12 PUBLIC SAFETY

INTRODUCTION AND BACKGROUND

Watsonville 2005 addresses public safety and noise control through analysis of conditions and hazards that have the potential to cause loss of life, injury, property damage, economic loss, and social dislocation. For Watsonville, these constraints include seismic and other geological hazards, flooding, urban and wildland fires, hazardous materials, aviation hazards, and harmful effects of noise. The City cannot be made hazard free, but the planning process can be used to minimize exposure to dangerous conditions. This is the concept of acceptable risk and it is an inherent part of the environmental planning process.

COMMUNITY CONCERNS

The safety concerns expressed by the community have already been noted in the Environmental Resource Management chapter (9) and the Public Facilities and Services chapter (11). They focus on the protection of people and physical environments from natural and built hazards by maintaining a high level of fire, police and other public services.

ACCEPTABLE RISK

Every community must decide what public safety standards are acceptable and the actions needed to maintain those standards. For planning purposes, an acceptable level of risk is on at which a hazard is deemed to be a tolerable exposure to danger, given the expected benefits to be gained. For some types of risk, e.g. noise and/or air pollution, numerical measures have been defined to identify the threshold of acceptable risk. In the case of seismic or flooding hazards, for example, specific locations are identified as unacceptable based on their distance from known faults or elevation.

Environmental impact review is frequently used to assist in the decision-making process. Each identifiable risk must be addresses with mitigation measures that eliminate or minimize potential hazards. The measures include limitation of use of location, which are prone to hazard, special construction techniques and site planning, programs to respond to hazardous conditions and the restriction or elimination of specific operations.

GEOLOGIC HAZARDS

Watsonville lies between two major fault zones, the San Andreas to the north and east, and the San Gregorio, offshore to the west. Other active or potentially active fault zones that could affect Watsonville include the Zayante and Corralitos in the Pajaro Valley, and the Monterey Bay fault zone to the west.

The U.S. Geological Service has estimated that the San Andreas Fault could produce an earthquake of 8.5 magnitudes on the Richter scale. In this event, the potential for surface rupture would be high. Other ground failures such as landslides and liquefaction are also possible depending on the intensity and duration of an earthquake. A large portion of Watsonville's urbanized area would be subjected to loss of soil strength resulting from liquefaction and settlement in the event of an earthquake with a magnitude similar to the 1906 San Francisco occurrence.

Liquefaction is a process by which water-saturated granular soils transform from a solid to a liquid state because of a sudden shock or strain. Liquefaction is associated with saturated soils, having high

sand and silt content. The soil conditions occur along broad bands, which follow the creeks, sloughs, rivers and lake that drain the Planning Area. Much of downtown Watsonville is in a zone of moderately high liquefaction potential. Site-specific investigations should be used to assess the potential for liquefaction-induced ground failure and identify possible mitigation measures.

Failure of reinforced masonry structures is another earthquake related concern in Watsonville. Un-reinforced masonry structures are particularly susceptible to crumbling and failure during earthquakes. Prior to the Loma Prieta Earthquake, Watsonville was in the process of addressing the issue of un-reinforced masonry structures in the city. The City proposes to develop a program in conformance with state law to identify and address the remaining suspected un-reinforced masonry structures in the city.

Areas adjacent to the San Andreas Fault possess high potential for landslides. The blockage of Hecker Pass Road, northeast of the city, in 1982 temporarily disrupted access to Watsonville. Appropriate land uses un unstable slopes include open space, agricultural or very low-density residential.

Seismic waves or tsunamis are large oceanic waves produced by sea floor faulting. A seiche is a similar wave but occurring inside a bay or harbor. Although the urbanized area of the Watsonville Planning Area would not be directly affected by these phenomena it is likely that persons living along the coast are at risk and would use San Andreas Road and Beach Road to seek temporary shelter in Watsonville.

The Loma Prieta Earthquake

On October 17, 1989, at 5:04 PM, a magnitude 7.1 earthquake on the Loma Prieta Fault rocked Watsonville and much of the San Francisco/ Monterey Bay area. The epicenter was five miles from the City and shook the City for approximately 22 seconds. The initial shock was followed by some 8000 aftershocks, eight of which measured five or more on the Richter scale. The earthquake caused $60 million in structural damages in Watsonville. Nineteen hundred structures sustained some level of damage, and 700 buildings were severely damaged. Twelve hundred persons were left homeless, 500 people were injured and there was one death.

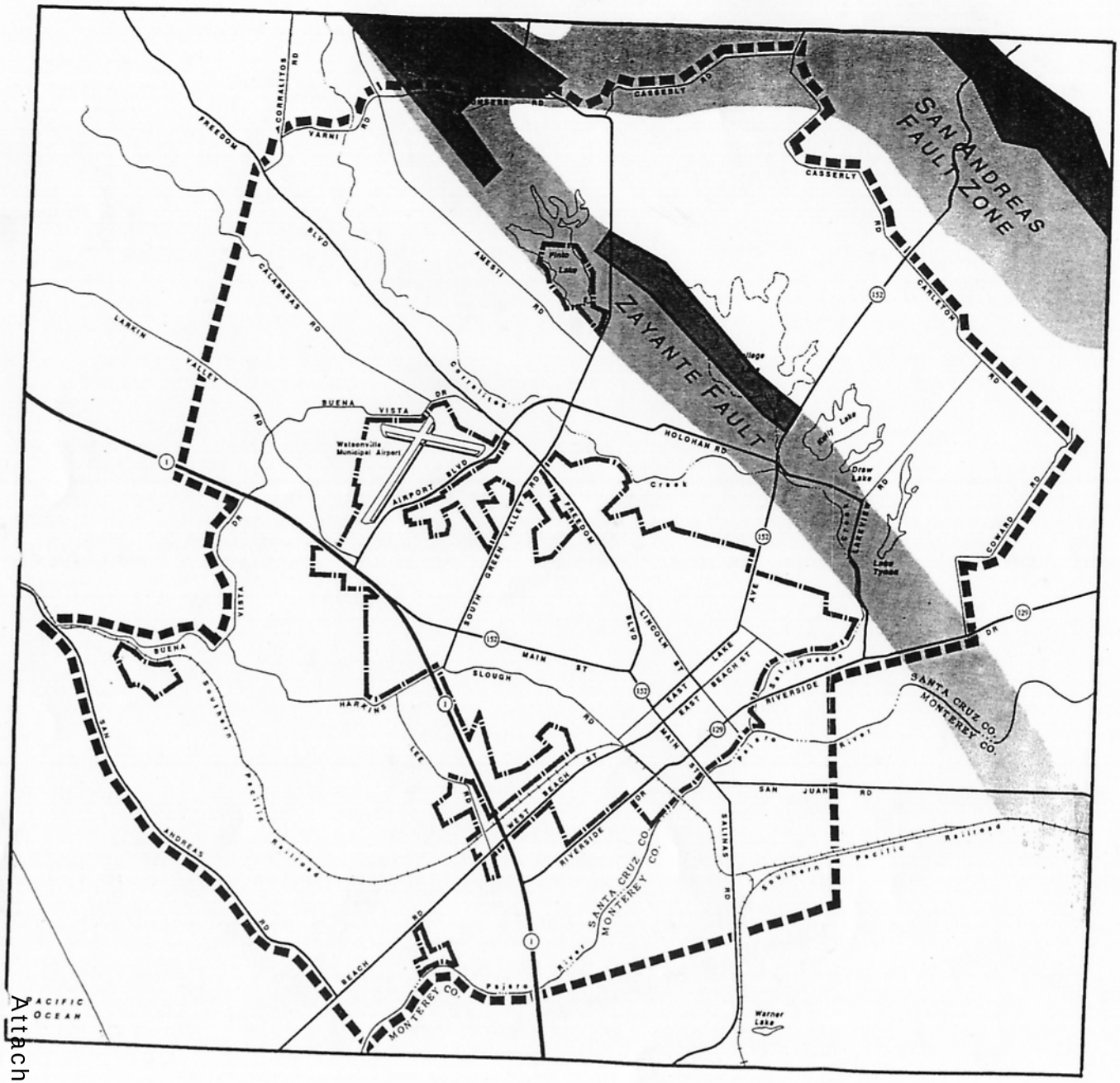
Approximately 90 percent of the structural damage resulted from the failure of unreinforced masonry construction and wood frame construction not properly attached to a foundation. Significant earthquake damage was noted in the older portions of town where much pre-1940's construction still existed and where soil is subject to liquefaction. Liquefaction and subsidence were identified as a major source of damage to streets, water systems, sewer systems, and other public infrastructure.

In 1986, the City had initiated a Multi-Functional Guidance Plan format for disaster planning and commenced significant staff training efforts. As a result, the City was able to respond well to the after-quake emergency. Since 1989, the City has made an assessment of its emergency response and developed the *Hazard Mitigation Plan* for the City of Watsonville to improve response capability for future emergencies.

The *Hazard Mitigation Plan* discusses in detail the successes and problems incurred during the Loma Prieta response. This document includes a work program of 26 items to mitigate problems before they occur and improve future emergency response. The City is in the process of implementing the findings of this report.

FLOOD HAZARDS

Figure 12-3 shows the portion of the Planning Area prone to inundation by a 100-year flood, a flooding even that has a one percent probability of occurring



KEY

- Alquist-Priolo Special Study Zones
- Other Zones of Potential Surface Rupture
- Watsonville City Limits as of 1992
- Planning Area Boundary

0 1,900 3,800
Scale in Feet

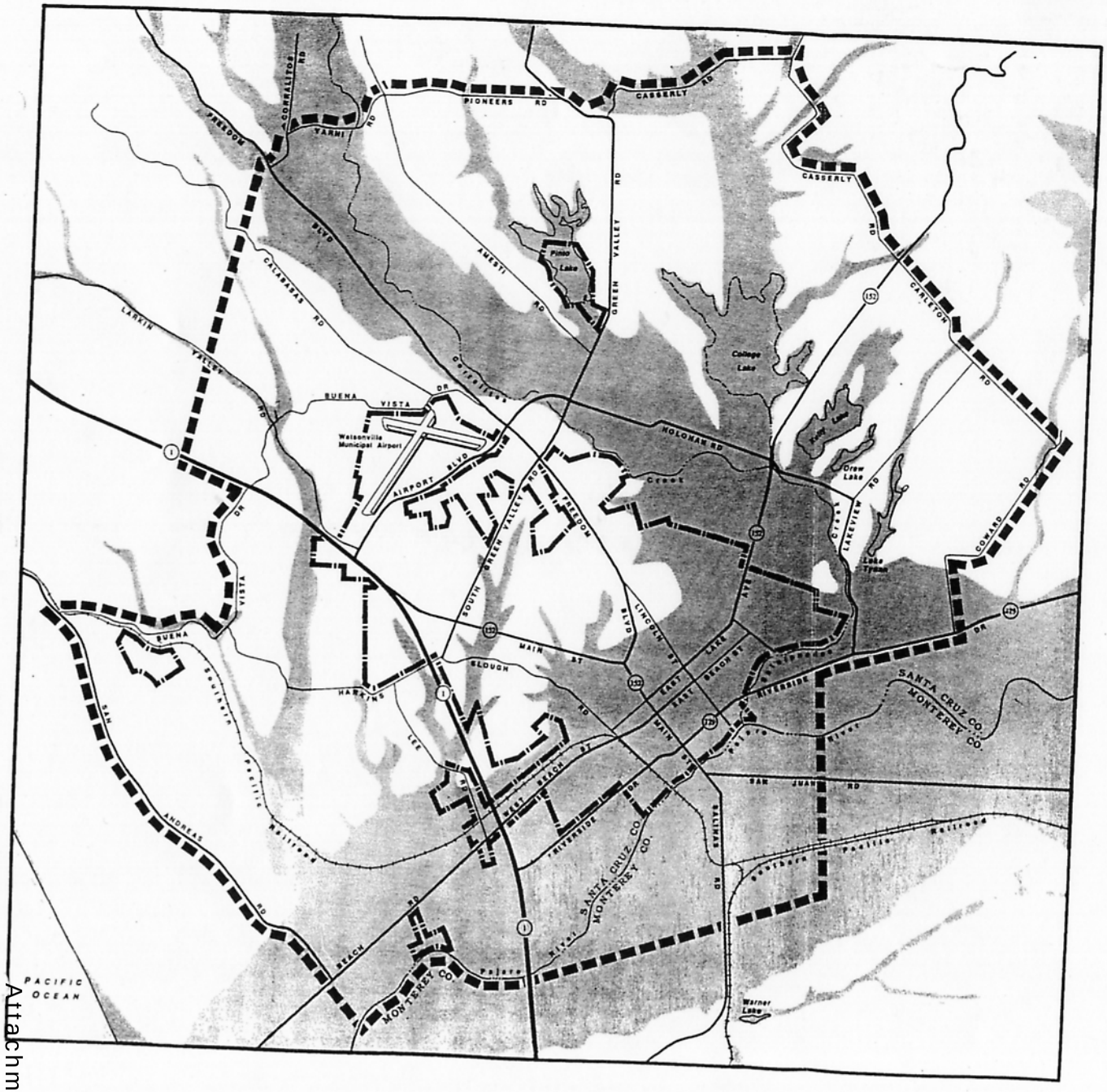
CITY OF WATSONVILLE
PLANNING DEPARTMENT

Seismic Surface Rupture Potential

Source: USGS Maps – State of California Special Studies Zones, 1976; and, Faults and their Potential Hazards in Santa Cruz County, 1974

This graphic is not intended to be used for site-specific decision making. Consult the City or County for detailed information.

Figure 12-1



KEY

Areas of high- to moderately-high potential for soil liquefaction during an earthquake

Watsonville City Limits as of 1992

Planning Area Boundary

0 1,900 3,800

Scale in Feet

CITY OF WATSONVILLE

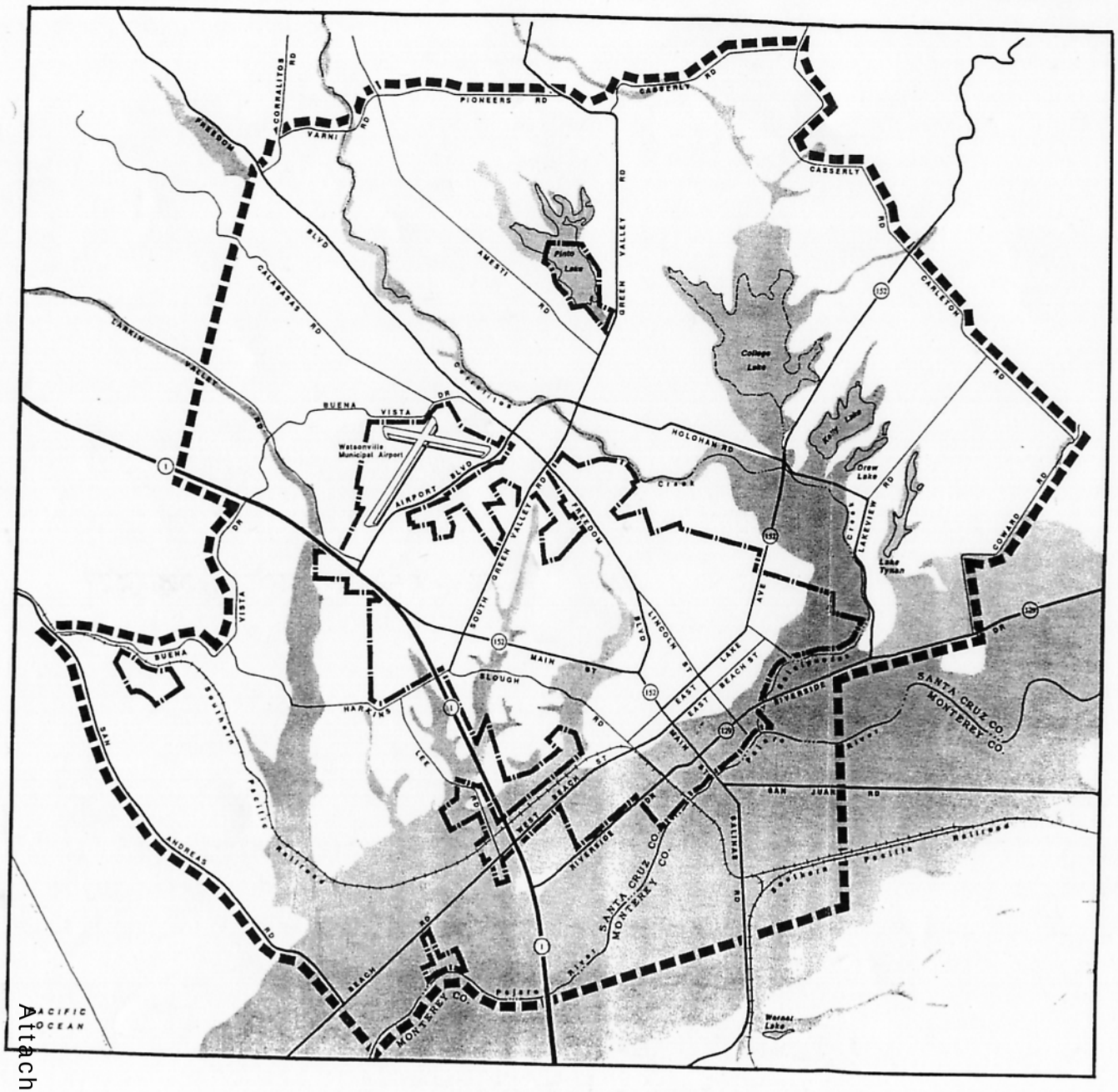
PLANNING DEPARTMENT

Liquefaction Potential

Source: Maps Showing Geology and Liquefaction Potential of Quarternary Deposits in Santa Cruz County, California, 1975

This graphic is not intended to be used for site-specific decision making. Consult the City or County for detailed information.

Figure 12-2



KEY

100-year Flood Zone

Watsonville City Limits as of 1992

Planning Area Boundary

0 1,900 3,800

Scale in Feet

CITY OF WATSONVILLE

PLANNING DEPARTMENT

Flood Hazard Boundary

Source: Flood Insurance Rate Maps, 1984

This graphic is not intended to be used for site-specific decision making. Consult the City or County for detailed information.

Figure 12-3

in any given year. More detailed information on flood-prone areas is available in the form of Flood Insurance Rate Maps produced by the Federal Emergency Management Agency (FEMA). These maps are available to the public and are used by the Public Works Department to determine the necessity for issuance of Flood Hazard Permits.

The Pajaro River and Corralitos Creek have a long history of flooding, as occurred in 1955 and 1975, and can be expected to flood again. In future flooding events, the extent of damage will depend upon the area inundated and the level of urbanization that exists in flood-prone areas. Under the Flood Insurance Program, new construction within the flood plain must be elevated above the 100-year flood level or flood proofed and will be at an acceptable level of risk.

Watsonville participates in the Pajaro Valley Task Force, a group comprised of representatives of public agencies and private interests, to address drainage concerns in the Pajaro Valley drainage basin. In October of 1991, this group recommended the establishment of Santa Cruz County Flood Control and Water Conservation District Zone 7, which is proposed to encompass the Pajaro River Valley Drainage Basin. In late 1991, both Watsonville and Santa Cruz County established Zone 7. Monterey County had not agreed to its establishment.

Since the formation of Zone 7, assistance from the Army Corps of Engineers has been requested to prepare a study to determine improvements that could be made throughout the Pajaro Valley Drainage Basin to improve flood capacity. In the Watsonville area, this study may make recommendations relative to the Corralitos and Salsipuedes Creeks and the Pajaro River. In addition, the City and County are currently working with the Department of Fish and Game to allow some clearing of vegetation, which could improve the carrying capacity of these channels by an additional three-year storm capacity. (Storm events, similar to flooding events, are described by the frequency a given magnitude storm event will occur on the average. A three-year storm is a storm that has an intensity that, on average, will occur only once every three years.)

Photo: Courtesy of the Register-Pajaronian

Willow trees and underbrush are cleared from the channel bottom of the Salsipuedes Creek, which flows into the Pajaro River. The work is designed to improve creek and river flow and to help control flooding of the Pajaro River during winter storms.

Without major improvements, some flooding is inevitable. The existing channel and levee system along the Pajaro River has approximately a 20-year storm capacity. The Corralitos and Salsipuedes

Creeks have five and seven-year storm capacities respectively. The Monterey County North County Area Plan (1984) has designated the entire course of the Pajaro River from San Benito County to Monterey Bay as a flood-prone area (100-year floodplain).

When streets, buildings, and parking lots cover the natural ground surface, adequate storm drainage facilities must be substituted for the soil's ability to absorb rainfall. In Watsonville, the natural drainage pattern has been supplemented by a system of structures, which is described in the 1980 *Storm Drainage Master Plan.* There are five separate drainage zones within the Planning Area:

- Watsonville Slough
- Struve Slough
- West Branch Struve Slough
- Downtown
- Salsipuedes Creek

New development is required to provide adequate mitigation measures to accommodate storm water run-off.

The Watsonville Zoning Ordinance provides for a Flood Protection Zoning District (EM-F). It serves as an overlay district to regulate the uses of land in areas subject to flood inundation.

FIRE HAZARDS

For land use planning purposes, fires are classified in two categories: (1) wildland fires that occur in underdeveloped areas; and (2) urban fires that involve structures and vehicles. Both types pose a threat to life and property in the Watsonville Planning Area.

Residential fire potential is high in certain areas of the city due to the age of the housing stock (approximately 3,000 units are over 40 years old), overcrowding (2,500 units were classified as overcrowded by the 1990 Census), and substandard building conditions. Based on the 1992 *Citywide Housing Survey*, 1,167 housing units in the city were found to be in need of some level of repair. Of these, only two units were considered dilapidated and eight units were in need of substantial repair. The remainder required minor or moderate repair. In addition, access to units located in certain areas is poor due to narrow alleys and limited on-site parking.

As a major food processing center, Watsonville has a highly concentrated aggregation of cold storage plants, freezing plants, canneries, and packing plants. The large buildings, intense use of plant equipment, chemicals and methods of production pose a potential fire safety problem. However, important fire prevention precautions have been taken to achieve an acceptable level of risk, including: extensive use of sprinkler systems, fire detectors linked to an approved central receiving station, frequent inspections, and improved access.

Wildland fires occasionally break out in the grasslands and on the dry, chaparral-covered hills. They are normally contained long before they pose a threat to the urbanized area. The California Division of Forestry has primary responsibility for fire suppression in watershed areas; but under provisions of mutual aid agreements, the City will provide reciprocal aid to other jurisdictions in time of emergency. The Freedom, Salsipuedes and County fire departments each have district boundaries and primary response within portions of the Planning Area.

HAZARDOUS MATERIALS

Hazardous materials include substances which are corrosive, poisonous, radioactive, flammable or explosive. Watsonville has taken action to identify and address safety issues associated with the use, storage, and transport of hazardous materials in the city. Emergency preparedness planning has been undertaken by the Watsonville Fire Department to address the issue of hazardous materials. In response

to the Tanner bill, the City has adopted its own hazardous material management plan.

ELECTROMAGNETIC FIELDS

Considerable debate has occurred over the past 10 years regarding the health impacts associated with the electromagnetic fields surrounding power lines and electrical appliances. While some linkage between exposure to electromagnetic fields and health problems, such as cancer, has been demonstrated, it should be noted that safe levels of exposure have not yet been determined by experts. As a result, no standards for the regulation of exposure have been developed. The City of Watsonville will continue to monitor this issue and require it to be addressed for projects in close proximity to power transmission lines as a part of the environmental review process.

AIRPORT HAZARDS

The Watsonville Airport is considered a reliever airport for general aviation from the San Francisco Bay area. Approximately 350 aircraft are located at the airport. By the year 2005, the number of aircraft based in Watsonville could increase consistent with the *Airport Master Plan*. There are 330 average daily aircraft operations (landings and takeoffs) from the Watsonville Airport.

The Watsonville Airport has a good safety record. Between 1973 and 1992, over one million operations have occurred at the airport with only 14 aircraft accidents (one death and four off-airport incidents). None of the recorded accidents involved a serious injury to a civilian or resident not involved with flying the aircraft.

Safety issues regarding compatibility between airport operations and the surrounding environment include noise impacts, ground safety, and flight hazards. The *Airport Master Plan* focuses on airport safety and noise abatement for future airport operations. An Airport Safety Committee meets regularly to address safety and noise issues. The City will work to aggressively manage airport noise and airport safety issues in the future.

The primary means of reducing the population's exposure to noise and accident risks is controlling land use density and limiting high occupancy structures such as schools, hotels, and hospitals.

An update of the *Airport Master Plan* began in 1991. Subsequent updates will be undertaken at least every five years to ensure that the airport's development is carried our in a manner that maintains an acceptable level of risk for the airport and the surrounding areas.

EMERGENCY PREPAREDNESS

The policies for environmental constraint management and public safety have been developed in an effort to protect lives and property by preventive measures. Watsonville also recognizes the need to remain prepared should disaster strike. The City has prepared a state-approved *Emergency Preparedness Plan* and has identified evacuation routes for the relocation of residents from any part of the Planning Area experiencing hazardous conditions. As illustrated in Figure 12-5, routes have been selected to move the population toward any point of the compass depending on the nature of the emergency.

In addition, the *Hazard Mitigation Plan,* developed ***in 1990*** after the Loma Prieta Earthquake, identifies several emergency preparedness improvements that are of benefit in emergencies other than earthquakes. The implementation of the recommendations in that Plan will improve that City's overall emergency response capability.

The City has developed and adopted a *Community-based Disaster Response Plan*, which describes a method of organizing the efforts of the entire community around disasters. This Plan includes coordinating the efforts of governmental agencies as well

as schools, hospitals, businesses, non-profit agencies, and other community groups and addresses short-term and long-term recovery needs.

In 2020, the City developed a Local Hazard Mitigation Plan (LHMP) in accordance with the federal Disaster Mitigation Act of 2000. Following FEMA's Local Hazard Mitigation Plan guidance, the LHMP provides a process that enables the City to identify and assess (1) natural hazards, including those that are created or exacerbated by climate change; (2) people and facilities that are at risk to hazard impacts; and (3) mitigation actions that reduce or eliminate hazard impacts.

The LHMP's risk assessment summarizes the vulnerability and potential impacts of hazards, including flooding, earthquakes, landslides, liquefaction, drought, wildfire, extreme heat, and sea-level rise. The risk assessment addresses climate risks by including climate projections from Cal-adapt and discussing how the frequency and magnitude of hazard events may increase due to climate change.

The LHMP provides short- and long-term strategies for protecting people and property from future hazard events.

Examples of identified mitigation actions include protecting essential infrastructure from sea-level rise, improving existing stormwater infrastructure to reduce flood risk, strengthening and stabilizing public facilities and infrastructure against fire and earthquake risk, developing back-up communications systems for essential infrastructure, and improving urban natural habitats to increase resilience and promote climate change adaptation.

In 2006, the state adopted Assembly Bill (AB) 2140—known as the California Disaster Assistance Act—which authorizes and incentivizes local jurisdictions to incorporate by reference their LHMP into the Safety Element of their General Plan if it meets applicable state requirements. By adopting its LHMP by reference in the General Plan, the City is compliant with AB 2140 and is therefore potentially eligible for additional disaster relief funding.

In 2015, California passed Senate Bill (SB) 379, which requires the City to update the Safety Element to address applicable climate adaptation and resiliency strategies. Specifically, SB 379 requires the City to develop goals, policies, and objectives based on a vulnerability assessment, identifying the risks that climate change poses to the local jurisdiction and the geographic areas at risk from climate change impacts. The bill also states that if a local jurisdiction has adopted the LHMP that fulfills commensurate goals and objectives and contains information related to climate change vulnerability and adaptation policies, separate from the General Plan, an attachment of, or reference to, the LHMP is sufficient in complying with SB 379. Therefore, by summarizing and incorporating by reference the City's 2020 LHMP into the Safety Element of the General Plan, the City is compliant with SB 379.

As part of this effort, the City also prepared an emergency evacuation route analysis in accordance with AB 747 (2019) and SB 99 (2019). This analysis provides an assessment of the transportation network's capacity, safety, and viability under a range of emergency scenarios, and is attached as Appendix D to the General Plan.

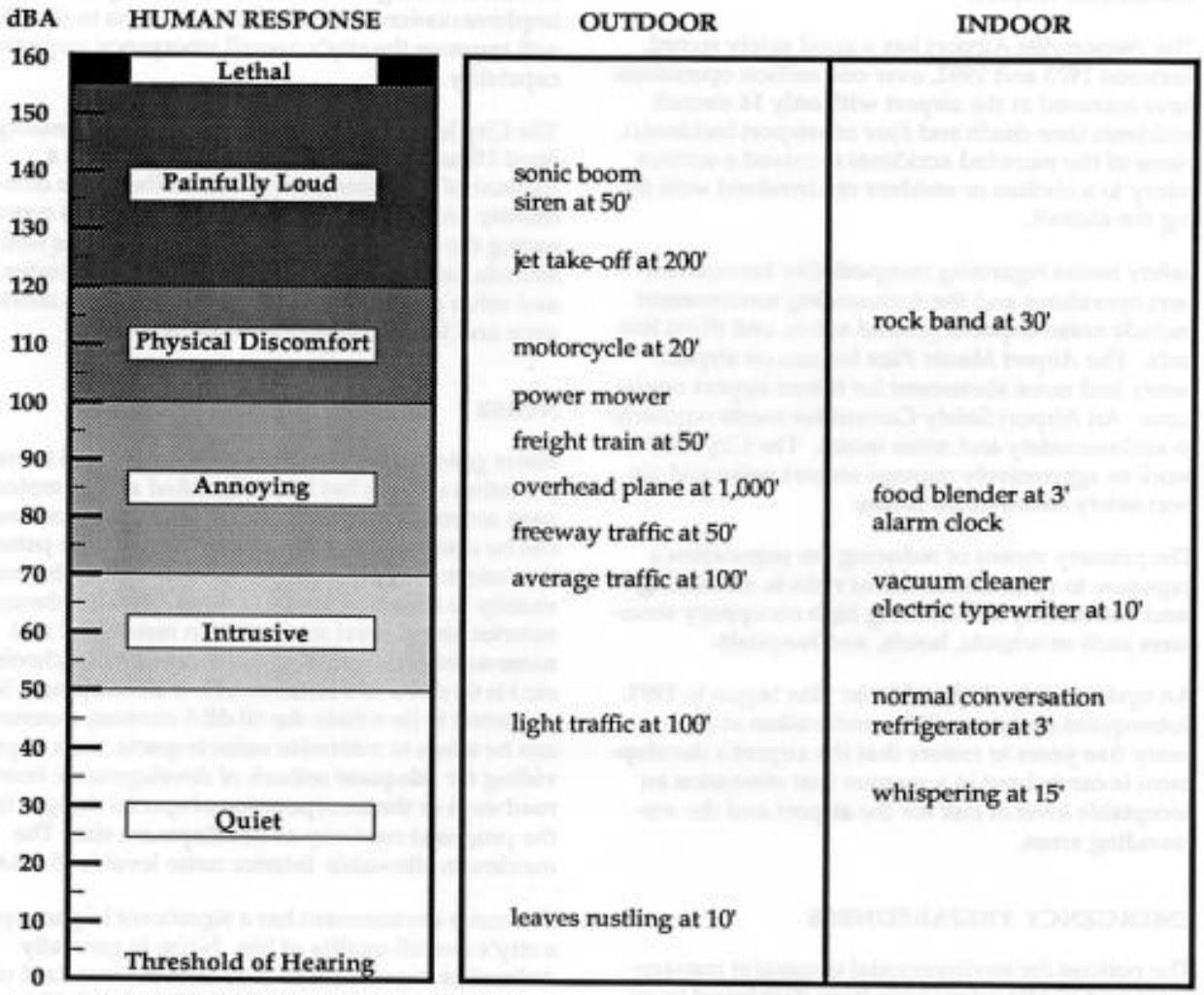
NOISE

Noise generated from existing and proposed transportation sources has been identified as the predominant source of noise in Watsonville. Noise contours can be used as a guide to establish a land use pattern that minimizes the exposure of residents of the community to excessive levels of noise. The

maximum exterior sound level acceptable in residential and noise-sensitive areas (e.g., parks, churches, schools, etc.) is 60 dBA. If a noise-sensitive development is projected to lie within the 60 dBA contour, measures can be taken to minimize noise impacts, such as providing for adequate setback of developments from roadways or the incorporation of special designs into the proposed roadway or development site. The maximum allowable interior noise level is 45 dBA.

The noise environment has a significant impact upon a city's overall quality of life. Noise is generally defined as "unwanted sound" and the standard unit or measurement is the decibel, abbreviated dBA (see Figure 12-4). Sound levels measured in dBA are calculated on a logarithmic basis similar to the scale used to measure earthquakes. Therefore, an increase of 10 dBA represents a 10-fold increase in the sound energy being released.

Figure 12-4 Acoustical Scale



Source: August 1989 Draft Watsonville 2005

The decibel scale exhibits the following characteristics:

- A 10-dBA increase in an existing sound level approximately doubles the perceived loudness of the sound.
- For each doubling of distance away from a line source of noise, such as a road, noise levels are reduced by 3 to 5 dBA. Doubling the distance away from a point source reduces the noise level by 6 dBA.
- The addition of two equivalent noise sources will equal a new value 3 dBA higher than the original sounds. If one sound is greater than 10 dBA higher than an adjacent sound, the lesser sound will not contribute to the resulting sound level.
- According to the Environmental Protection Agency (EPA) and various noise studies, the effects of noise on people include the following:
- Noise levels above 40-50 dBA can disturb a sleeping person.
- Speech interference begins to occur at 45-50 dBA, becoming severe at 60 dBA and above.
- Work performance can be affected at noise levels of 65 dBA and above.
- Damage to the human ear can occur at about 70 dBA, and sounds above 70 dBA can cause physical stress, such as muscular tension, increased heartbeat, and adrenaline flow.

Measuring the effects of noise is subjective at best, since individuals have different perceptions about noise effects. The State Department of Health Services has developed average levels of sound acceptability, which define noise exposure levels for varying land uses (see Figure 12-6).

The level of noise within a community is typically represented on noise contour maps. Noise contours are lines drawn about a noise source indicating constant or average dBA levels of sound during a 24-hour period exposure, as measured by the Ldn level. The noise contour for 60 dBA sound levels was used as the critical value in this analysis.

The 60 dBA sound level is consistent with the state exterior noise level standard of 60 dBA or less. Inherent in the 60 dBA exterior-noise standard is a recommended maximum interior of 45 dBA. Using normal construction techniques, it is assumed that typical building reduces outdoor noise levels by 10 to 15 dBA with open windows, and 20 to 24 dBA with closed windows. Where exterior sound levels are greater then 60 dBA, an acoustal analysis for projects may be required to ensure that the indoor standards can be achieved.

The Federal Highway Administration (FWHA) has developed a method for predicting noise generated by constant-speed traffic. This method predicts the energy of a reference noise level and adjusts it for grade, traffic flow, vehicle classification, and shielding. By using the peak-hour volumes for daily traffic, an estimate of noise level can be determined at a given distance from a source. The model was adjusted to also calculate the distance for a given level of sound. Using the standard noise level of 60 dBA, the distance that this sound level occurs can be calculated and the corresponding noise contours developed.

DEVELOPING NOISE CONTOURS

Traffic counts provided by Caltrans and the Santa Cruz County Transportation Commission were used for estimating noise levels on the highway and arterial system. The locations of the 60 dBA, 65 dBA, and 70 dBA noise contours from the road centerline were developed for each roadway link. The transportation model of the 1988-2005 Master Street Plan provided the future traffic volumes used to determine the future noise contours.

Noise contours for the airport operations were developed in the Watsonville *Airport Master Plan* in May 1985. These contours were based on yearly runway operations, ranging from 215,000 to 230,000 per year. The *Airport Master Plan* is being updated during 1991 and 1992, and noise contours for the Airport will be updated as necessary based on information provided in the Plan.

Railroad noise is concentrated primarily in the industrial triangle formed by Route 1, Harkins Slough Road, and Beach Street. In general, rail operations are limited, and therefore have little impact on daily level of noise in the city. Although sound levels generated by train passbys have been measured at 86 dBA at 50 feet, and whistle blasts may be as high at 98 dBA, these sound levels are of very short duration and occur infrequently. The existing daily frequency of freight operations is not expected to generate sound levels in excess of desirable standards. A noise analysis should be considered if and when additional freight or passenger rail operations are contemplated, particularly if operation is proposed during the evening hours.

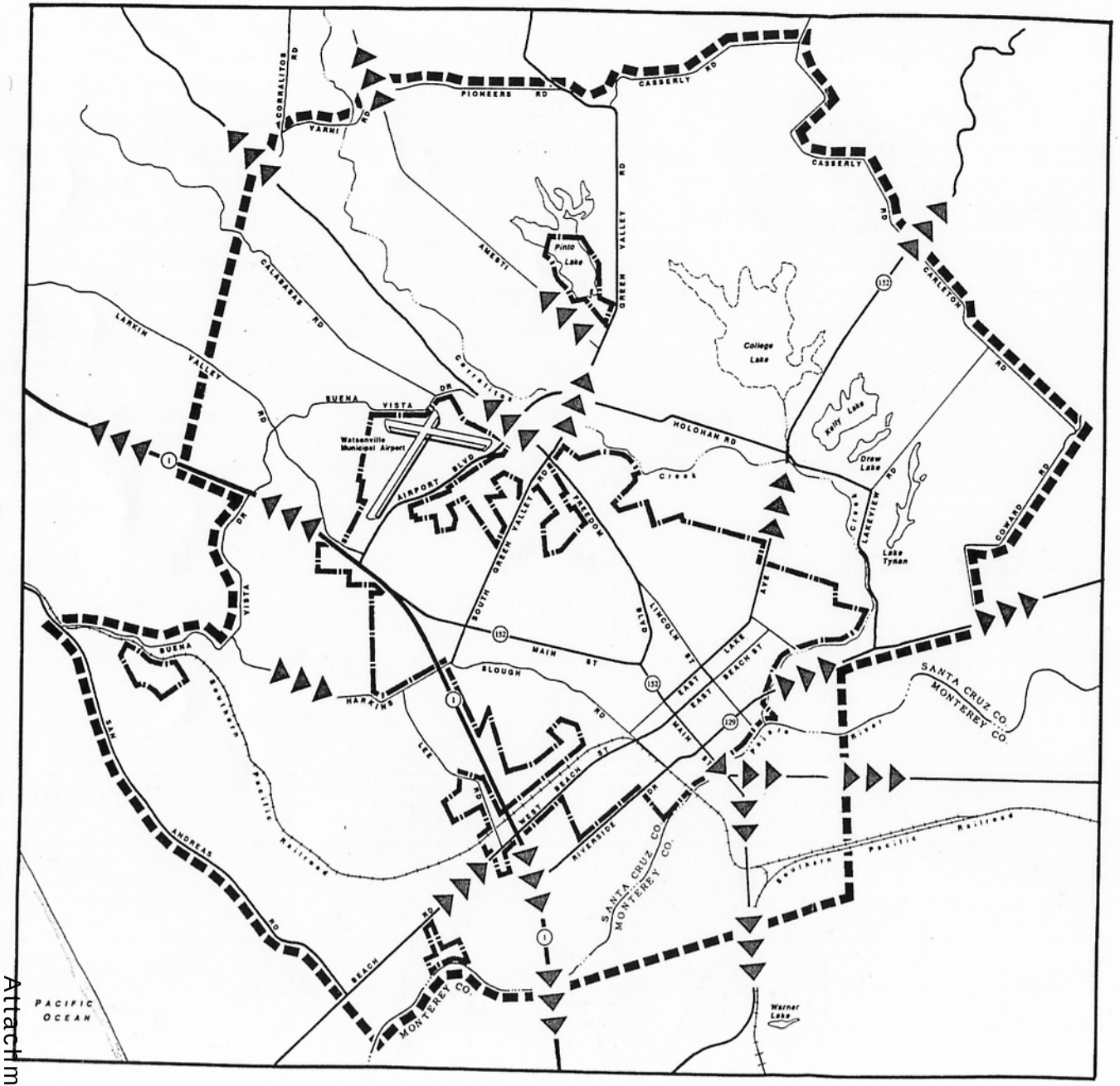
The highway and airport noise contours were combined for the development of the noise contour maps. The worst case between the two LOS networks was used to identify the future noise level contours. It was found that the difference between the C and D networks was very minor. The estimated 2005 noise contours are presented in Figure 12-7 and Figure 12-8.
Transportation noise effects are concentrated along the highways with the greatest volume of traffic and highest speeds. The largest noise areas that exist presently and will exist in the future are in the vicinity of the airport and along Highway 1. A large portion of the city is shielded from Highway 1 noise by the natural contours in the area. However, where direct line of sight to Highway 1 is possible, the 60-dBA contour reaches out in excess of 1,000 feet.

Another area of significant noise impacts occurs along Route 129. The noise intrusion band along Route 129 is nearly 600 feet wide on both sides of the highway. This is primarily because of the high speed of the facility and the flat terrain.

The major difference between the existing and future noise conditions is the growth of noise sensitive areas (60 dBA and higher) along the peripheral roads of the city, such as Martinelli and Bridge-Wagner Streets. New streets, such as Errington Road, will introduce a new noise source in the areas they traverse.

The use of landscaped earth berms and sound walls can be used along new and existing corridors to mitigate potential noise increases. For example, the use of earth berms on Highway 1 substantially reduces the area of noise impact. In the residential areas in the north side of the city, it may be useful to lower the travel speeds of the peripheral routes in order to reduce anticipated sound levels. A plus or minus of 3 dba change in the level of sound can occur by doubling or halving the traffic volume, or by changing the speed by ±7 miles per hour.

The primary purpose for establishing the noise contour maps is to provide the City of Watsonville with a means to plan for the compatibility of projected land uses with the expected noise environment. If, during the project review process, a proposed noise-sensitive development is found to lie within the 60-dBA contour, measures can be taken to minimize noise impacts, such as providing for an adequate setback of the development from the roadway. A special noise analysis may be required for the project to ensure that the structure will be designed to achieve the interior noise level standard of 45 dBA



KEY

Evacuation Routes

Watsonville City Limits as of 1992

Planning Area Boundary

0 1,900 3,800

Scale in Feet

CITY OF WATSONVILLE

PLANNING DEPARTMENT

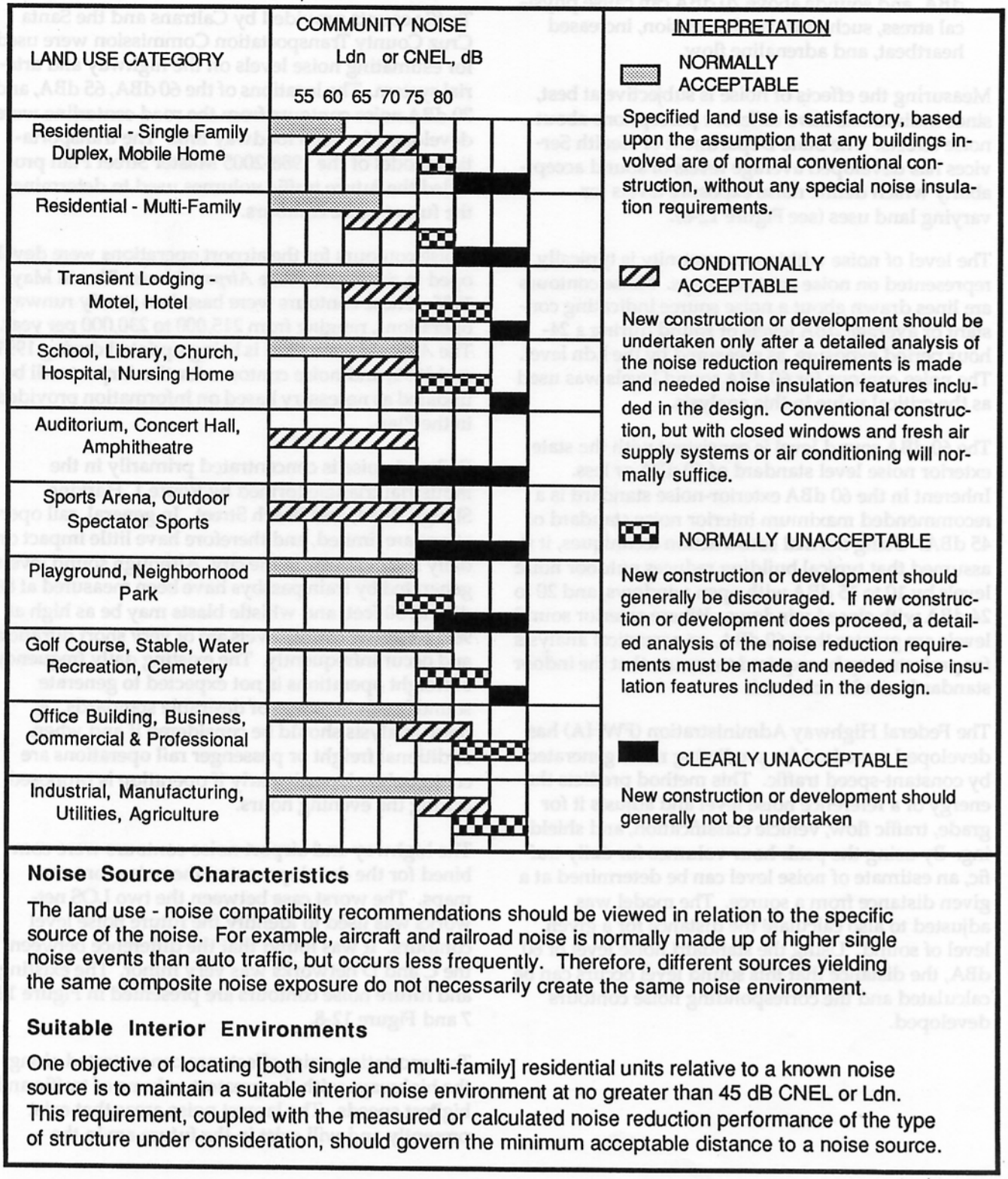
Evacuation Routes

Source: Watsonville Multihazard Functional Planning Guide, 1986

This graphic is not intended to be used for site-specific decision making. Consult the City or County for detailed information.

Figure 12-5

Figure 12-6 Land Use Compatibility for Community Noise Environments

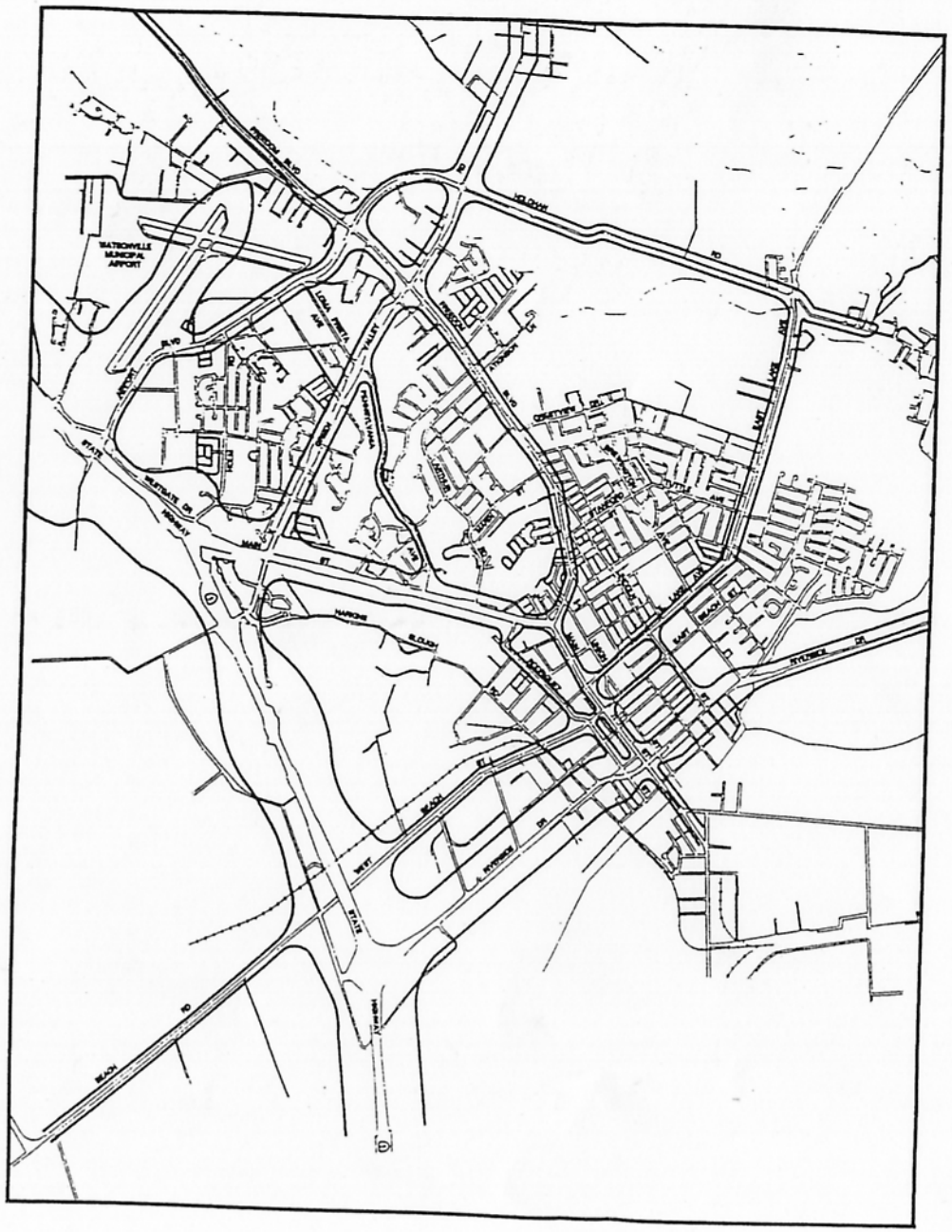


Noise Source Characteristics

The land use - noise compatibility recommendations should be viewed in relation to the specific source of the noise. For example, aircraft and railroad noise is normally made up of higher single noise events than auto traffic, but occurs less frequently. Therefore, different sources yielding the same composite noise exposure do not necessarily create the same noise environment.

Suitable Interior Environments

One objective of locating [both single and multi-family] residential units relative to a known noise source is to maintain a suitable interior noise environment at no greater than 45 dB CNEL or Ldn. This requirement, coupled with the measured or calculated noise reduction performance of the type of structure under consideration, should govern the minimum acceptable distance to a noise source.



KEY

60 Decibel Ldn Sound Level

0 2000
FEET

CITY OF WATSONVILLE

PLANNING DEPARTMENT

Existing Noise Contours: 1988 Transportation Sources

Source: Barton-Aschman / Ergo Engineering, 1989

This graphic is not intended to be used for site-specific decision making. Consult the City or County for detailed information.

Figure 12-7

KEY

60 Decibel Ldn Sound Level

0 2000
FEET

CITY OF WATSONVILLE
PLANNING DEPARTMENT

Future Noise Contours: 2005 Transportation Sources

Source: Barton-Aschman / Ergo Engineering, 1989

This graphic is not intended to be used for site-specific decision making. Consult the City or County for detailed information.

Figure 12-8

GOALS FOR PUBLIC SAFETY

The goals for this element address state mandates for Safety and Noise. They also reflect community concerns for emergency preparedness and personal safety.

Goal 12.1 Land Use Safety

Plan for and regulate the uses of land in order to provide a pattern of urban development that will minimize exposure to hazards from either natural or human-related causes.

Goal 12.2 Seismic and Other Geologic Hazards

Reduce the potential for loss of life, injury, and economic damage resulting form earthquakes and associated geologic hazards such as landslides and liquefaction.

Goal 12.3 Flood Hazard Reduction

Reduce the potential for loss of life and property damage in areas known to be flood prone.

Goal 12.4 Fire Safety/Protection

Ensure that all existing structures in the city are maintained at adequate levels of fire suppression standards, that new structures conform to current fire safety standards, and the coordination is maintained between urban and rural fire districts for the prevention and suppression of structural and wildland fires.

Goal 12.5 Hazardous Materials

Reduce the potential danger related to the use, storage, transport, and disposal of hazardous materials to an acceptable level of risk for city residents.

Goal 12.6 Personal Safety

Ensure that community standards for personal safety are enforced.

Goal 12.7 Emergency Preparedness

Anticipate the potential for disasters; maintain continuity of life-support functions during an emergency; and maximize efforts for post-emergency recovery.

Goal 12.8 Noise Hazard Control

Evaluate new and existing land uses in the city for compatibility related to noise effects and require, as appropriate, mitigation where harmful effects can be identified and measurable improvements will result.

POLICIES AND IMPLEMENTATION MEASURES

The policy statements for public safety are oriented toward reduction of risks to life and property. It is recognized that good planning and management can reduce risk potential, but the city cannot be made risk free. For additional policies and implementation measures on public safety, see the Public Services and Facilities chapter (11).

Policy 12.A Environmental and Public Safety

The City shall plan for and maintain development standards that minimize risks to human lives and property resulting from environmental and man-caused hazards.

The City shall protect neighboring residential development from the immediate threats of potentially hazardous industrial or agricultural materials and airport hazards through careful land use planning.

Implementation Measures

12.A.1 Airport Compatibility – The City shall use its development review process to ensure that proposals within the Airport Operations Impact Area are carefully analyzed

to prevent and minimize potential hazards. Projects shall be consistent with the city and state's guidelines for buildings and land uses compatible with airports.

12.A.2 Airport Operation Buffer – Those areas within the safety sensitive airport operations buffer area shall be maintained in open space, which serves agricultural, recreational, alternative transportation, and/or environmental protection needs.

12.A.3 Industrial Buffer Zones – The City shall require new industrial projects to provide a clear zone between industrial structures and adjacent residential land use.

12.A.4 Notification – In addition to establishing agricultural buffer areas, the City shall encourage notification of residents of abutting residential property when applications of insecticides or other dangerous substances are scheduled.

12.A.5 Risk Reduction – The City shall identify, avoid, and/or minimize natural and human-caused hazards in the development of property and the regulation of land use.

12.A.6 Electromagnetic Fields – The City shall continue to pursue the evaluation of the impact of electromagnetic fields associated with power transmission lines as a part of the project environmental review process.

Policy 12.B Seismic Hazards

They City shall use the development review process to ensure that potential geologic hazards are evaluated and mitigated prior to construction.

Implementation Measures

12.B.1 Geologic Review – The City may require a geo-technical report prepared by a registered professional prior to the issuance of a building permit.

12.B.2 Structural Design – The City shall place structural design conditions on new development to ensure that recommendations of the geo-technical evaluation are implemented.

12.B.3 Setbacks – The City shall require that all structures be located a minimum of 50 feet from any active or potentially active fault trace.

12.B.4 Essential Facilities Integrity – The City shall evaluate the ability of essential public facilities to maintain structural integrity as defined by the state in the event of a strong earthquake. Those facilities unable to maintain structural integrity shall be modified in order to bring them into conformance. Emergency guidelines shall be developed in those buildings where structural modification is not feasible.

12.B.5 Safety Conditions – The City shall require the application of seismic safety use conditions for development in the Seismic Safety District (EM-SS) as described in the Zoning Code.

12.B.6 Un-reinforced Buildings – The City shall establish a program to evaluate, and mitigate where possible, potentially hazardous buildings constructed prior to the adoption of building codes for earthquake resistant design. The focus of this evaluation shall be buildings constructed of un-reinforced masonry walls.

12.B.7 Seismic Hazard Mapping – The City shall update current seismic hazard zone maps as new information becomes available and use those maps in the development and application of an environmental constraint matrix to evaluate proposed building sites.

12.B.8 Public Information – The City shall participate with other appropriate agencies to provide the public with information on what actions to take before, during, and after an earthquake.

Policy 12.C Soil Constraints

The City shall take all appropriate actions to ensure that current land use activities and new developments are mitigated to prevent soil failure and other soil-related dangers.

Implementation Measures

12.C.1 Risk Mitigation – The City shall identify and mitigate to an acceptable level of risk new development proposed in areas with geologic, seismic, flood, or other environmental constraints.

12.C.2 Soils Investigation – The City shall require a soils investigation report prior to new development on sites deemed to have a high potential for soil erosion, landslide, or other soil-related constraints.

12.C.3 Foundation Design – The City shall require that new development provide for appropriate foundation design to comply with city building standards and recommendations of the soils investigation.

12.C.4 Slope – The City shall not permit new development on soils that are subject to landslide.

12.C.5 Final Soil Grade – The City shall require that soil grading blend with natural topography and that final cut slopes shall be no steeper than three horizontal to one vertical (33 percent).

Policy 12.D Flood Hazard Reduction

The City shall pursue the protection of new and existing development from the impacts of flooding up to the 100-year event.

Implementation Measures

12.D.1 Flood Protection – The City shall require new development to conform to the Flood Damage Prevention Ordinance and the guidelines of the National Flood Insurance Program.

12.D.2 Storm Water Retention – The City shall condition new development to provide for onsite retention and percolation of storm water run-off.

12.D.3 Storm Drains – New development shall be required to pay for or extend all necessary storm drains to serve the project site.

12.D.4 Storm Water Collection – The City shall require street design to include curbs and gutters that collect and direct storm water run-off to drainage facilities.

12.D.5 Flood Mitigation – The City shall pursue planning and financial support for the improvement of flood conditions along Corralitos and Salsipuedes Creeks, the Pajaro River, and other areas of the drainage basin impacting Watsonville as recommended by the Santa Cruz County Flood Control and Water Conservation District Zone 7.

Policy 12.E Hazardous Materials Control

The City shall strictly enforce ordinances and regulations for the use, storage, transport and disposal of hazardous materials.

Implementation Measures

12.E.1 Inspections – The City shall conduct periodic safety inspections of industrial and commercial facilities that use and store hazardous materials and dangerous chemicals.

12.E.2 Training – The City shall conduct periodic training exercises for the identification, containment, decontamination, and disposal of hazardous materials.

12.E.3 Planning – The City shall conduct periodic review and update of all Hazardous Materials Management Plans, as well as the city's Area Plan, for responding to and controlling hazardous materials emergencies.

12.E.4 Education – The City shall conduct public education programs on the safe use, storage, and disposal of hazardous materials.

12.E.5 Collection and Disposal – The City shall follow state and federal regulations to ensure that hazardous wastes are collected, and disposed of, in a manner that prevents contamination to air, soil, or water. Special effort shall be made to develop a Hazardous Waste Disposal Program for low-level users (i.e., households, small businesses).

12.E.6 Identification of Potentially Hazardous New Businesses – The City shall use the development processing and business license process to identify potential hazardous uses and to require preventative programs including, but not limited to, the development of neighborhood, area evacuation plans, and hazardous material handling and disposal plans.

Policy 12.F Fire Safety Standards

The City shall use development approval authority, code enforcement, and periodic inspections to ensure that fire prevention standards are maintained.

Implementation Measures

12.F.1 Access – The City shall require that new driveways and roadways meet minimum standards of the Uniform Fire Code or subsequent standards established by city ordinances.

12.F.2 Cul-de-Sacs – New cul-de-sac streets shall have a minimum 32-foot turning radius.

12.F.3 Private Access Roads – All private access roads shall be maintained be a responsible party to ensure safe and expedient passage to the Fire Department at any time. All locking devices shall be subject to approval of the Fire Department.

12.F.4 Road Construction – Roadways shall be "all-weather" type, as defined by city standards.

12.F.5 Width and Vertical Clearance – All roadways shall maintain city standards for minimum width and vertical clearance.

12.F.6 Alleys – Existing alleyways shall be upgraded to city standards for emergency access, street addressing, and available water supply.

12.F.7 Emergency Access – On dead end streets longer than allowed by the city development standards, secondary emergency access shall be required for use by emergency vehicles or approved built-in fire protection provided.

12.F.8 Fire Flow – New development shall be conditioned to provide adequate water for fire suppression in accordance with city standards for minimum volume and duration of flow.

12.F.9 Open Area – Property owners shall be responsible for maintaining vacant sites free of trash, weeds, or other fire safety hazards.

12.F.10 Building Safety – Property owners shall be responsible for maintaining their structures at a reasonable degree of fire and life safety as identified by the uniform fire, building, mechanical, electrical and other such adopted codes and city ordinances.

12.F.11 Built-in Fire Protection – The City shall continue to promote the installation of built-in fire extinguishing systems and early warning fire alarm systems. The City acknowledges that fact that built-in fire protection is a better substitute than expanding public fire protection services.

12.F.13 Street Name and Numbering – The City shall ensure that new developments within the city do not duplicate area-wide street names and that address numbering follows a logical progression.

12.F.13 Fire Cause Investigation – The Fire Department shall determine the cause of all fires responded to and support law enforcement agencies in their investigation of deliberately set fires.

Policy 12.G Fire Safety Education

The City shall use Fire Department personnel to perform effective fire safety and prevention programs.

Implementation Measures

12.G.1 Public Schools – The City shall provide fire safety and prevention programs for the Pajaro Valley Unified School District.

12.G.2 Institutions – The City shall provide classes in fire safety for high occupancy institutional land uses, and commercial and industrial occupancies.

12.G.3 Community Groups – The City shall provide presentations on fire safety to community groups and forums.

12.G.4 Child Fire Setters – The City shall provide counseling services under the Child Fire Setter Counseling Program.

Policy 12.H Fire Suppression Planning

The City shall maintain a level of fire protection for the community that emphasizes an aggressive initial attack to stop fires in early stages as well as to have adequate staff and equipment (including mutual aid) to prevent a conflagration.

Implementation Measures

12.H.1 Level of Service – The City shall strive to provide properly staffed and equipped fire stations to provide a response time of four minutes from the nearest fire station to all portions of the city as measured by the Fire Chief, except for the following: residential neighborhoods having no special fire hazard or special populations having a medical related problem, i.e. convalescent homes and senior housing, which

may install an approved fire sprinkler system to substitute for the fire station location in the area between four and seven minute response time.

12.H.2 Action Priorities – When multiple emergency requests for service occur, the Fire Department shall take action but the following ranked priorities.

a. Control of the most life-threatening fire or hazardous materials incident.
b. Rescue and treatment of victims facing life-threatening injury.
c. Control over non-life threatening emergency incidents.
d. Support for other city and county departments to perform their emergency responsibilities.

12.H.3 Future Mutual Benefit Fire Stations – The City shall work toward agreements with the Freedom, Salsipuedes and Santa Cruz County Fire Districts to augment fire station locations as the Planning Area population increases.

12.H.4 Mutual Aid – The City shall continue to fulfill legal obligations and support mutual aid efforts to coordinate fire suppression within Santa Cruz County and the State of California to prevent and suppress major wildland and urban fire destruction.

12.H.5 Fire Apparatus – The City shall maintain apparatus and equipment necessary to accomplish an aggressive and effective initial attack, as well as to prevent a potential conflagration.

12.H.6 Financing – New development shall be required to contribute a proportional share of the cost of constructing and equipping additional fire stations.

12.H.7 Personnel Preparedness – The City promotes clearly identified job standards and structured, well-planned training for all personnel involved with public fire protection. All suppression personnel shall be supplied with proper safety equipment to safely and effectively deal with fire and hazardous materials emergencies. The City promotes actions that develop a healthy and physically fit work force.

12.H.8 Fire Pre-planning – The Fire Department shall continually evaluate target fire hazards and pre-plan for major emergencies.

12.H.9 Planning Area Fire Protection – The City shall promote the concepts of fire prevention and suppression adopted in the City's General Plan in the Planning Area located outside the City limit boundaries.

Policy 12.I Crime Prevention

The City shall provide sufficient funding, adequate personnel levels, and necessary equipment to maintain civil order and prevent crime.

Implementation Measures

12.I.1 Neighborhood Support – The Policy Department shall promote neighborhood crime prevention efforts and encourage area residents to report unusual behavior and circumstances.

12.I.2 Project Security Review – The City shall refer new development projects to the Police Department for a security review. This review shall include, but not be limited to:

a. The provision of adequate lighting for personal security.

b. The provision of adequate locking devices for windows and doors.
c. The location of walkways and access points.

12.I.3 Children, Youth and Families – The City recognizes that the best way to ensure the safety of children, youth and families is through prevention and early intervention programs. Therefore, the City will work to prevent and correct unsafe situations to the extent possible.

Policy 12.J Emergency Medical Care

The City shall strive to maintain field emergency medical services consistent with population growth in the Planning Area.

Implementation Measures

12.J.1 Service – The Fire Department shall continue to provide basic life support emergency medical services when not otherwise occupied with fire and hazardous materials problems.

12.J.2 Paramedic – The Fire Department shall support continuation of advanced life support services in the city, and shall attempt to provide this service should private service no longer be feasible or available.

Policy 12.K Rescue Services

The City shall strive to maintain emergency rescue services consistent with population growth in the city.

Implementation Measures

12.K.1 Light Rescue – The Fire Department shall maintain adequate equipment and hand tools for the extraction of victims from vehicles, aircraft, buildings, and for other emergency rescue circumstances.

12.K.2 Heavy Rescue Management – The Fire Department shall manage heavy-duty rescue situations in which special equipment and methods are required. Special equipment in these circumstances may be obtained from other city departments or the private sector.

Policy 12.L Emergency Preparedness

The City shall be prepared to maintain critical public services during emergency situations.

Implementation Measures

12.L.1 Training – All City departments shall conduct the appropriate level of training activities to ensure preparedness before an emergency situation, continuity of services during an emergency situation, and recovery operations after the event.

12.L.2 Critical Facilities – The City shall evaluate the ability to survive and continue to operate during emergency conditions, and identify alternate facilities and operating plans for post-emergency recovery.

12.L.3 Planning – The City shall annually update the Emergency Preparedness Plan ***and Local Hazard Mitigation Plan (LHMP)*** and coordinate planning efforts with the local community and the Santa Cruz County Office of Emergency Services.

12.L.4 Evacuation – The City shall designate evacuation routes for the Planning Area, according to the planning format outlined in the Emergency Preparedness Plan ***and emergency evacuation route analysis in Appendix D***.

12.L.5 ***Local*** Hazard Mitigation Plan – The City of Watsonville shall actively pursue the implementation of the recommendations included in the ***2020 LHMP and subsequent updates*** ~~Hazard Mitigation Plan for the City of Watsonville that was developed after the 1989 Loma Prieta Earthquake, including preparation of the *Community-based Disaster Response Plan*~~.

Policy 12.M Noise

The City shall utilize land use regulations and enforcement to ensure that noise levels in developed areas are kept at acceptable levels, and that future noise-sensitive land uses are protected from noise that is harmful.

Implementation Measures

12.M.1 Traffic Noise – The City shall enforce provisions of the California Vehicle Code and local ordinances to reduce vehicular noise intrusion in residential areas and near other noise sensitive land uses such as schools and hospitals.

12.M.2 Truck Routes – The City shall continue efforts to designate truck routes that bypass residential areas and other noise sensitive areas.

12.M.3 Equipment Maintenance – The City shall maintain all vehicles and mechanical equipment in peak operating condition and correctly fitted with noise control devices.

12.M.4 Soundproofing – The City shall use the development review process and provisions of the Uniform Building Code to ensure adequate levels of soundproofing in all new construction.

12.M.5 Noise Ordinance – The City shall prepare, adopt and enforce a comprehensive noise control ordinance.

12.M.6 Site Planning – The City shall evaluate sire orientation and building design to decrease the potential for noise intrusion, using the noise contour map and compatibility guidelines.

12.M.7 Aircraft Noise – The City shall periodically review and update noise contour measurements as aircraft operations increase or change in nature. Recommendations for noise attenuation contained in the *Watsonville Airport Master Plan* shall be implemented on a project-by-project basis.

The policies for environmental constraint management and public safety serve to implement long-term goals. The association between goals and policies is shown below in the form of a matrix.

Public Safety Goals and Policies

		Policies												
		12A	12B	12C	12D	12E	12F	12G	12H	12I	12J	12K	12L	12M
Goals	12.1	•	•	•	•		•							•
	12.2		•	•										
	12.3				•									
	12.4						•	•	•					
	12.5					•								
	12.6									•	•	•		
	12.7												•	
	12.8													•

APPENDIX D

EMERGENCY EVACUATION ROUTE ANALYSIS

BACKGROUND

Assembly Bill (AB) 747[1], passed in August of 2019, requires the City to update the Safety Element of their General Plan to identify evacuation routes and assess the capacity, safety, and viability of those routes under a range of emergency scenarios. Senate Bill (SB) 99[2] similarly requires the City to identify residential developments in hazard areas that do not have at least two emergency evacuation routes. Authoritative state guidance has not yet been developed to determine the type and level of analysis needed under AB 747 and SB 99.

This supplemental evacuation analysis was prepared in support of the 2020 Local Hazard Mitigation Plan. It utilizes a methodology described below and identifies residential developments without sufficient evacuation routes, and evaluates the efficacy of existing evacuation routes under various hazard scenarios in compliance with these two statutes.

HAZARD SCENARIOS

Evacuation route viability is largely determined by the location of the hazard. Because the City of Watsonville is surrounded by moderate and high wildfire risk areas, the Planning Team considered three wildfire scenarios to evaluate the safety and capacity of evacuation routes for residents. A total of five hazard scenarios are considered in this analysis:

1. Baseline (no hazard location specified)
2. Wildfire originating in the area north of the City
3. Wildfire originating to the east of the City
4. Wildfire originating to the south of the City
5. Flood
6. Earthquake

DATA, ASSUMPTIONS & DEFINITIONS

The evacuation route analysis utilizes updated parcel data from CoreLogic, a leading provider of real estate data in the United States and 2017 TIGER road data from the U.S. Census, which includes all roads in the U.S. Census Bureau's Master Address File Integrated Geographic Encoding and Referencing database. This includes primary roads, secondary roads, local neighborhood roads, rural roads, city streets, vehicular trails, ramps, service drivers, walkways, stairways, alleys, and private roads.

[1] An act to add Section 65302.15 to the Government Code.
[2] An act to amend Section 65302 of the Government Code.

To develop a methodology that effectively evaluates the safety and capacity of evacuation routes, and identifies residential areas that lack two evacuation routes, the following definitions and assumptions apply:

1. "Evacuation route vulnerability" refers to the reduced ability of people to evacuate under emergency conditions. Evacuation route vulnerability scores are calculated for each residential parcel. Lower values indicate lower levels of vulnerability, while higher values indicate greater evacuation route vulnerability.
2. "Capacity" is defined by the ability of a road to accommodate traffic volume. In this analysis, road type (local, collector, arterial, or highway/freeway) is used as an indicator of road capacity. "Local" roads are streets that are primarily used to gain access to property. Proximity to local roads was not considered a significant determinant of evacuation vulnerability. "Collector" roads are considered low-to-moderate capacity roads which serve to move traffic from local streets to arterial roads. An "arterial" road is a high-capacity urban road. The primary function of an arterial road is to deliver traffic from collector roads to highways/freeways, which are the highest capacity evacuation route.
3. Evacuation proceedings are primarily reliant on "outbound" roads—roads that transport drivers away from the city. Outbound roads are either freeways or arterials. Outbound roads begin at the intersection closest to the City boundary.
4. "Proximity" is defined by the distance from a residential parcel to nearest road (for collector roads) or "nodes" —the nearest intersection on the following road types: arterial, out-bound, or highway/freeway.
5. All roads have a potential role in evacuations. Closer proximity to higher capacity roads and outbound roads reduce evacuation vulnerability.
6. Hazard scenarios influence the direction people evacuate (away from the hazard area).
7. Segments of roads with bridges under an earthquake scenario are not viable.

METHODOLOGY

Evacuation route vulnerability scores were assigned to each residential property based on several factors including proximity, capacity, and viability. The geospatial analysis included the following steps:

1. Map all residential parcels within the City, and all collector, arterial, outbound roads, and freeways.
2. Create nodes at the intersection of collector and local roads to arterial roads, and all intersections on out-bound roads, including on-ramps for highways/freeways.
3. Determine the proximity of each residential parcel to the nearest evacuation route (highway/freeway or outbound road) by:
    a. Calculate the distance from the parcel to the nearest collector road.
    b. Calculate the distance to the nearest arterial, outbound road, or highway/freeway node.[3]

[3] To account for the assumption that drivers would take the route that leads them out of the City most efficiently, if the distance from a parcel to a higher capacity road is less than the distance to a lower capacity road, the distance to the lower capacity road is assigned a value of 0.

c. Each distance value is weighted (see step 4). Add weighted distance values together to calculate the "Evacuation Route Vulnerability Score". Lower values indicate lower levels of evacuation route vulnerability; higher values indicate greater vulnerability.

4. Apply the following weights to the road capacity (type) as follows to reflect the higher vulnerability of lower capacity roads and roads with bridges:

Road Type	Vulnerability Weight
Freeway	1
Outbound Road	2
Arterial Road	3
Collector Road	4
Road segment with bridge	10

5. For each hazard scenario[4], identify residential parcels whose evacuation route vulnerability has changed (increased or decreased) from the baseline, and determine if there are less than two evacuation routes for residential areas.

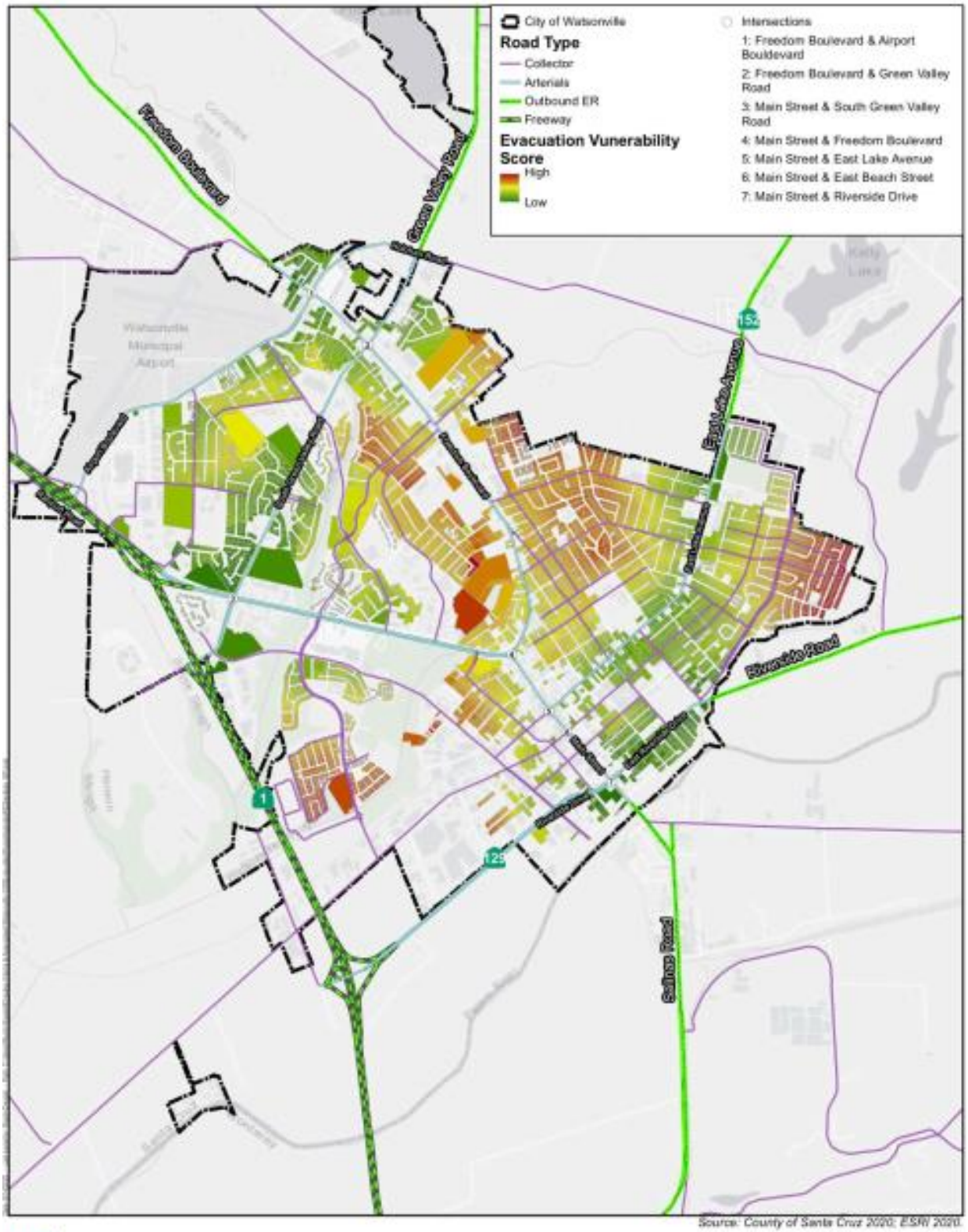
RESULTS

1. Baseline

The baseline scenario evaluates the evacuation route vulnerability of residential parcels absent a hazard event. In the baseline scenario, all outbound roads are available to residents for evacuation. Key intersections within the City boundary (where arterial roads connect) are labeled on the map below. These intersections are necessary to efficiently route residents to outbound roads. Residential parcels with the highest evacuation route vulnerability score are highlighted in red. Assuming all evacuation routes are viable, residents in the city center have the highest evacuation route vulnerability, as they have the furthest to travel to access outbound evacuation routes. The Pajaro Village and Stone Creek Apartment locations also show evacuation vulnerability in this scenario.

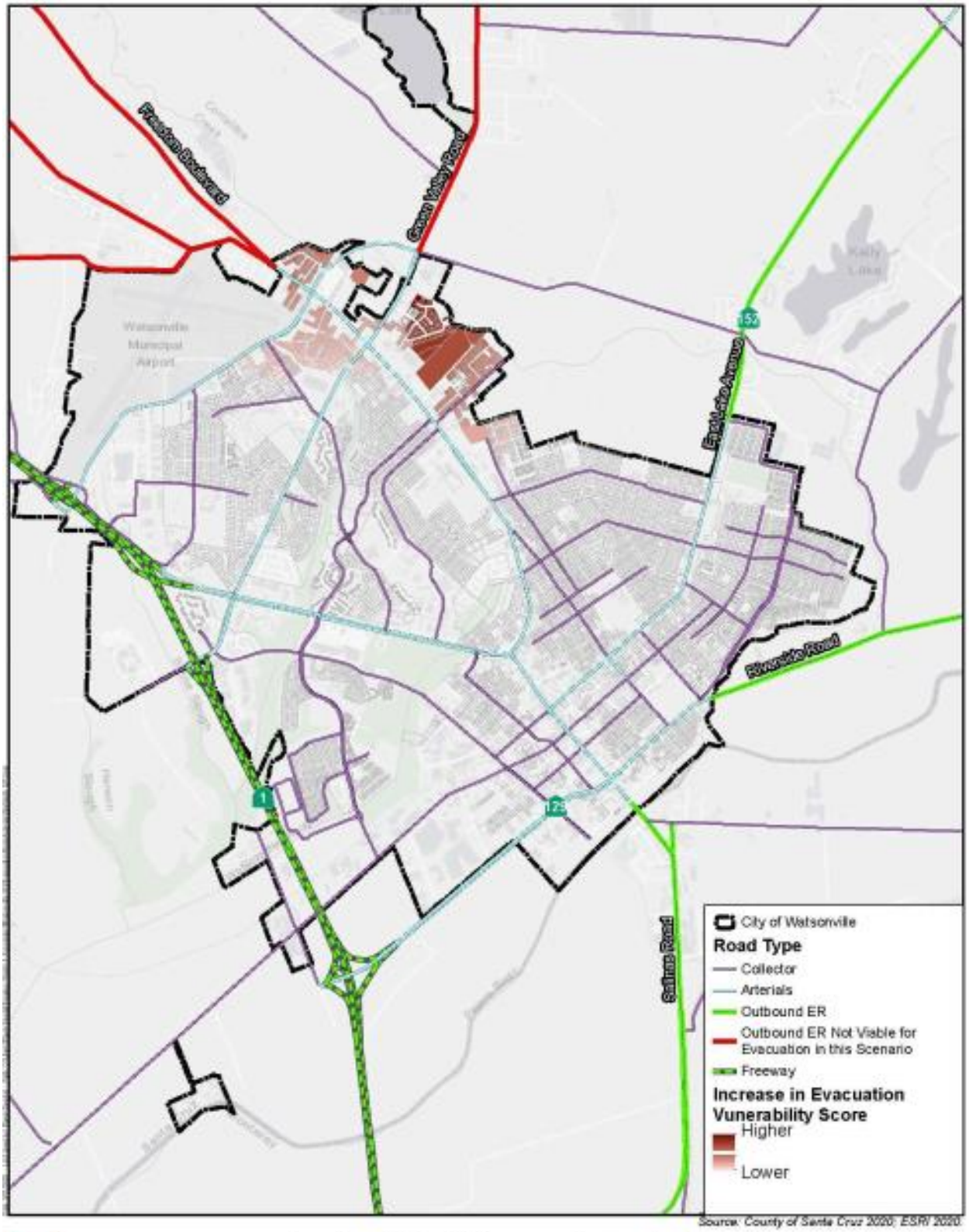
In addition to considering evacuation route vulnerability, the vulnerability of residents should be considered in determining which areas may need to be prioritized by first responders during an evacuation. Areas within the City with a greater percentage of elderly people, disabled people, households that do not own a vehicle (i.e. transit dependent populations), and institutionalized populations require greater levels of support during an evacuation. For example, the following areas have the highest percentage of elderly (over 65): (a) southeast portion of the City between Salsipuedes Creek, East Lake Ave. and Beck St.; (b) the Northeast corner between Corralitos Creek, Freedom Blvd. and Airport Blvd; (c) and the area between Main St., South Green Valley Rd., and the Struve Slough. Areas with a higher percent of institutionalized people include: (a) the western boundary and southwest corner of the City; and (b) the city center near the Portola Heights Mobile Home Park. Other vulnerable groups should be examined relative to evacuation route vulnerability.

[4] Except Earthquake scenario, which follows its own methodology as described on page 217.


City of Watsonville
Road Type
Collector
Arterials
Outbound ER
Freeway
Evacuation Vunerability Score
High
Low
Intersections
1: Freedom Boulevard & Airport Bouldevard
2: Freedom Boulevard & Green Valley Road
3: Main Street & South Green Valley Road
4: Main Street & Freedom Boulevard
5: Main Street & East Lake Avenue
6: Main Street & East Beach Street
7: Main Street & Riverside Drive
Freedom Boulevard
Green Valley Road
East Lake Avenue
Riverside Road
Salinas Road
Watsonville Municipal Airport
152
1
129
Source: County of Santa Cruz 2020; ESRI 2020.
Harris & Associates
N
0
1,500
3,000
Feet
Residential Evacuation Vunerability Score for All Directions

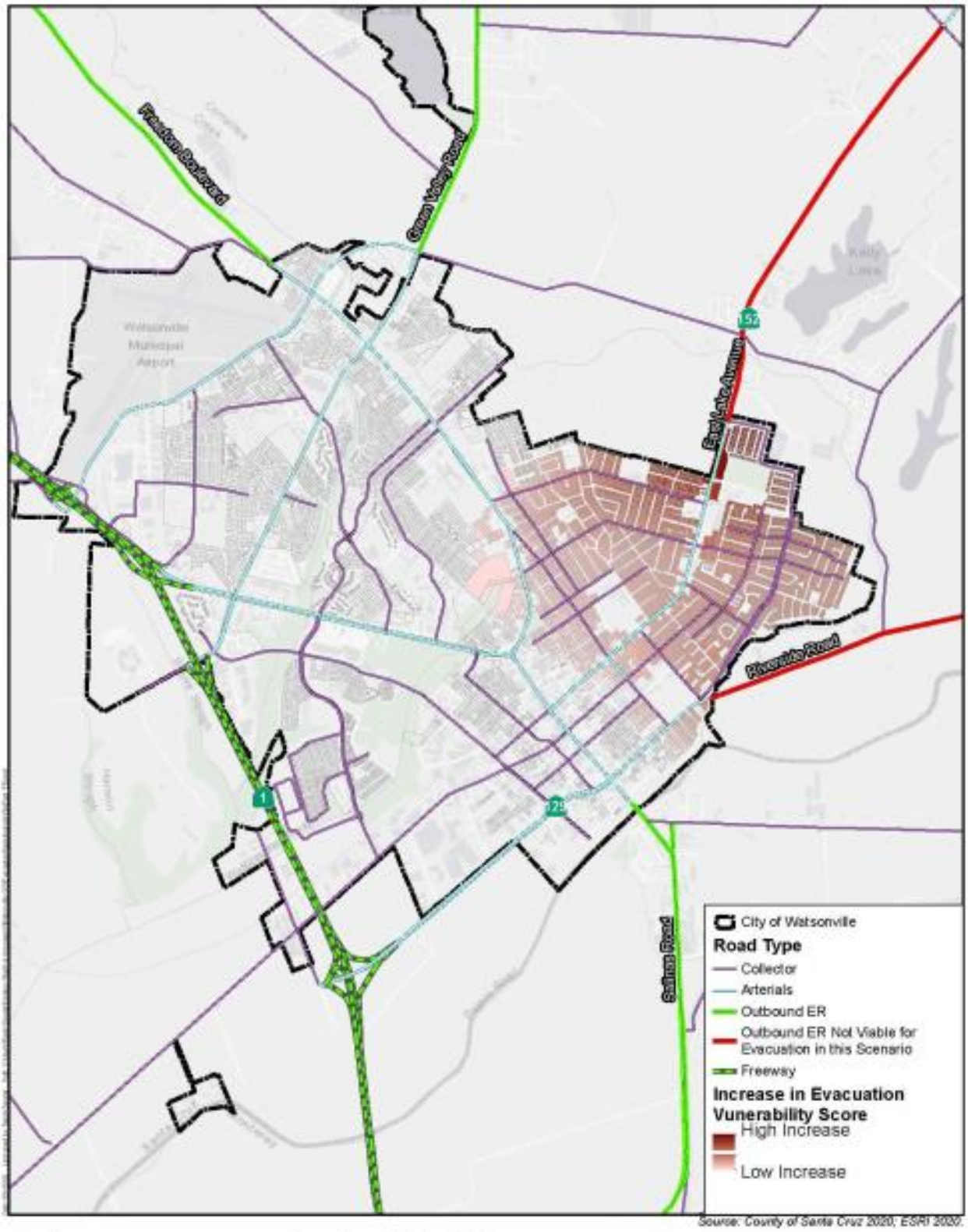
2. Wildfire (North)

This scenario assumes a wildfire north of the City. Outbound roads leading north are not viable, including Freedom Boulevard and Green Valley Road. Evacuation route vulnerability scores are recalculated to account for the increased distance to the next closest, viable outbound road. The map below highlights residential parcels with evacuation route vulnerability scores that increased as a result of the two northbound evacuation routes being closed. It is likely that the most utilized evacuation routes will be Highway 1 and Salinas Road, because eastbound outbound roads lead to other high fire risk areas. Parcels highlighted on the map will likely depend on South Green Valley Road to access Highway 1, or Freedom Blvd. to access the Salinas Rd. evacuation routes. The intersections of Main St./S. Green Valley Rd., Main St./Freedom Blvd, and Main St./Riverside Dr. may get congested as residents try to access Highway 1 and Salinas Rd. evacuation routes. Emergency responders should consider activating evacuation traffic management at these intersections and as contra-flow lane reversal on the highway to allow both lanes to be used for southbound evacuation, though this requires extensive coordination and should be reserved for extreme wildfire threats.


Freedom Boulevard
Green Valley Road
Watsonville Municipal Airport
Lake Avenue
Riverside Road
Salinas Road
City of Watsonville
Road Type
Collector
Arterials
Outbound ER
Outbound ER Not Viable for Evacuation in this Scenario
Freeway
Increase in Evacuation Vunerability Score
Higher
Lower
Source: County of Santa Cruz 2020; ESRI 2020
Harris & Associates
N
0 1,500 3,000
Feet
Increase in Evacuation Vunerability Score for Northern Fire Scenario

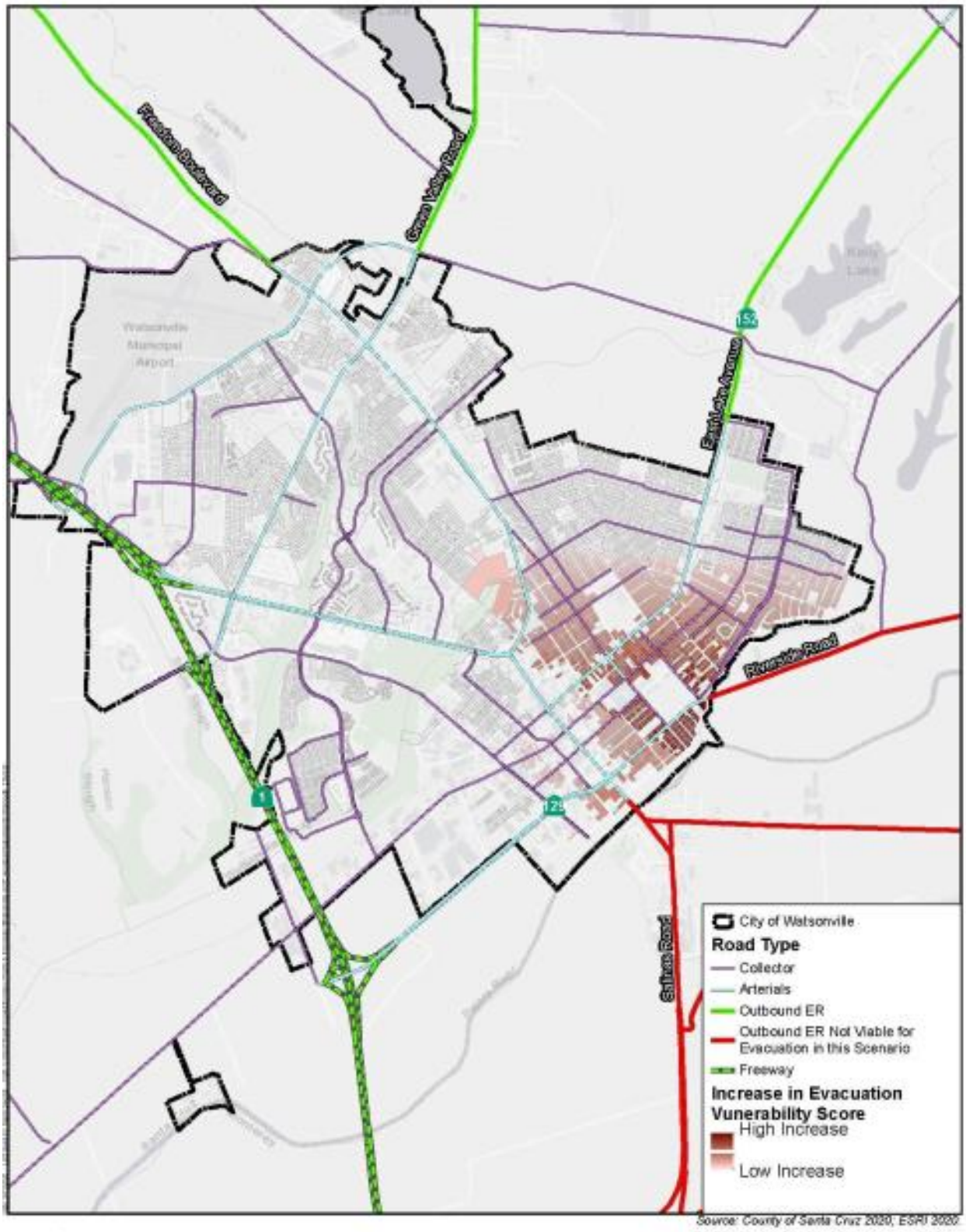
3. Wildfire (East)

This scenario assumes a wildfire east of the City. Outbound roads leading East are not viable, including East Lake Ave. and Riverside Road. Evacuation vulnerability scores are re-calculated to account for the increased distance to the next closest, viable outbound road. The map below highlights residential parcels with evacuation route vulnerability score that increased as a result of the two eastbound evacuation routes being closed. Freedom Blvd., Salinas Rd., and Highway 1 are the outbound roads most likely to be utilized in this scenario, because eastbound outbound roads lead to other high fire risk areas. Both directions of Highway 1 (North/South) are likely to be viable under this scenario, which increases overall evacuation capacity. However, it may take more resources to evacuate those in the Pajaro Village area because of the reduced mobility of the population that resides in those neighborhoods. The critical intersections in this scenario are likely to be Main Street and Freedom Blvd., Main Street and East Riverside Drive.


Freedom Boulevard
Green Valley Road
Watsonville Municipal Airport
Kelly Lake
152
East Lake Avenue
Hazelwood Road
1
129
Salinas Road
City of Watsonville
Road Type
Collector
Arterials
Outbound ER
Outbound ER Not Viable for Evacuation in this Scenario
Freeway
Increase in Evacuation Vunerability Score
High Increase
Low Increase
Source: County of Santa Cruz 2020; ESRI 2020.
Harris & Associates
N
0
1,500
3,000
Feet
Increase in Evacuation Vunerability Score for Eastern Fire Scenario

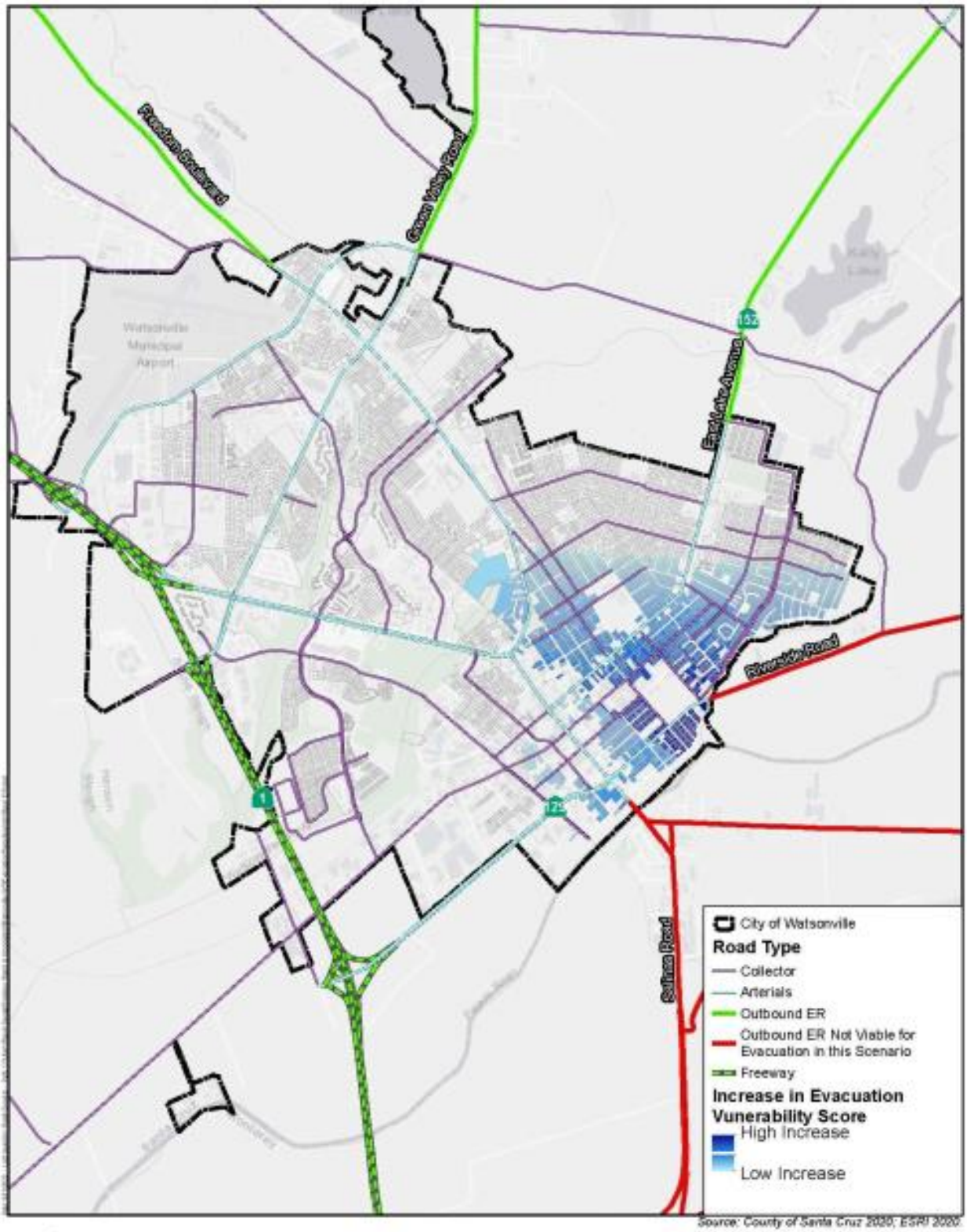
4. Wildfire (South)

This scenario assumes a wildfire to the south of the City. Outbound roads leading South are not viable, including Riverside Road and Salinas Road. Evacuation route vulnerability scores are re-calculated to account for the increased distance to the next closest, viable outbound road. The map below highlights residential parcels with evacuation route vulnerability score that increased as a result of the two southbound evacuation routes being closed. Freedom Blvd and northbound Highway 1 are the outbound roads most likely to be utilized in this scenario, because eastbound outbound roads lead to other high fire risk areas. The intersections of Main St./S. Green Valley Rd., Main St./Freedom, and Freedom/Green Valley Rd. may get congested as residents try to access Highway 1 and Freedom Rd. evacuation routes. Emergency responders should consider activating evacuation traffic management at these intersections and as contra-flow lane reversal on the highway to allow both lanes to be used for northbound evacuation, though this requires extensive coordination and should be reserved for extreme wildfire threats.


Freedom Boulevard
Green Valley Road
Watsonville Municipal Airport
Eastlake Avenue
Riverside Road
Salinas Road
152
1
129
City of Watsonville
Road Type
Collector
Arterials
Outbound ER
Outbound ER Not Viable for Evacuation in this Scenario
Freeway
Increase in Evacuation Vunerability Score
High Increase
Low Increase
Source: County of Santa Cruz 2020; ESRI 2020
Harris & Associates
N
0
1,500
3,000
Feet
Increase in Evacuation Vunerability Scores for Southern Fire Scenario

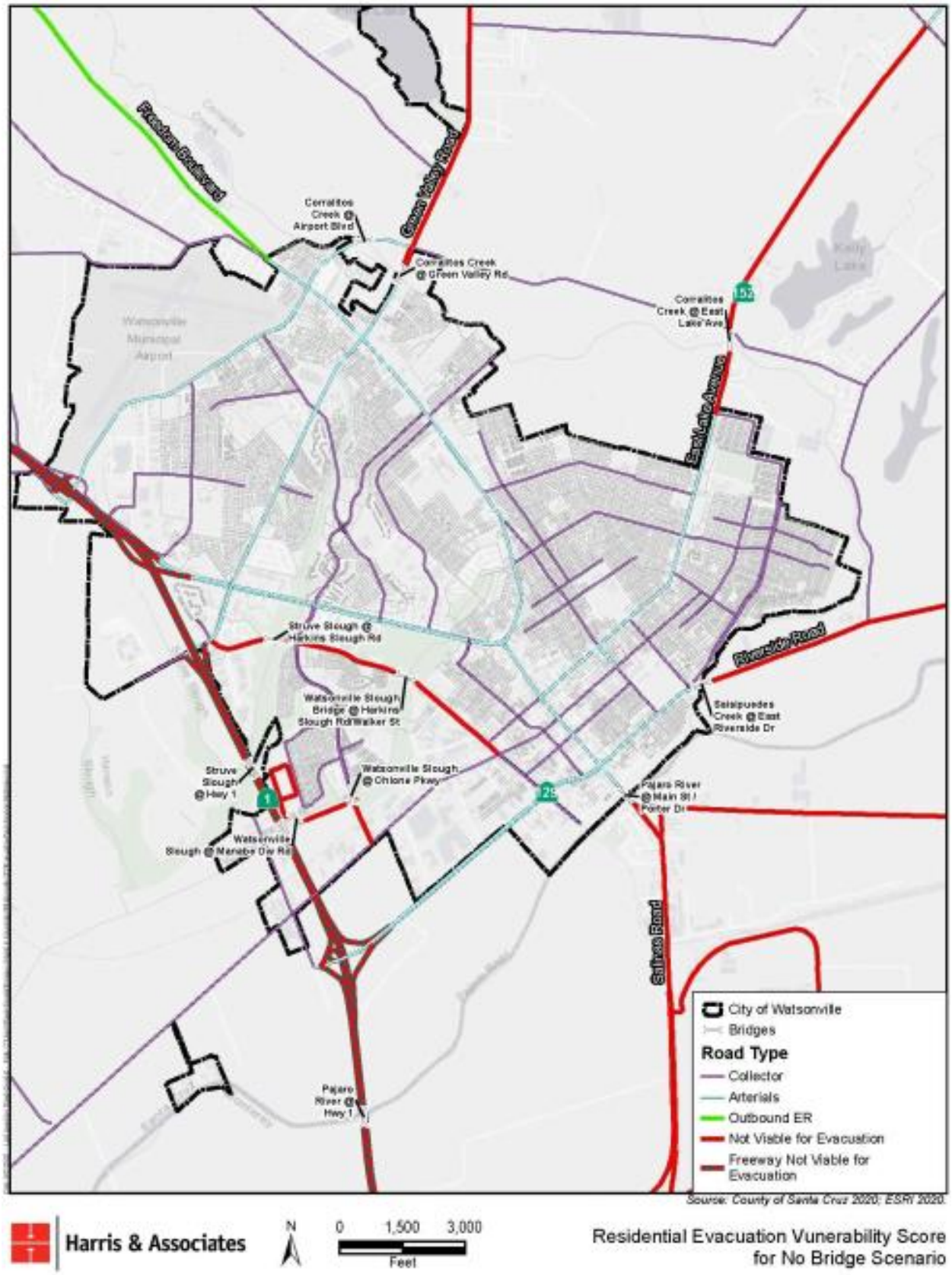
5. Flood

The flood scenario assumes that people will evacuate away from the flood zone. Since the flood zone is along the South side of the City along the Pajaro River, the two Southbound evacuation routes are assumed to be non-viable. Therefore, the results are the same as Scenario #4. The time it takes to evacuate is not as critical during a flood event because it is a slower-onset hazard. However, it may be more difficult for first responders to access vulnerable populations that need to be evacuated once the water inundates the area. Roads may be inundated, further hampering evacuation. Residents may not need to evacuate out of the City but only away from the flood zone. Therefore, there is likely to be less evacuation route congestion compared to other hazard scenarios.


Freedom Boulevard
Green Valley Road
Watsonville Municipal Airport
152
East Lake Avenue
Riverside Road
1
129
Salinas Road
City of Watsonville
Road Type
Collector
Arterials
Outbound ER
Outbound ER Not Viable for Evacuation in this Scenario
Freeway
Increase in Evacuation Vunerability Score
High Increase
Low Increase
Source: County of Santa Cruz 2020; ESRI 2020
Harris & Associates
N
0
1,500
3,000
Feet
Increase in Evacuation Vunerability Scores for Flood Scenario

6. Earthquake

Unlike other scenarios, earthquakes have the potential to damage any part of the City. For this reason, it is difficult to predict which evacuation routes will be available post-earthquake. Because earthquakes can damage bridges, one key assumption was made for evaluating evacuation route capacity: outbound roads that require a bridge crossing may not be viable evacuation routes after an earthquake. This assumption removes all but one evacuation route from the analysis—Freedom Blvd. All the other outbound roads have bridge crossings. Though emergency responders should consider the possibility of bridge failure, it is unlikely that all bridges would fail in the event of an earthquake occurrence. While it is likely two evacuation routes will still be available under this scenario, it is theoretically possible that all bridges are damaged and less than two emergency evacuation routes are available to residents in the event of a severe earthquake. Post-earthquake, emergency responders should be prepared to inspect bridges efficiently and effectively in the event of an earthquake event so that evacuation routes can be established and communicated safely and quickly.


Freedom Boulevard
Green Valley Road
Corralitos Creek @ Airport Blvd
Corralitos Creek @ Green Valley Rd
Corralitos Creek @ East Lake Ave
East Lake Avenue
Riverside Road
Struve Slough @ Harkins Slough Rd
Watsonville Slough Bridge @ Harkins Slough Rd/Walker St
Struve Slough @ Hwy 1
Watsonville Slough @ Chlorine Pkwy
Watsonville Slough @ Manabe Ox Rd
Pajaro River @ Main St / Porter Dr
Salsipuedes Creek @ East Riverside Dr
Pajaro River @ Hwy 1
Salinas Road
152
1
129
City of Watsonville
Bridges
Road Type
Collector
Arterials
Outbound ER
Not Viable for Evacuation
Freeway Not Viable for Evacuation
Source: County of Santa Cruz 2020; ESRI 2020
Harris & Associates
N
0
1,500
3,000
Feet
Residential Evacuation Vunerability Score for No Bridge Scenario

CONCLUSION & RECOMMENDATIONS

The evacuation route analysis did not identify any residential parcels that lack two evacuation routes (it remains theoretically possible, but highly unlikely, that all evacuation routes are blocked in the event of a severe earthquake). The baseline scenario suggests that residents closest to the city center are most vulnerable given the distance they would need to travel to access an outbound road. The results for the five hazard scenarios were as expected: residential parcels located near outbound roads that were assumed to be non-viable under the hazard scenario saw an increase in their evacuation route vulnerability score, reflecting the greater distance residents would travel to access the next nearest outbound evacuation route. There are a greater percentage of socially vulnerable groups in the southwest, southeast, and northwest corner of the city, as well as pockets of vulnerability around the Watsonville Slough that may require a greater level of assistance during evacuation proceedings.

The analysis suggests that emergency responders must be flexible in emergency scenarios, considering the location and extent of a hazard may disrupt established evacuation routes. Given the potential for congestion when certain evacuation routes are closed, emergency responders should consider contraflow lane reversal as one strategy to efficiently evacuate residents. All but one outbound evacuation routes rely on a bridge. These bridges should be inspected prior and post hazard events to ensure the evacuation routes remain viable. Social vulnerability indicators, including age, disability, and other mobility factors should be further examined to determine other potential barriers to evacuation besides distance to and capacity of evacuation routes. These recommended strategies require advanced coordination across departments to ensure an efficient and well-communicated process for evacuation in response to various hazard scenarios.