA to evaluate the RECs or other environmental concerns and shall submit the Phase II ESA to the city for review and approval. Phase I and II ESA reports shall be prepared by a qualified environmental assessment professional and include recommendations for further investigation or remedial action, as appropriate, for hazardous materials contamination. Remedial actions may include but not necessarily be limited to the preparation and implementation of a Soil and Groundwater Management Plan, removal of hazardous materials containers/features (e.g., underground or aboveground storage tanks, drums, piping, sumps/vaults, hydraulic lifts, oil/water separators, or impoundments), proper destruction of water supply wells, removal and off-site disposal of contaminated soil or groundwater, in-situ treatment of contaminated soil or groundwater, or engineering/institutional controls (e.g., capping of contaminated soil, installation of vapor intrusion mitigation systems, and establishing deed restrictions). The project applicant shall implement the recommendations for additional investigation and/or remedial actions and shall submit to the city evidence of approvals from the appropriate federal, State, or regional oversight agency(ies) for any proposed remedial action prior to the city issuing demolition, grading, or building permits, and following completion of the remedial action and prior to the city issuing a certificate of occupancy.
 - If the project applicant indicates that in their view regulatory agency oversight/approval is not required for the proposed project based on the findings of the Phase II ESA and/or the proposed remedial actions, then the Phase I and II ESAs and proposed remedial action plans shall be reviewed by a third party qualified environmental assessment professional selected by the city and funded by the project applicant. The third party qualified environmental assessment professional shall either approve of the proposed remedial actions or provide recommendations for further investigation, additional/alternative remediation actions, and/or regulatory agency oversight for the project site, and the recommendations of the third party qualified environmental assessment professional shall be implemented.
- v. If any projects initiated under the proposed project would require the importation of soil to backfill any excavated areas, proper sampling of the soil shall be conducted to ensure that the imported soil is free of contamination according to DTSC's 2001 *Information Advisory Clean Imported Fill Material*, or more current guidance from DTSC

11.10 DISASTER RESPONSE

Antioch maintains an Emergency Operations Plan (EOP) addressing the response to disasters, including but not limited to earthquakes, floods, fires, hazardous spills or leaks, major industrial accidents, major transportation accidents, major storms, airplane crashes, environmental response, civil unrest, and national security emergencies. Emergency operations centers are maintained at the city's central police facility and at the City's water treatment plant.

The EOP indicates that Antioch would experience casualties, significant property damage, and utility service interruptions following a major Bay Area earthquake. The potentially catastrophic effects of an earthquake on the Hayward Fault would more than likely exceed the response capabilities of both the City of Antioch and the County.

The EOP primarily outlines the general authority, organization, and response actions for city staff to undertake when disasters happen. Recently updated in 2021, the EOP meets current statutory requirements and best practices, with the main objectives of reducing life, injury, and property losses through effective management of emergency forces, and accomplish the following:

- Identifies who is in charge during disaster response and clarifies who does what.
- Lists the necessary jobs for disaster response and what each person is to do.
- Ensures survivability and availability of government services, or the continuity of government.
- Helps to understand the City of Antioch's emergency organization.
- Provides guidance for disaster education and training.

11.10.1 Disaster Response Objective

Maintain a level of preparedness to adequately respond to emergency situations to save lives, protect property, and facilitate recovery with minimal disruption.

11.10.2 Disaster Response Policies

- a. Maintain and update the City's Emergency Operations Plan, as required by State law.
 - b. Disseminate disaster preparedness information to local residents and businesses, describing how emergency response will be coordinated, how evacuation, if needed, will proceed, and what residents and businesses can do to prepare for emergency situations. Provide information to the public about:
 - Environmental hazards existing in Antioch.
 - The costs of doing nothing to mitigate these hazards.
 - Why governmental agencies can not eliminate all hazards.
 - What the city does to assist.
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- What the city cannot do.
 - What the public can do to protect itself.
- c. Maintain an effective and properly equipped emergency operations center, along with trained personnel, for receiving emergency calls, providing initial response and key support to major incidents, meeting the demands of automatic and mutual aid programs, and maintaining emergency incident statistical data.
- d. Maintain ongoing emergency response coordination with surrounding jurisdictions.
- e. Encourage private businesses and industrial uses to be self-sufficient in an emergency by:
- Maintaining a fire control plan, including on-site firefighting capability and volunteer response teams to respond to and extinguish small fires; and
 - Identifying personnel who are capable and certified in first aid and CPR.
- f. Regularly review and clarify emergency evacuation plans for dam failure, fire, and hazardous materials releases.

11.11 EVACUATION

Evacuation refers to the movement of people that are at risk of being impacted by a disaster to a safer location, using routes that do not pose a significant danger to the evacuees. Thus, both the destination and the route need to be scrutinized, preferably before the evacuation orders are issued. This involves deciding which of the potential temporary shelters in the city be opened, based on the shelters' locations relative to the impending disaster and their ease of accessibility from the safest identified routes. Evacuations in the city are conducted in cooperation between the Antioch Police Department and the Contra Costa County Fire Protection District (CCCFPD). Depending on the incident type, will depend on which city Department/Agency takes the lead in conducting evacuation procedures, however most incidents would default to the Antioch Police Department. To understand the areas of the city with potential evacuation constraints, the city conducted an analysis that identified the following:

- **Constrained Roadways** are segments of the roadway network that have a single point of connection with the rest of the roadway network. These could be cul-de-sacs or roadways with secondary connections that are not publicly accessible due to a gate or other constraint, Figure 11-8 identifies these roadways (in red) within the city.
- **Constrained Parcels** are areas of the city where at least 30 parcels are located along a constrained roadway. These parcel locations are accessible by one means of ingress/egress, which is consistent with Cal FIRE guidance regarding Public Resources Code Section 4290.5. Under this guidance, Cal Fire is concerned with subdivisions within the state that have 30 or more dwellings accessing a single roadway. Figure 11-8 identifies these areas (in blue and/or orange) within the city.

This analysis identified 19 locations where at least 30 parcels/dwellings meet the constrained parcel threshold. The concern regarding areas with constrained parcels is the ability to evacuate residents safely and effectively in the event of an emergency. Four (4) of these constrained parcel areas are located within or adjacent to Fire Hazard Severity Zones. Potential implementation actions should consider the possible future changes associated with fire hazard severity zone mapping, as well as identify and better understand these areas and the ramifications associated with evacuation.

The City of Antioch has identified a variety of evacuation routes to be used during a potential hazard event. The two primary routes out of the city are CA SR-4 and CA SR-160, allowing for evacuation to the east/ west and north/ south. Deer Valley Rd, Lone Tree Way, Hillcrest Ave, and Contra Loma Blvd, act as north/south collectors for these state routes. East 18th St, James Donlon Blvd, and West 10th St/Pittsburg Antioch Hwy act as east/west collectors. These routes may be changed during an evacuation, depending on the specific nature of the emergency. Figure 11-9 identifies the primary routes potentially used for evacuation purposes during a hazard event. While these are used as a general guide for future events, actual routes designated for evacuation purposes will be identified by the City based on real-world parameters and information that ensures evacuees are able to adequately travel to a safer location.

11.11.1 Evacuation Objective

Ensure that Antioch staff, residents, and businesses can effectively respond and evacuate during hazard events.

11.11.2 Evacuation Policies

- a. Ensure adequate evacuation capacity and infrastructure is available for existing and new development.
 - i. Develop Evacuation Master Plan that identifies routes, potential hazard incidents and criteria regarding capacity, safety, and viability.
- b. Coordinate with neighboring jurisdictions and Caltrans regarding transportation network constraints and improvements.
- c. Ensure all new development and redevelopment projects provide adequate ingress/egress for emergency access and evacuation.
- d. Identify and construct additional evacuation routes in areas of high hazard concern or limited circulation, where feasible.
- e. Ensure the city's transportation network allows for effective emergency response and evacuation activities.
- f. Develop evacuation standards and metrics for constrained neighborhoods and alternative evacuation plans, where necessary.
- g. Monitor changes to hazard conditions and vulnerabilities to ensure the accessibility or viability of evacuation routes in the future.
- h. Enhance the city's existing education and outreach program, "A Citizen Guide to Disaster Preparedness," with potential evacuation scenarios and the activities that residents and businesses can do to protect their properties and prepare for potential events.
- i. In areas with inadequate access or without at least two evacuation routes provide adequate mitigation actions to address the deficiencies required by the Fire Code and State law.

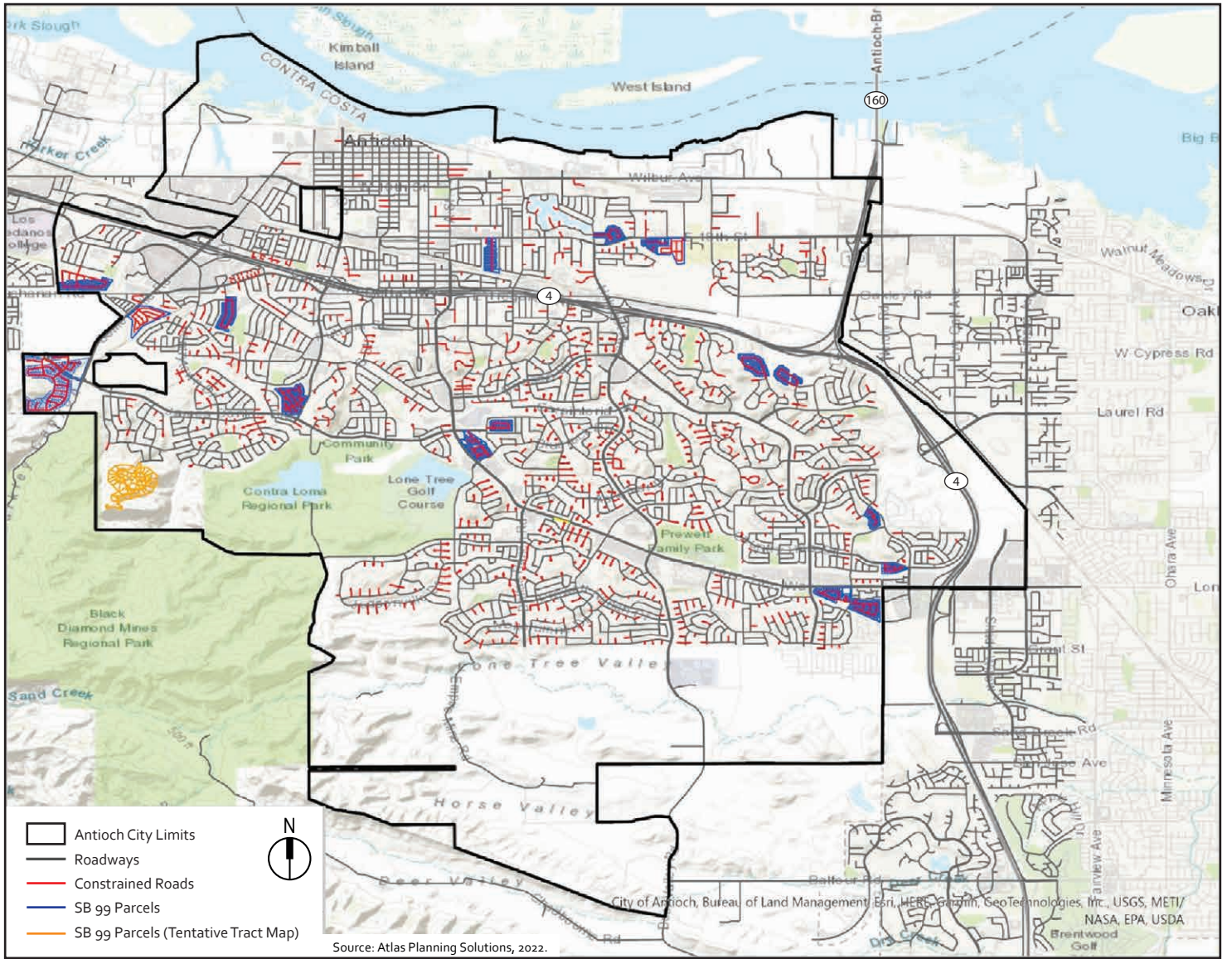


Figure 11-8
Constrained Parcels and Roadways

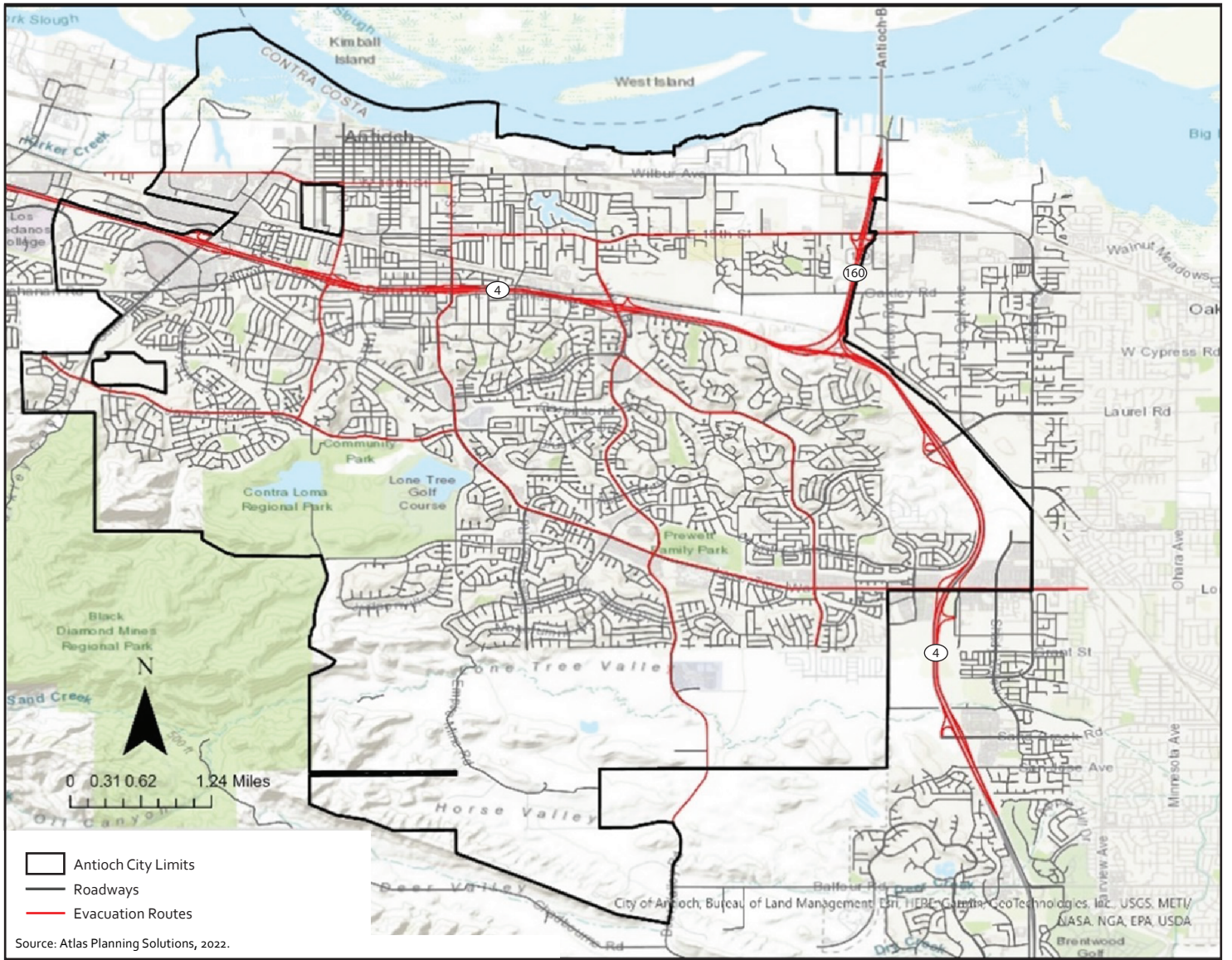


Figure 11-9
Evacuation Routes