DRAFT

City of Watsonville Local Hazard Mitigation Plan

July 2020

Prepared for:

City of Watsonville
Department of Public Works and Utilities
250 Main Street
Watsonville, California 95076

Prepared by:

Harris & Associates

1401 Willow Pass Road, Suite 500
Concord, California 94520
(925) 827-4900
Contact: Eric Vaughan

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Chapter A Planning Process

A.1 Documentation of the planning process, including how it was prepared and who was involved in the process for each jurisdiction (Requirement Section 201.6[c][1])

a. Documentation of how the plan was prepared, including the schedule or time frame and activities that made up the plan's development as well as who was involved

The Local Hazard Mitigation Plan (LHMP) was developed by the City of Watsonville (City) and the Local Hazard Mitigation Plan Planning Committee (planning committee), with support from the Local Hazard Mitigation Plan Steering Committee (steering committee), other stakeholders, and the public. The City's Public Works and Utilities Department led the LHMP's development and established a process to develop a team of cross-agency and stakeholder representatives. Starting in September 2019, the City kicked off the planning process with a pre-planning meeting to identify stakeholders, invite steering and planning committee members, identify roles and responsibilities, propose future meeting dates, and begin to develop the public involvement process. The LHMP was developed through a series of planning committee and outreach meetings that were open to the public and designed to identify LHMP goals and objectives; identify hazards of concern; develop a public outreach strategy; identify critical facilities; perform and review risk and vulnerability assessment; develop mitigation actions; integrate Community Rating System (CRS) credits; and develop a plan for monitoring, maintenance, and evaluation. The planning committee also developed the LHMP with input from the steering committee, surveys, and public comment on the Draft LHMP. The first planning committee meeting was held on October 14, 2019, and the planning committee concluded with the ENTER MONTH AND DATE OF FINAL MEETING, 2020, meeting.

Table A-1 lists the date and time, type, and description of how the LHMP was developed by the planning committee, stakeholders, and the public through monthly meetings. Meeting participants are identified in Table A-2, and meeting sign-in sheets are included in Appendix A, organized by meeting date.

Table A-1. City of Watsonville Local Hazard Mitigation Plan Meetings

Date and Time	Type	Description
September 6, 2019, at 12:00 p.m.	LHMP Pre-Planning Meeting with the City	Identify planning committee members, schedule the public outreach meeting, and identify roles and responsibilities
October 1, 2019, at 1:30 p.m.	Public Outreach Meeting No. 1	Inform the public of the purpose of the LHMP, present the planning process, and invite the public to participate in the LHMP
October 14, 2019, at 9:00 a.m.	Planning Committee Meeting No. 1	Review the planning process, public outreach and involvement, NFIP and CRS, and the LHMP study area and identify hazards of concern

Table A-1. City of Watsonville Local Hazard Mitigation Plan Meetings

Date and Time	Type	Description
October 14, 2019, at 10:00 a.m.	Steering Committee Meeting No. 1	Introduce the LHMP and the planning process, steering committee function, and hazards of concern workshop
November 14, 2019, at 6:00 p.m.	Planning Committee Meeting No. 2	Confirm hazards of concern, identify goals and objectives, develop public involvement strategy, review NFIP and CRS compliance, review critical facilities list, and review repetitive damage facilities
January 16, 2020, at 2:30 p.m.	Planning Committee Meeting No. 3	Review survey results; discuss hazards of concern and how climate change was incorporated into each hazard; evaluate the hazard analysis and risk assessment; review general impacts and vulnerabilities; review goals for mitigation actions; and review NFIP structures, repetitive damage, and mitigation actions
February 20, 2020, at 6:00 p.m.	Planning Committee Meeting No. 4	Review and revise goals; develop mitigation actions; review NFIP participation and continued compliance; discuss mitigation action prioritization, implementation, and administration; discuss integration of LHMP into other planning documents; review impacts, vulnerabilities, repetitive damage, and mitigation actions related to NFIP structures
March 19, 2020, at 2:30 p.m.	Planning Committee Meeting No. 5	Canceled due to the shelter-in-place and City shutdown as a result of COVID-19
March 24, 2020, at 1:00 p.m.	Steering Committee Meeting No. 2 (held virtually on teleconference due to Citywide shelter-in-place related to COVID-19)	Review mitigation actions, develop prioritization process and identify mitigation action time frame, department/agency, and potential funding sources
June 24, 2020, at 3:00 p.m.	Steering Committee Meeting	Developed plans to involve public during the LHMP's maintenance process. The Project Manager will reconvene the Planning Committee to monitor, evaluate, and update the LHMP Identified processes for updating the LHMP during the 5-year cycle and applying for grants. Reviewed existing authorities, policies, programs, and resources, and the ability to expand upon these resources. Mitigation action prioritization and how the LHMP can be integrated into other planning documents and mechanisms.
TBD	Planning Committee Meeting No. 6 (held virtually on teleconference due to Citywide shelter-in-place related to COVID-19)	Discussion and review of all inputs received from the public posting of the LHMP Public Review Draft.

Notes: City = City of Watsonville; CRS = Community Rating System; LHMP = Local Hazard Mitigation Plan; NFIP = National Flood Insurance Program

Table A-2 identifies the individuals who were involved in the LHMP's development, the agencies they represent, and their titles. Jackie McCloud, Senior Utilities Engineer in the City's Public Works and Utilities Department was the project manager. The City's Public Works and Utilities Department team developed the planning and steering committee structures, created the project timeline and assigned tasks, and facilitated the work of the planning team with the project consultant, Harris and Associates (Harris). Harris reviewed planning documents to ensure compliance with the California Office of Emergency Services (Cal OES) and Federal Emergency Management Agency (FEMA) requirements and supported the planning committee with modifying or enhancing information to use in the LHMP's development.

Planning committee members represent a large cross-section of agencies, including the City's Public Works and Utilities Department, City's Community Development, Santa Cruz County Flood Control and Water Conservation District, Pajaro Valley Water Management Agency (PVWMA), and City's Fire Department. Other participants included the Pajaro/Sunny Mesa Community Services District, Pajaro Valley Unified School District, and Watsonville City Council, among others. The "X" in Table A-3 identifies the meetings the individual committee members, stakeholders, or members of the public participated in. Planning committee members participated in the LHMP's development by performing the following:

- Providing input on the identification of hazards, impacts, and vulnerabilities
- Reviewing existing plans, technical reports, and studies
- Developing and prioritizing mitigation goals and actions
- Developing the monitoring, assessment, and updating plan
- Attending public meetings

The meeting agendas and sign-in sheets are included in Appendix A, organized by meeting date.

Table A-2. City of Watsonville Local Hazard Mitigation Plan Participants

First Name	Last Name	Agency	Title	Pre-Planning Meeting	Public Meeting Oct. 1, 2019	Steering Meeting Oct. 14, 2019	Planning Meeting Oct. 14, 2019	Planning Meeting Nov. 14, 2019	Planning Meeting Jan. 16, 2020	Steering Meeting Mar. 24, 2020
Austin	Robey	City	GIS Coordinator	—	X	—	X	X	X	X
Holly	Browne	City resident	—	—	—	—	X	—	—	—
Jonathan	Pilch	Watsonville Wetlands Watch	Executive Director	—	—	—	X	—	X	—
Harry	Durbin	City	Engineer	—	—	—	X	—	X	—
Judy	Vazquez-Varela	Pajaro/Sunny Mesa Community Services District	Operations Manager	—	—	—	X	X	X	—
Deborah	Muniz	City	Executive Assistant	—	—	—	X	X	X	X
Justin	Meek	City Community Development Department	Principal Planner	—	—	—	X	—	X	—
Rob	Allen	City Community Development Department	Building Official	—	—	—	X	—	X	—
Christopher	Gregorio	City	Assistant Engineer	X	X	X	X	—	X	—
Ruth	Gonzalez	Pajaro Valley Unified School District	Risk and Safety Manager	—	—	—	X	X	—	—
Jackie	McCloud	City	Senior Utilities Engineer	X	X	X	X	X	X	X
Tom	Sims	City Police Department	Assistant Chief	—	—	—	X	—	X	—
Amy	Cebada	City	Communications and Environmental Outreach Coordinator	—	—	—	X	—	X	—
Chris	Miranda	City	Neighborhood Services Department	—	X	—	—	—	X	—

Table A-2. City of Watsonville Local Hazard Mitigation Plan Participants

First Name	Last Name	Agency	Title	Pre-Planning Meeting	Public Meeting Oct. 1, 2019	Steering Meeting Oct. 14, 2019	Planning Meeting Oct. 14, 2019	Planning Meeting Nov. 14, 2019	Planning Meeting Jan. 16, 2020	Steering Meeting Mar. 24, 2020
Nancy	Faulstick	Regeneration Pajaro Valley	Executive Director	—	X	—	—	—	—	—
Barbara	Crum	City resident	—	—	X	—	—	—	—	—
Alfredo	Torres	Northern California AAA	Agent	—	X	—	—	X	—	—
Casey	Meusel	PVWMA	Associate Hydrologist	—	—	X	—	—	—	—
Tom	Avila	City Fire Department	Division Chief	—	—	X	—	X	X	—
Antonella	Gentile	Santa Cruz County Flood Control and Water Conservation District	Resource Planner	—	—	X	—	X	—	X
Michelle	Templeton	City Public Works and Utilities Department	Assistant Director	—	—	X	—	—	—	—
Justin	Meek	City Community Development Department	Principal Planner	—	—	X	—	—	X	X
Sonia	Ortiz	Community member	—	—	—	—	—	X	—	—
Maria	Vigil	Community member	—	—	—	—	—	X	—	—
Jesus	Vigil	Community member	—	—	—	—	—	X	—	—
Cristina	Vigil	Community member	—	—	—	—	—	X	—	—
Matilde	Martinez	Community member	—	—	—	—	—	X	—	—
Maria	Lopez	Community member	—	—	—	—	—	X	—	—
Maria	Guitierrez	Community member	—	—	—	—	—	X	—	—
Olga	Fuentes	Community member	—	—	—	—	—	X	—	—
Kate	Giberson	Community member	—	—	—	—	—	X	—	—
Rebecca	Garcia	Watsonville City Council	Council Member	—	—	—	—	—	X	—

Table A-2. City of Watsonville Local Hazard Mitigation Plan Participants

First Name	Last Name	Agency	Title	Pre-Planning Meeting	Public Meeting Oct. 1, 2019	Steering Meeting Oct. 14, 2019	Planning Meeting Oct. 14, 2019	Planning Meeting Nov. 14, 2019	Planning Meeting Jan. 16, 2020	Steering Meeting Mar. 24, 2020
Ariana	Garcia	Community Bridges	Senior Human Resources Analyst	—	—	—	—	—	X	—
Bill	Llewellyn	Harris	Project Manager	X	X	X	X	—	—	—
Wendy	Boemecke	Harris	Lead Planner	X	X	X	X	—	—	X
Carl	Walker	Harris	Senior Project Manager	X	X	X	X	—	—	—
Eric	Vaughan	Harris	Project Director	X	—	X	X	—	—	X
Alex	Yasbek	City	Senior Engineer	—	—	—	—	—	—	X
Cristy	Cassel-Shimabukuro	City	Conservation Program Manager	—	—	—	—	—	—	X
Marcus	Mendiola	PVWMA	Water Conservation and Outreach Specialist	—	—	—	—	—	—	X

Notes: City = City of Watsonville; GIS = geographic information system; Harris = Harris & Associates; LHMP = Local Hazard Mitigation Plan; PVWMA = Pajaro Valley Water Management Agency

b. List of the jurisdiction(s) participating in the plan that are seeking approval

The City's LHMP is a single, local jurisdiction plan and, therefore, does not include other participating jurisdictions. Table A-2 identifies those who participated in the LHMP, ranging from City representatives to stakeholders, regional organizations, and community members.

c. Identification of who represented each jurisdiction (At a minimum, it must identify the jurisdiction represented and the person's position or title and agency within the jurisdiction.)

The City's LHMP is a single, local jurisdiction plan and, therefore, does not include other participating jurisdictions. While stakeholders from other agencies or jurisdictions were invited to participate in the planning committee or public outreach meetings, they were not involved in the LHMP's development as participating jurisdictions with a separate annex in the LHMP. The City's Public Works and Utilities Department was the lead agency and managed the LHMP's development. Table A-2 identifies the City departments, community members, stakeholders, and community organizations with their titles that served on the planning committee, attended the planning committee meetings, or contributed to the development of the LHMP. Meeting notes and agendas are attached in Appendix A.

The planning committee and steering committee members representing the City and external stakeholder agencies are listed in Table A-3.

Table A-3. Planning Committee Members

Name	Title
Planning Committee	
Christopher Gregorio	City, Public Works Engineer – Elevation
Christy Cassel-Shimabukuro	City, Conservation Program Manager and Public Outreach – Climate Action Planning
Jackie McCloud	City, Senior Utilities Engineer – Structure Flood Control
Rob Allen	City, Building Official – Building Code, Planning Department
Tom Sims	City, Assistant Police Chief – Emergency Services
Jonathan Pilch or representative	Watsonville Wetlands Watch
Judy Vazquez-Varela	Pajaro/Sunny Mesa Community Services District, Operations Manager
Ruth Gonzalez	Pajaro Valley Unified School District
Steering Committee	
Ivan Carmona or representative	City, Planning Department
Jackie McCloud	City, Senior Utilities Engineer – Structure Flood Control
Justin Meek	City, Planner – Planning Department
Michelle Templeton	City, Public Outreach – Climate Action Planning
Rudy Lopez or representative	City, Fire Chief – Fire Department

Table A-3. Planning Committee Members

Name	Title
Antonella Gentile	County of Santa Cruz, Resource Planner – Floodplain Management
Brian Lockwood or representative	PVWMA

Notes: City = City of Watsonville; PVWMA = Pajaro Valley Water Management Agency

A.2 Documentation of an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process (Requirement Section 201.6[b][2])

a. Documentation of an opportunity for neighboring communities, local, and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development, as well as other interested parties to be involved in the planning process

Members from neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies with authority to regulate development were invited to participate in and attend the planning committee and steering committee meetings and public outreach meetings. The City project manager emailed invitations to prospective planning and steering committee members, and information about public outreach meetings was posted on the City's website and social media, announced in the community newsletter, and posted on bulletin boards around City Hall. Copies of the invitations, steering and planning committee members, and online and bulletin posts are included in Appendix A. The first planning and steering committee meetings were held on October 14, 2019. The first public outreach meeting was held on October 1, 2019. Neighboring communities and agencies were invited to attend the outreach meetings and planning committee meetings because both were open to the public. The dates and topics of the planning and steering committee and public outreach meetings are in Table A-1. Meetings and public outreach concluded on END DATE HERE, TBD.

Throughout the course of the planning committee and public meetings, attendees from neighboring communities, local and regional hazard mitigation agencies, development agencies, and other interest groups contributed to the LHMP's development. Meeting participants discussed and provided input on the LHMP's goals and objectives, hazards of concerns, risk assessment, critical infrastructure and facilities, impacts and vulnerabilities, mitigation actions, and evaluation. In addition to providing in-person input during the meetings, participation from these groups was encouraged through paper and online surveys to identify hazards of concerned and vulnerabilities. Copies of the invitations and posts advertising the meetings and the sign-in sheets and surveys are included in Appendix A.

b. Identification of how the stakeholders were invited to participate in the process

The City project manager sent invitations to stakeholders, inviting them to participate in the planning process as a member of the planning committee. The invitations to join the planning committee was sent on Thursday, September 19, 2019, and the first meeting was held on Monday, October 14, 2019. The dates and topics of the planning committee meetings are in Table A-1. Participants were invited to develop the LHMP through five additional meetings held throughout the planning process time frame. Stakeholders invited to participate in the LHMP's development included representatives from the City, Pajaro Valley Unified School District, County of Monterey, County of Santa Cruz, Pajaro/Sunny Mesa Community Services District, Watsonville Wetlands Watch, and Cabrillo College. Stakeholders participated in the LHMP's development by identifying and reviewing hazard mitigation goals and objectives; hazards of concern; risks and vulnerabilities; critical infrastructure and facilities; mitigation actions; and the process for monitoring, updating, and evaluating the LHMP. Copies of the invitations, meeting agendas, materials, and sign-in sheets are included in Appendix A, organized by meeting date.

A.3 Documentation of how the public was involved in the planning process during the drafting stage (Requirement Section 201.6[b][1])

a. Documentation of how the public was given the opportunity to be involved in the planning process

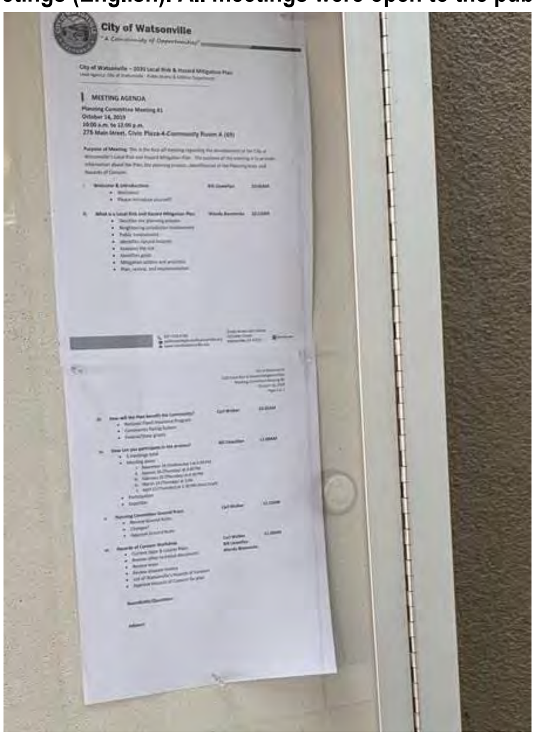
The public was invited to participate in the planning process through specific public outreach meetings, surveys, and planning committee meetings. The planning committee meetings were open to the public, and through these meetings, the public was encouraged to participate in the identification and review of mitigation goals; hazards and vulnerabilities; impacts; mitigation strategies and actions; and the process for updating, monitoring, and evaluating the LHMP. The City's Neighborhood Services Division Manager performed outreach with the Latino community to invite them to participate in the meetings. In addition, interpretation was available at every meeting and meeting materials were translated in Spanish.

The meeting dates and information about the public outreach meetings were posted outside City Hall, posted on the City's website in English and Spanish, announced in the City's community newsletter, and posted to social media, including Facebook. The first public outreach meeting was held on October 1, 2019. The dates and topics of the planning committee meetings are in Table A-1. Copies of the announcements are included in Appendix A.

In addition to participating in the planning committee meetings, the public was also encouraged to complete paper and online surveys about hazards, disaster preparedness, and their perceived risk to natural hazards. Invitations, meeting announcements, photographs, and copies of the surveys are in Appendix A, with a few copies included below for reference.

Photograph 1: Facebook Post of Planning Committee meetings (English). All meetings were open to the public.

Photograph 2: Facebook Post of Planning Committee meetings (Spanish). All meetings were open to the public.



Photograph 3: October 1, 2019, Public outreach meeting agenda posted outside at City Hall.

Photograph 4: Photo of first public outreach meeting from October 1, 2019.

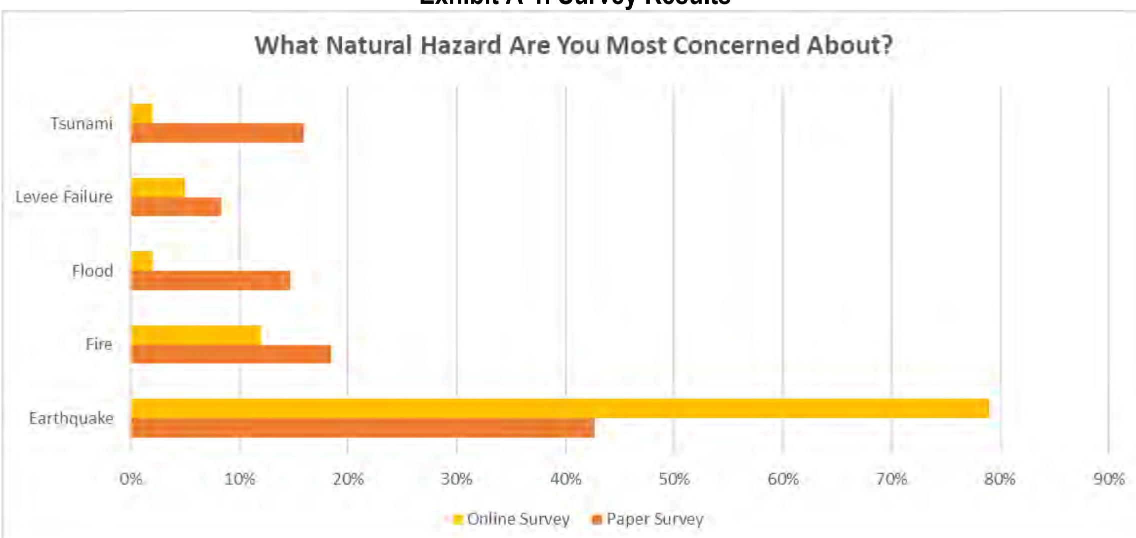
Photograph 5: Photo of Planning Committee Meeting from October 14, 2019.

b. Documentation of how the public's feedback was incorporated into the plan

The public's feedback was incorporated into the LHMP through the planning committee meetings, public outreach, and surveys. Participants in the planning committee and public outreach meetings developed goals and objectives, identified and prioritized hazards, assessed vulnerabilities, identified critical infrastructure, and developed mitigation actions.

The survey consisted of eight questions, ranging from self-assessed level of disaster preparedness, hazard risk prioritization, and perceived vulnerabilities to hazards. One way the planning committee incorporated public input was by considering the prioritized hazards identified in the survey. The majority of survey respondents identified earthquake as the risk they were most concerned about (see Exhibit 1). This feedback was incorporated into the planning committee's hazard identification, risk and vulnerability assessment, critical facilities, and development and prioritization of mitigation actions. Copies of the survey questions and results are attached in Appendix A.

Exhibit A-1. Survey Results



In addition to providing input through the surveys, members of the public were active participants in the development of the LHMP. During the planning meetings and public outreach, attendees participated in the identification and discussion of goals and objectives, hazards of concern, critical infrastructure and facilities, impacts and vulnerabilities, and mitigation actions. Specifically, participants reviewed the 2018 California State Hazard Mitigation Plan to identify relevant goals, discussed and ranked goals relevant to the Watsonville area, identified and categorized critical facilities, identified impacts and determined vulnerabilities, and developed mitigation actions with the planning committee. Spanish translations were provided to ensure accessibility and participation for the City's Spanish-speaking population. The Draft LHMP was reviewed during the final planning committee meeting and was made available to the public for review and comment. Public comments were incorporated where feasible. In addition, the LHMP is now posted on the City's website for the public to review and participate in the annual plan maintenance, monitoring, and evaluation meetings.

A.4 Description of the review and incorporation of existing plans, studies, reports, and technical information (Requirement Section 201.6[b][3])

The planning committee reviewed existing plans, studies, reports, and technical information from a variety of local, county, regional, and state sources (Table A-4).

Table A-4. Existing Plans, Studies, and Reports

No.	Document Name	Agency Department	Elements Review by Planning Committee
1	Watsonville VISTA 2030: City of Watsonville 2030 General Plan Draft, Chapter 13	City's Community Development Department	Hazards and critical facilities (flood, fire, airport)
2	City of Watsonville Climate Action Plan 2018 Progress Report	City's Community Development Department	Climate change risk (coastal land use plan, flood early warning system, erosion control standards, emergency response)
3	City of Watsonville Disaster Plan	City's Public Works and Utilities Department	Hazards and emergency response (earthquakes, flooding, dam failure, incident command system, emergency management)
4	Watsonville 2005 Coastal Zone Implementation Plan	City Clerk's Office as part of the City's Municipal Code	Critical infrastructure and planning area (coastal land use, protection of agriculture, environmentally sensitive habitat)
5	City of Watsonville Hazard Mitigation Plan (never submitted)	Fire Chief, City Manager, Planning	Hazard identification, risk assessment, mitigation actions (Post-Loma Prieta, damage assessment, Emergency Operations Center)
6	Figure 2.1, City of Watsonville Planning Area (from General Plan)	City's Community Development Department	Planning area boundary map
7	Figure 3.2, City of Watsonville Liquefaction Potential	City's Community Development Department	Hazard identification and assessment (liquefaction potential in and around planning area)
8	Figure 13.3, City of Watsonville Seismic Surface Rupture Potential	City's Community Development Department	Hazard identification and risk assessment (seismic surface rupture potential, fault zones)
9	Figure 13.4, City of Watsonville Local Flood and Slope Hazards (from General Plan)	City's Community Development Department	Hazard identification and risk assessment (flood zones, slope gradient, levees)
10	City of Watsonville Request for Proposals for Downtown Specific Plan	City's Community Development Department	Planning area (downtown specific plan, amendment for general plan, environmental impact report)
11	State of California Emergency Plan	Cal OES	Hazard identification and risk assessment (emergency/disaster response, hazards and vulnerabilities, emergency management operations)

Table A-4. Existing Plans, Studies, and Reports

No.	Document Name	Agency Department	Elements Review by Planning Committee
12	2018 California State Hazard Mitigation Plan, Chapter 6	Cal OES	Hazard identification and risk assessment (earthquakes and others)
13	2018 California State Hazard Mitigation Plan, Chapter 7	Cal OES	Hazard identification and risk assessment (flooding)
14	2018 California State Hazard Mitigation Plan, Chapter 8	Cal OES	Wildfire hazards
15	2018 California State Hazard Mitigation Plan, Chapter 9	Cal OES	Other hazards (drought, extreme weather, others)
16	Santa Cruz County Local Hazard Mitigation Plan	County of Santa Cruz	Goals, hazards, and mitigation actions

Notes: Cal OES = California Office of Emergency Services; City = City of Watsonville

In addition to reviewing existing studies, reports, and plans, the planning committee also reviewed technical information to identify hazards and critical facilities (Table A-5). To perform the risk and vulnerability assessment, the planning committee analyzed City parcel data and other data layers from the County of Santa Cruz GIS Department, U.S. Department of Conservation, U.S. Geological Survey, U.S. Census Bureau, FEMA, California Department of Forestry and Fire Protection, Cal-Adapt, and National Oceanic and Atmospheric Administration.

Table A-5. Technical Information

Source of Technical Information	Data
City	Parcel data
County of Santa Cruz GIS Department	Liquefaction potential, severity areas data
U.S. Department of Conservation	Landslide risk
U.S. Geological Survey	Earthquake risk
U.S. Census Bureau	Social vulnerability
FEMA	Flood risk
California Department of Forestry and Fire Protection	Wildfire risk
Cal-Adapt	Climate change data
National Oceanic and Atmospheric Administration	Sea-level rise risk

Notes: City = City of Watsonville; FEMA = Federal Emergency Management Agency; GIS = geographic information system

A.5 Discussion of how the community will continue public participation in the plan's maintenance process (Requirement Section 201.6[c][4][iii])

a. Description of how the jurisdiction will continue to seek public participation after the plan has been approved and during the plan's implementation, monitoring, and evaluation

The City will provide several opportunities for the public to continue to participate in the LHMP's maintenance process. The approved and adopted LHMP will be posted on the City's website with an email address that the public can use to send comments on the LHMP to the City. The City may also hold public meetings for annual review. During these annual review meetings, the public will be invited to attend and provide input on the LHMP and progress of the mitigation strategy.

A.6 Description of the method and schedule for keeping the plan current (monitoring, evaluating, and updating the mitigation plan within a 5-year cycle) (Requirement Section 201.6[c][4][i])

a. Identification of how, when, and by whom the plan will be monitored (how will implementation be tracked) over time

The City project manager will reconvene the planning committee on an annual basis where the LHMP will be monitored and evaluated by the entire planning committee. Yearly review of the LHMP is required for CRS compliance and will allow the planning committee to update the progress of the mitigation actions. During this review meeting, the planning committee will review the status of the mitigation actions identified in the mitigation strategy (attached in Chapter C, Mitigation Strategy, and in Appendix B). The planning committee will update the spreadsheet with the progress made for implementation of each action and reprioritize actions based on what has been completed at the time of the review. In addition, to continue compliance with CRS, the planning committee will produce a report to submit to the NFIP.

b. Identification of how, when, and by whom the plan will be evaluated (assessing the effectiveness of the plan at achieving stated purpose and goals) over time

The planning committee, led by the committee chair, will evaluate the effectiveness of the LHMP at achieving the stated purpose and goals during the same yearly meetings where the LHMP is monitored, which is scheduled to occur on an annual basis. During these monitoring and evaluation meetings, the planning committee will review the stated purpose, goals, and actions; solicit input from the community; update the progress of the mitigation strategy; and make any re-prioritizations. In addition to the yearly meetings, the mitigation strategy will be monitored and evaluated on an ongoing basis as identified mitigation actions are implemented and completed.

c. Identification of how, when, and by whom the plan will be updated during the 5-year cycle

d. The title of the individual or name of the department/agency responsible for leading each of these efforts

The City's Public Works and Utilities Department, which is the lead department responsible for the LHMP, will manage updating the LHMP every 5 years to maintain compliance with FEMA requirements. To prepare for LHMP updates, the City will begin applying for Hazard Mitigation Grant Program grants approximately 24–36 months prior to the LHMP's expiration date. This will ensure the City accesses the funding and creates a timeline necessary to update the LHMP, receive FEMA approval, and ensure adoption by City Council prior to the 5-year expiration date.

Chapter B Hazard Identification and Risk Assessment

Introduction

This Risk Assessment was developed in support of the City of Watsonville's (City's) 2020 Local Hazard Mitigation Plan (LHMP). The Risk Assessment includes (1) a description of the LHMP Planning Committee's hazard selection process, (2) hazard descriptions of selected primary and secondary hazards, (3) hazard profiles for primary hazards, and (4) a vulnerability assessment that includes a summary of the risk primary hazards pose to the City's built, social, and natural environment and a discussion of secondary hazards. These four sections address Element B requirements, which appear in the following Risk Assessment as headings B1–B3, described in the Federal Emergency Management (FEMA) LHMP Review Guide.

B.1 Description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)(Requirement §201.6(c)(2)(i))

b. The rationale for the omission of any natural hazards that are commonly recognized to affect the jurisdiction(s) planning area

Hazard Selection

The Federal Emergency Management Agency (FEMA) Local Mitigation Planning Handbook identifies specific hazards that communities should consider in their hazard mitigation plans. Communities may also consider including additional hazards not specified by FEMA. The City of Watsonville (City) Local Hazard Mitigation Plan (LHMP) Planning Committee (Committee) reviewed an extensive list of hazards and excluded those that either pose very low risk to the City or are human caused (with the exception of climate change, which is human-caused and exacerbates natural hazards). Table B-1 lists the hazards considered by the Committee and states whether each hazard was included in the 2013 California Multi-Hazard Mitigation Plan (Cal OES 2013) and the reason each hazard was included or excluded by the Committee.

Table B-1. Hazards Considered by the City of Watsonville Local Hazard Mitigation Plan Planning Committee

Hazard	Included in California SHMP?	Included in LHMP?	Reason for Inclusion/Exclusion
Agricultural Pest	Yes	No	This is not a natural hazard.
Climate Change	Yes	Yes	Climate change contributes to the frequency, intensity, and location of other hazards. It is treated as a stand-alone hazard and is discussed as a factor of other hazards.
Dam Inundation	Yes	No	After completing the Hazard Assessment as part of this Risk Assessment, the Committee determined the risk to the City was not significant enough to justify completing a risk

Table B-1. Hazards Considered by the City of Watsonville Local Hazard Mitigation Plan Planning Committee

Hazard	Included in California SHMP?	Included in LHMP?	Reason for Inclusion/Exclusion
			assessment. Dam inundation did not reach the City boundary.
Drought	Yes	Yes	Droughts are a recurring and potentially severe hazard that could significantly impact the City's agricultural economy.
Earthquake	Yes	Yes	The City is in a seismically active area and has been impacted by earthquakes in the past.
Extreme Heat	Yes	Yes	The City is projected to experience more intense and frequent extreme heat days as a result of climate change.
Flood	Yes	Yes	Floods occur occasionally in the City and pose a threat to people and property.
Groundwater Overdraft	No	Yes	Drought may result in groundwater overdraft, which would potentially exacerbate saltwater intrusion. The City is highly dependent on groundwater.
High Winds	No	Yes	Future occurrence are projected.
Landslide	Yes	Yes	Landslide hazards are identified in a few locations in the City. Slope failures are a potential risk to lives and property.
Levee Failure	Yes	Yes	The City has a major levee that could pose a significant risk to public safety if it fails.
Liquefaction	No	Yes	Because the City is in a coastal area in a seismically active zone, liquefaction could occur in the City.
PSPS	No	Yes	The City experienced a PSPS as a result of the 2019 wildfire risks. PSPS events are projected to occur in the future.
Sea-Level Rise	Yes	Yes	The City has low-lying coastal areas susceptible to sea-level rise.
Tsunami	Yes	No	After completing the Hazard Assessment as part of this Risk Assessment, the Committee determined the risk to the City was not significant enough to justify completing a risk assessment. Tsunami inundation did not reach the City boundary.
Wildfire	Yes	Yes	The City is in and around high wildfire severity areas.

Notes: City = City of Watsonville; Committee = Local Hazard Mitigation Plan Planning Committee; LHMP = Local Hazard Mitigation Plan; PSPS = Public Safety Power Shutoff; SHMP = State Hazard Mitigation Plan

Table B-2 shows the hazards included by recommendation of the Committee as either primary hazards or secondary hazards in this 2020 LHMP. Primary hazards are assessed fully with respect to FEMA guidelines and include a hazard profile and vulnerability assessment. Secondary hazards are significant hazards that may occur as a result of a primary hazard. Secondary hazards in Table B-2 are defined and discussed in the vulnerability assessment section of the LHMP under the corresponding primary hazard, with the exception of extreme heat and sea-level rise, which are given the same level of analysis as primary hazards. Secondary hazards that are bold in Table B-2 are hazards selected by the Committee but are analyzed only with respect to their corresponding primary hazard in the vulnerability assessment. Secondary hazards that are not bold are also primary hazards listed in Table B-2. No hazard is addressed more than once; however, there may be other secondary hazards for each primary hazard that are not listed in the Table B-2.

Table B-2. 2020 Local Hazard Mitigation Plan Hazards of Concern

Primary Hazard	Secondary Hazard
Climate Change	**Extreme Heat and Sea-Level Rise**
Dam Failure	Flood
Drought	**Groundwater Overdraft, Saltwater Intrusion,** Wildfire
Earthquake	Liquefaction, Landslide
Flood	Landslide
High Winds	**PSPS**, Wildfire
Landslide	NA
Liquefaction	NA
Tsunami	Flood
Wildfire	Flood, Landslide, PSPS

Notes: NA = not applicable; PSPS = Public Safety Power Shutoff

Bold = Hazards selected by the Committee that are addressed only with respect to their primary hazard in the vulnerability assessment.

[1] Climate change also exacerbates or otherwise affects climate-induced hazards, including flood, high winds, and wildfire.

[2] Includes flooding due to levee failure.

Table B-3 summarizes the Committee's ranking of the identified hazards. To start this process, the Committee analyzed the State's Hazard Mitigation Plan and Santa Cruz County's Local Hazard Mitigation Plan, and evaluated the applicability of the hazards to the local Watsonville context. The Committee completed the Hazard Worksheet, summarized as Table B-3, to identify, profile, and rate the occurrence probability of the identified hazards. The Committee ranked the hazards of concern by the likelihood of the hazard occurring in the future and is described as "highly likely" occurring every 1-10 years, "likely" as occurring every 10-50 years, and "unlikely" as occurring at intervals greater than 50 years.

The primary hazards identified in Table B-2 are profiled in more detail in Section B.2.

Table B-3. 2020 Local Hazard Mitigation Plan Ranking of Hazards of Concern

Primary/Secondary Hazard	Ranking
Climate Change	Highly likely
Dam Failure	Likely
Drought	Unlikely
Earthquake	Likely
Flood	Highly likely
High Winds	Likely
Landslide	Likely
Liquefaction	Likely
Tsunami	Unlikely
Wildfire	Highly likely

a. A description of the natural hazards that can affect the jurisdiction(s) in the planning area

Hazard Description

A brief description of each natural hazard that could negatively impact the City is provided below:

- **Climate Change.** Climate change is the long-term alteration of temperature and typical weather patterns due to global increases in greenhouse gas emissions. While climate change primarily exacerbates existing hazards, it can also result in new hazards that communities have not historically experienced. Extreme heat and sea-level rise, as follows, are new hazards due to climate change that have not previously threatened the City but may pose a risk in the future:
  - **Extreme Heat.** Extreme heat can be defined by average, minimum, and maximum daily temperatures or by nighttime temperatures. There is no standard method for defining an extreme heat event. However, there are dependent relationships between temperature, illness, and mortality across different regions and seasons; these relationships vary based on average temperatures in those locations and the timing of the heat events. Therefore, it is more useful to define temperature extremes in a given locality by reference to local average temperatures rather than an absolute temperature.

    An extreme heat day is defined in this assessment by temperatures exceeding the 98th percentile of maximum temperatures based on daily temperature maximum data between 1961 and 1990. For the City, the extreme heat day threshold is 90.1 degrees Fahrenheit (°F) (Cal-Adapt 2020). It is important to note that extreme heat events do not include days when the humidity affects the perceived temperature because humidity can make the air feel hotter than it actually is.

Extreme heat primarily threatens human lives. Even temperatures as low as 80°F can cause fatigue after prolonged exposure, and heat exhaustion may follow. When a person's internal temperature reaches 105°F, organ failure and even death can result. Heat also intensifies the number of photochemical reactions that produce smog, fine particulates (particulate matter less than 2.5 microns in diameter), ground-level ozone pollution, and other respiratory irritants that can contribute and exacerbate respiratory disease and result in more asthma and heart attacks. People at risk are the elderly, outdoor laborers, and transient populations.

  - **Sea-Level Rise.** Sea-level rise is the increase in the height of the ocean's surface. Land subsidence, regional ocean currents, erosion, topography, and other regionally specific factors can change sea-level heights relative to land. Sea-level rise can occur temporarily with a storm surge or gradually as part of a global rise in sea level caused by melting glaciers and ice sheets. During a storm surge, strong winds push water ashore and raise the height of the sea above the normal astronomical tide.

    Global sea-level rise is a gradual, long-term trend caused by rising atmospheric and ocean temperatures. Melting glaciers and ice sheets release large volumes of water into the ocean. Warmer temperatures also cause ocean water to expand. These processes raise the global mean sea level, which represents the height of the ocean irrespective of its relative heights to land.

- **Dam Failure.** When a dam fails, the energy of the water is capable of causing destructive flooding downstream, potentially resulting in loss of life or serious property damage. Potential flooding due to dam failure is a threat anywhere where water has been channeled, dammed, or otherwise harnessed.
- **Drought.** Drought is a period of dry weather that continues long enough to cause water supply shortages, crop damage, or other impacts. While droughts are not unusual, they are unpredictable and vary in severity. Droughts can be measured by a lack of rainfall over time, low soil moisture levels, or low groundwater levels. The primary impact of a drought is reduced local water supplies for residential use and irrigation. While the City is not significantly vulnerable to drought, due to its primary reliance on groundwater, extreme dry periods would impact the City. A severe drought could impact the agricultural in the region, which could, in turn, have economic impacts on the City.
  - **Groundwater Overdraft.** Groundwater overdraft occurs when groundwater use exceeds the amount of recharge into an aquifer, which leads to a decline in groundwater level. The accelerated rate of decline in groundwater levels across California results from overdraft and low rates of natural recharge and is exacerbated by droughts.

- **Saltwater intrusion.** Saltwater intrusion can occur in coastal groundwater basins, where over-pumping of groundwater aquifers and sea-level rise can cause seawater to drain into aquifers and contaminate the water supply.

- **Earthquake.** An earthquake is the sudden, rapid shaking of Earth's surface caused by the slip of tectonic plates across a fault line. The location below Earth's surface where the earthquake starts is called the hypocenter, and the location directly above it on Earth's surface is called the epicenter (USGS 2020a). The tectonic plates of Earth's crust, while constantly moving and generating energy, are held in place by friction. When stress overcomes the friction of two adjacent plates, the plates fracture, releasing rock and the accumulated energy. The waves of energy travel throughout Earth's crust, causing the vibrations or shaking typically felt during an earthquake.
- **Flood.** A flood occurs when a waterway receives a discharge greater than its conveyance capacity. Floods may result from intense rainfall, localized drainage problems, tsunamis, or failed flood control or water supply structures such as levees, dams, or reservoirs. Floodwaters can carry large objects downstream with a force strong enough to destroy stationary structures such as residences, bridges, and utility infrastructure. Floodwaters also saturate materials and soil. As a result, structures may be destroyed or become unstable. Severe flooding may result in loss of life. The City is threatened by three distinct types of flooding, as follows:
  1. **Localized or Flash Flooding.** Floods can be local, short-lived events that happen suddenly, sometimes with little or no warning. Localized flooding is caused by intense storms that produce more runoff than an area can absorb or a stream can carry in its normal channel. Small streams are subject to flash floods (very rapid increases in runoff), which may last anywhere from a few minutes to a few hours. Flooding of larger streams usually last anywhere from several hours to a few days. A series of storms may keep a river above flood stage (the water level at which a river overflows its banks) for several weeks. In urban and developed areas, street drains clogged with leaves or other debris may not drain correctly and cause localized flooding from a heavy downpour. Additionally, power outages associated with intense storms, can shut down drainage pumps, allowing water to back up and potentially flood residential areas.
  2. **Slow-Rise Flooding.** Heavy and continuous rains may develop into the gradual rise of streams and rivers, resulting in slow-rise flooding. When slow-rise flooding occurs, rain falls at a rate that maximizes outflows from upstream dams and heavy inflow from tributary streams, increasing stress on the levee system and possibly beyond its capabilities.
  3. **Levee Failure.** Levee failure can be caused by overtopping, breach, or erosion. Levees can be damaged by water saturation (boils), overtopping, erosion, land

subsidence, earthquake, burrowing animals, or lack of maintenance. Overtopping occurs when floodwaters exceed the height of a levee. When overtopping occurs, water passing over the levee can erode the structure, worsening the flooding and potentially causing an opening or breach in the levee through which floodwaters can pass. A breach can occur gradually or suddenly. The most dangerous and damaging breaches happen quickly during high water periods. The ensuing water surge can flood a large area behind the failed levee with little to no warning.

- **High Winds.** Wind is the movement of air caused by differences in atmospheric pressure. Wind flows from areas of higher pressure to areas of lower pressure. The steeper the difference in air pressure, the stronger the wind. The typical threshold for wind speeds that are strong enough to be dangerous is 50 miles per hour, although wind damage can be possible at lower speeds. High winds may directly damage structures, create airborne debris, and topple large trees and branches. Flying debris in strong winds is dangerous to public safety.
- **Public Safety Power Shutoff (PSPS).** During gusty winds and dry weather conditions, utility companies may opt to turn off electricity to customers in order to reduce fire risk. While no single factor will automatically initiate a PSPS, some factors include a National Weather Service Red Flag Warning, low humidity levels, forecasted sustained winds above 25mph and wind gusts in excess of 45mph, and the condition of dry fuel or vegetation on the ground. Outages could last several days.
- **Liquefaction.** Liquefaction is a process that occurs when the force of an earthquake causes loosely packed sediment to lose strength and behave like a liquid. Areas with a shallow groundwater table (e.g., along the coast or near bodies of water) are at higher risk of liquefaction.
- **Landslide.** Landslides occur when the soils on a hillside become unstable and slide down toward the base of the slope. The movement can damage or destroy structures built on that soil and objects in the path of the landslide. Landslides are often induced either by earthquakes or by excessive moisture in the ground. Earthquake-induced landslides occur when ground shaking or liquefaction loosens the soil or when ground shaking or fault rupture fractures the rocks that make up a slope. In both instances, the earthquake creates enough instability in the slope that the ground begins to slide. Moisture-induced landslides occur when soil becomes waterlogged. If soil absorbs enough water, it can lose its stability and slide. Water can also erode the base of a slope, causing material farther up the hill to slide. A type of landslide called "lateral spreading" can occur in areas prone to liquefaction, when liquefied soils become fluid enough to slide down very minor slopes and spread out laterally at the base.
- **Tsunami.** A tsunami is a series of long waves typically generated by a shallow marine earthquake with a magnitude of 7.5 or greater. Most tsunamis originate in oceanic

subduction zones, where a sudden tectonic movement causes a large-scale disturbance to the ocean's surface, generating large waves that can travel hundreds of miles. As the wave approaches the shallow depths of the coast, it slows in speed but grows in height (as high as 100 feet).

- **Wildfire.** A wildfire is any uncontrolled fire occurring on undeveloped land that requires fire suppression. Wildfires most frequently occur in forests, rangelands, or crop fields and can be ignited by natural occurrence (e.g., lightning) or, more frequently, by human activity such as smoking, campfires, equipment use, and arson. Wildfires pose a high risk to the City's built environment and residential and biological communities.

c. Information on location, extent, previous occurrences, and future probability for each hazard

B.2 Information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))

a. The history of previous hazard events for each of the identified hazards

b. The probability of future events for each identified hazard

Previous Hazard Occurrences

Tables B-4 and B-5 list the federal- and state-designated hazards that have occurred previously in the City. The Stafford Disaster Relief and Emergency Act provides for two types of federal disaster declarations: emergency declarations and major disaster declarations. Both declarations authorize the president of the United States to provide supplemental federal disaster assistance. However, the two declaration types differ as follows.

Emergency declarations can be declared by the president for any occasion or instance in which federal assistance is needed. Emergency declarations supplement state, local, and Native American tribal government efforts to provide emergency services, such as the protection of lives and property, provision of public health and safety, and decrease or prevention of the threat of a catastrophe in any part of the United States. The total amount of assistance provided for a single emergency may not exceed $5 million without congressional approval.

Major disaster declarations can be declared by the president for any major disaster associated with a natural event, including hurricanes, tornados, storms, high water, wind-driven water, tidal waves, tsunamis, earthquakes, volcanic eruptions, landslides, mudslides, snowstorms, or droughts, or regardless of cause, a fire, flood, or explosion that the president determines has caused damage of such severity that it is beyond the combined capabilities of state and local governments to respond. A major disaster declaration provides a range of federal assistance programs for individuals and public infrastructure.

In addition to the previously mentioned federal disaster declarations, a **fire management assistance declaration** can be declared by the president when a state submits a request for assistance to the FEMA regional director at the time a "threat of major disaster" exists. Eligible firefighting costs may include expenses for field camps; equipment use, repair, and replacement; tools, materials, and supplies; and mobilization and demobilization activities.

Table B-4. Federal Emergency and Major Disaster Declarations – City of Watsonville

FEMA No.	Federal Declaration Date	Disaster Name	Incident Period
DR-845	10/18/1989	Loma Prieta Earthquake	10/17/1989–12/18/1989
DR-894	02/11/1991	Severe Freeze	NA
DR-1044	01/10/1995	1995 Winter Storms	01/03/1995–02/10/1995
DR-1046	03/12/1995	1995 Late Winter Storms	02/13/1995–04/19/1995
DR-1155	01/04/1997	Winter Storms	12/28/1996–04/01/1997
DR-1203	02/09/1998	El Nino 1998 Winter Storms	02/02/1998–04/30/1998
EM-3248	09/13/2005	Hurricane Katrina Evacuation	08/29/2005–03/01/2006
DR-1628	02/03/2006	2005/06 Winter Storms	12/17/2005–01/03/2006
DR-1646	06/05/2006	2006 Spring Storms	03/29/2006–04/16/2006
FM-2766	05/22/2008	Summit Fire	05/22/2008–05/28/2008
FM-2772	06/11/2008	Martin Fire	06/11/2008–06/17/2008
EM-3287	06/28/2008	2008 Mid-Year California Fires	06/20/2008–08/20/2008
DR-4301	02/14/2017	January 2017 Storms	01/03/2017–01/12/2017
DR-4305	03/16/2017	Late January 2017 Storms	01/18/2017–01/23/2017
DR-4308	04/01/2017	February 2017 Storms	02/01/2017–02/23/2017

Source: OHP 2020.

Notes: CDAA = California Disaster Assistance Act; FEMA = Federal Emergency Management Agency; NA = not applicable

At the state level, the California Disaster Assistance Act authorizes the director of the California Governor's Office of Emergency Services to administer a disaster assistance program that provides financial assistance from the state for costs incurred by local governments as a result of a disaster event. The program also provides for the reimbursement of local government costs associated with certain emergency activities taken in response to a state of emergency proclaimed by the governor.

Table B-5. California Disaster Declarations – City of Watsonville

CDAA No.	Local Proclamation	Director's Concurrence	Governor's Proclamation	Disaster Name	Incident Period
95-01	Various	NA	Varies from 01/09/1995 to 02/17/1995	1995 Winter Storms (Northern California)	01/03/1995–02/10/1995
95-03	Various	NA	Varies from 03/12/1995 to 03/24/1995	1995 Late Winter Storms (Northern California)	02/13/1995–04/19/1995
96-01	Various	NA	01/02/1996	Torrential Winds and Rain	12/11/1995–12/13/1995
96-07	12/10/1996	12/27/1996	NA	Flooding and Falling Trees	12/10/1996–12/16/1996
97-01	Various	NA	Varies from 01/02/1997 to 01/31/1997	Winter Storms	12/28/1996–04/01/1997
98-01	Various	NA	Varies from 02/04/1998 to 05/15/1998	El Nino 1998 Winter Storms	02/02/1998–08/07/1998
2006-01	Various	NA	01/02/2006 01/03/2006 01/12/2006	2005–2006 Winter Storms	12/17/2005–01/03/2006
2006-03	Various	NA	04/10/2006 04/13/2006 05/02/2006 06/05/2006	Spring Storms 2006	03/29/2006–04/16/2006
2008-02	Various	NA	05/22/2008 05/24/2008 06/11/2008 06/12/2008 06/23/2008 06/26/2008 06/30/2008 07/01/2008 07/03/2008 08/06/2008	2008 Mid-Year California Fires	05/22/2008–08/20/2008
2009-03	08/13/2009	NA	08/14/2009	Lockheed Fire	08/12/2009–08/23/2009
2009-13	10/20/2009	NA	11/20/2009	Santa Cruz County Storms	10/12/2009–10/14/2009
2011-02	Various	NA	03/11/2011	March 2011 California Tsunami	03/11/2011–03/13/2011
2016-02	03/15/2016	05/25/2016	NA	March 2016 Storms	03/05/2016–03/15/2016
2017-01	Various	NA	01/23/2017	January 2017 Storms	01/03/2017–01/12/2017

Table B-5. California Disaster Declarations – City of Watsonville

CDAA No.	Local Proclamation	Director's Concurrence	Governor's Proclamation	Disaster Name	Incident Period
2017-02	Various	NA	02/10/2017	Late January 2017 Storms	01/18/2017–01/23/2017
2017-03	Various	NA	03/07/2017	February 2017 Storms	02/01/2017–02/23/2017
2019-03	Various	NA	05/18/2019	Late February 2019 Storms	02/24/2019–03/08/2019

Source: OHP 2020.

Hazard Profile

The following hazard profiles describe the location and extent of hazards, notable previous occurrences, and likelihood of future occurrence.

Climate Change

Location and Extent

Though climate change is a global phenomenon, its impacts are felt locally. Furthermore, the effects of climate change are not limited by geographic borders.

Previous Occurrences

The planet has experienced climate change before. Earth's temperature has fluctuated throughout the planet's 4.5 billion-year history. Previous warming episodes were triggered by increases in how much sunlight reached Earth's surface due to small variations in Earth's orbit. Climate has changed on all time scales throughout Earth's history. Some aspects of the current climate change are not unusual; however, the concentration of carbon dioxide (CO_2) in the atmosphere has reached a record high relative to the amount in the past 0.5 million years and has done so at an exceptionally fast rate. Current global temperatures are warmer than they have been in at least the past five centuries (IPCC 2014).

Probability of Future Occurrence

Changes in global and California temperatures depends on the accumulation of CO_2 and other heat-trapping gases emitted from human activities into the atmosphere. The future emissions and resulting accumulation of greenhouse gases could take a range of pathways depending on the success or failure of international and local efforts to reduce greenhouse gas emissions. The climate projections in this assessment were taken from Cal-Adapt, a state-sponsored website that downscales global climate models to project climate impacts at the local level (6-kilometer resolution) (CEC 2020). The projections are based on the standardized climate change scenarios from the Intergovernmental Panel on Climate Change Representative Concentration Pathway (RCP) scenarios: the "mitigating" scenario (RCP 4.5) and the "business-as-usual" scenario (RCP

8.5). An RCP is a greenhouse gas concentration (emissions) trajectory. Under the RCP 4.5 scenario, emissions peak around mid-century at approximately 50 percent higher than 2000 levels and then decline rapidly over 30 years and stabilize at half of 2000 levels. Under the RCP 8.5 scenario, emissions continue to rise throughout the twenty-first century. The California Governor's Office of Planning and Research recommends that local agencies and jurisdictions use the RCP 8.5 scenario for planning out to 2050.

Secondary Hazards

Climate change will increase the intensity and frequency of some assessed hazards and is incorporated into the relevant sections of this assessment covering the probability of future occurrences in the City. Extreme heat and sea-level rise have not historically posed a risk to the City but may in the future due to climate change and are considered below as secondary hazards.

Extreme Heat

Location and Extent

Extreme heat events can occur anywhere in the City. No single part of the City is more prone to experiencing an extreme heat event than another. The severity of an extreme heat event is typically measured by how temperature and humidity combine to impact human health, as shown in the heat index chart developed by the National Weather Service (Exhibit B-1).

Exhibit B-1. NOAA's National Weather Service Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	126	130					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Source: NWS 2020.

Previous Occurrences

In September 2019, the National Weather Service issued a heat warning for 30 cities, including the City. Cal-Adapt records an average of 4 extreme heat days per year for the City between 1961 and 1990 (CEC 2020a). Historically, however, the City has not been at risk from extreme heat due to its proximity to the coast, which yields a mild year-round climate.

Probability of Future Occurrences

Heat waves in the City are likely to become more frequent in the future due to climate change (Table B-6).

Table B-6. Projected Number of Extreme Heat Days by Year

Scenario	Historical	RCP 8.5			RCP 4.5		
Time Frame	1961–1990	2011–2040	2041–2070	2070–2100	2011–2040	2041–2070	2070–2100
Count (No.)	4	6	9	17	NA	7	9

Source: CEC 2020.

Notes: NA = not applicable; RCP = Representative Concentration Pathway

Sea-Level Rise

Location and Extent

Sea-level rise directly threatens the unincorprated coastline of the County and the nearby Pajaro Dunes west of the City (Figure B-1, Sea-Level Rise Inundation Areas 1–6 Feet). The sea-level rise data used in this assessment were compiled by the National Oceanic Atmospheric Administration Office for Coastal Management (NOAA 2016). The data depict the potential inundation of coastal areas resulting from a projected 1- to 6-foot rise in sea level above current mean higher high water conditions. The model used to produce these projections does not account for erosion, subsidence, or any future changes in the area's hydrodynamics. It is a method to derive data to visualize the potential scale, not exact location, of inundation from sea-level rise. The Watsonville Slough may be inundated with 1 foot of sea-level rise. However, saltwater intrusion into the City's groundwater may occur before the 1 foot of sea-level rise.

Previous Occurrences

Since 1900, the global mean sea level has risen faster than during any comparable period in history. Sea-level rise rates prior to 1990 (approximately 1–2 millimeters per year) have since tripled to approximately 3 millimeters per year from 1993 to present (Dangendorf et al. 2017). Regional rates of sea-level rise are highly variable, depending on ocean and atmospheric circulation patterns and gravitational effects due to land-based ice mass changes, among other factors (NRC 2012). Historical sea-level rates along the Central Coast are consistently on the lower end of the global average but are documented by only a few tide gauges with relatively short records. On the Central Coast, water level gauges have measured a steady increase (1.57 millimeters per year) in the height of the ocean's surface since 1973. Since 1973, the Monterey tide gauge (the closest tide gauge to the City) has recorded an average sea-level rise rate of 1.39 millimeters per year (Langridge 2018).

Probability of Future Occurrences

The California Coastal Commission's 2018 Sea Level Rise Policy Guidance (CCC 2018) provides recommendations on how to address sea-level rise risks in local communities. The guidance is consistent with previous direction from the California Ocean Protection Council on sea-level rise scenarios to use in plannning and development of coastal communities. Specifically, the California Coastal Commission recommends that "all communities evaluate the impacts from the 'medium-high risk aversion' scenario" (CCC 2018). A city is risk averse if they have they prefer avoiding loss over making a gain; in the context of sea level rise planning, cities that are risk averse will consider and plan for the worst case scenario. Table B-7 identifies sea level rise projections by probability of occurrence and risk aversion scenarios (planning for lower probability projections is associated with higher risk aversion). As listed in Table B-7, local governments should also include the extreme risk aversion scenario to evaluate the vulnerability of planned or existing assets that would have little to no adaptive capacity, would be irreversibly destroyed or significantly costly to repair, or would have considerable public health, public safety, or environmental impacts should that level of sea-level rise occur.

Table B-7. Sea-Level Rise Projections for the City of Watsonville

Probabilistic Projections (in feet) (based on Kopp et al. 2014)								H++ Scenario (Sweet et al. 2017) *Single Scenario
		Median	Likely Range			1-in-20 Chance	1-in-200 Chance	
		50% Probability Sea-Level Rise Meets or Exceeds…	66% Probability Sea-Level Rise is Between…			5% Probability Sea-Level Rise Meets or Exceeds…	0.5% Probability Sea-Level Rise Meets or Exceeds…	
					Low Risk Aversion		Medium-High Risk Aversion	Extreme Risk Aversion
High Emissions	2030	0.4	0.3	–	0.5	0.6	0.8	1.0
	2040	0.6	0.5	–	0.8	1.0	1.3	1.8
	2050	0.9	0.6	–	1.1	1.4	1.9	2.7
Low Emissions	2060	1.0	0.6	–	1.3	1.6	2.4	3.9
High Emissions	2060	1.1	0.8	–	1.5	1.8	2.6	
Low Emissions	2070	1.1	0.8	–	1.5	1.9	3.1	5.2
High Emissions	2070	1.4	1.0	–	1.9	2.4	3.5	

Table B-7. Sea-Level Rise Projections for the City of Watsonville

Probabilistic Projections (in feet) (based on Kopp et al. 2014)									H++ Scenario (Sweet et al. 2017) *Single Scenario
		Median	Likely Range			1-in-20 Chance	1-in-200 Chance		
		50% Probability Sea-Level Rise Meets or Exceeds…	66% Probability Sea-Level Rise is Between…			5% Probability Sea-Level Rise Meets or Exceeds…	0.5% Probability Sea-Level Rise Meets or Exceeds…		
				Low Risk Aversion			Medium-High Risk Aversion	Extreme Risk Aversion	
Low Emissions	2080	1.3	0.9	–	1.8	2.3	3.9	6.6	
High Emissions	2080	1.7	1.2	–	2.4	3.0	4.5		
Low Emissions	2090	1.4	1.0	–	2.1	2.8	4.7	8.3	
High Emissions	2090	2.1	1.4	–	2.9	3.6	5.6		
Low Emissions	2100	1.6	1.0	–	2.4	3.2	5.7	10.2	
High Emissions	2100	2.5	1.6	–	3.4	4.4	6.9		

Source: OPC 2018.

Dam Failure

Location and Extent

The nearest dam facility to the City is Soda Lake, approximately 8 miles east of the City. Soda Lake is a storage facility for fine-grained materials, or “fines,” from the Wilson Quarry in the County of San Benito. Failure of the Soda Lake levees could potentially release fines and impact one or more nearby residences in the County and encroach on State Route 129. Due to the remote location of the lake, the City would not be affected by the dam failure hazard.

Previous Occurrences

The City has not experienced any dam failure.

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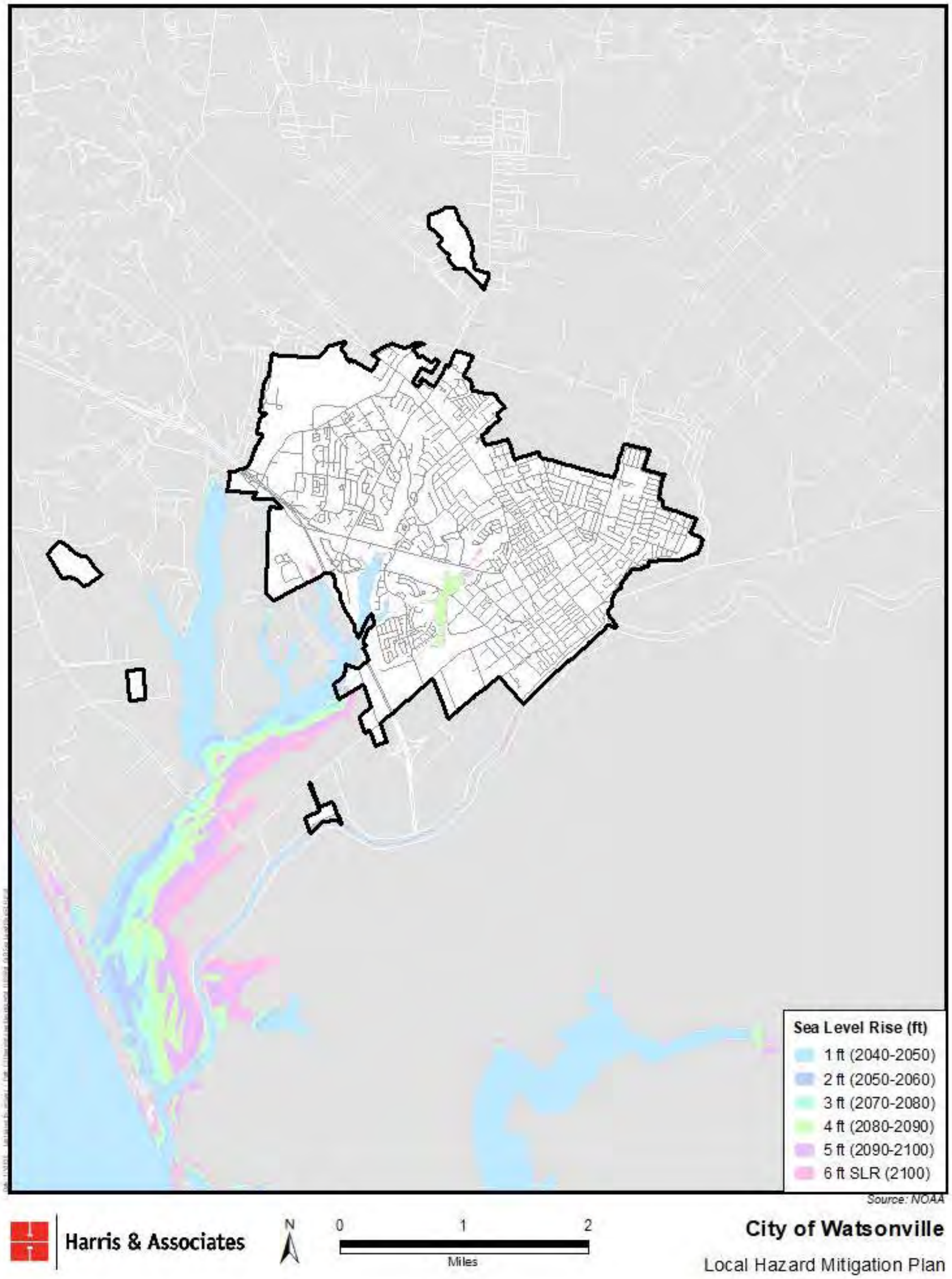
Figure B-1. Sea-Level Rise Inundation Areas 1–6 Feet



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Probability of Future Occurrences

Dam failure was considered in the LHMP hazard assessment but, due to the low probability of future occurrence determined by assessing the location and extent of the hazard, is not discussed further in the following vulnerability assessment.

Drought

Location and Extent

Droughts are regional in nature; therefore, all parts of the City face the same risk of experiencing a drought. There are several ways to measure drought conditions, although the most common is the U.S. Drought Monitor Classification Scheme. This scheme's rating system is a synthesis of multiple different scales into a descriptive index (Table B-8).

Table B-8. U.S. Drought Monitor Classification Scheme Rating System

Category	Description	Possible Impacts
D0[1]	Abnormally dry	Slower growth of crops and pastures.
D1	Moderate drought	Some damage to crops and pastures. Some water shortages may occur or may be imminent. Voluntary water use restrictions can be requested.
D2	Severe drought	Likely crop and pasture losses. Water shortages are common, and water restrictions can be imposed.
D3	Extreme drought	Major crop and pasture losses. Widespread water shortages and restrictions.
D4	Exceptional drought	Exceptional and widespread crop and pasture losses. Emergency water shortages develop.

Source: NDMC et al. 2019.

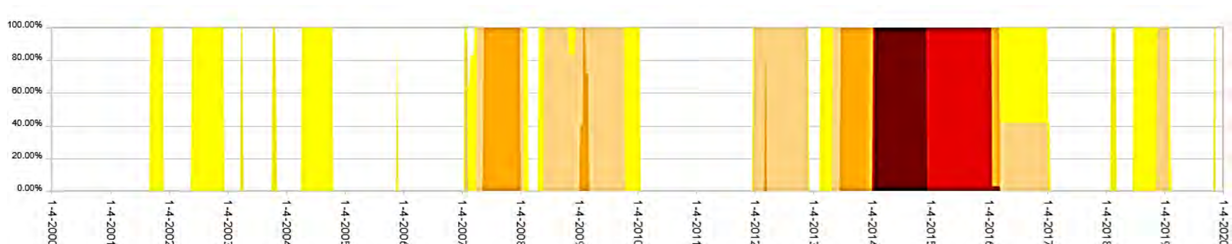
Notes:

[1] D0 areas are those under "drought watch" but not technically in a drought. They are potentially heading into drought conditions or recovering but not yet back to normal.

Previous Occurrences

The County has experienced three drought periods in recent history: from 1987 to 1992, 2007 to 2009, and most recently from 2014 to 2016. Exhibit B-2 portrays the frequency and intensity of drought events over the last 20 years (NDMC et al. 2019).

Exhibit B-2. Watsonville, CA Percent Area Experiencing Drought



Source: NDMC et al. 2019.

Probability of Future Occurrences

Based on previous occurrences, current climate outlook, and projected water demand, drought conditions will recur in the City as they will throughout the state. Climate change is anticipated to increase both the frequency and severity of future droughts. Changes in climate may reduce the amount of seasonal rainfall and may prolong the periods between wet years, both of which induce drought conditions. Furthermore, rising sea levels may increase the likelihood of saltwater intrusion in groundwater supplies, resulting in more severe impacts from future droughts. Overall, the City may be relatively unaffected by short-term droughts but may experience significant impacts by long-term droughts that affect groundwater supplies.

Earthquake

Location and Extent

California is seismically active because it sits on the boundary between two of Earth's tectonic plates: the North American plate and the Pacific plate. The San Andreas Fault is considered the boundary between the two plates. Most of the state, including the City, is on the North American plate. The relative rate of movement is approximately 2 inches (50.8 millimeters) per year.

The City lies between two major fault zones: the San Andreas to the north and east and the San Gregorio offshore to the west (Figure B-2, Major Faults Near the City of Watsonville). Other active or potentially active fault zones that could affect the City include the Zayante-Vergeles in Pajaro Valley and the Monterey Bay to the west.

Alquist-Priolo fault zones are state-designated high-risk earthquake zones that are in proximity to major earthquake faults. The Alquist-Priolo Earthquake Fault Zoning Act requires local jurisdictions to disclose their proximity to Alquist-Priolo fault zones. The City does not have Alquist-Priolo fault zones within the City limits, but fault zones exist on the outskirts of the City.

The two primary methods of measuring earthquakes are by magnitude and by intensity. Magnitude is a measurement of the size, or amount, of seismic energy released at the hypocenter of the earthquake and is based on the measurement of the maximum motion recorded on a seismograph. Seismographs measure vibrations as they travel through Earth's layers. Magnitude is the same number no matter the location or what the shaking feels like. Moderately sized earthquakes that can cause damage and threaten public safety are typically at least 6.5 or more in magnitude.

Intensity is a measure of the damage and shaking, which varies by location and distance from the fault rupture area. The intensity of seismic shaking is a result of the amount of energy released by the fault rupture, the length of the rupture, and the depth at which the rupture occurs (ruptures that occur closer to the surface cause greater shaking). The intensity scale is based on observed facts, including noticeable movement and shaking, damage, and destruction. The Modified Mercalli Intensity Scale is the intensity scale most commonly used and is detailed in Table B-9.

Figure B-2. Major Faults Near the City of Watsonville

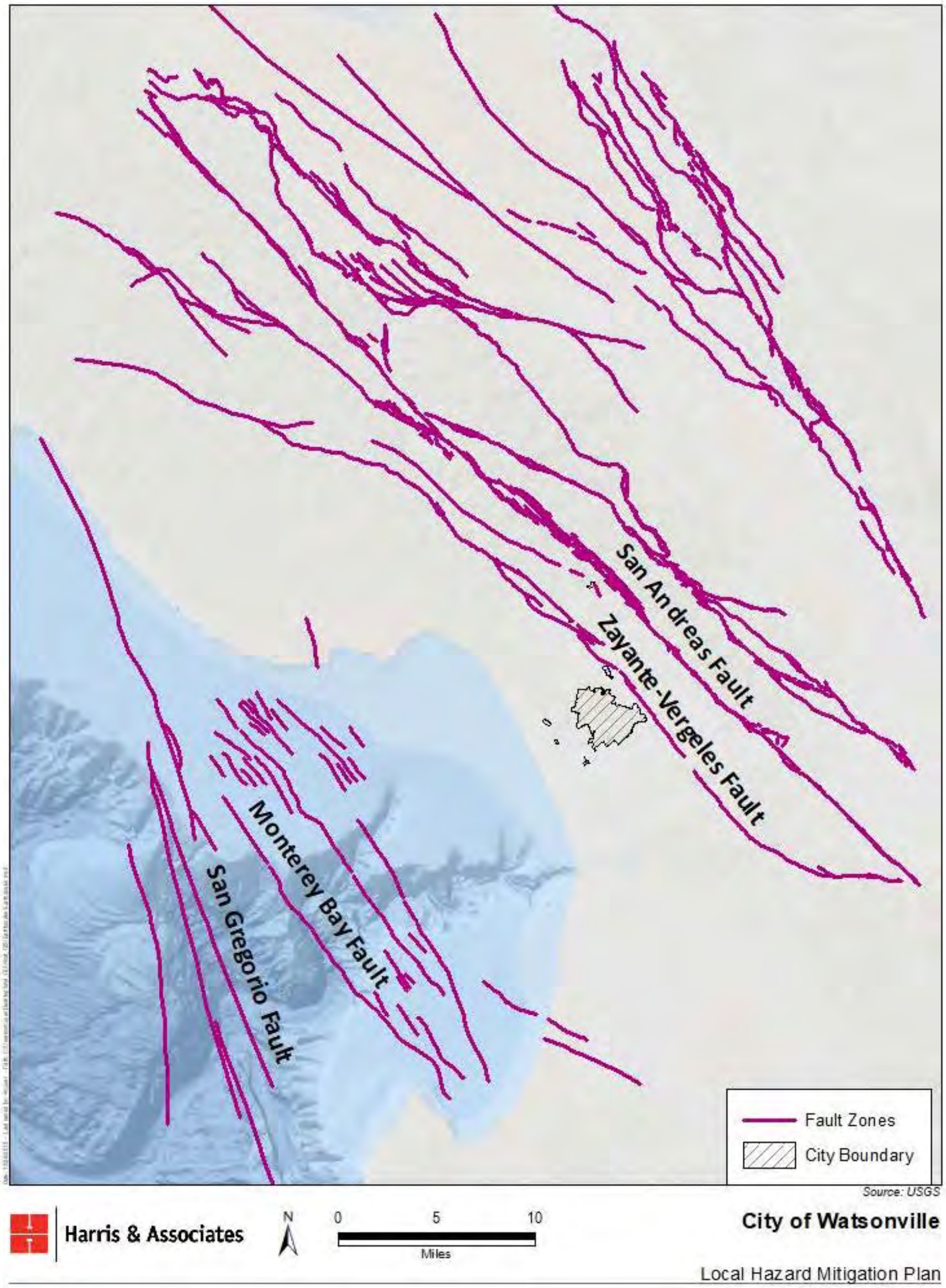


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Table B-9. Modified Mercalli Intensity Scale

Intensity	Shaking	Description
I	Not Felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone, many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very Strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Slight damage in well-built buildings, considerable damage and partial collapse in ordinary buildings, and great damage in poorly built buildings.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: USGS 2020b.

Damage due to ground shaking accounts for a significant amount of building losses in a typical earthquake. The ground movement can damage or destroy infrastructure on or under the ground surface, including roads, rail lines, utility lines, and pipes. This damage can result in the release of hazardous materials, such as wastewater, that may impact human and environmental health. Building damage can be both structural and non-structural (i.e., damage to building contents) and can cause injury or loss of life.

Previous Occurrences

While the City and greater County of Santa Cruz (County) have experienced numerous earthquakes, the Loma Prieta earthquake is the most recent notable earthquake, resulting in a major disaster declaration for the area. It struck the County and the greater San Francisco Bay region on October 17, 1989, registering as 6.9 magnitude (Table B-10). The epicenter was in the Santa Cruz Mountains along the San Andreas Fault, and the most intense shaking lasted for 20 seconds. The earthquake resulted in 63 deaths, 3,757 injuries, and $10 billion worth of damage and business interruption (DOC 2020).

Table B-10. Significant Earthquakes (6.0 + Magnitude) within 100 Miles of the City of Watsonville

Originating Location	Date	Magnitude
Santa Clara County	02/26/1864	6.1
Alameda County	03/05/1864	6.1
South of San José	10/08/1865	6.5
Southwest of Stockton	07/15/1866	6.0
Hayward	10/21/1868	6.8
Santa Cruz Mountains	03/26/1884	6.0
Central California	04/12/1885	6.2
San Francisco Bay Area	05/19/1889	6.0
Central California – Pajaro Gap	04/24/1890	6.0
Northern California	06/20/1897	6.2
Central California	03/03/1901	6.4
San Francisco Bay Area	04/18/1906	7.9
San Francisco Bay Area	07/01/1911	6.6
Offshore Central California	10/22/1926	6.3
Northwest of Cambria	11/22/1952	6.2
Central California	05/02/1983	6.7
Loma Prieta	10/18/1989	6.9
Central California	12/22/2003	6.5
South Napa	08/24/2014	6.0

Source: USGS 2020c.

Probability of Future Occurrences

Given the significant seismic activity in the City in the past, it is nearly certain that such activity will occur in the future. The U.S. Geological Survey models a 72 percent probability that an earthquake of magnitude 6.7 or greater will occur in the San Francisco Bay region before 2044. Although the timing of the next earthquake is impossible to predict, future earthquake hazards are inevitable due to the City's proximity to multiple fault lines. The U.S. Geological Survey has developed an earthquake forecast model, the Uniform California Earthquake Rupture Forecast (UCERF3), which provides a 30-year outlook from 2015 to 2045. The model forecasts that the northern San Andreas Fault has a lower likelihood of an earthquake compared to the southern San Andreas Fault partly because of the relatively recent 1906 earthquake on the northern fault. The Hayward-Rodgers Creek and Calaveras Faults are more likely to rupture than the northern San Andreas Fault given the time since the last earthquake. Table B-11 shows the probabilities for future earthquakes of 6.7+ magnitude originating from faults near the City.

Table B-11. UCERF3 Fault Rupture Probability

Fault	Probability (6.7+ Magnitude)
Monterey Bay –Tularcitos Subsection 9	0.85 percent
San Andreas (Santa Cruz Mountains)	13.99 percent
San Gregorio (South) Subsection 12	1.38 percent
Zayante-Vergeles Subsection 5	0.08 percent

Source: WGCEP 2020.

Flood

Location and Extent

The City is in portions of two major drainage basins: Pajaro River Basin and the Watsonville Slough watershed. The eastern and downtown areas of the City drain to the Pajaro River and its tributaries, Salsipuedes and Corralitos Creeks. The central and western areas of the City drain to the Watsonville Slough and its tributaries, Harkins Slough, Struve Slough, and West Struve Slough. The Pajaro River Basin covers approximately 1,300 square miles and spans the Counties of San Benito, Santa Clara, Santa Cruz, and Monterey. The Pajaro River, Salsipuedes Creek, and Corralitos Creek are channelized with levee improvements in the eastern and downtown areas of the City.

High-intensity storms occur most often from December through April, although they can occur as early as September and as late as May. Storms occurring early in the season are unlikely to result in excessive runoff because infiltration and surface storage capacities are high.

The following three primary contributors to flooding exist in the City (FEMA 2017):

- **Inadequate interior drainage.** This can create shallow flooding (less than 3 feet in depth) from accumulating surface runoff.
- **Overtopping of the Salsipuedes Creek or Pajaro River levees.** The U.S. Army Corps of Engineers has indicated that it is reasonable to assume that the Pajaro River levees would fail during a major storm (e.g., 100-year storm) when flows significantly exceed the channel capacity. The Salsipuedes Creek levees are more likely to remain intact during a 100-year storm because of the limited overflow volume and amount of time it is likely to be overflowing.
- **Overflow of Corralitos Creek upstream of the levees.** This can cause flooding in the eastern half of the City. Flow that overtops Corralitos Creek would be unable to re-enter downstream because of the levees.

Flood magnitude measurements reflect statistical averages only; it is possible for two or more rare floods (with a 100-year or higher recurrence interval) to occur within a short period. Assigning recurrence intervals to historical floods on different streams can help indicate the intensity of a storm over a large area. For example, the 1955 flood was determined to be a 27-year flood event on the Pajaro River and an 8.33-year flood event on Corralitos Creek.

The flood hazard areas in the City have been identified on the FEMA Flood Insurance Rate Map (FIRM) as Special Flood Hazard Areas (SFHAs). The SFHAs are labeled as Zone A, Zone AO, Zone AH, and Zone AE (Zone AE is used on new and revised maps in place of Zones A1–A30) on the FIRM. Moderate flood hazard areas, labeled as Zone X (shaded), are the areas between the limits of the 1 percent annual chance (or 100-year) flood and the 0.2 percent annual chance (or 500-year) flood. The areas of minimal flood hazard that are outside of the SFHA and higher than the elevation of the 0.2 percent annual chance flood are labeled Zone X (unshaded). Table B-12 contains an explanation of each of these zones. Figures B-3, City of Watsonville Flood Zones, and B-4, City of Watsonville 100-Yr Flood Zone Depth, shows the flood zones in the City, and Figure B-5, Levee Failure Inundation Area, shows the levee failure inundation area.

Table B-12. Flood Zones in the City of Watsonville

Zone	Description
A	Areas subject to a 1 percent or greater annual chance of flooding in any given year. Because detailed hydraulic analyses have not been performed on these areas, no base flood elevations are shown.
AO	Areas subject to a 1 percent or greater annual chance of shallow flooding in any given year. Flooding is usually in the form of sheet flow with average depths between 1 and 3 feet. Average flood depths are shown as derived from detailed hydraulic analyses.
AH	Areas subject to a 1 percent or greater annual chance of shallow flooding in any given year. Flooding is usually in the form of ponding with average depths between 1 and 3 feet. Base flood elevations are shown as derived from detailed hydraulic analyses.
AE, A1–A30	Areas subject to a 1 percent or greater annual chance of flooding in any given year. Base flood elevations are shown as derived from detailed hydraulic analyses (Zone AE is used on new and revised maps in place of Zones A1-A30).
X (shaded)	Areas of moderate flood hazard from the principal source of flood in the area determined to be within the limits of 1 percent and 0.2 percent annual chance floodplain.
X (unshaded)	Areas of minimal flood hazard from the principal source of flood in the area and determined to be outside the 0.2 percent annual chance floodplain.

Source: SNMAPMOD 2020.

Previous Occurrences

According to the Pajaro River Flood Risk Management General Reevaluation Report and Integrated Environmental Assessment (USACE 2017), in 1955, 1958, 1995, and 1998, major floods on the Pajaro River and its tributaries occurred that resulted in significant flooding caused by overtopping or breaching of the levees. The 1955 and 1958 storms resulted in the two largest floods on record for the Pajaro River. The associated discharges for these events were 24,000 cubic feet per second and 23,500 cubic feet per second, respectively, at the Chittenden Road gauge. The estimated recurrence intervals for floods of these magnitudes are 27 years and 26 years, respectively. In comparison, the estimated discharge at the Chittenden Road gauge for a 100-year flood is 43,000 cubic feet per second.

Figure B-3. City of Watsonville Flood Zones

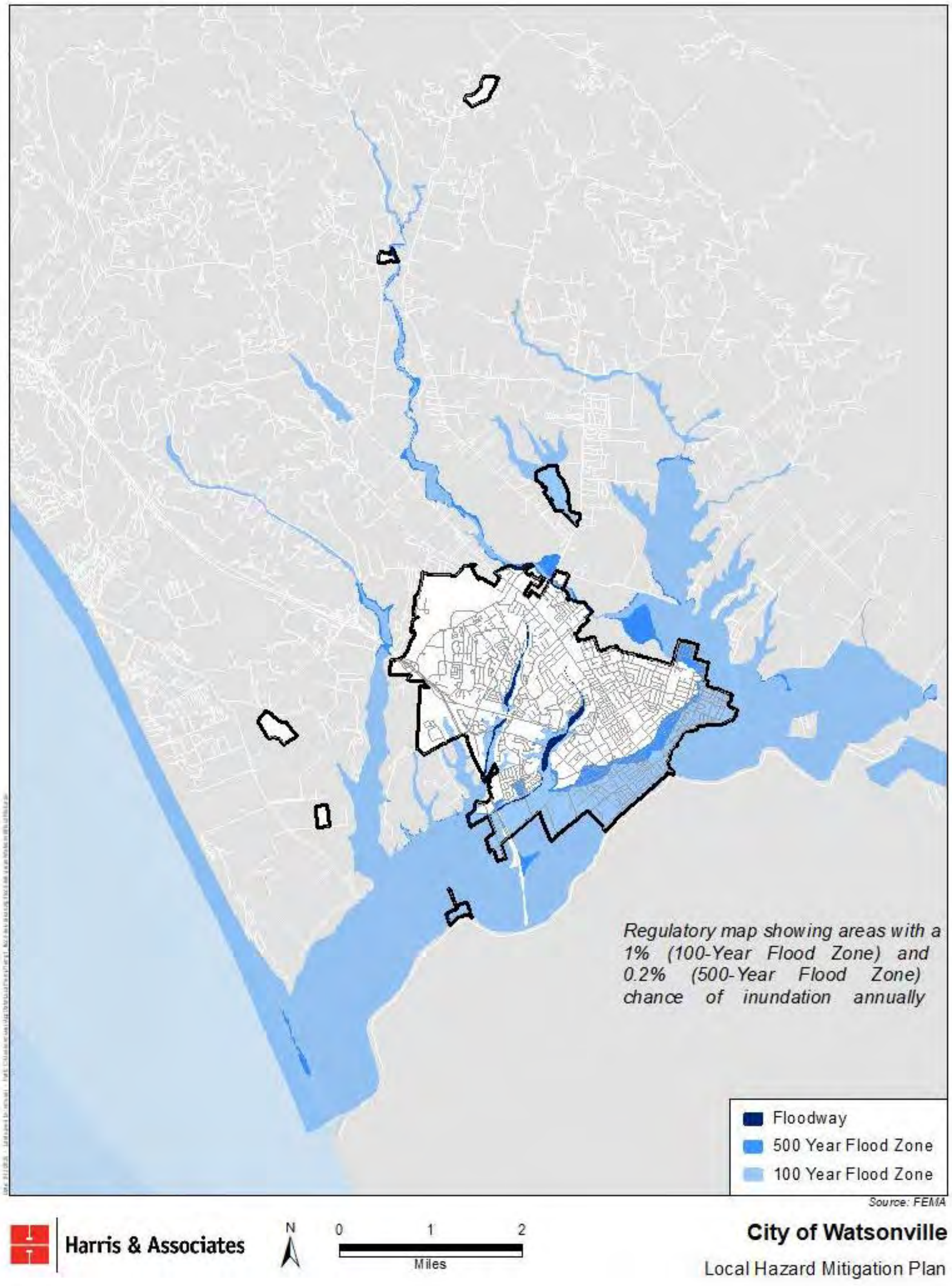

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Figure B-4. City of Watsonville 100-Yr Flood Zone Depth

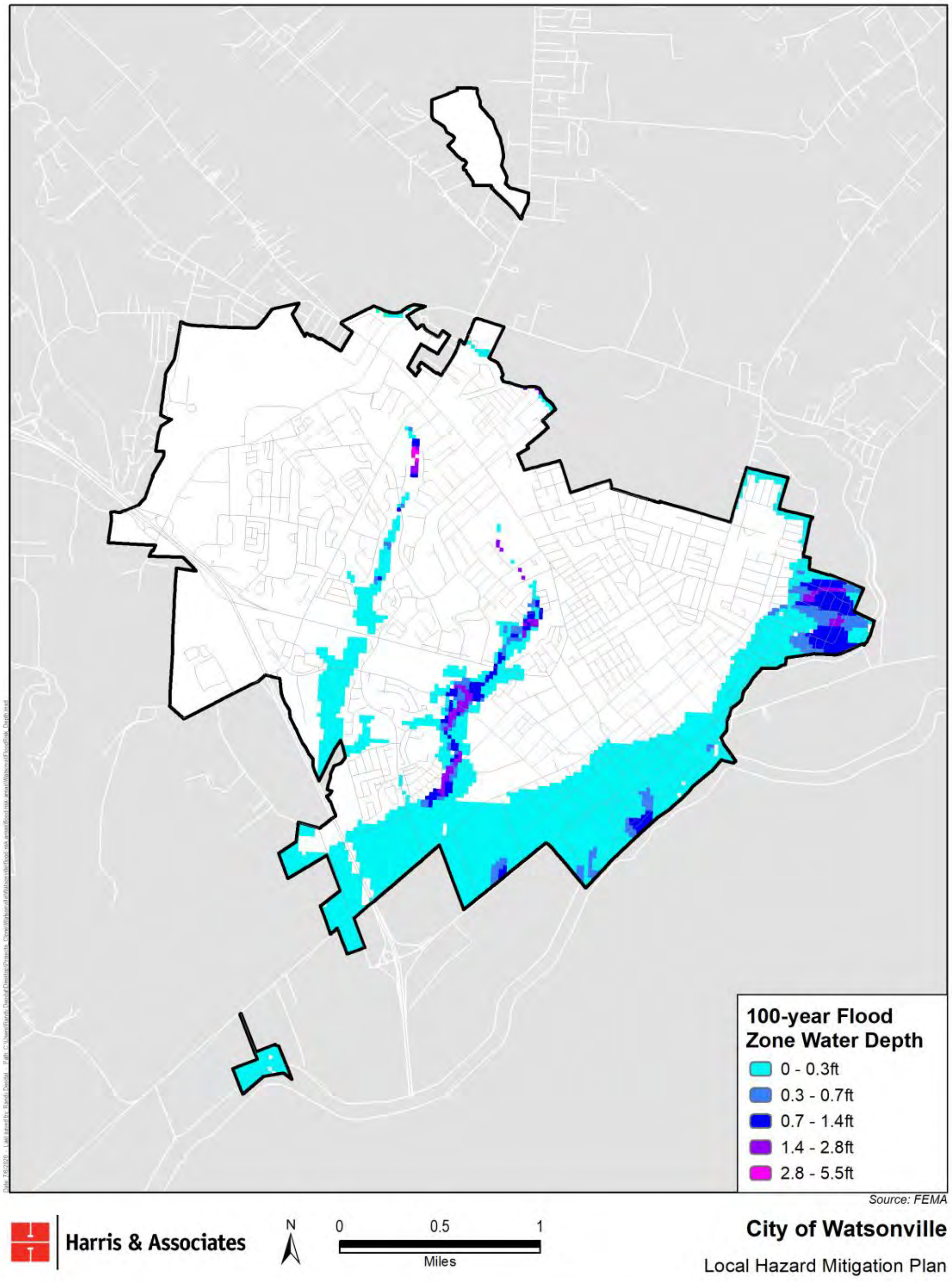

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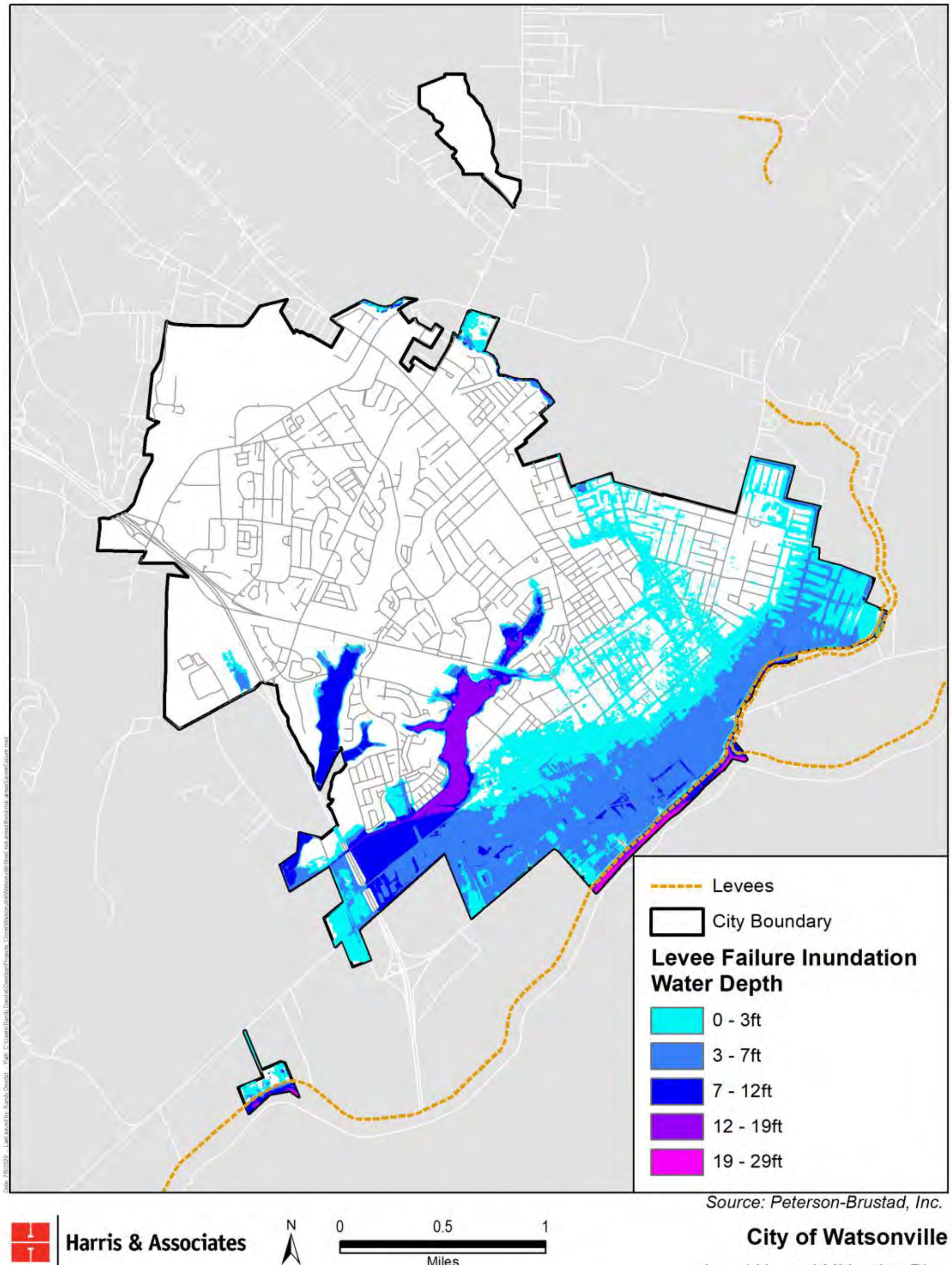
Figure B-5. Levee Failure Inundation Area and Water Depth



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During the 1955 flood, the overflow of Corralitos Creek upstream of the leveed section on Salsipuedes Creek flooded 29 blocks in the City. Peak discharges for Corralitos Creek at Green Valley Road have been estimated from high water elevations. The estimated discharges for the 1955 and 1958 floods are 3,620 cubic feet per second and 2,680 cubic feet per second, which correspond to 8.33 and 14.29 percent annual chance recurrence intervals, respectively. In comparison, the 1 percent annual chance discharge for Corralitos Creek at Green Valley Road is 7,900 cubic feet per second. Although no lives were lost, 972 people were evacuated and $1.12 million in damages was incurred. Included in these costs were monies spent to repair levees damaged by erosion. Additional levee repairs were required because of the 1958 flood; however, no other significant damage resulted.

More recently, the 1995 flood event breached the Pajaro River levees, and the Town of Pajaro was flooded. The flood caused damage estimated to be more than $95 million, the greatest flood damages in the City's history.

Probability of Future Occurrences

Intensity and duration of precipitation events are likely to increase under future climate conditions. Projections of changes in precipitation are more nuanced and have less separation between RCP 4.5 and 8.5 scenarios. There is projected increase of year-to-year variability with wetter days during periods of precipitation but fewer total days with precipitation. Average annual precipitation under RCP 8.5 shows significant increases by 2100 (Table B-13). These changes would likely create more serious flooding events alongside overall drier conditions as more intense storm events yield a larger overall percentage of the total annual volume of precipitation with fewer total storm events.

Table B-13. Projected Annual Total Precipitation

Scenario	Historical	RCP 8.5			RCP 4.5		
Time Frame	1961–1990	2011–2040	2041–2070	2071–2100	2011–2040	2041–2070	2071–2100
Precipitation (inches)	21.5	24	24	27	NA	23.9	24

Source: CEC 2020c.

Notes: NA = not applicable; RCP = Representative Concentration Pathway

Atmospheric rivers are the dominant drivers of local extreme rainfall events and are associated with most major inland floods in California. For example, the large number of atmospheric rivers that struck the Central Coast during the winter of 2016–2017 led to record flooding (East et al. 2018). Extreme atmospheric river events and severe flooding are expected to increase in California under projected climate change.

An extreme precipitation event is defined by 2-day rainfall totals during a water year (October–September) exceeding the 95th percentile of maximum rainfall based on precipitation data between 1961 and 1990. The City's extreme precipitation event threshold is 1.57 inches. Only 5 percent of historical precipitation events have exceeded this threshold. The City can expect an increase in the frequency of these events (Table B-14).

Table B-14. Average Number of Extreme Precipitation Events by Water Year

Scenario	Historical	RCP 8.5			RCP 4.5		
Time Frame	1961–1990	2011–2040	2041–2070	2071–2100	2011–2040	2041–2070	2071–2100
Events (No.)	7	8	9	11	NA	8	9

Source: CEC 2020d.

Notes: NA = not applicable; RCP = Representative Concentration Pathway

In addition to increasing in frequency, precipitation events are projected to increase in intensity. Table B-15 and Exhibit B-3 summarize the projected intensity of extreme precipitation events—those exceeded on average once every 20 years—for the late twenty-first century under the RCP 8.5 scenario.

Table B-15. Projected Intensity of Extreme Precipitation Events, 2070–2099, RCP 8.5

Model Name	Simulation Type	Precipitation (inches)	95 Percent Confidence Interval (inches)
CanESM2	Average	6.95	6.13–8.86
CNRM-CM5	Cooler/wetter	11.12	8.52–17.6
HadGEM2-ES	Warm/drier	7.33	5.80–11.5
MIROC5	Complement	6.72	5.13–11.1

Source: CEC 2020d.

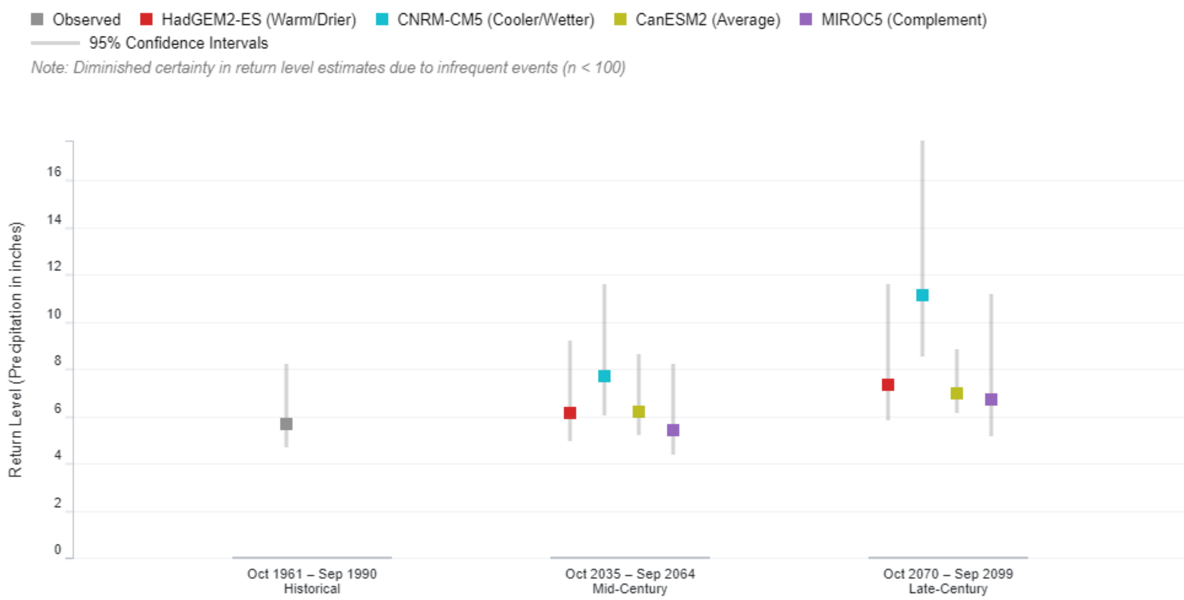
Notes: RCP = Representative Concentration Pathway

Exhibit B-3. Changes in Intensity of Extreme Precipitation Events

Changes in Intensity of Extreme Precipitation Events

This chart shows estimated intensity (*Return Level*) of Extreme Precipitation events which are exceeded on average once every 20 years (*Return Period*) and how it changes in a warming climate over historical, mid-century and late-century time periods. Data is shown for Watsonville under the RCP 8.5 scenario in which emissions continue to rise strongly through 2050 and plateau around 2100.

Extreme Precipitation events are days during a water year (Oct–Sep) with 2-day rainfall totals above an extreme threshold of 1.57 inches.



- Source: Cal-Adapt. Data: LOCA Downscaled Climate Projections (Scripps Institution of Oceanography), Gridded Historical Observed Meteorological and Hydrological Data (University of Colorado, Boulder).
- Four models have been selected by California's Climate Action Team Research Working Group as priority models for research contributing to California's Fourth Climate Change Assessment. Projected future climate from these four models can be described as producing:
  - A *warm/dry* simulation (HadGEM2-ES)
  - A *cooler/wetter* simulation (CNRM-CM5)
  - An *average* simulation (CanESM2)
  - The model simulation that is most unlike the first three for the best coverage of different possibilities (MIROC5)

Source: CEC 2020.

High Winds

Location and Extent

Strong winds can affect any part of the City and are not more or less likely to occur in any particular area of the City. The severity of wind damage in an area depends on the structural condition of buildings, roofs, tree limbs, and other large infrastructure.

Winds are commonly measured with the Beaufort Wind Scale, developed in 1805. The 0–12 scale is based on wind speed and observed effects. Wind speeds that reach scale 9 or above are generally considered intense and may result in a hazardous condition (Table B-16).

Table B-16. Beaufort Wind Scale

Scale	Speed (mph)	Description
0	0–1	Calm: Smoke rises vertically, and the sea is flat.
1	1–3	Light air: The direction of wind is shown by smoke drift but not wind vanes.
2	4–7	Light breeze: Wind is felt on the face, leaves rustle, and wind vanes are moved. Small wavelets appear on the ocean but do not break.
3	8–12	Gentle breeze: Leaves and small twigs are in motion, and light flags are extended. Large wavelets appear on the ocean, and crests begin to break.
4	13–18	Moderate breeze: Dust and loose paper become airborne, and small branches are moved. Small waves appear on the ocean.
5	19–24	Fresh breeze: Small trees begin to sway, and moderate waves form.
6	25–31	Strong breeze: Large branches are in motion, and using an umbrella becomes difficult. Large waves begin to form.
7	32–38	Near gale: Whole trees are in motion, and walking against the wind can be difficult. Foam from breaking waves is blown ins streaks.
8	39–46	Gale: Walking is difficult, and twigs break off trees.
9	47–54	Severe gale: Slight structural damage. Crests of waves begin to topple.
10	55–63	Storm: Trees are uprooted and considerable damage to structures occurs. Very high waves form in long, overhanging crests.
11	63–72	Violent storm: Widespread damage occurs. Exceptionally high waves form, and the ocean is completely covered in foam.
12	73+	Hurricane: Devastating damage occurs. On the ocean, the air is filled with foam and spray.

Source: NOAA and NWS 2020.
Notes: mph = miles per hour

Previous Occurrences

No previous occurrences of hazardous wind conditions have occurred in the City.

Probability of Future Occurrences

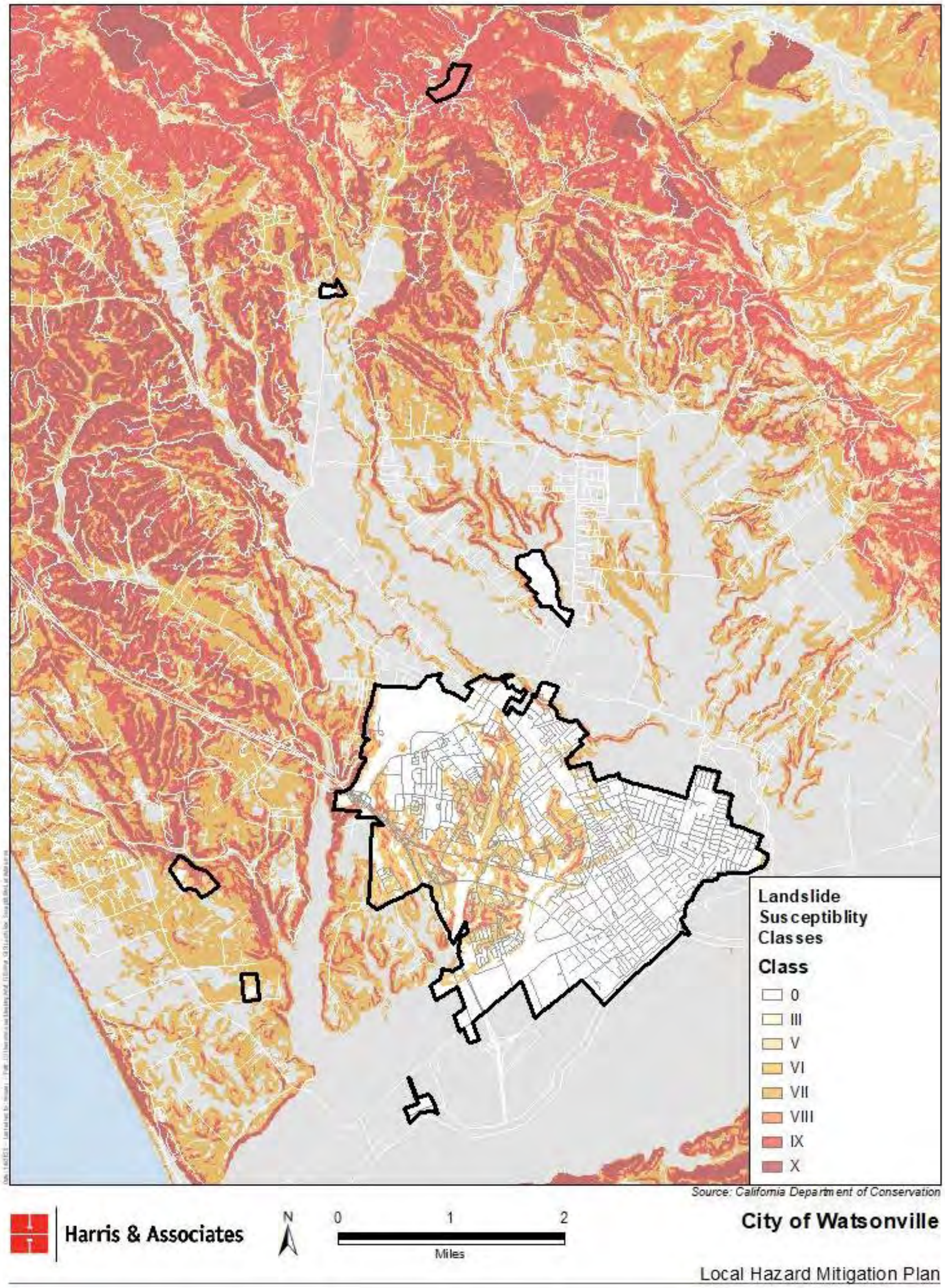
Globally, wind speeds have fallen by as much as 25 percent since the 1970s. This phenomenon, termed "stilling," is a consequence of rising global temperatures that reduce the temperature differential (McVicar et al. 2012). However, the impact of climate change on local wind speeds is very complicated. Researchers at University of California, Santa Cruz, found that a general increase in wind speeds along the coast is likely to accompany regional changes in climate due to the difference in rates of increase among land and ocean temperatures (Snyder et al. 2003).

Landslide

Location and Extent

Landslides are more likely in areas with weak rocks and steep slopes. Figure B-6, City of Watsonville Landslide Susceptibility Areas, maps the relative likelihood of deep-seated landslides based on regional estimates of rock strength and slope steepness.

Figure B-6. City of Watsonville Landslide Susceptibility Areas



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Originally published in 2011, the Susceptibility to Deep-Seated Landslides grid map covers the entire State of California (CGS 2011). The map layer makes use of several data sets such as Landslide Inventory, Geology, Rock Strength, and Slope of varying scales and formats. For the statewide analysis of landslide susceptibility, a method combining the rock strength and slope data layers was used to create classes (0 to 10, low to high) of landslide susceptibility. These classes express the generalization that, on very low slopes, landslide susceptibility is low, even in weak materials, and that landslide susceptibility increases with slope and near weak rocks.

Previous Occurrences

Previous landslides in the City have been minor. Over the last 30 years, several residences and the backyards of several residences in housing developments east of Green Valley Road and adjacent to Struve Slough have experienced landslides. These landslides may be attributed to poorly constructed retaining walls and fills. Green Valley Road adjacent to Struve Slough has slid and was closed for repairs during the late 1980s (Lipoma 2020).

Probability of Future Occurrences

Although the City is near several fault lines, the probability of earthquake-induced landslides is relatively low. Future earthquake-induced landslides are more likely to occur around the floodway or in areas of subsidence. Future moisture-induced landslides may occur more frequently as a result of more intense precipitation events projected under climate change scenarios.

Liquefaction

Location and Extent

The most vulnerable areas to liquefaction are areas that were originally bays or marshlands and were filled with artificial, poorly compacted material (Figure B-7, City of Watsonville Liquefaction Hazard Areas). Some soil types in the City are porous and prone to liquefaction, and areas where the height of the water table is less than 30 feet from the ground surface are vulnerable to liquefaction. Land subsidence is the gradual or sudden sinking of the ground as a result of underground mining, oil and gas extraction, sinkholes, or drainage and decomposition of organic soils (NRC 1991). Areas where there is ground subsidence could be at risk of liquefaction because sinking ground will bring the surface of the ground closer to the groundwater table.

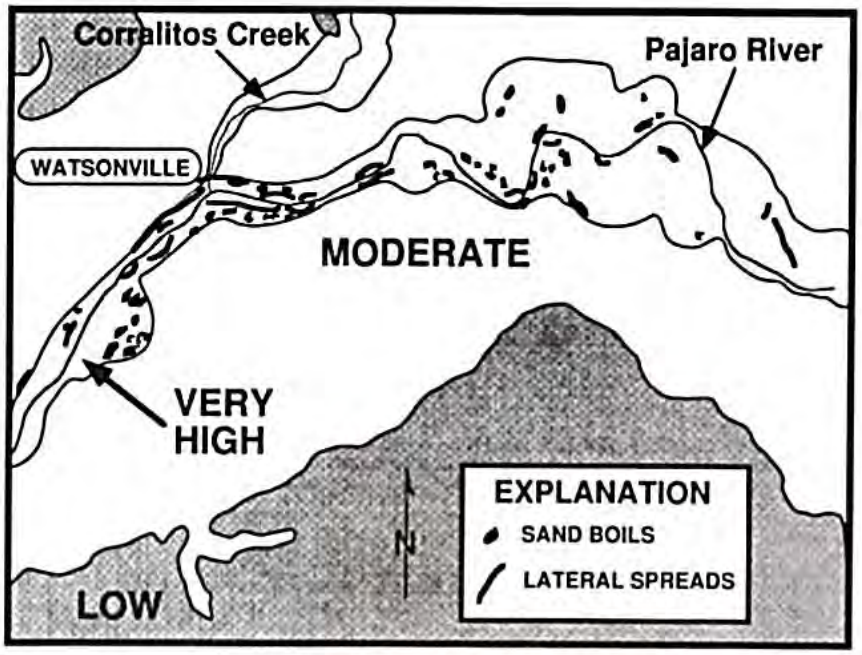
Previous Occurrences

Liquefaction and associated ground failure during the 1989 Loma Prieta earthquake were widespread (Exhibit B-4). Liquefaction-induced ground failure caused extensive damage to flood control levees, pipelines, buildings, utilities, irrigation facilities, bridges, and precisely graded agricultural tracts. Liquefaction was especially conspicuous along the lower reaches of the Pajaro

River, where groundwater is shallow, and along estuaries, abandoned channels, and adjacent fluvial tributaries in the Moss Landing area.

Lateral spreading occurred along approximately 60 percent of the lower 15 kilometers of the Pajaro River. A small lateral spread failure occurred in artificial road fill along Carleton Road, approximately 4 kilometers northeast of the City (USGS 1998).

Exhibit B-4. Liquefaction Effects from 1989



Watsonville showing distribution of liquefaction effects from 1989 Loma Prieta earthquake in relation to zones of predicted susceptibility. Source: USGS 1998.

Probability of Future Occurrences

The presence of liquefaction-prone soils means that future earthquakes could trigger liquefaction in the City. Earthquakes at nearby Zayante-Vergeles and San Gregorio Faults could cause sufficient ground shaking to trigger liquefaction, although the chance of an earthquake on these faults is relatively low. Larger, more distant faults, including the San Andreas Fault, are more likely to cause significant earthquakes, although the shaking from these earthquakes may not be strong enough to trigger liquefaction.

Tsunami

Location and Extent

Tsunamis can inundate coastal areas, causing widespread flooding and destruction to developed areas, and cause damage far away (hundreds or even thousands of miles) from the seismic event that triggers them. Since the City is approximately 11 miles west of Monterey Bay, it would not be affected by coastal flooding or tsunamis (Figure B-8, Tsunami Inundation Zone).

Figure B-7. City of Watsonville Liquefaction Hazard Areas

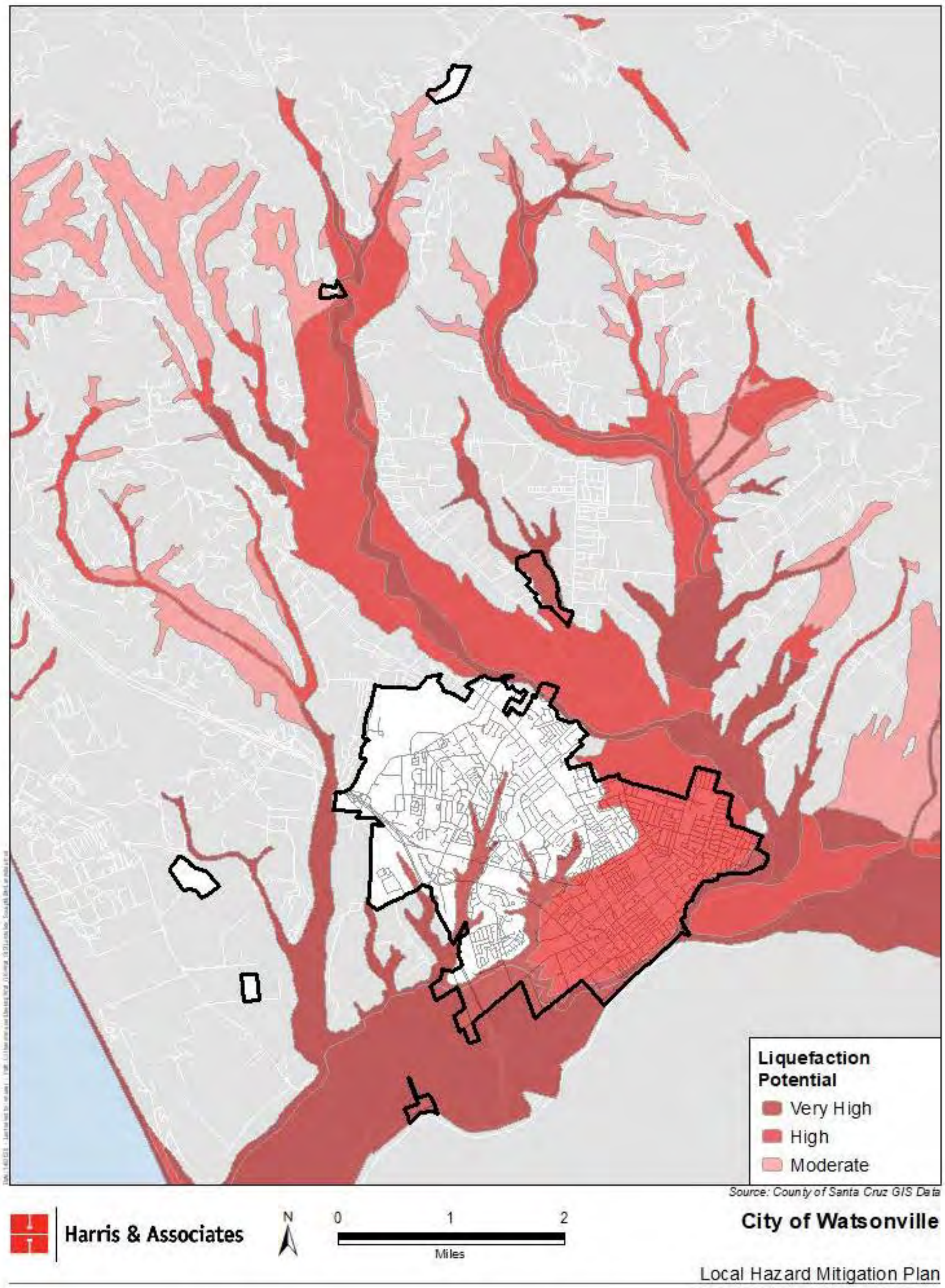


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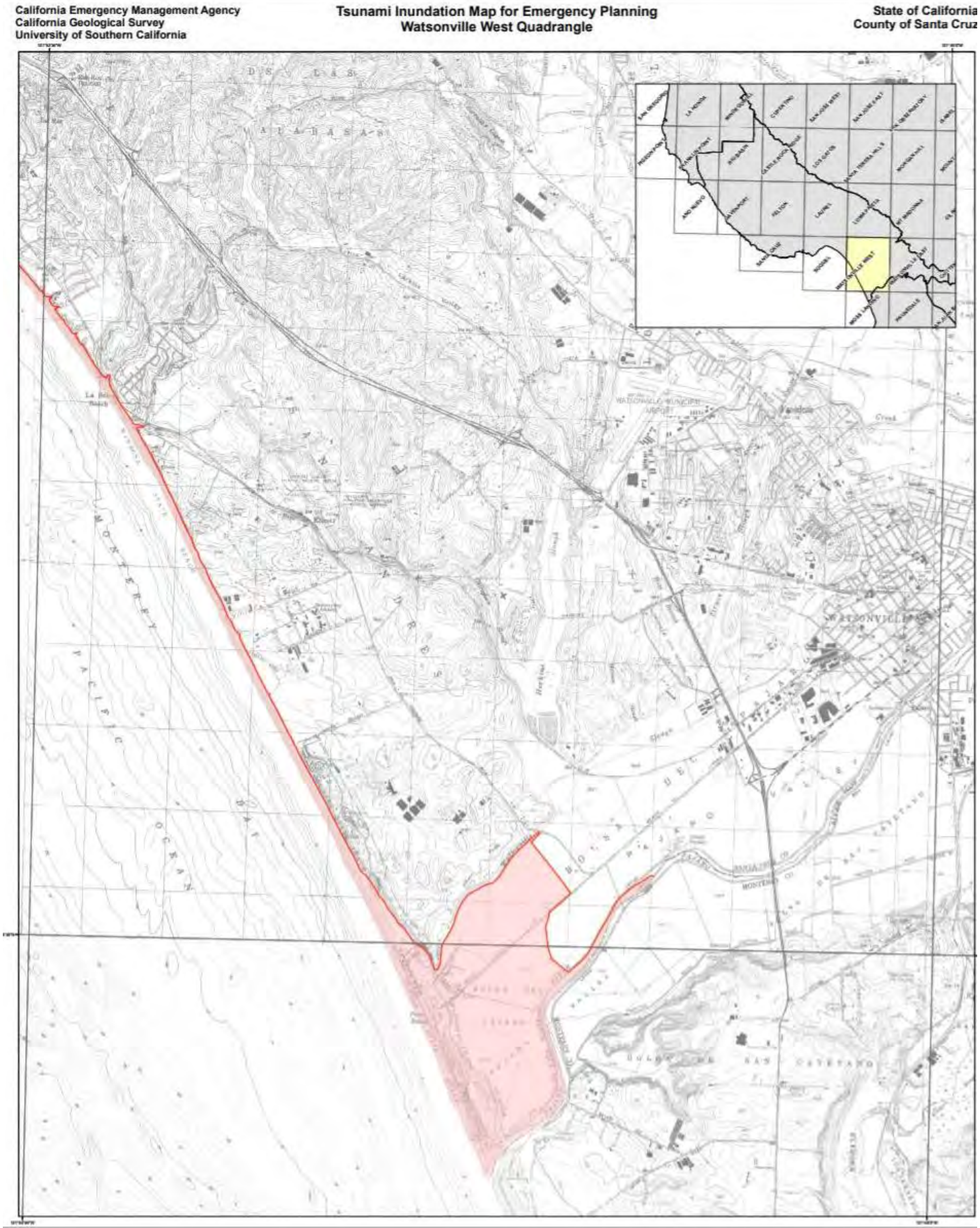
Figure B-8. Tsunami Inundation Zone



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Previous Occurrences

The City has not experienced any tsunamis.

Probability of Future Occurrences

Earthquakes along the Monterey Bay or San Gregorio Faults are the events that are most likely to produce a tsunami that could impact the City. However, an earthquake on either fault does not guarantee a tsunami will occur. The highest probability of a 6.7 magnitude earthquake along either of these fault lines in the next 30 years is less than 1.4 percent (WGCEP 2020). Tsunamis were considered in the LHMP hazard assessment but, due to the low probability of future occurrence, are not discussed further in the following vulnerability assessment.

Wildfire

Location and Extent

The strength and magnitude of a wildfire is heavily influenced by fuel, weather, and topography. The speed at which a wildfire spreads throughout a terrain depends on the type of fuel that exists in the area, such as grass, brush, and trees; local weather, including humidity and wind; and topographical factors, such as slope and aspect that influence wildfire behavior. Figure B-9, Fire Hazard Severity Areas, County of Santa Cruz, shows the areas in the City with moderate, high, and very high risk of wildfire.

Previous Occurrences

The City has been close to or threatened by a number of wildland fires in the County (Figure B-10, Historical Fires Near Watsonville). For example, in 2008, the Trabing Fire came within 0.5 mile of the northwestern City boundary, destroying 75 structures. During the 2008–2009 fire seasons, over 13,000 acres were burned in five major fires in the County (CAL FIRE 2020).

Recent or significant wildland fires that affected the City include the following (CAL FIRE 2020):

- 1997: Redwood Retreat – 90 acres consumed
- 2002: Merill – 63 acres consumed
- 2002: Croy – 3,007 acres consumed
- 2008: Summit – 4,175 acres consumed
- 2008: Hummingbird – 786 acres consumed
- 2008: White Hurst – 256 acres consumed
- 2008: Trabing – 594 acres consumed
- 2011: Red Barn – 22 acres consumed
- 2017: Bally – 109 acres consumed

Probability of Future Occurrences

In general, climate change is expected to increase wildfire frequency, size, and severity beyond the historical range of natural wildfire variability due to increasing length of the fire season and drier fuels. These changes are being driven by changes in temperature and precipitation regimes from a cooler and wetter condition to a warmer and drier condition. However, the relationship between climate change and fire regimes varies significantly by location and season.

Between 1972 and 2018 in the Central Coast region, the annual summer burned area did not increase in non-forested lands. The summer, non-forested burned area is most strongly promoted by high precipitation in 1 or 2 years before the fire year. The rainfall increases plant growth that becomes fuel for fire spread in the subsequent year. Warm, dry weather during the months immediately preceding the fire season can also promote summer wildfires, but this correlation is weak compared to the relationship between summer wildfires and high precipitation years before the fire year (Williams et al. 2019). Overall, the link between anthropogenic climate change and summer wildfire in non-forested regions like the City appears weak.

Large fall wildfires often occur when strong offshore wind events coincide with dry fuels. Although climate models project these wind events to decrease in frequency and intensity in the future, continued warming and delayed onset of winter precipitation may strengthen the likelihood of fall fire events (Williams et al. 2019). However, the likelihood and extent of fires throughout the County are expected to increase substantially by the end of the century (Table B-17).

Table B-17. Historical and Projected Annual Average of Area Burned in Santa Cruz County

Scenario	Historical	RCP 8.5			RCP 4.5		
Time Frame	1961–1990	2011–2040	2041–2070	2071–2100	2011–2040	2041–2070	2071–2100
Hectares	592	634	850	1074	NA	766	878

Source: CEC 2020 (“central” population scenario).

Notes: NA = not applicable; RCP = Representative Concentration Pathway

Figure B-9. Fire Hazard Severity Areas, County of Santa Cruz

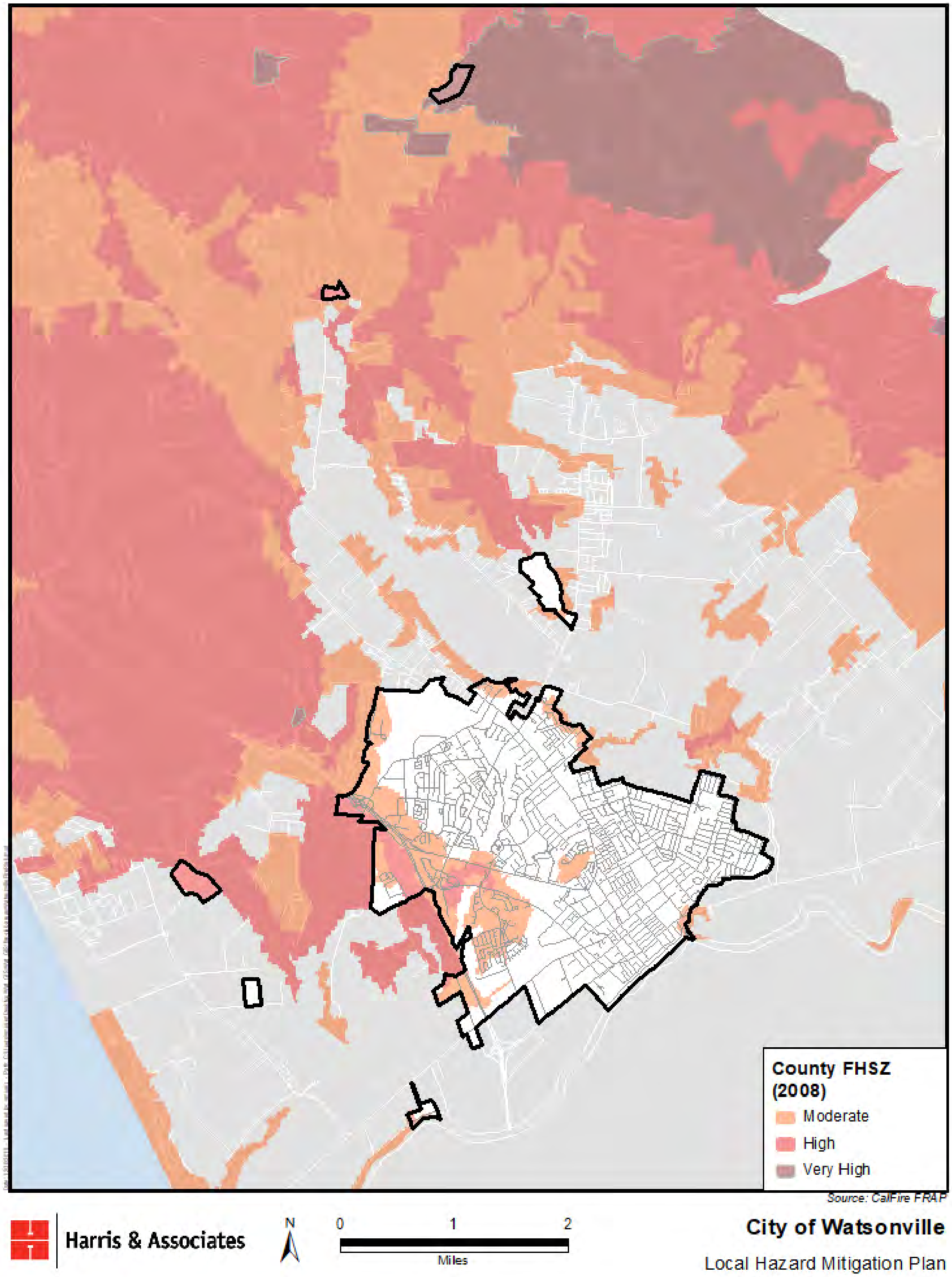

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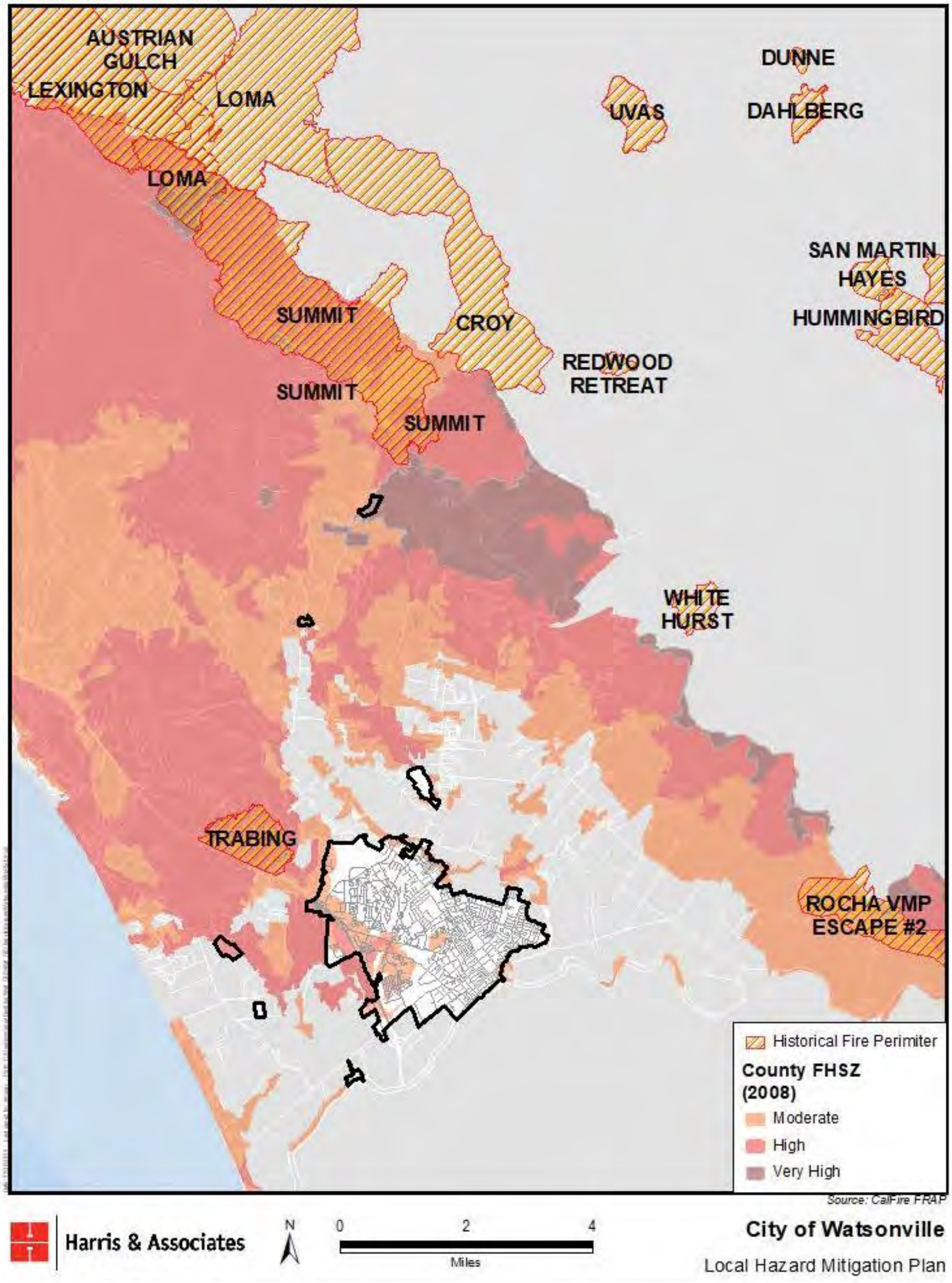
Figure B-10. Historical Fires Near Watsonville



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B.3 A description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))

a. A description of the potential impacts of each of the identified hazards on the community

b. An overall summary of each jurisdiction's vulnerability to the identified hazards. The overall summary of vulnerabilities identifies structures, systems, populations or other community assets as defined by the community that are susceptible to damage and loss from hazard events

Impacts

Impact refers to the consequence or effect of the hazard on the community and its assets. The Committee assessed the impacts, where applicable, with respect to each hazard on the following:

- People
- Residences
- Businesses
- Police stations
- Government-owned buildings
- Roads
- Environment
- Agriculture
- Economy
- Schools
- Hospitals
- Levees
- Culverts
- Water systems
- Sewer systems
- Churches
- Airports
- Nursing homes
- Storage facilities
- Vehicles or equipment
- Emergency operation centers
- Utilities
- Communication sites
- Bridges
- Railroads

These impacts are grouped into the following categories to provide a framework for assessing the City's vulnerability:

- **Physical vulnerability:** Impact on buildings, critical facilities, and infrastructure, including associated economic losses
- **Social vulnerability:** Impact on people (i.e., social vulnerability analysis)
- **Environmental vulnerability:** Impact on natural environment and agricultural assets

1. Physical Vulnerability

Critical facilities are structures and institutions necessary for a community's response and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery. In this Risk Assessment, critical facilities were categorized into "facilities" and "infrastructure" to differentiate between community and utility resources. The critical facilities are community resources that could potentially support evacuation procedures or serve as headquarters for administrating preparation and recovery efforts.

The Committee identified 149 critical facilities and infrastructure. Tables B-18 and B-19 show the number of critical facilities and infrastructure in each category in the City.

Table B-18. Critical Facilities in the City of Watsonville

Category	Count
Community Facility	2
Emergency Shelter	20
Medical Facility	22
Municipal Services	7
School	22
Total	**73**

Table B-19. Critical Infrastructure in the City of Watsonville

Category	Count
Bridge	6
Communication	10
Energy	7
Wastewater/Drainage	27
Water	26
Total	**76**

The physical vulnerability assessment considers the number and types of facilities and infrastructure that are in hazard or high-risk areas. Hazard events may damage or destroy these facilities, leaving them with limited capacity or functionality. Facilities outside the hazard areas may still be affected by a hazard event, but the risk is considered lower. There are several assets outside the City limits, including water, wastewater, and communication infrastructure (Figures B-11, Critical Facilities in Watsonville, and B-12, Critical Infrastructure in Watsonville).

2. Social Vulnerability

A hazard event may have a different impact based on the sensitivity of groups or individuals. Indicators including age, socioeconomic status, access to resources, household type, and other demographic factors that can affect a person's or group's ability to cope with or recover from natural disasters.

The vulnerability analysis identifies segments of the population that may be disproportionately impacted by hazard events in designated hazard areas. As part of the social vulnerability analysis, populations with the following characteristics were identified as more sensitive to hazards than others:

- **Economically Disadvantaged.** People with an income below the federal poverty threshold are less likely to have the financial resources to prepare for or cope with impacts associated with hazard events. Those with low incomes are also more likely to live in dangerous or under-resourced environments. If a hazard event significantly disrupts the local economy, this population could face substantial hardship.
- **Older Adults.** People over the age of 65 are more likely to have limited mobility or medical conditions that may affect their ability to respond to or recover from a hazard event. This population is also more likely to have pre-existing health conditions that may be exacerbated during a hazardous event. Older adults living alone are especially at risk because they may not have access to a support network to contact for help before, during, or after a hazard event.
- **Linguistically Isolated.** Linguistic isolation (defined in this assessment by the percent of occupied housing units in which no one 14 years or older speaks English "very well") may prevent people from performing self-protective behaviors during extreme weather and natural disasters because it may limit access to or understanding of health or evacuation warnings.
- **Medically Uninsured.** Extreme weather conditions are expected to cause direct and indirect health impacts, particularly for vulnerable populations with limited or no access to health services. Health insurance enables access to medical care by connecting people to health care providers and protecting them against high and often unexpected medical costs. Job loss is associated with increased risk of unmet health care needs since unemployment leads to the loss of employer-sponsored health care benefits (Doty 2011).
- **Mobile Home Residents.** Mobile homes are not designed to withstand severe weather or flooding. Because mobile homes are frequently found outside city centers, they may not be readily accessible by highways or public transportation, which could restrict access to critical resources and medical care after a hazard event.
- **Renters.** Approximately 63 percent of renters in the United States do not have renter's insurance (Insurance.com 2017). During a hazard event, most renters are at risk of losing their belongings without the ability to replace them. Renters also have a greater risk of being displaced post-disaster.

There are other groups that may be more vulnerable during a hazard event—such as people experiencing homelessness, with disabilities, and who are undocumented. However, data for these populations are not available at the local (census block) level. Socially vulnerable groups are mapped in hazard areas for each hazard considered in this Risk Assessment.

3. Environmental Vulnerability

The City shares the same geography as the larger Pajaro Valley. The Pajaro Valley, the floodplain of the Pajaro River and its tributaries, is characterized by rich agricultural soils. The preservation of agricultural lands and open spaces is important for food production, employment, economic productivity, and environmental ecosystems. The Watsonville Slough is one of the largest remaining freshwater marshlands in the state's coastal zone and provides a crucial open space for thousands of birds and other wildlife in the slough, including 23 native plant and wildlife species that are listed as threatened, endangered, or of special concern. Within the City boundaries, there are 670 acres of critical habitat that is home to threatened and endangered species including the Santa Cruz tarplant (*Holocarpha macradenia*), tidewater goby (*Eucyclogobius newberryi*), and California red-legged frog (*Rana draytonii*). The environmental vulnerability assessment provides a qualitative analysis of the potential impacts to natural habitats and agriculturally productive land in the City from hazard events.

Figure B-11. Critical Facilities in Watsonville

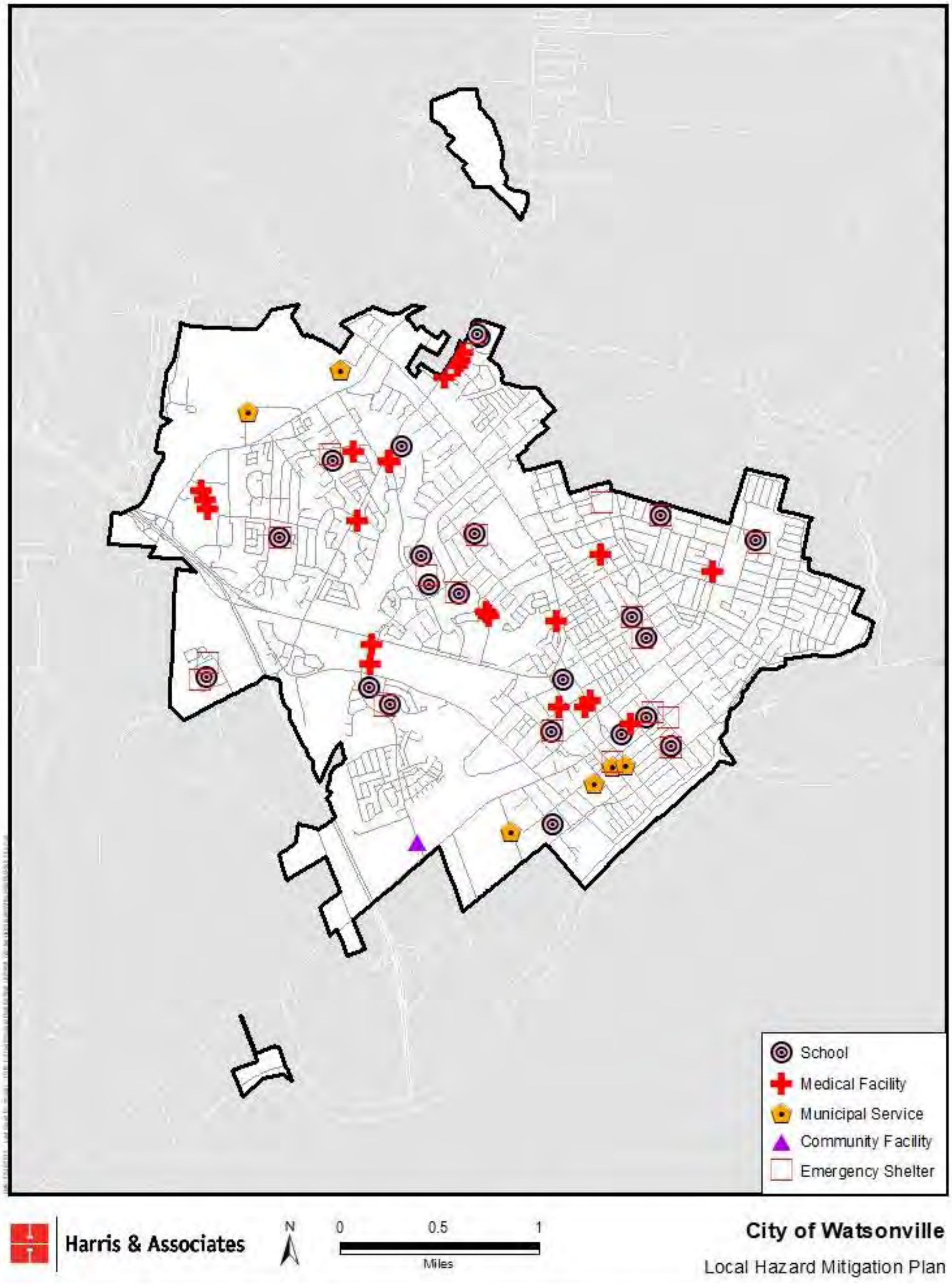

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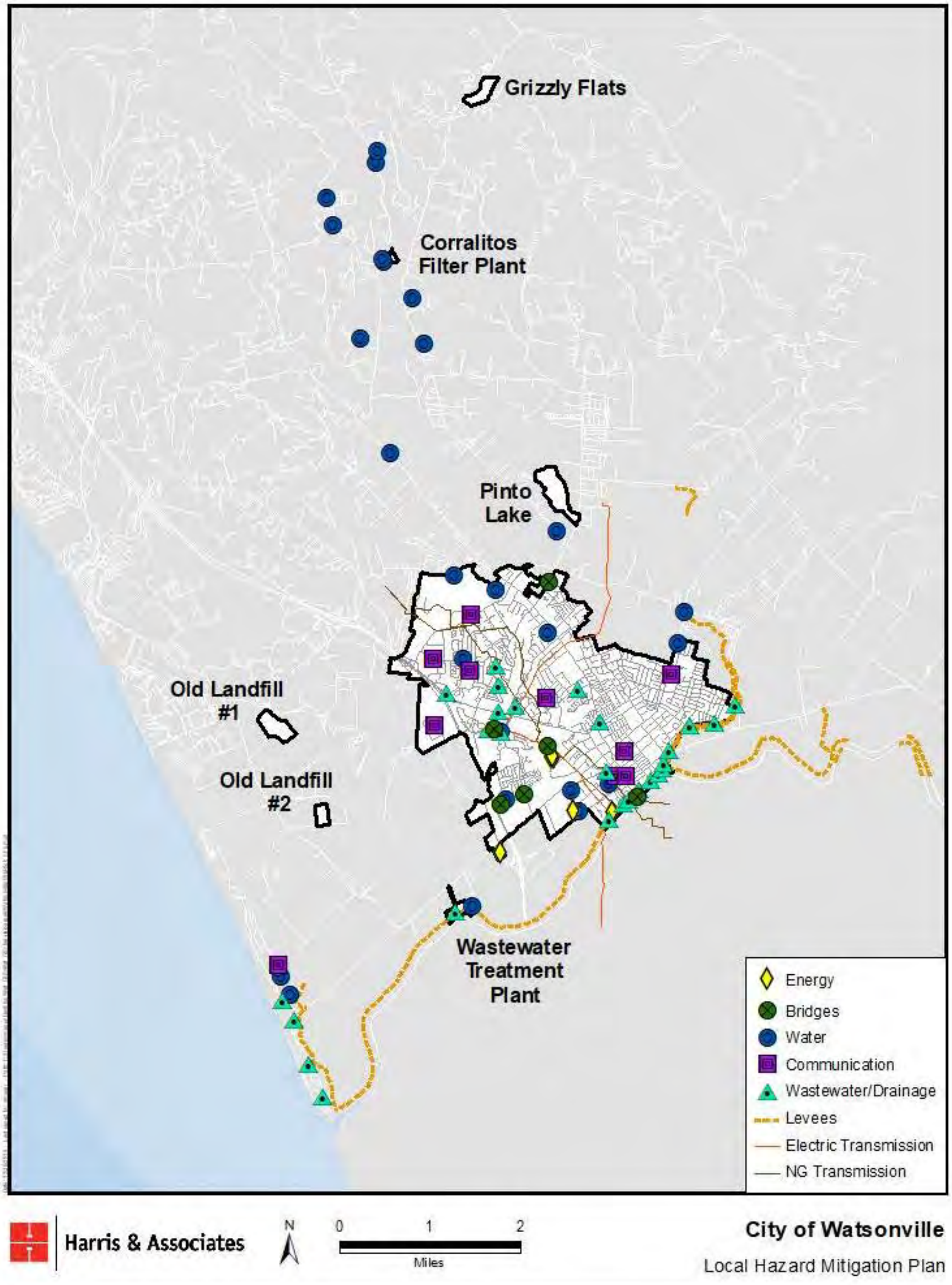
Figure B-12. Critical Infrastructure in Watsonville



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Vulnerability Assessment

The vulnerability assessment is a process for measuring the potential impacts described previously, including loss of life and property, economic losses, and injury to the natural environment. Outputs from this section include quantitative and qualitative analysis of the potential extent of harm that particular hazards pose to the City.

Climate Change

1. Physical Vulnerability

Climate change exacerbates existing hazards, contributing to the increased frequency and intensity of heat, drought, flooding, and wildfires, among others, all of which have historically contributed to damaged or lost structures and infrastructure.

2. Social Vulnerability

Climate change affects all populations but not equally. The degree to which impacts are felt depends on a population's capacity to cope with its consequences. Studies have shown that social variables, such as age, race, and income, affect the ability of an individual to prepare, respond, and recover from a natural disaster or other potential climate impact (Cutter et al. 2009). Sensitive groups, such as those discussed previously, are likely to be disproportionately burdened by the impacts of climate change.

3. Environmental Vulnerability

The impact of climate change on the natural environment is extensive and complex. Changes in climate from atmospheric warming can impact air quality by increasing ground-level ozone. Increases in runoff due to flooding or sea-level rise may also affect water quality. In addition, climate change has the potential to stress native biodiversity and alter the conditions in existing ecosystems. Temperature and precipitation changes, drought timing and frequency, and beach erosion can result in habitat loss, species loss, and the disruption of ecosystem interactions.

Secondary Hazards

There are numerous secondary impacts associated with climate change, including but not limited to reductions in agricultural productivity and grid reliability, as well as increases in migration and disease. In addition to exacerbating existing hazards, climate change would introduce new hazards to the City, including extreme heat and sea-level rise.

Extreme Heat

1. Physical Vulnerability

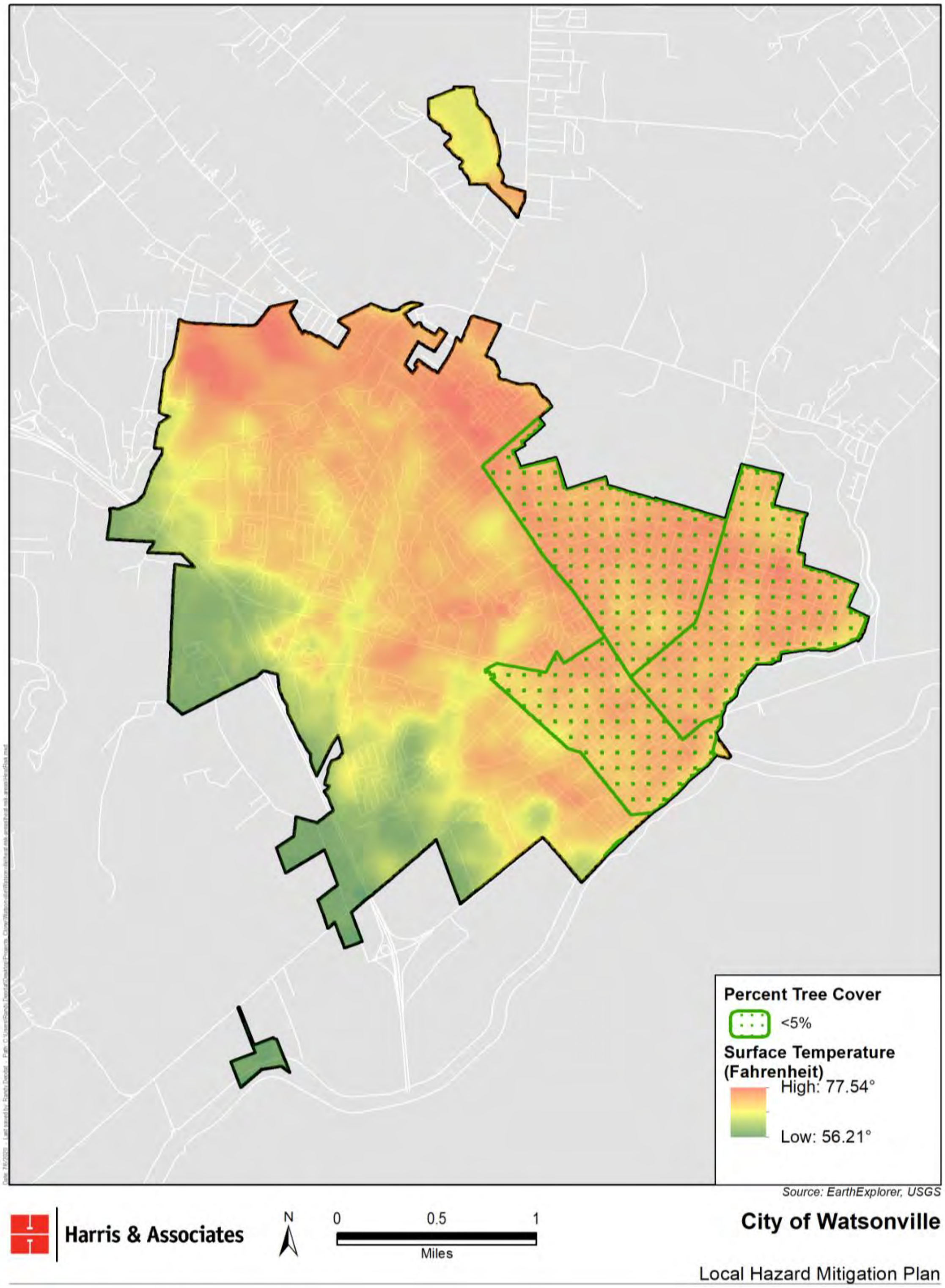
Many types of infrastructure are affected by extreme heat, including roads, railroads, and power generation facilities. Depending on the paving materials, the traffic, and the load of a given road, high temperatures increase the risk of pavement deterioration. After wet winters that increase soil moisture, extreme heat events can cause concrete to expand and sidewalks and roads to buckle. The City is unlikely to experience temperatures (approaching 110°F) that would result in these impacts. When temperatures reach 90°F, trains may need to reduce speeds to prevent accidents, and power outages may occur due to higher peak electricity demand as people run air conditioners and other cooling equipment. Higher temperatures may cause compromising effects on power plants and transformers and reduced capacity of substations and transmission and distribution lines.

The tendency of urban areas to remain warmer than surrounding areas is referred to as the "urban heat island" effect. Areas with the highest building density tend to retain higher temperatures. This effect is caused mostly by the lack of vegetation and soil moisture. To identify hot spots in the City that contribute to the urban heat island effect, the average of two Landsat scenes from August 2019 was taken, areas with elevated daytime land surface temperature were located, and the City's tree canopy distribution was then overlaid (Figure B-13, Land Surface Temperature and Tree Canopy). Hotspots represent areas where the City can prioritize heat mitigating activities, including increasing urban tree canopy or using white pavement technology.

2. Social Vulnerability

The impacts of heat waves are geographically variable in nature as local populations adapt to the prevailing climate through changing physiological, behavioral, cultural, and technological responses. Increased temperatures that manifest as heat waves directly harm human health through heat-related illnesses and the exacerbation of pre-existing conditions for climate-sensitive populations. The City has relatively high rates of heat-sensitive populations: approximately 5% percent of the population suffer from cardiovascular disease, and approximately 43% percent suffer from asthma (CEC 2020e).

Figure B-13. Land Surface Temperature and Tree Canopy



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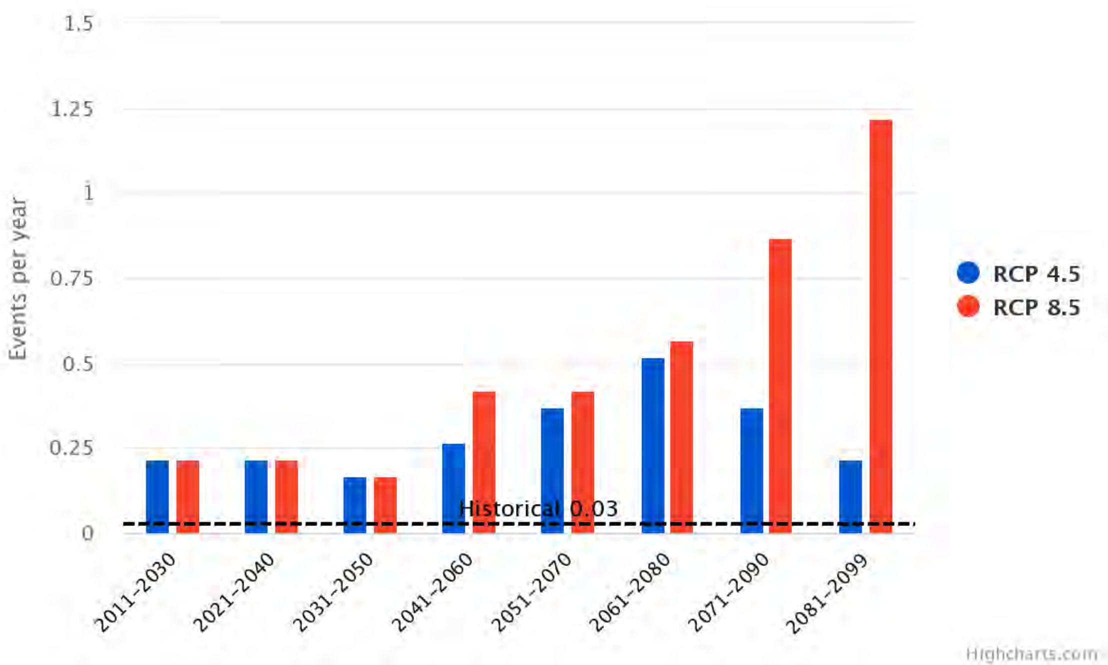
Despite having milder local temperatures, coastal residents are at higher risk for cardiovascular hospitalizations during heat waves compared to those living in non-coastal regions. This can be attributed to the lack of acclimatization among residents who normally experience milder temperatures. Although air conditioning is the primary mitigation measure for heat-related illness, many residents lack air conditioning devices in their residences due to the generally lower regional temperatures.

A heat health event is any event that generates a public health impact regardless of absolute temperature. Heat health event thresholds were determined by pairing daily meteorological data (1984–2013) with the most recently available emergency department visitation data (2005–2013). Historically, the City has experienced on average 0.03 heat health events per year (CEC 2020e). Exhibit B-5 shows how heat health is projected to increase corresponding to emissions scenarios RCP 4.5 and RCP 8.5.

Exhibit B-5. Frequency



Source: CEC 2020e.

Compared to highly urbanized areas, the City has fewer cooling places for residents who lack indoor air conditioning. Moreover, indoor air conditioning provides no protection for approximately 19% of the population who primarily work outdoors (CEC 2020e).

3. Environmental Vulnerability

Plant and wildlife species have a preferred temperature range and ecological setting. Climate change results in altered seasonal temperature, which can affect the suitability of habitats for species. For example, species already surviving at the upper end of their preferred temperature range are likely to experience more frequent and prolonged thermal stress. These changes not only alter the physical comfort of the species but may alter its habitat type. Shifts in temperature and precipitation may affect chaparral phenology or chaparral distribution, although sensitivity likely varies by species, and not all range shifts can be attributed to temperature and precipitation drivers. Warmer temperatures may also affect germination and abundance of some sage scrub species.

Sea-Level Rise

1. Physical Vulnerability

Rising sea levels will likely result in higher groundwater levels during extreme tides, affecting urban drainage systems. Groundwater inundation prevents drainage and runoff infiltration. Combined with more intense precipitation events, sea-level rise will threaten the ability of these systems to cope with the required discharge and will result in increased flooding and more frequent sewage discharge from combined sewer overflows. In addition, the presence of saltwater will likely increase the rate of corrosion for water and sewer pipes. In addition to underground infrastructure, water treatment plants in low-lying areas are susceptible to flooding or extreme high tides caused by sea-level rise. Many treatment plants discharge their wastewater through underwater pipes, which can cause flooding from the inside as waters rise before the surface water levels overrun the outside of the structures. More pumps will be needed to keep treatment plants in service. Flooded wastewater facilities will experience structural damages, and inundation could cause damage to the electrical systems and affect the operation of treatment plants.

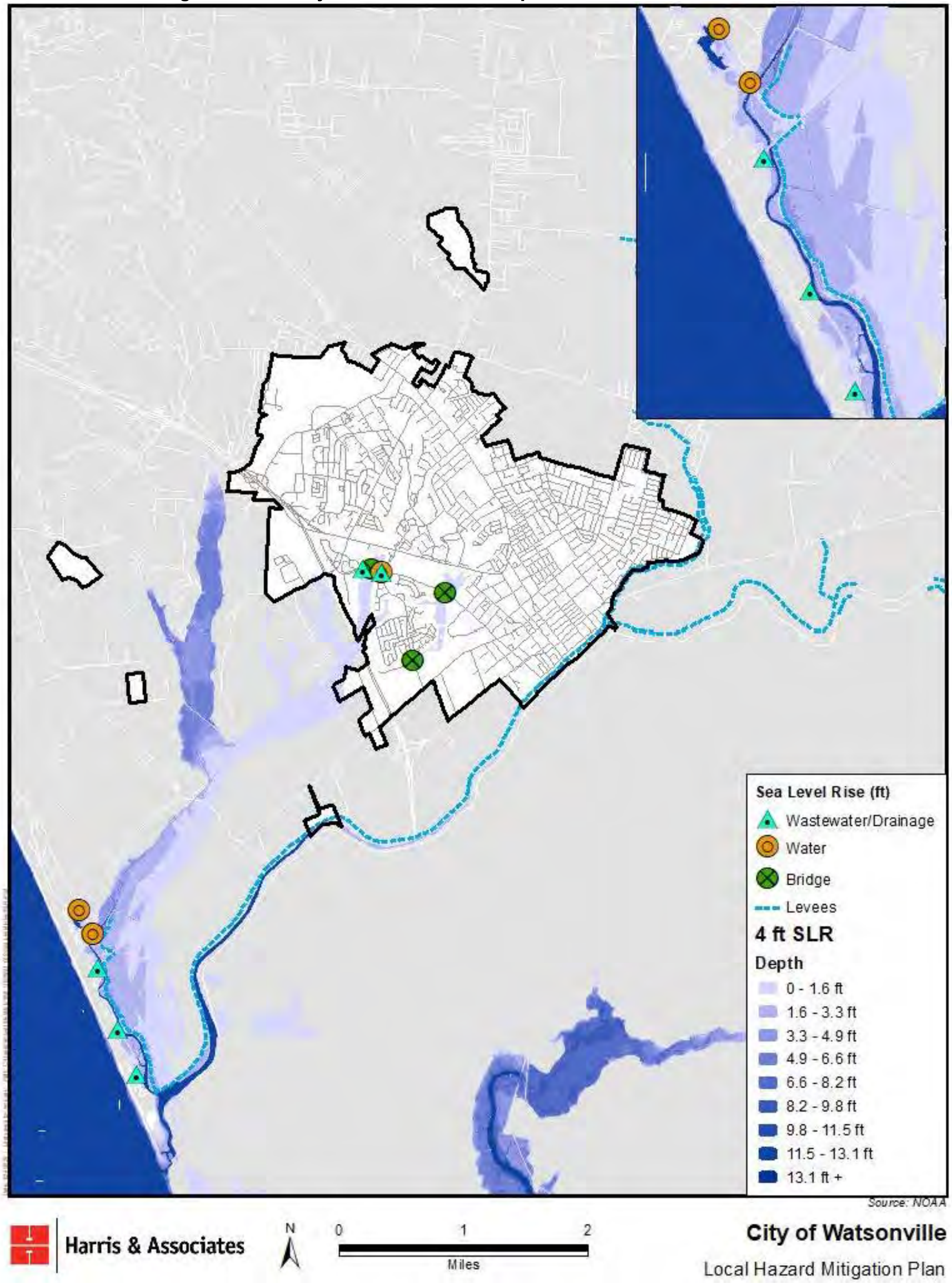
Identifying thresholds beyond which the stability and performance of existing stormwater systems are adversely impacted is important to understand the current and future vulnerability to changing coastal total water levels. Several infrastructure facilities, especially those along the coast, are at risk of inundation at a 4-foot sea-level rise. Figure B-14, Projected Inundation Depth at 4-Foot Sea-Level Rise, shows the projected inundation depth at the 4-foot feet sea-level rise. Inundation depth is calculated by subtracting land elevation values from the water surface level (due to sea-level rise). The facilities mapped below would need to be elevated by water depth value to avoid impact from sea-level rise at 4 feet.

The City should further assess the loss of service capacity of both its water facilities and its wastewater facilities and continue to monitor sea-level rise and associated flooding to determine whether and when these facilities should be relocated to areas at lower risk of inundation from sea-level rise.

2. Social Vulnerability

Because most residential properties are inland, and the onset of sea-level rise is gradual, the City's social vulnerability to sea-level rise is low at this time.

Figure B-14. Projected Inundation Depth at 4-Foot Sea-Level Rise



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3. Environmental Vulnerability

Even a small increase in sea level can have devastating effects on coastal habitats. Sea-level rise will likely cause severe erosion and wetland flooding, resulting in lost habitat for fish, birds, and plants. In particular, saltwater intrusion leads to the loss of freshwater vegetation and the spread of mudflats into previously vegetate areas, threatening the diversity of plants and wildlife.

Drought

1. Physical Vulnerability

Drought is a regional hazard that could have an impact on critical facilities in the City. It can cause sewage and water systems to become less efficient or more prone to contamination. Water and wastewater infrastructure will likely be affected by droughts that are intensified by climate change. Energy delivery infrastructure is also vulnerable to intense droughts because droughts will likely lead to less hydroelectric power production. This could lead to a greater strain on the power grid because energy will need to come from more distant sources. In extreme heat conditions, the combination high temperatures and low energy production caused by intense drought could lead to power outages.

The City of Watsonville Water Department serves the City and areas of the unincorporated County, including parts of Corralitos, Freedom, and Pajaro Dunes. The service area consists of 9 hydraulic pressure zones, 14 wells, 8 storage facilities, 9 booster stations, and over 170 miles of pipelines and a slow sand filter water treatment plant. The City's regional water system serves approximately 66,000 customers (City of Watsonville 2016). Approximately 95 percent (21,000 acre-feet per year) of the 22,000 acre-feet of water per year that is projected to be supplied by the district by 2020 would be from groundwater sources, while surface water would account for approximately 5 percent (1,000 acre-feet per year) of the district's water supply. The City's wastewater treatment facility can provide up to 4,000 acre-feet per year of recycled water, though this recycled water is intended for agricultural purposes only and, therefore, is not included in total water supply volume calculations. Surface water sources are more vulnerable to drought events. However, because the City uses more groundwater than surface water, it is less susceptible to significant impacts from a drought. During a drought, the City would depend more heavily on groundwater. City wells are not currently run at full capacity and can supply additional water if necessary. While there is potential to improve the capacity of all three water sources (i.e., groundwater, surface water, and recycled water), the City's wells and surface water supplies have the capacity to meet both current and projected water demands. Water resources planning, such as the City's 2015 Urban Water Management Plan, in anticipation of drought events can mitigate the severity of drought-related impacts.

2. Social Vulnerability

Drought can also affect people's health and safety. Examples of drought impacts on a community include higher incidents of heat stroke, reduced incomes, unemployment (or underemployment), anxiety or depression over economic loss, and fewer recreational activities. Dryer conditions can lead to higher concentrations of particulate matter in the air, which can threaten public health, especially impacting those suffering from asthma or other respiratory diseases. A prolonged or severe drought may require extracting more groundwater from deeper wells, thereby increasing the costs to consumers. Droughts are more likely to impact people who are economically disadvantaged because they can least afford reduced incomes, economic loss, or increased water rates.

3. Environmental Vulnerability

Reduction in regional water supplies would have the most direct physical impact on agriculture, which could, in turn, have economic impacts on the City. The City's 2015 Urban Water Management Plan (City of Watsonville 2016) identified heightened water demand vulnerabilities in the Pajaro Integrated Regional Water Management region, including increased demands from agricultural irrigation that could result in groundwater overdraft and subsequent seawater intrusion. The Pajaro River Watershed Integrated Regional Water Management Plan highlights an expected increase in agricultural areas and a significant shift in the types of crops grown (moving from lower to higher water use crops) (PRWIRWM 2014). On the other hand, the agricultural community is also making significant advances in water conservation by implementing climate-based irrigation systems and other technology, and substantial water savings could result from these efforts. However, it is uncertain how much water will be needed to maintain yield and quality in future years.

Drought also threatens parks and natural preserves with rich ecological habitats. Plants and wildlife depend on water to survive. Droughts can cause food supplies to shrink, and species' habitats can be temporarily or permanently damaged. Environmental impacts may include the following:

- Loss or destruction of fish and wildlife habitats
- Lack of food and drinking water for wildlife
- Migration of wildlife
- Increased stress on native, locally rare, and threatened and endangered species
- Loss of wetlands
- Wind and water erosion of soils

Secondary Hazards

Drought events may result in saltwater intrusion or groundwater overdraft. Groundwater overdraft occurs when groundwater use exceeds the amount of recharge into an aquifer, which leads to a decline in groundwater level. Overdraft has been a concern in the Pajaro Valley Basin (which includes the City of Watsonville Water Department) since 1980, when the California Department of Water Resources named the Pajaro Valley as 1 of 11 basins in the state with critical conditions of groundwater overdraft (PVWMA 2006). The City of Watsonville Water Department works with the Pajaro Valley Water Management Agency, which oversees the Pajaro Valley Basin, to reduce the amount of pumping from wells, which when over pumped, induce saltwater intrusion and threaten groundwater supplies.

Saltwater intrusion occurs when too much groundwater is pumped from coastal aquifers (overdraft), thereby upsetting the subterranean balance between inland freshwater and the ocean. Saltwater intrusion has moved further inland over the past 25 years, and even more inland saltwater intrusion is expected, especially during drought events as groundwater recharge declines due to reduced precipitation (Wallace and Lockwood 2010).

Drought conditions can also substantially increase wildfire risk. As plants and trees wither and die (from lack of precipitation, increased insect infestations, and diseases—all of which are associated with drought), they become fuel for wildfires. Long periods of drought lead to more wildfires and more intense wildfires, which impact communities, the economy, and the environment in many ways, including the destruction of residences, buildings, neighborhoods, crops, and habitats.

Earthquake

1. Physical Vulnerability

Earthquakes can cause widespread damage or destruction to buildings and other structures. Buildings in the community, including critical facilities, are threatened by earthquakes. The risk of harm from earthquakes varies widely, depending on the magnitude and the location of the fault line causing the earthquake.

Two earthquake scenarios were assessed in this vulnerability assessment. The reported "loss estimates" were formulated using Hazus, a geographic information system (GIS)-based, nationally standardized tool developed by FEMA (FEMA 2020). The following tables and maps show the following as they relate to each earthquake scenario: (1) the peak ground acceleration by census tract, (2) the estimated total structure loss (in U.S. dollars) by census tract, and (3) the resulting cumulative direct economic losses due to building damage. Peak ground acceleration is a measure of the strength of ground movement and is expressed as a fraction of gravitational acceleration, g (32.2 ft/s^2).

- **Earthquake Scenario 1** shows a possible repeat of the Loma Prieta earthquake of 1989 (magnitude 6.89).
- **Earthquake Scenario 2** shows a potential rupture along the Zayante-Vergeles Fault line (magnitude 7.0).

Earthquake Scenario 1: A Possible Repeat of the Loma Prieta Earthquake of 1989

Under this scenario, the southwestern portion of the City and the area bounded by Freedom Boulevard, South Green Valley Road, State Route 1, and the Watsonville Municipal Airport would experience the greatest economic losses. Although the southwestern portion of the City is projected to experience less intense ground shaking, the property value of the potentially damaged buildings is higher in this area, resulting in greater economic losses. The economic losses from building damage and business interruption were estimated using HAZUS-MH (FEMA 2020), and the results are summarized in Table B-20 and shown on Figures B-15, Peak Ground Acceleration by Census Tract, and B-16, Total Structure (Economic) Loss by Census Tract.

Table B-20. Building-Related Economic Loss Estimates

Category	Area	Total ($)
Building Loss	Structure	38,344
	Non-Structure	154,349
	Content	62,058
	Inventory	2,528
	Subtotal	**257,279**
Business Interruption	Capital Loss	6,323
	Relocation	16,154
	Rental Income	6,818
	Wage	8,098
	Subtotal	**37,393**
	Total	**294,672**

Figure B-15. Peak Ground Acceleration (PGA) by Census Tract (Loma Prieta)

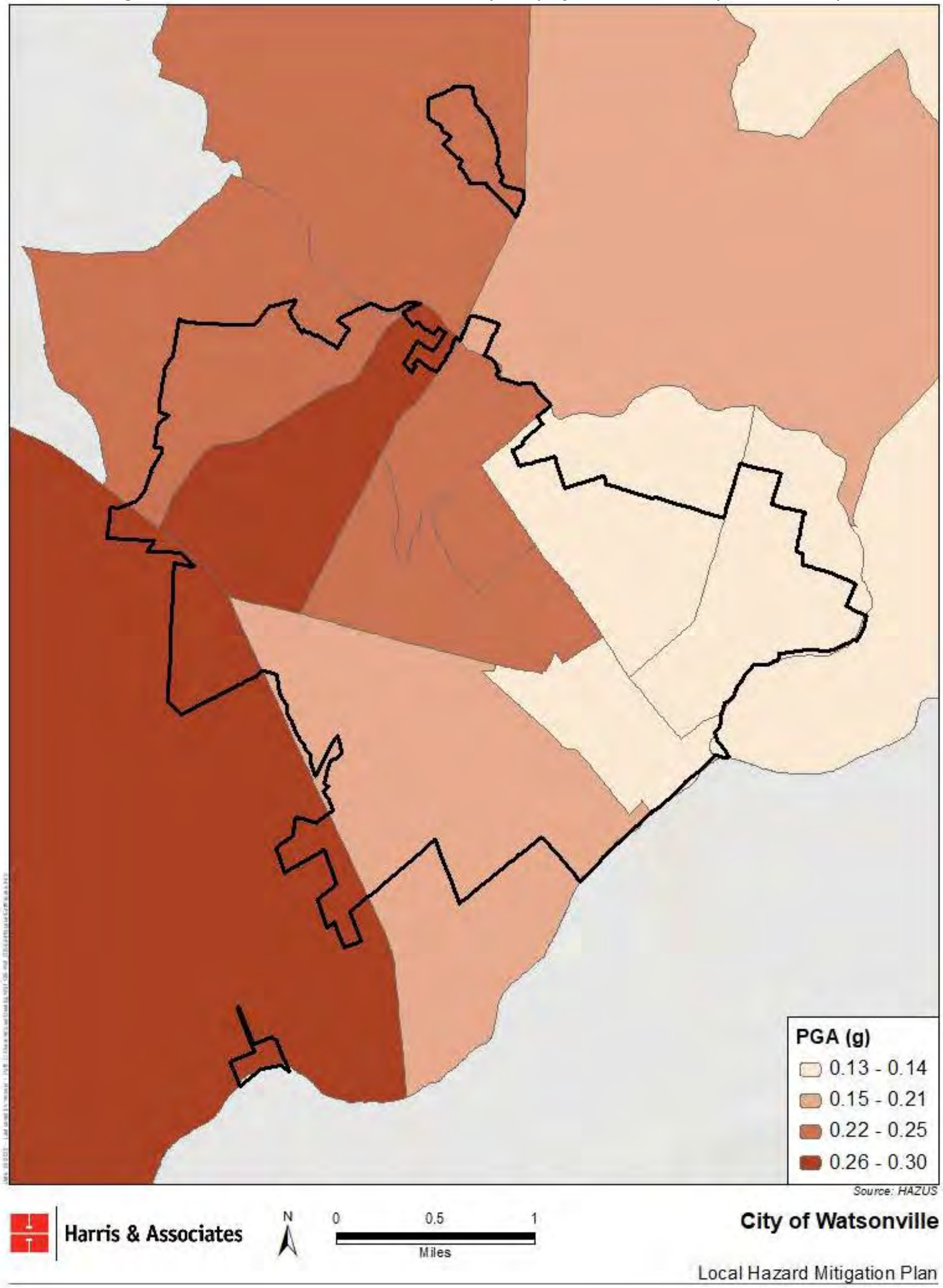

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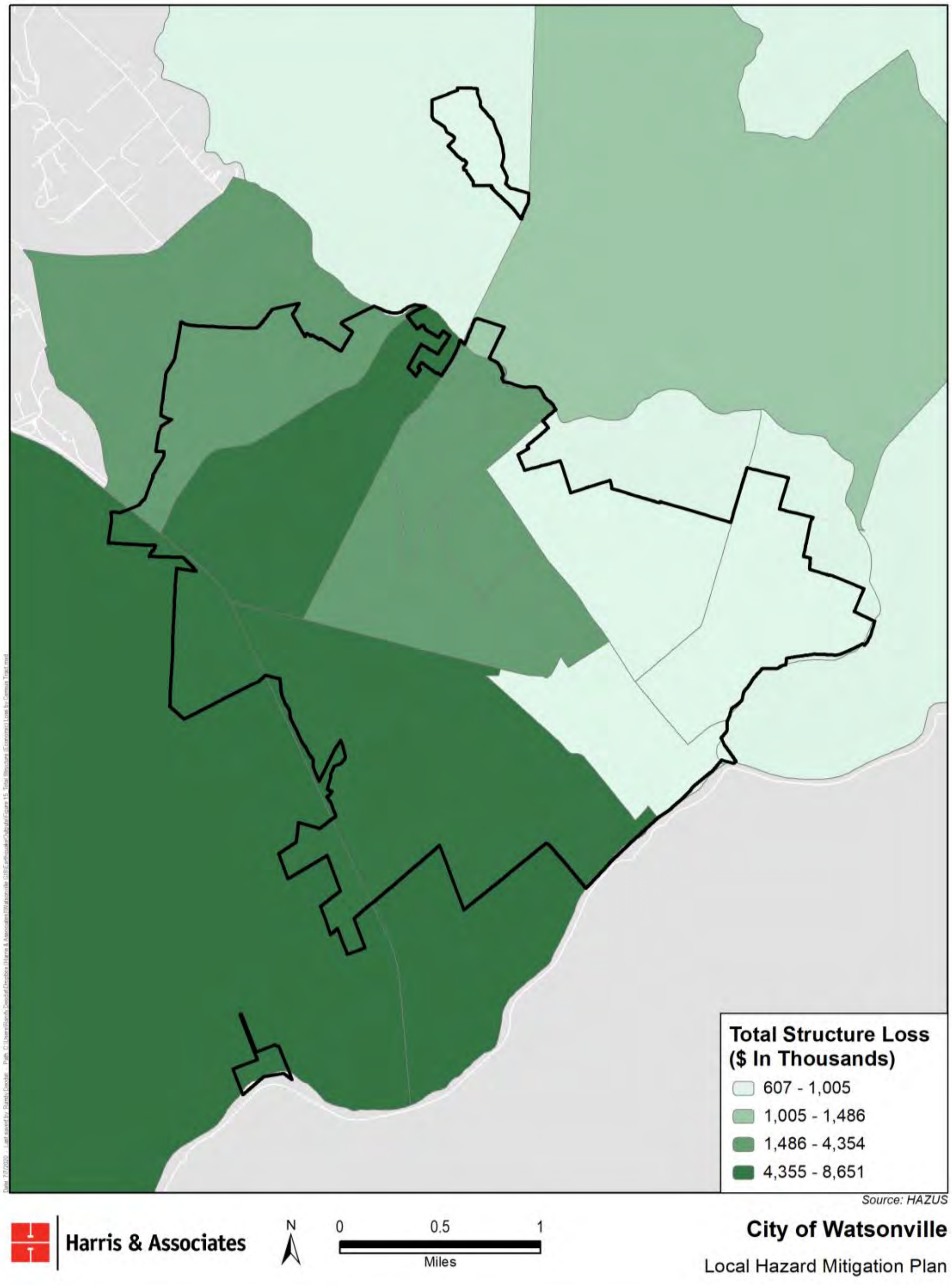
Figure B-16. Total Structure (Economic) Loss by Census Tract (Loma Prieta)



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Earthquake Scenario 2: A Potential Rupture along the Zayante-Vergeles Fault Line

Similar to Scenario 1, an earthquake along the Zayante-Vergeles Fault line would result in great economic losses in the southwestern portion of the City. The greater projected damages correlate with the severity of ground shaking. An earthquake along the Zayante-Vergeles Fault would be much more severe and costly compared to Scenario 1. The economic losses from building damage and business interruption were estimated using HAZUS-MH (FEMA 2020), and the results are summarized in Table B-21 and shown on Figures B-17, Peak Ground Acceleration by Census Tract (Zayante Vergeles), and B-18, Total Structure (Economic) Loss by Census Tract (Zayante Vergeles).

Table B-21. Building-Related Economic Loss Estimates

Category	Area	Total ($)
Building Loss	Structure	217,677
	Non-Structure	767,351
	Content	297,339
	Inventory	13,030
	Subtotal	**1,295,397**
Business Interruption	Capital Loss	33,351
	Relocation	88,012
	Rental Income	39,205
	Wage	43,254
	Subtotal	**203,822**
	Total	**1,499,219**

2. Social Vulnerability

Because the City could be affected by an earthquake, all communities in the City could be impacted. However, populations with mobility or financial resource limitations could face significantly greater hardship in the aftermath of a major quake. People over the age of 65 (especially those living alone) and those with disabilities could have a harder time evacuating after an earthquake, and people with an income below the federal poverty threshold may lack resources to make seismic safety improvements to their residences pre-disaster.

Levels of earthquake preparedness and disaster resilience also determine how vulnerable people are to seismic hazards. Individuals, organizations, and communities that have invested in assessing their risks and in formulating and implementing mitigation measures are likely to experience fewer losses of life, less damage, and less disruption from earthquakes.

3. Environmental Vulnerability

The biological effects of earthquakes have not been well studied. However, extreme ground shaking has resulted in documented biodiversity loss, contamination of critical habitat, and changes in the hydrological cycle. Subterranean biodiversity is particularly vulnerable due to the relationship between ground shaking, aquifer strain, fracturing, and habitat alterations for wildlife. Groundwater environments already under a variety of severe anthropogenic pressures, such as pollution and water extraction, may suffer or risk extinction from the additional stress of an earthquake.

Seismic shaking can also affect groundwater levels through repeated rises and falls (oscillations) and offsets. The common aquifer response to an earthquake is oscillation in groundwater levels. An instantaneous groundwater offset may result in a well flow at surface level or wells going dry. Offsets and oscillations occur near the earthquake rupture because the earthquake subjects Earth's crust, including its aquifer systems, to stress and deformation.

Secondary Hazards

Earthquakes may result in secondary hazards including liquefaction and landslides. Another secondary impact of an earthquake is hazardous material spills, such as if storage tanks rupture and spill into streams, rivers, or the drainage system.

Flood

1. Physical Vulnerability

A Level 1 HAZUS-MH analysis (FEMA 2020) was used to assess the risk and vulnerability to flooding in the City under two scenarios. The first scenario included the use of a 100-year flood depth grid derived from the flood elevations from the FEMA FIRM and the digital terrain model data from the U.S. Geological Survey. The second scenario included the use of a draft composite levee failure depth grid prepared as part of a project funded by the County. The draft composite levee failure model includes nearly 25 individual flooding scenarios and identifies the worst-case scenario for areas in the County subject to the levee failure hazard, including the City.

The HAZUS-MH (FEMA 2020) calculates losses to structures from flooding by looking at depth of flooding and type of structure. Using historical flood insurance claim data, HAZUS-MH estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. This inventory comes pre-loaded in the HAZUS-MH model and is based on data from the U.S. Census Bureau, state databases, the U.S. Highway Administration, and other sources.

Default values can be overridden with locally generated data if available. For this analysis, using the Base Flood Elevations provided in the 2017 FEMA Flood Insurance Study, local data consisting of depth grids representing the inundation extents and depth from the 100-year flood event were used for estimating flood losses due to the 100-year flood event. The analysis also included a depth grid representing the extents and depth from the draft composite levee failure model currently under development through a study underway by the County.

Figure B-17. Peak Ground Acceleration (PGA) by Census Tract (Zayante Vergeles)

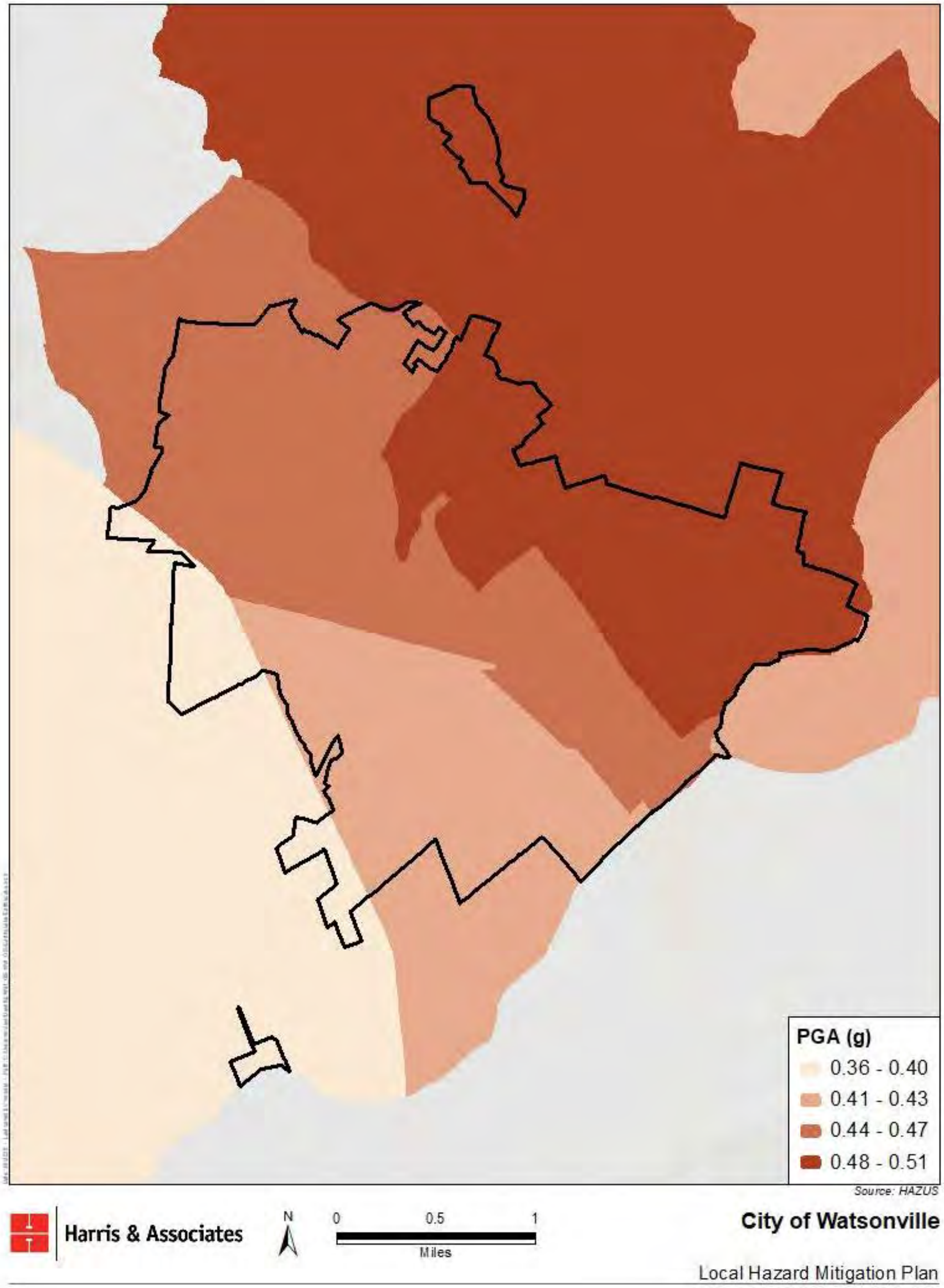

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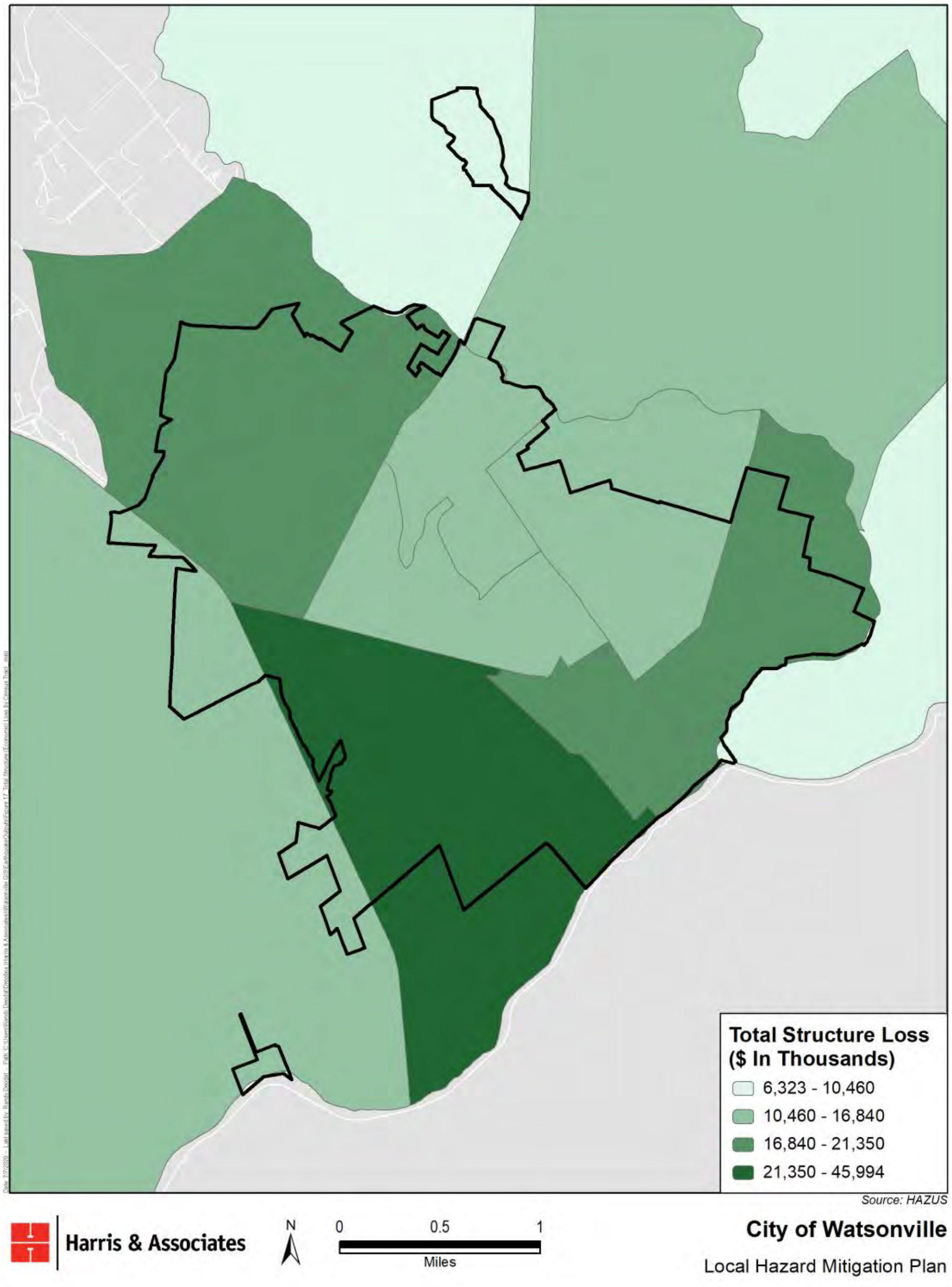
Figure B-18. Total Structure (Economic) Loss by Census Tract (Zayante Vergeles)



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Where possible, HAZUS-MH data for this Risk Assessment were enhanced using GIS data from the City and county, state, and federal sources. The following section describes risk exposure and vulnerability of critical facilities, infrastructure, and the general building stock in the City's mapped regulatory floodplain (Tables B-22 and B-23; Figures B-19, Critical Facilities in the 100- and 500-Year Flood Zone, and B-20, Critical Infrastructure in the 100-Year and 500-Year Flood Zone).

Table B-22. Critical Facilities in Flood Hazard Areas

Facility Type	FEMA Flood Hazard Areas		Levee Failure Area
	100-Year	500-Year	
Community Facility	1	1	1
Emergency Shelter	2	2	7
Medical Facility	0	1	4
Municipal Services	4	4	4
School	2	3	9

Note: FEMA = Federal Emergency Management Agency

Table B-23. Critical Infrastructure in Flood Hazard Areas

	FEMA Flood Hazard Areas		Levee Failure Area
	100-Year	500-Year	
Bridge	5	5	5
Communication	2	2	3
Energy	3	3	7
Wastewater/Drainage	17	18	18
Water	8	9	6

Note: FEMA = Federal Emergency Management Agency

Flooding poses numerous risks to the following critical facilities and infrastructure:

- Roads or railroads that are blocked or damaged can prevent access throughout the area, isolate residents, and impede emergency service providers trying to reach vulnerable populations or make repairs.
- Bridges washed out or blocked by floods or debris from floods can cause isolation.
- Creek or river floodwaters can back up drainage systems, causing localized flooding.
- Culverts can be blocked by debris from floodwaters, causing localized urban flooding.
- Floodwaters can penetrate drinking water supplies, causing contamination.
- Sewer systems can be backed up, causing waste to spill into residences, neighborhoods, rivers, and streams.
- Underground utilities can be damaged.

HAZUS-MH was used to estimate the flood loss potential of critical facilities and infrastructure exposed to the flood risk. The model uses depth and damage function curves to estimate the percent of damage to a building and its contents and correlates that information with an estimate of functional downtime (i.e., the time it will take to restore a facility to 100 percent functionality) (FEMA 2020).

The HAZUS-MH model for the 100-year flood event determined that one fire station, one police station, and three schools would incur at least moderate damage (FEMA 2020).

The HAZUS-MH model for the levee failure event determined that one fire station, one police station, and five schools would incur at least moderate damage. The model also determined that the loss of use of one fire station, one police station, and four schools would result from a levee failure (FEMA 2020).

The City's wastewater treatment plant is in the floodplain and would be impacted during a 100-year flood.

County Assessor data (County of Santa Cruz 2020) were used to summarize the number and type of structures in the City's 100-year floodplain (FEMA Special Flood Hazard Area) and levee failure inundation areas. During a levee failure, the structures in the FEMA Special Flood Hazard Area and the Levee Failure Area would be inundated (Table B-24).

Table B-24. Structures in the FEMA Special Flood Hazard Area and Levee Failure Area

	No. of Structures						
	Residential	Commercial	Industrial	Religious	Government	Education	Total
FEMA Special Flood Hazard Area	1,183	49	70	6	24	2	1,334
Levee Failure Area	2,458	74	51	7	7	3	2,600

Note: FEMA = Federal Emergency Management Agency

The values of exposed buildings in the City's Special Flood Hazard Area and Levee Failure Area were generated using HAZUS-MH and are summarized in Tables B-25 and B-26. This method estimated approximately $1.65 billion worth of building exposure to the 100-year flood hazard and $2.85 billion worth of building exposure to the level failure hazard.

Table B-25. Value of Exposed Buildings in the FEMA Special Flood Hazard Area

Buildings	Value ($)	Total Value (%)
Commercial	$299,650,000	38.2
Education	$24,622,000	40.0
Government	$29,924,000	92.2
Industrial	$326,562,000	74.1
Religion	$19,090,000	27.2
Residential	$919,020,000	28.4
Total	**$1,652,156,000**	**35.2**

Note: FEMA = Federal Emergency Management Agency

Table B-26. Value of Exposed Buildings in the Levee Failure Area

Buildings	Value ($)	Total Value (%)
Agricultural	$53,769,000	84.2
Commercial	$497,343,000	63.4
Education	$39,316,000	63.2
Government	$30,209,000	93.1
Industrial	$360,041,000	81.7
Religion	$39,332,000	56.0
Residential	$1,827,079,000	56.4
Total	**$2,847,089,000**	**60.7**

The levee has a history of erosion and seepage distress observed during prior storms. Several times since construction, the levee has been breached, and numerous flood fights have occurred (USACE 2017). Although flooding is relatively shallow in depth, there is a potential for loss of life and economic damages associated with estimated flooding. The levee system is currently undergoing review by the U.S. Army Corps of Engineers, and the risk level may be updated in the future.

The buildings and infrastructure in the area protected by the existing levee system are considered exposed and potentially vulnerable. Properties closest to the levee have the greatest potential to be hit with the largest, most destructive surge of water. Utilities such as overhead power, cable, and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation area.

Levee failure can cause severe downstream flooding and may transport large volumes of sediment and debris, depending on the magnitude of the event. Widespread damage to building and infrastructure affected by an event would be expensive to repair. In addition to the cost of repairing physical damage, business income can be lost due to business closures while flood waters recede and utilities are returned to service.

The HAZUS-MH analyses for the 100-year flood and levee failure events are summarized in Tables B-27 and B-28. It is estimated that there would be up to $5.31 million in flood losses from a 100-year event and nearly $515 million in flood losses from a levee failure event (FEMA 2020).

Table B-27. Building-Related Economic Loss Estimates for a 100-Year Flood Event (millions of dollars)

Category	Area	Residential	Commercial	Industrial	Other	Total
Building Loss	Structure	3.19	0.06	0.00	0.00	**3.25**
	Content	1.76	0.22	0.04	0.02	**2.05**
	Inventory	0.00	0.00	0.01	0.00	**0.01**
	Subtotal	**4.96**	**0.28**	**0.05**	**0.02**	**5.31**
Business Interruption	Income	0.15	3.24	0.02	0.16	**3.57**
	Relocation	6.03	0.72	0.03	0.09	**6.87**
	Rental Income	2.29	0.54	0.01	0.01	**2.84**
	Wage	0.36	2.62	0.04	0.43	**3.44**
	Subtotal	**8.84**	**7.12**	**0.09**	**0.68**	**16.73**
	Total	**13.79**	**7.40**	**0.14**	**0.70**	**22.04**

Table B-28. Building-Related Economic Loss Estimates for a Levee Failure Flood Event (millions of dollars)

Category	Area	Residential	Commercial	Industrial	Other	Total
Building Loss	Structure	124.78	19.67	38.58	6.76	**189.78**
	Content	79.52	57.82	133.23	32.32	**302.90**
	Inventory	0.00	1.98	19.30	0.98	**22.26**
	Subtotal	**204.30**	**79.46**	**191.11**	**40.06**	**514.93**
Business Interruption	Income	1.03	46.37	5.27	11.37	**64.04**
	Relocation	42.94	15.95	5.87	8.45	**73.22**
	Rental Income	20.56	11.45	1.52	1.92	**35.44**
	Wage	2.42	56.16	8.41	98.52	**165.51**
	Subtotal	**66.95**	**129.93**	**21.07**	**120.26**	**338.21**
	Total	**271.25**	**209.40**	**212.18**	**160.32**	**853.15**

The HAZUS-MH data for the levee failure scenario were also compared with the data available from the National Levee Database (NLD), which estimated 3,080 people and $1.6 billion are at risk from flooding due to the levee failure hazard (USACE 2020). The NLD is the authoritative resource for information on levees in the United States. It is a modern, web-based information system that connects levee-related information and activities, including flood risk communication, levee system evaluation for the National Flood Insurance Program, levee inspections, floodplain management, and risk assessment. The NLD is intended to be a primary information resource for federal, state, and local governments, agencies, and organizations and the general public. The NLD classifies the risk level of the levee system protecting the City as "Moderate," considering the levee's historical performance, the frequent chance of storms overflowing the channel, and the potential flooding consequences.

Figure B-19. Critical Facilities in the 100- and 500-Year Flood Zone

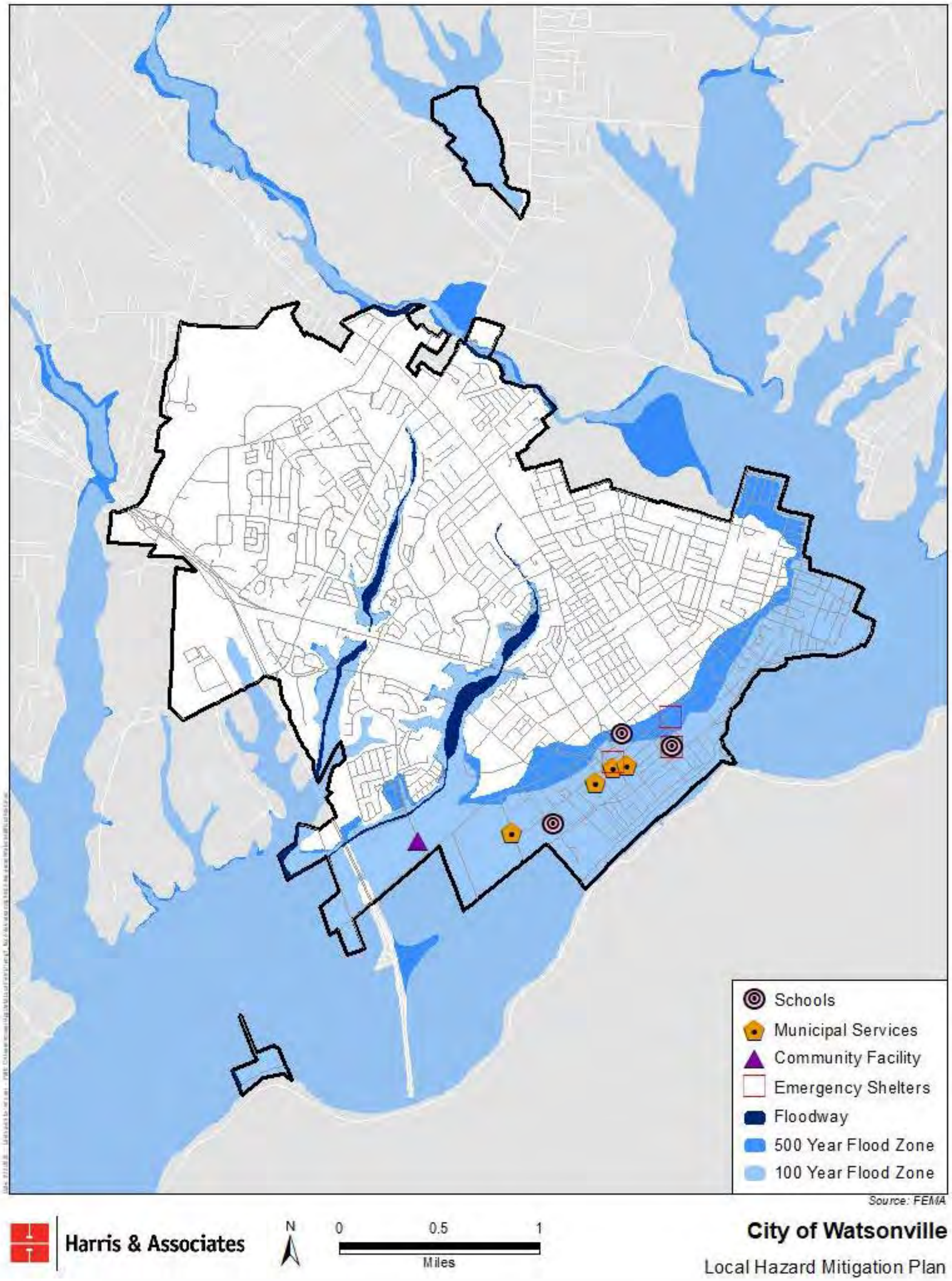

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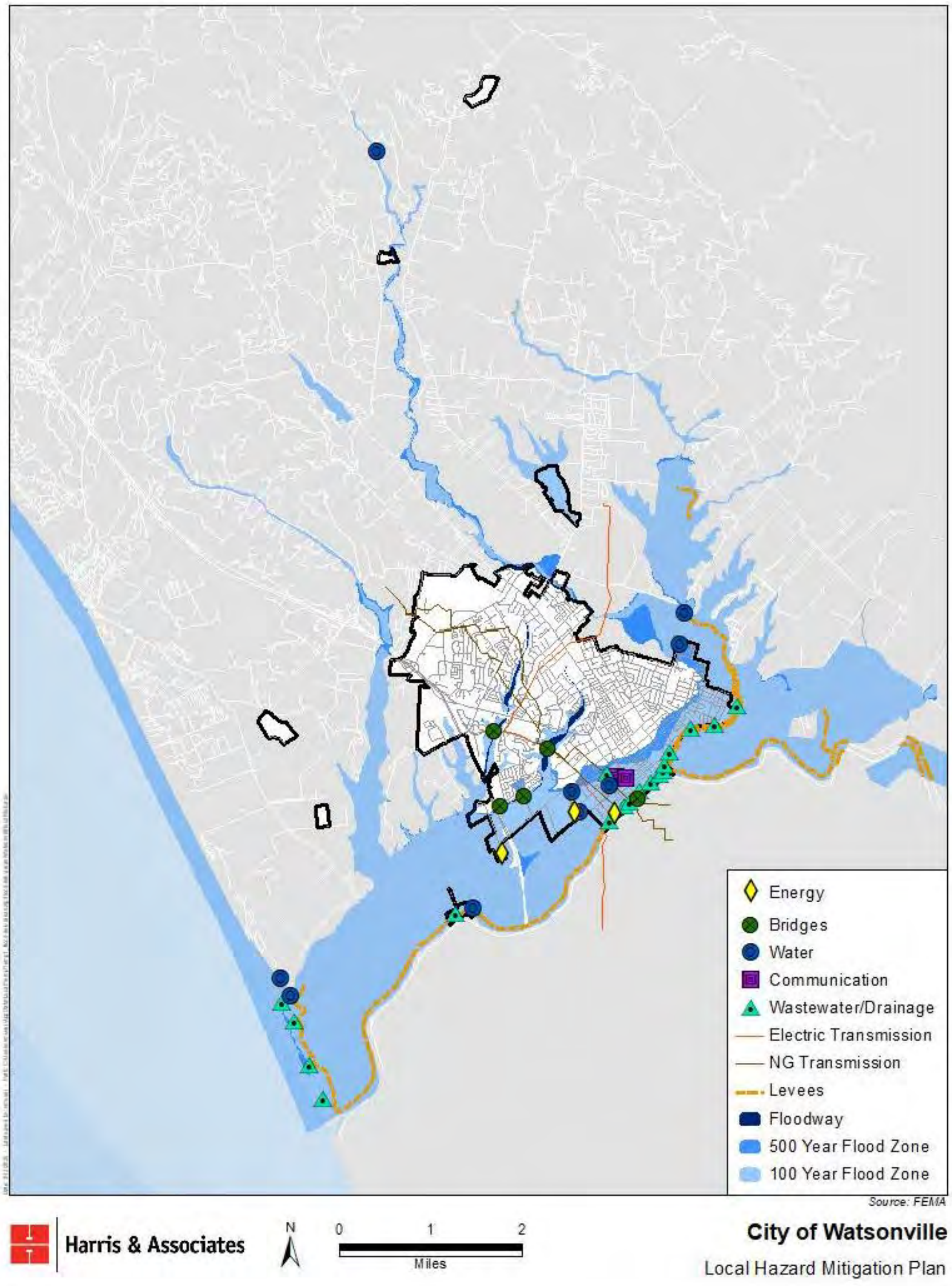
Figure B-20. Critical Infrastructure in the 100-Year and 500-Year Flood Zone



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Flood Insurance

Flood insurance statistics help identify vulnerability by showing where there is claim activity, where there is a high rate of flood insurance in force, and where flooding may be occurring in areas not identified as flood-prone. Table B-29 includes the flood insurance statistics for the City.

Table B-29. Flood Insurance Statistics for the City of Watsonville

Date of entry – initial FIRM effective date	06/15/1984
Current FIRM effective date	05/16/2012
Number of flood insurance policies in force as of 08/31/2019	620
Total annual premium	$819,352
Average policy cost	$1,322
Total insurance coverage	$155,946,200
Total claims filed (from 06/15/1984 to 08/31/2019)	82
Value of claims paid	$764,076
Average claim paid	$9,318
Number of flood insurance policies in force in the SFHA	562
X standard/B/C policies	24
Preferred risk policies	34
Number of flood insurance policies in force outside of SFHA	58

Notes: FIRM = Flood Insurance Rate Map; SFHA = Special Flood Hazard Area

The flood insurance statistics for the City show that 562 structures in the SFHA (approximately 23 percent) are covered by a flood insurance policy. The number of flood insurance policies covering insurable property outside of the SFHA is 58 policies, which represents approximately 2 percent of the insurable properties in the levee failure inundation area.

B.4 NFIP insured structures that have been repetitively damaged by floods. (Requirement §201.6(c)(2)(ii))

a. A description of the types (residential, commercial, institutional, etc.) and estimate the numbers of repetitive loss properties located in identified hazard area

Repetitive Loss

Several federal government programs encourage communities to identify and mitigate "repetitive loss" properties. Nationwide, repetitive loss properties make up 1 to 2 percent of the flood insurance policies currently in force (FEMA 2014). However, they account for 30 percent of flood insurance claim payments.

FEMA identifies repetitive loss structures based on flood insurance payments. A repetitive loss area is the portion of the floodplain where numerous buildings have been subject to repetitive flooding. The purpose of identifying repetitive loss areas is to identify structures that are subject to the same risk but are not on FEMA's list because a flood insurance policy was not in force at the time of the loss. FEMA has not identified any repetitive loss properties in the City of Watsonville.

2. Social Vulnerability

Flooding can be a deadly hazard. The first largest risk from flooding is roads running through low-lying areas prone to sudden and frequent flooding. Motorists often attempt to drive through barricaded or flooded roadways. Because most vehicles can be carried away by 18 to 24 inches of water moving across a roadway, floods can present significant safety risks. The second largest risk is people walking or playing in or near flooded areas. Generally, floods cause loss of life in one of two situations: when people ignore basic safety precautions (such as evacuations and warnings) and when a flash flood hits an area with no warning.

While levees can help reduce the risk of flooding, they do not eliminate the risk. Levees can, and do, deteriorate over time and must be maintained to retain their effectiveness. The direct and indirect losses associated with levee failure include injury and loss of life, damage to structures and infrastructure, agricultural losses, utility failure, and stress on community resources. The warning time for a levee failure event is often limited, which contributes to the direct and indirect losses.

The entire population in a levee-protected zone is considered exposed and potentially vulnerable. Of the population exposed, the most vulnerable include the economically disadvantaged and those over the age of 65. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on the net economic impact to their family. The population over the age of 65 is also highly vulnerable because they are more likely to need medical attention that may not be available because of isolation during a flood event, and they may have more physical difficulty evacuating.

As stated earlier, warning time for levee failure is often limited. These events are frequently associated with other natural hazard events such as earthquakes, landslides, or severe weather, which limits predictability and compounds the hazard. Populations without adequate warning of the event are highly vulnerable to this hazard. Ongoing mitigation efforts, including information dissemination and use of early warning systems, should help avoid the most likely cause of injury: people trying to cross flooded roadways or channels during a levee-failure-induced flood.

Estimates of the population living in the 100-year floodplain and levee failure inundation areas in the City were generalized by analyzing census blocks that intersect the regulatory floodplain and levee inundation areas in the City. Census blocks do not follow the same boundaries as the floodplain and levee failure areas. Therefore, the method used to generate these estimates counted census block groups whose center are in the floodplain and levee failure areas. HAZUS-MH estimated the exposed population in the regulatory floodplain is estimated to be approximately 13 percent of the City's population of 51,199 (Table B-30). HAZUS-MH also estimated the exposed population in the worst-case levee failure scenario to be 28 percent of the City's population (FEMA 2020).

Table B-30. Population and Households in Flood Risk Areas

Hazard	Population	Households
100-year flood	26,583	2,194
Levee Failure	14,599	4,866
Total	**41,182**	**7,060**

Source: Urban Footprint 2020.

Figures B-21 through B-26 show the geographic distribution of particularly vulnerable groups to flooding events.

3. Environmental Vulnerability

Flooding is a natural event, and floodplains provide many natural and beneficial functions for the environment. Nevertheless, flooding can impact the environment in the following negative ways:

- Migrating fish can wash onto roads or over dikes and levees into flooded fields with no possibility of escape.
- Pollution from roads, such as oil, and hazardous materials can wash into rivers and streams.
- Pollutants carried by floodwaters can settle onto normally dry soils, polluting them for agricultural uses.
- Human development, such as bridge abutments and levees, can increase streambank erosion, causing rivers and streams to migrate into non-natural courses.

With a significant amount of the City's SFHA zoned for open space use, the City has taken necessary steps to preserve the natural and beneficial functions of the floodplain while reducing the risk exposure to the built environment. Nevertheless, the vegetation and wildlife resources and corridors in the floodplain, such as grasslands, oak woodlands, riparian areas, and seasonal wetlands, are exposed to the flood hazard.

Floods can distribute large amounts of water, sediment, and valuable minerals from riverbeds over vast areas. In some areas, this sediment helps replenish valuable topsoil components to agricultural lands, keeps the elevation of land masses above sea level, and prevents subsidence. Alternatively, flooding on the Pajaro River can result in debris deposits and erosion of agricultural soils that leads to crop losses. Agricultural lands are considered to be the major source of nutrient and sediment loading into the Pajaro River. In March 1995, flooding caused total economic losses over $95 million dollars, including $67 million in damage to agricultural fields in the nearby Town of Pajaro (USACE 2017).

In more developed areas, floodwater can be devastating for the surrounding ecosystem. Agricultural chemicals, including fertilizers and pesticides, and other pollutants, such as paint or gasoline, can contaminate natural habitats and the groundwater. Groundwater is the main source of water for residents and farmers in the Pajaro Valley. The alluvial aquifer in the area is most affected by agricultural runoff and pollutants because it is closest to the surface.

Secondary Impacts

The most significant secondary impact of flooding in the City is stream bank erosion. Another secondary impact of flooding is hazardous material spills, such as if storage tanks rupture and spill into streams, rivers, or the drainage system. Extreme flooding may also induce a landslide hazard.

High Winds

1. Physical Vulnerability

High winds that accompany storms or dry Santa Ana winds can cause weak utility poles, lines, trees, or other vegetation to fall and become a public threat. Electrical lines, electric substations, medical facilities, and older structures are some of the physical assets that are likely to be impacted if wind speeds intensify. Since severe wind can occur anywhere in the City, it is not possible to know what facilities would be impacted by severe winds. However, a building's load resistance capacity to a high wind event can depend on the age of the building, quality of construction, and construction materials, among other factors. Figure B-27, Building by Age in City of Watsonville, shows the distribution of buildings by age throughout the City.

2. Social Vulnerability

City residents are potentially vulnerable to high wind events. Because economically disadvantaged people and renters may not have the financial resources to repair the damage or move to an undamaged apartment, they may experience longer periods of displacement and take more time to repair damage from high winds that topple trees and destroy residential roofs and buildings.

3. Environmental Vulnerability

High wind may cause higher rates of soil erosion, a process of removing soil particles that causes the soil to deteriorate. Eroded topsoil can be transported by wind into streams and other waterways. Although wind erosion is a problem, water erosion is generally more severe. High winds may also result in flower and fruit shedding, and crops and trees with shallow roots may be uprooted.

Secondary Impacts

Along with many other weather conditions, wind can interfere with electrical and distribution lines, which can ignite fires. When winds reach high speeds, utilities throughout the state may consider a Public Safety Power Shutoff (PSPS)—a forced blackout in response to the growing risks of disastrous wildfires. Entire regions may experience power shutdowns, which can last up to 7 days. Vulnerable populations, including people who depend on medical equipment at home, whose workplaces are closed, and who are economically disadvantaged, face increased food insecurity without refrigeration that may be severely impacted by PSPS.

Figure B-21. Economically Disadvantaged Population in Flood Hazard Zone

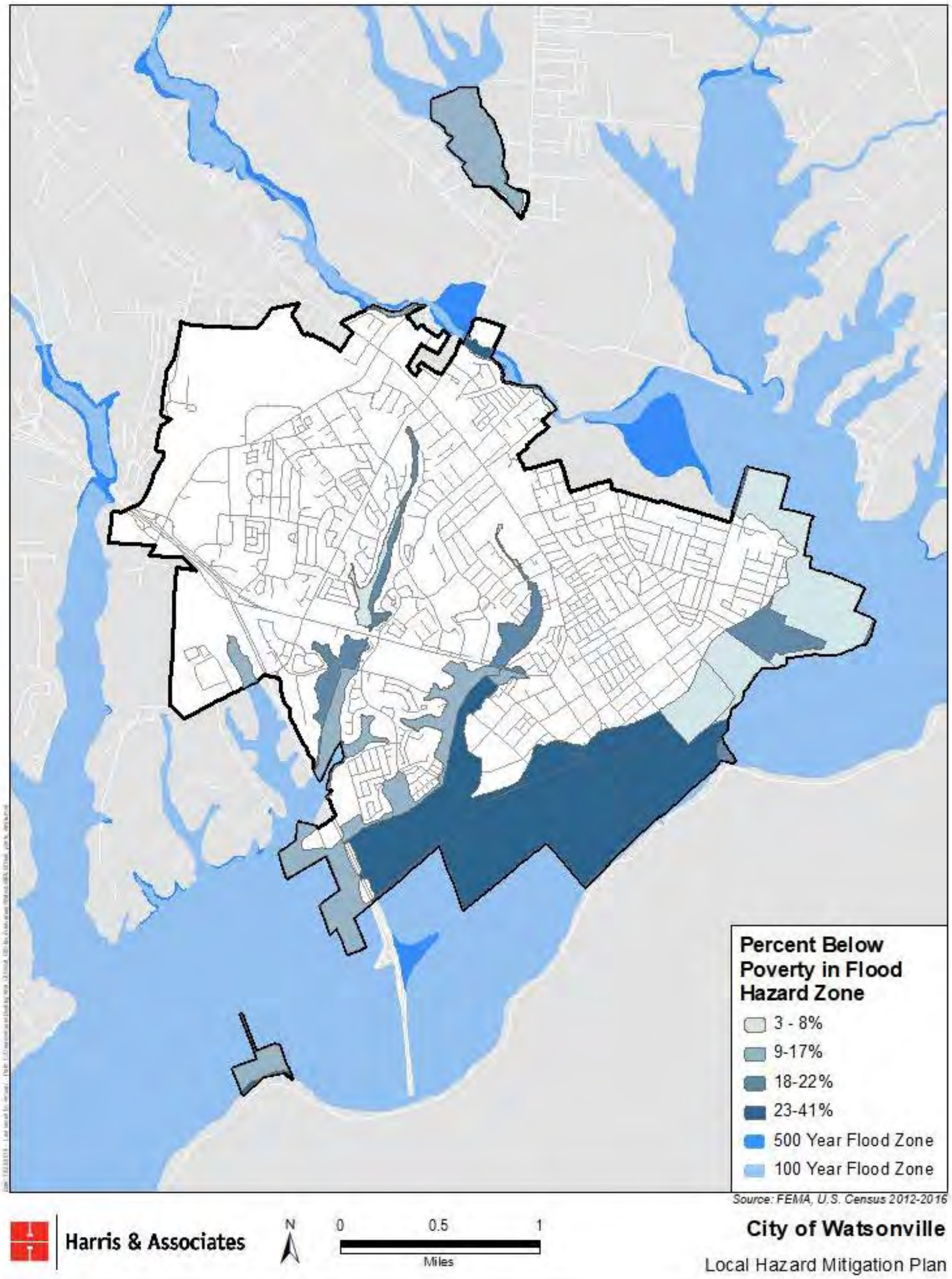

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Figure B-22. 65+ Population in Flood Hazard Zone

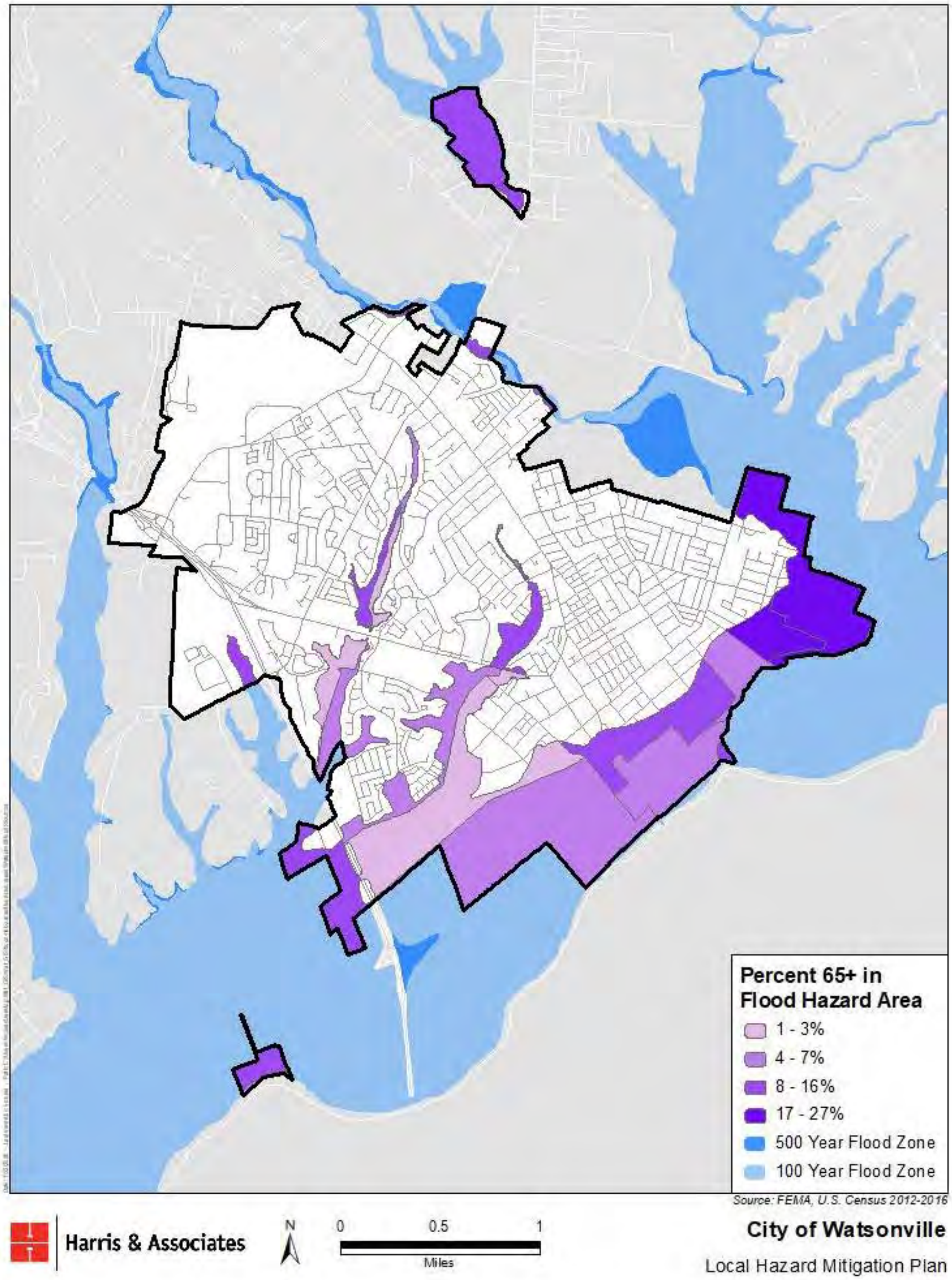

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Figure B-23. Linguistically Isolated Population in Flood Hazard Zone

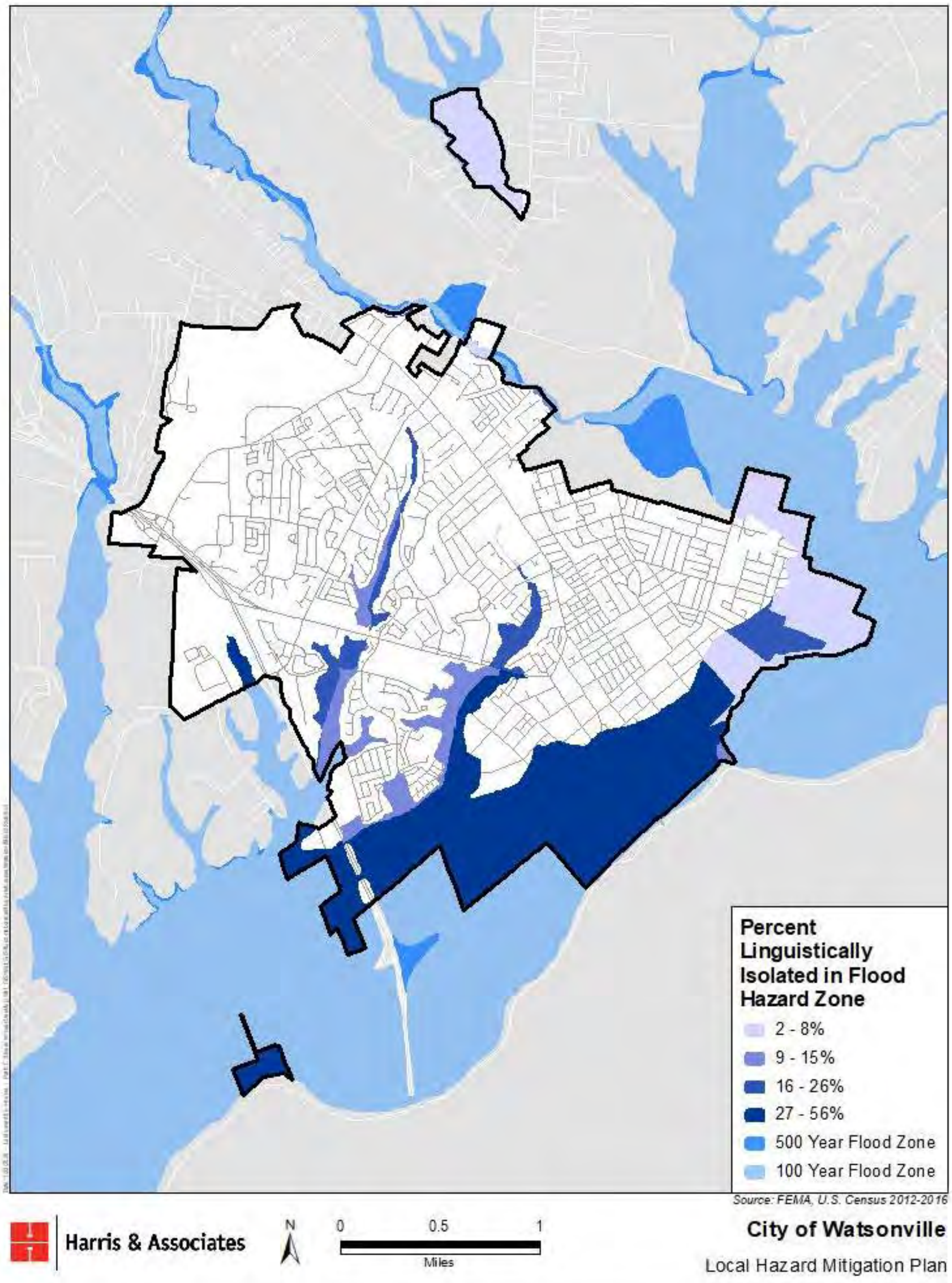

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Figure B-24. Population Without Health Insurance in Flood Hazard Zone

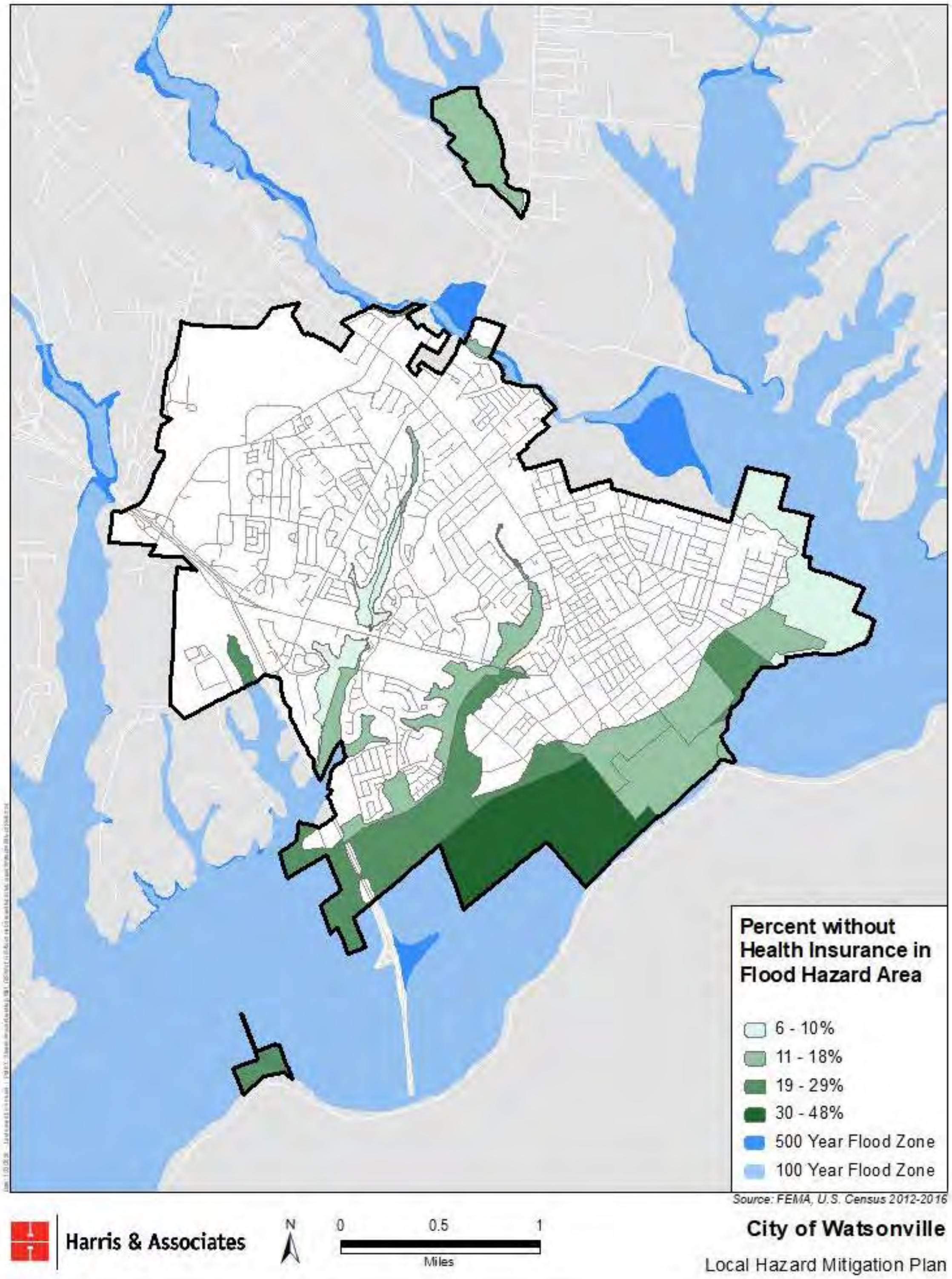

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Figure B-25. Mobile Home Population in Flood Hazard Zone

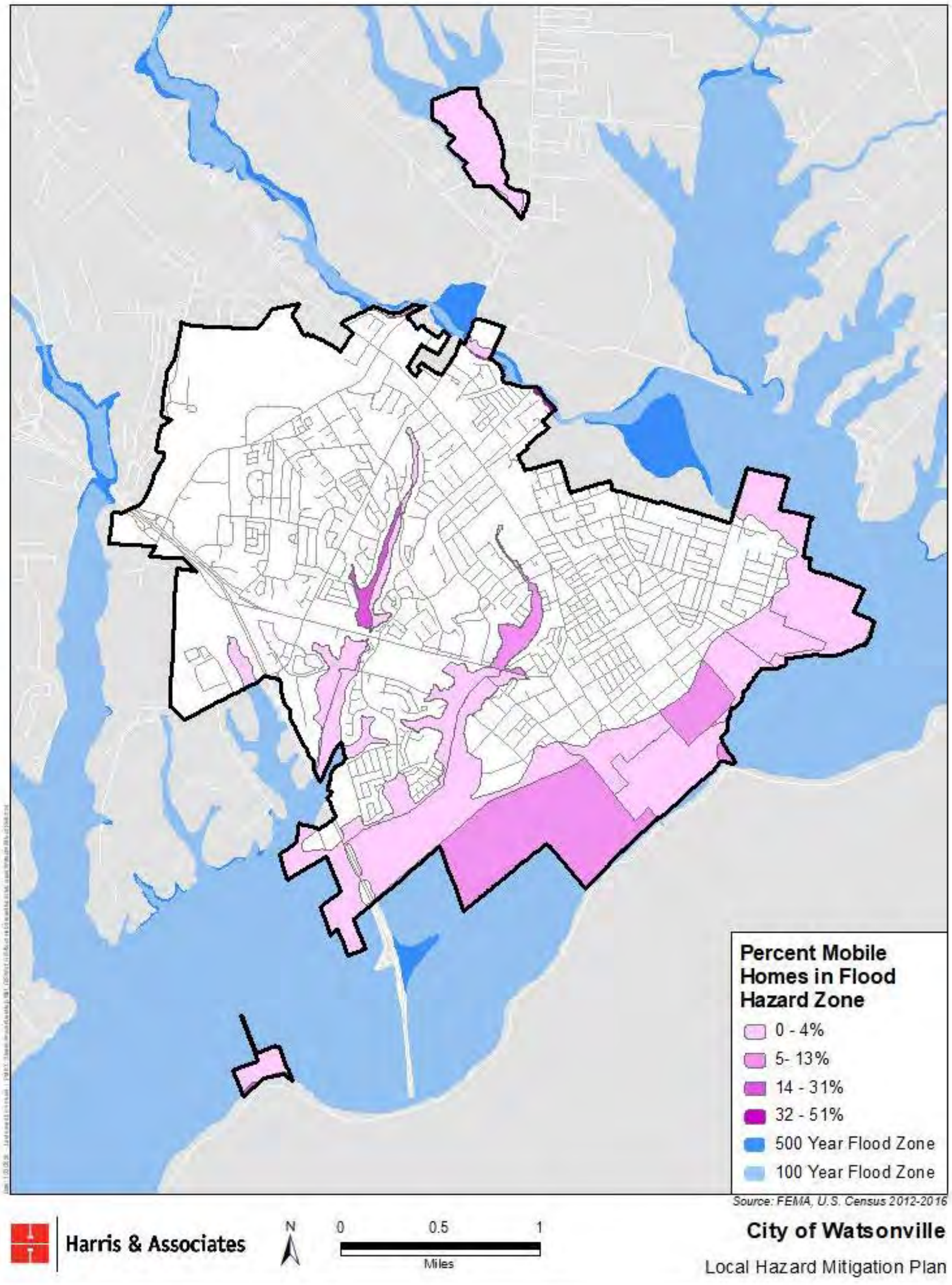

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Figure B-26. Renters in Flood Hazard Zone

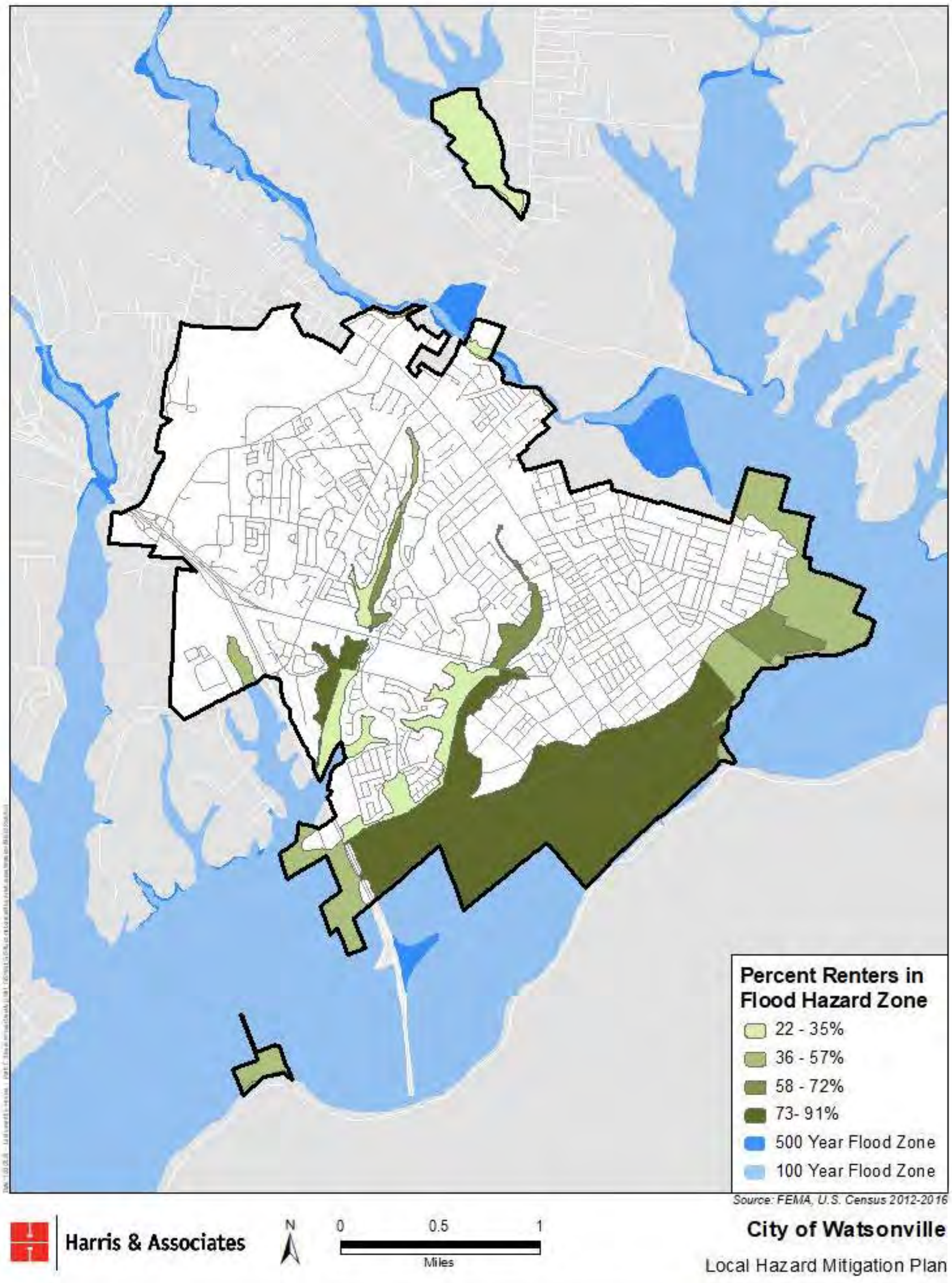

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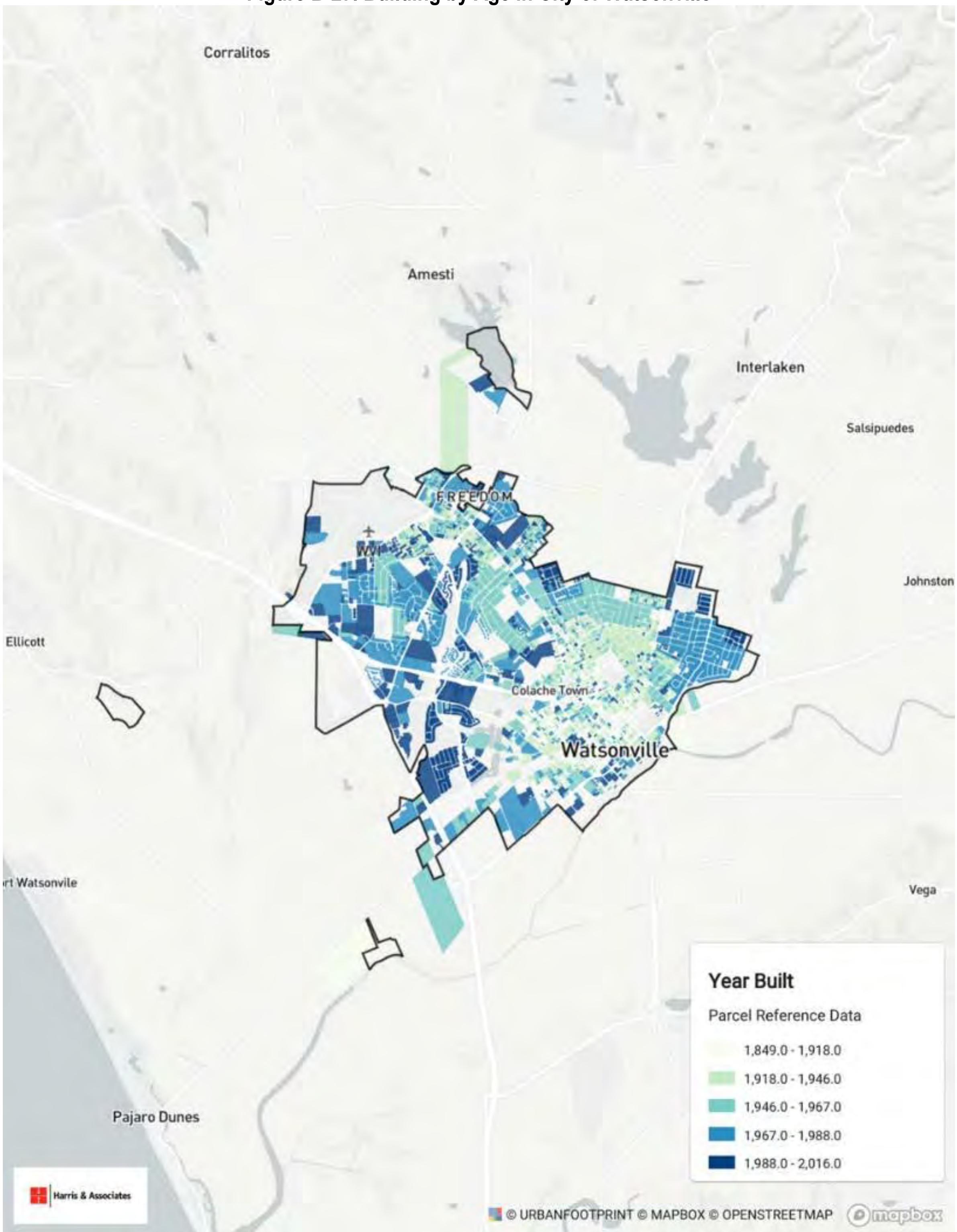
Figure B-27. Building by Age in City of Watsonville



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Landslides

1. Physical Vulnerability

As described in the hazard profile, landslides have a high risk of occurring in areas with loose, unconsolidated soils with shallow groundwater and prone to seismic shaking. The coastline west of the City and areas adjacent to the Pajaro River are vulnerable to liquefaction. In total, 38 critical facilities and infrastructure are in the mapped landslide hazard zone. Figures B-28, Critical Facilities in Landslide Hazard Zone, and B-29, Critical Infrastructure in Landslide Hazard Zone, show the critical facilities and infrastructure in the landslide hazard zones in the City. Loss estimates were calculated based on the improvement values of parcels in the hazard area (Tables B-31, B-32, and B-33).

Table B-31. Critical Facility in Landslide Hazard Area

Category	Count in Susceptibility Class "Strong" (VI) and Above
Emergency Shelter	4
Medical Facility	7
School	5

Table B-32. Critical Infrastructure In Landslide Hazard Area

Category	Count in Susceptibility Class "'Strong"' (VI) and Above
Bridge	1
Communication	3
Wastewater/Drainage	9
Water	9

Table B-33. Landslide Loss Estimates

Loss Estimates	Total Hazard
Parcels Impacted	2,452
Total Improvement Value ($)	600,956,255

2. Social Vulnerability

Although seismic shaking could threaten the entire community, certain areas are more vulnerable to landslides Figures B-30 through B-35 show the geographic distribution of particularly vulnerable groups in landslide susceptibility areas.

Liquefaction

1. Physical Vulnerability

According to the City's GIS data (City of Watsonville 2020), 4,529 parcels are in the liquefaction risk areas. Loss estimates are calculated based on the improvement values of these parcels. In total, 82 critical facilities and infrastructure are in high or very high hazard areas, and 4 are in moderate hazard areas (Tables B-34, B-35, and B-36). However, structures on steep slopes with loose or water-saturated soil are vulnerable to landslides. Figures B-36, Critical Facilities in Liquefaction Hazard Zone, and B-37, Critical infrastructure in Liquefaction Hazard Zone, show the geographic distribution of the critical facilities and infrastructure in liquefaction risk areas.

Table B-34. Critical Facilities in Liquefaction Risk Areas

Category	Very High	High	Moderate
Community Facility	1	0	0
Emergency Shelter	0	11	0
Medical Facility	1	5	0
Municipal Services	0	4	0
School	0	12	0

Table B-35. Critical Infrastructure in Liquefaction Risk Areas

Category	Very High	High	Moderate
Bridge	4	0	0
Communication	0	4	0
Energy	5	2	0
Wastewater/Drainage	12	9	0
Water	4	8	4

Table B-36. Liquefaction Loss Estimates

Loss Estimates	Very High	High	Moderate	Total Hazard
Total Parcels Impacted	393	4,135	1	4,529
Total Improvement Value ($)	78,573,064	766,662,739	0	845,235,803

2. Social Vulnerability

Although seismic shaking could threaten the entire City, certain areas would be more vulnerable to liquefaction. Table B-37 shows the total population under each type of liquefaction risk potential. Figures B-38 through B-43 show the geographic distribution of the previously discussed vulnerable groups in liquefaction risk areas.

Table B-37. Population in Liquefaction Risk Areas

Liquefaction Potential	Population
Moderate	0
High	5,860
Very High	1,790
Total	**7,650**

Figure B-28. Critical Facilities in Landslide Hazard Zone

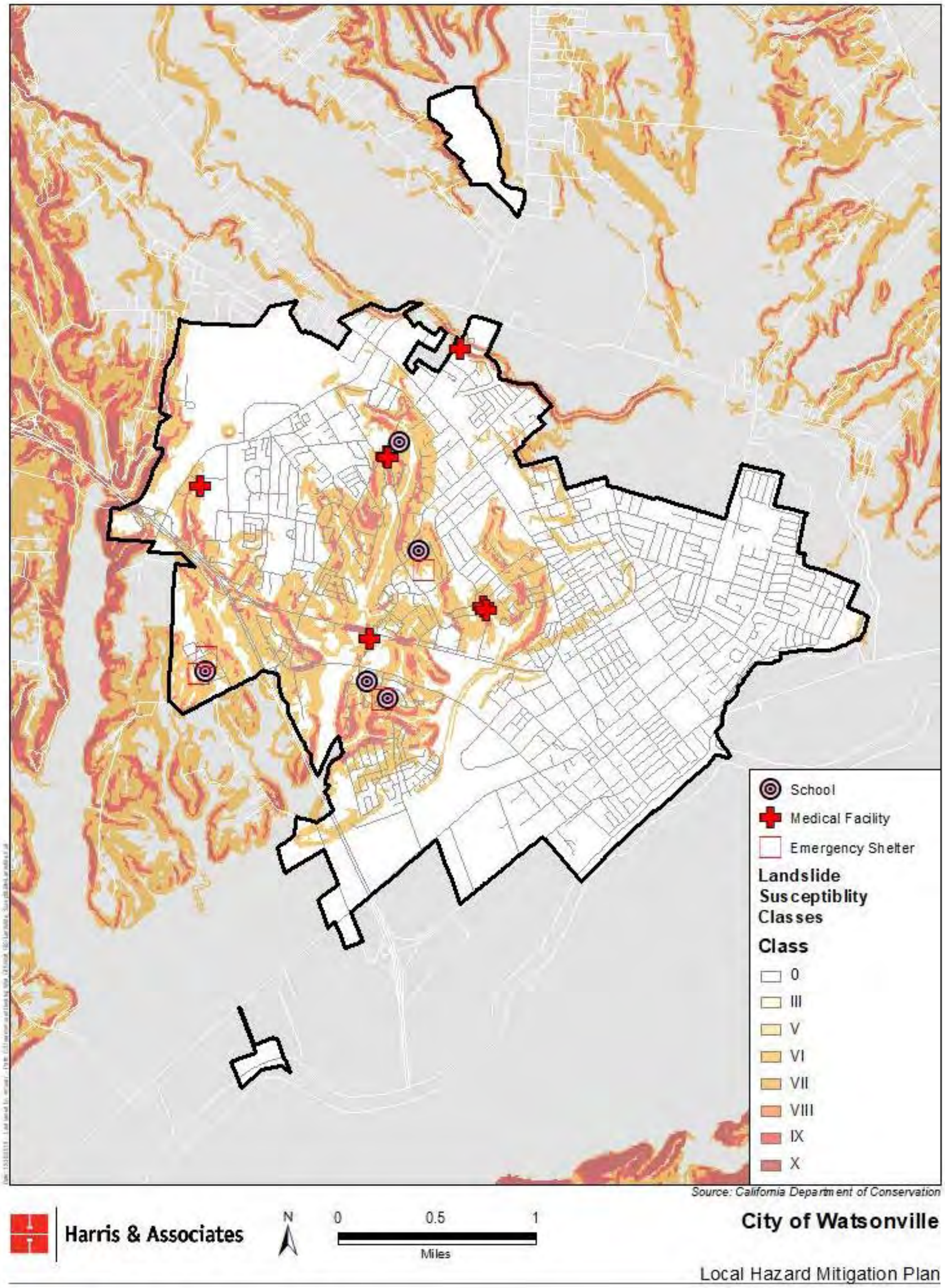

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Figure B-29. Critical Infrastructure in Landslide Hazard Zone

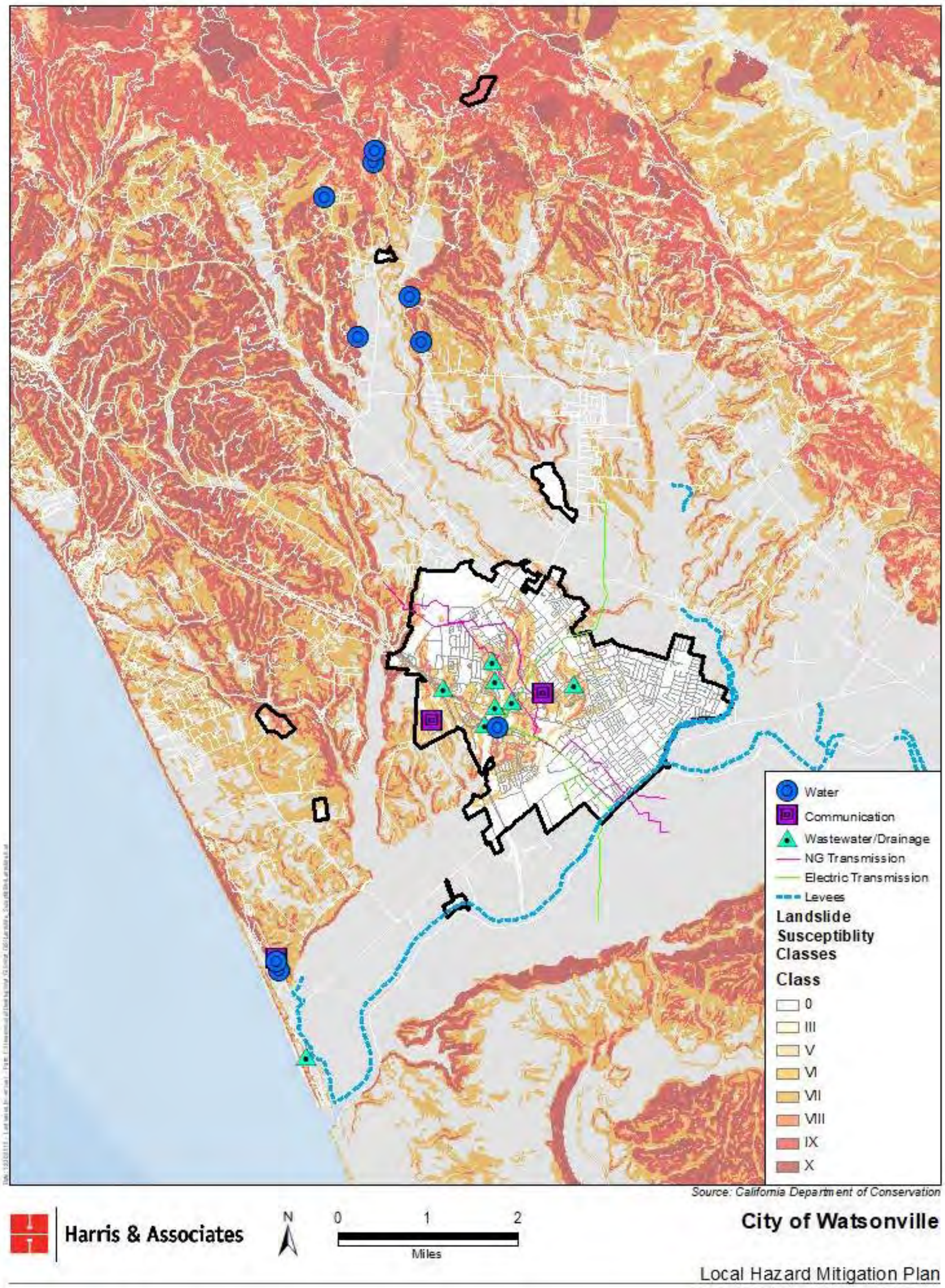

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Figure B-30. Economically Disadvantaged Population in Landslide Hazard Zone

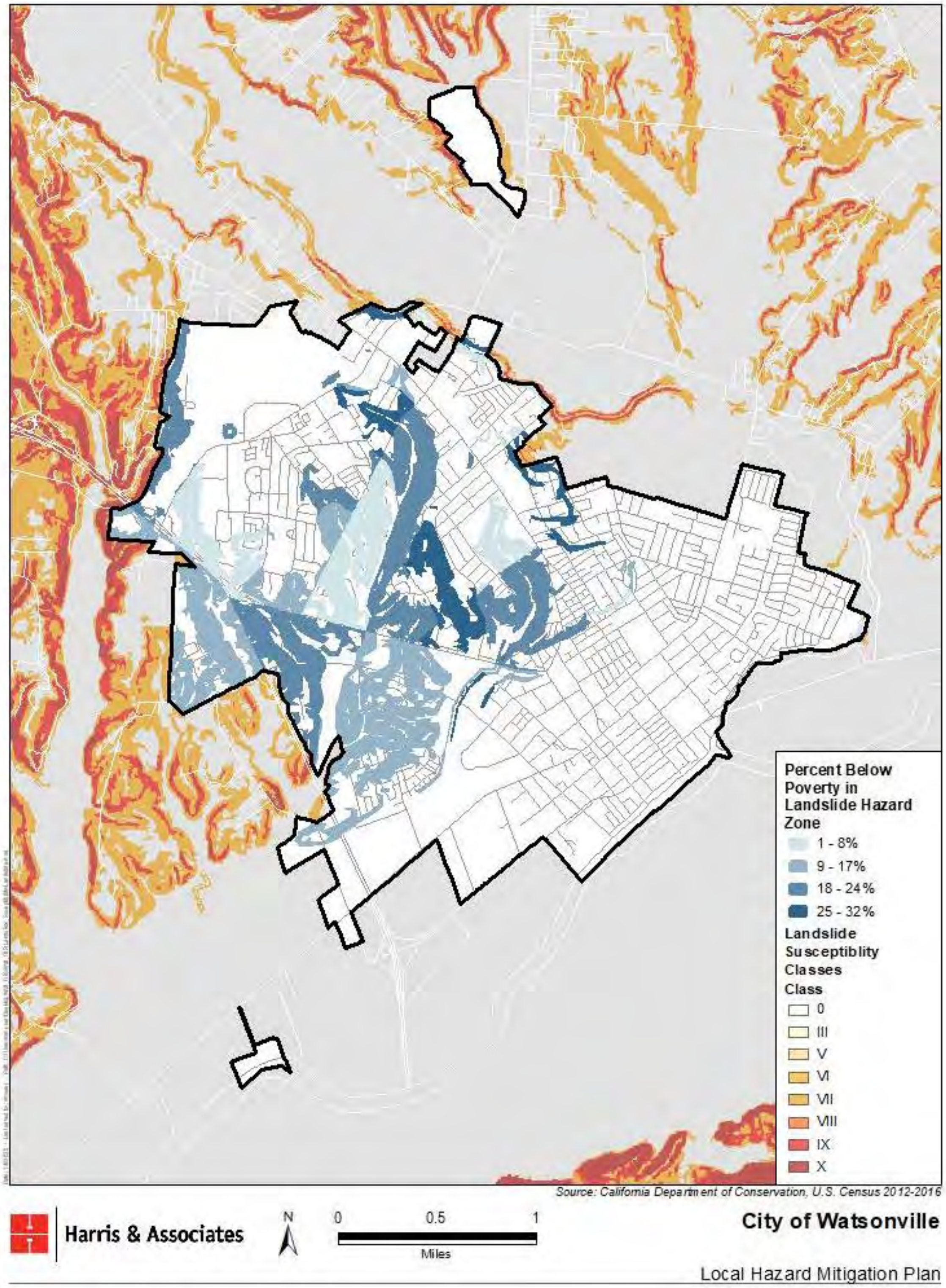

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Figure B-31. 65+ Population in Landslide Hazard Zone

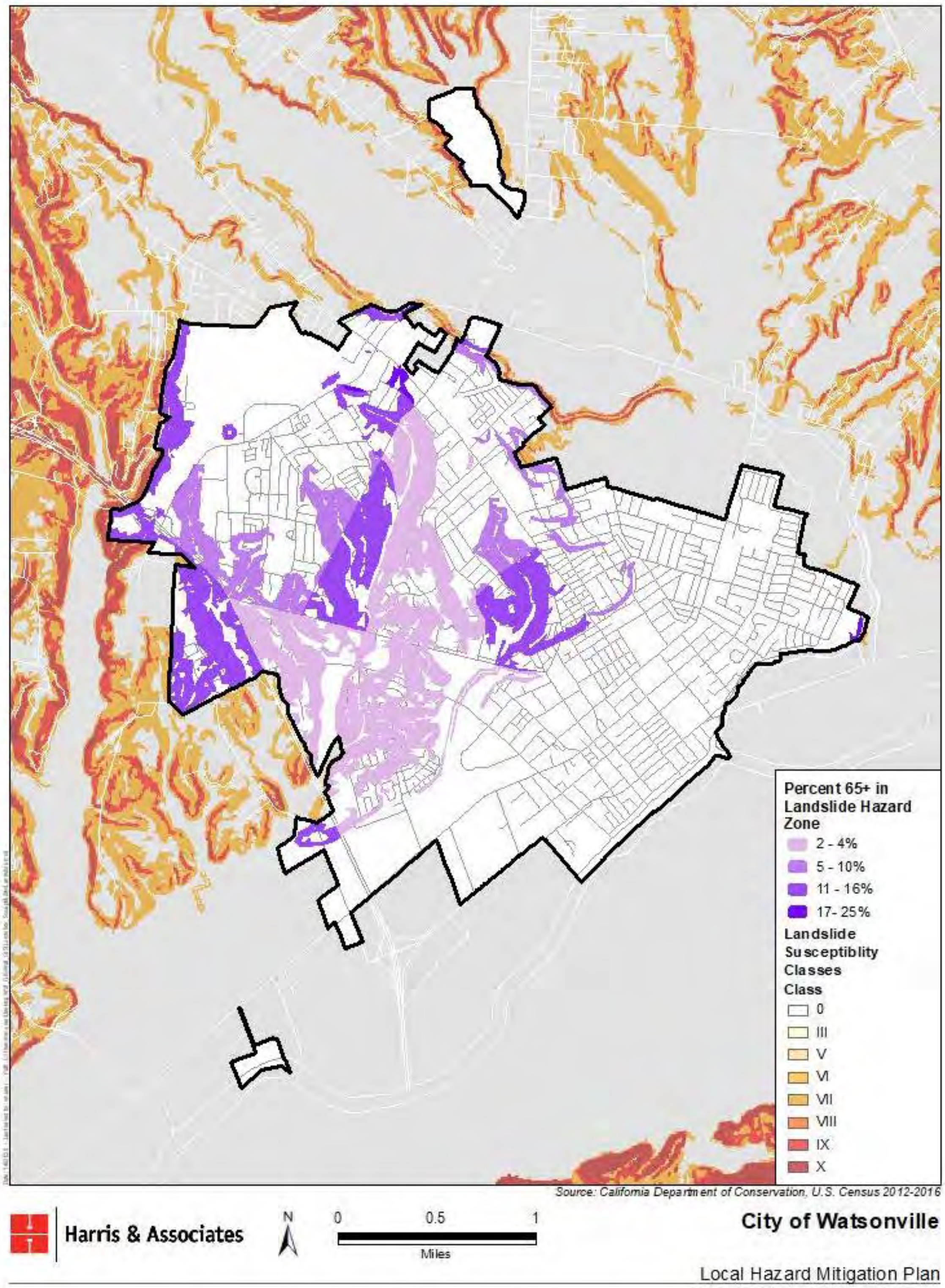

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Figure B-32. Linguistically Isolated Population in Landslide Hazard Zone

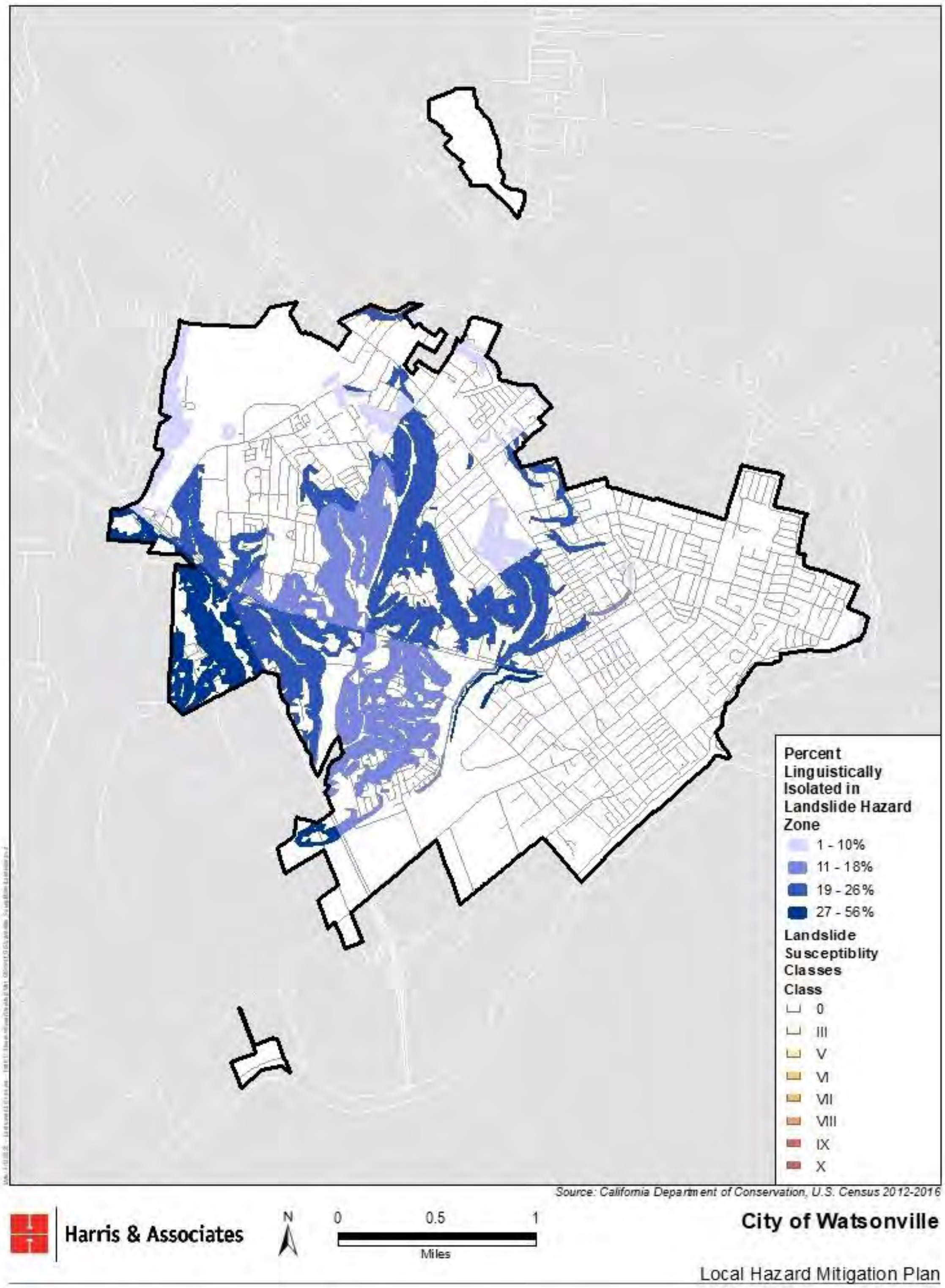

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Figure B-33. Population Without Health Insurance in Landslide Hazard Zone

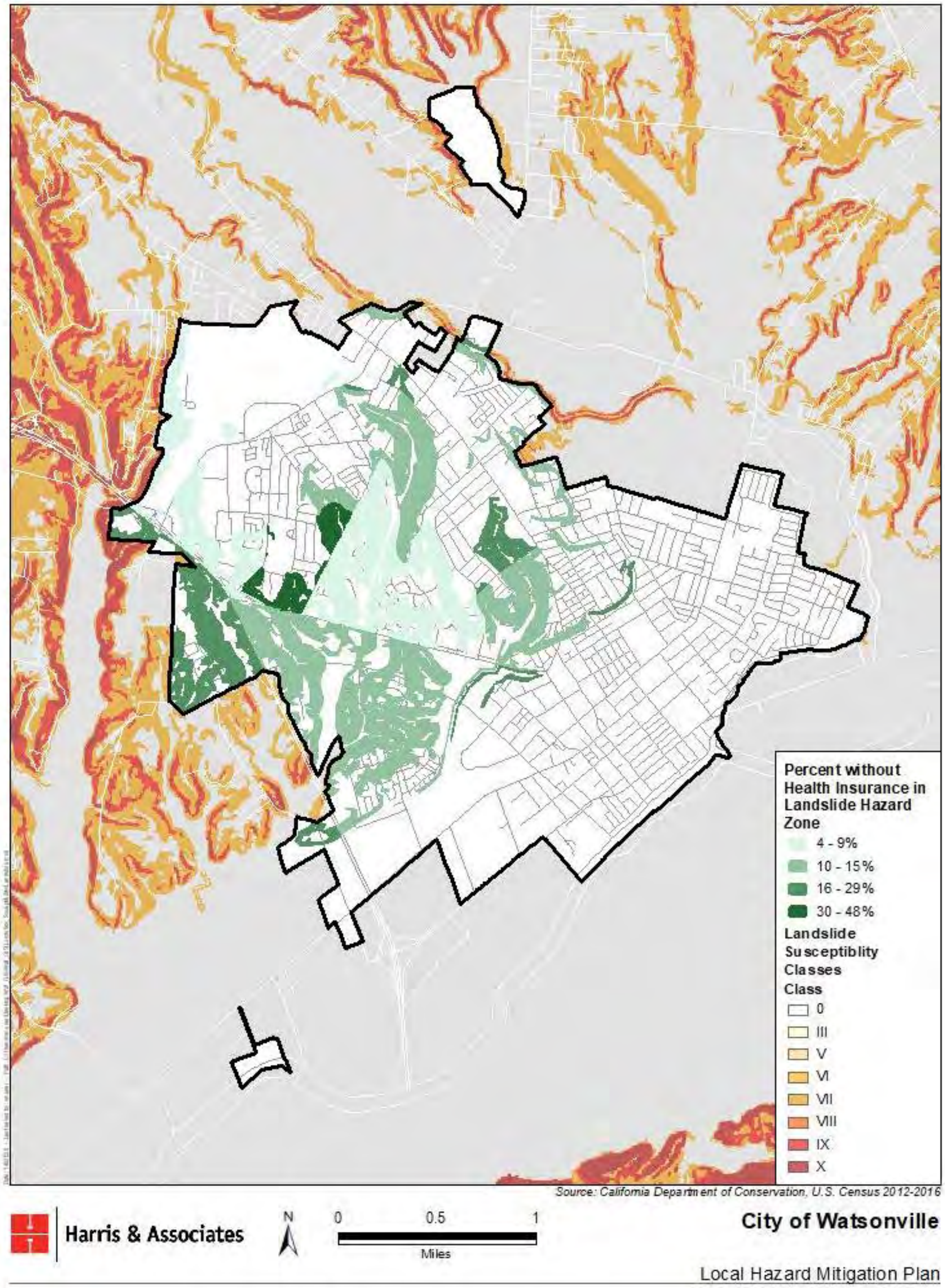

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Figure B-34. Mobile Home Population in Landslide Hazard Zone

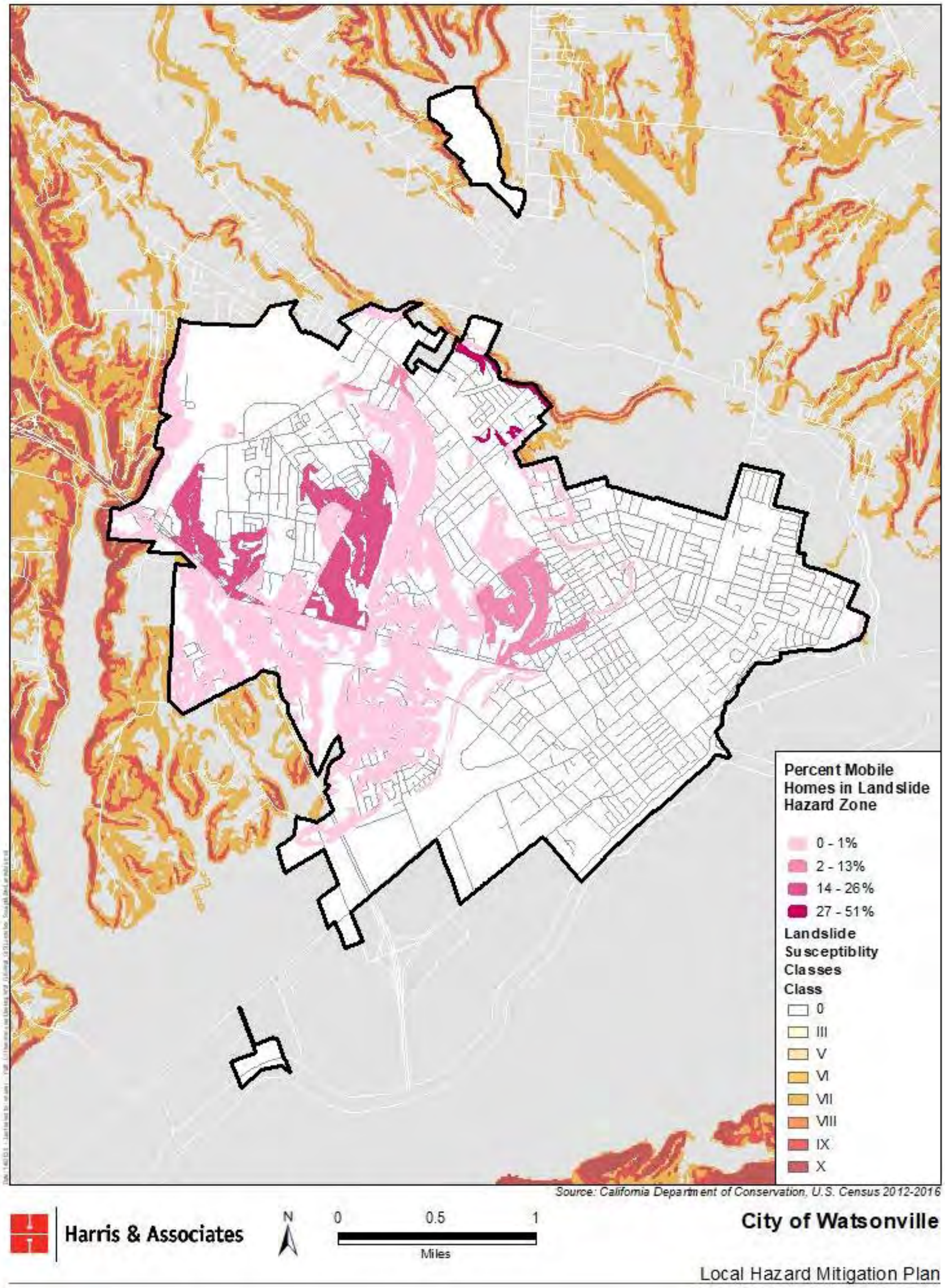

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Figure B-35. Renters in Landslide Hazard Zone

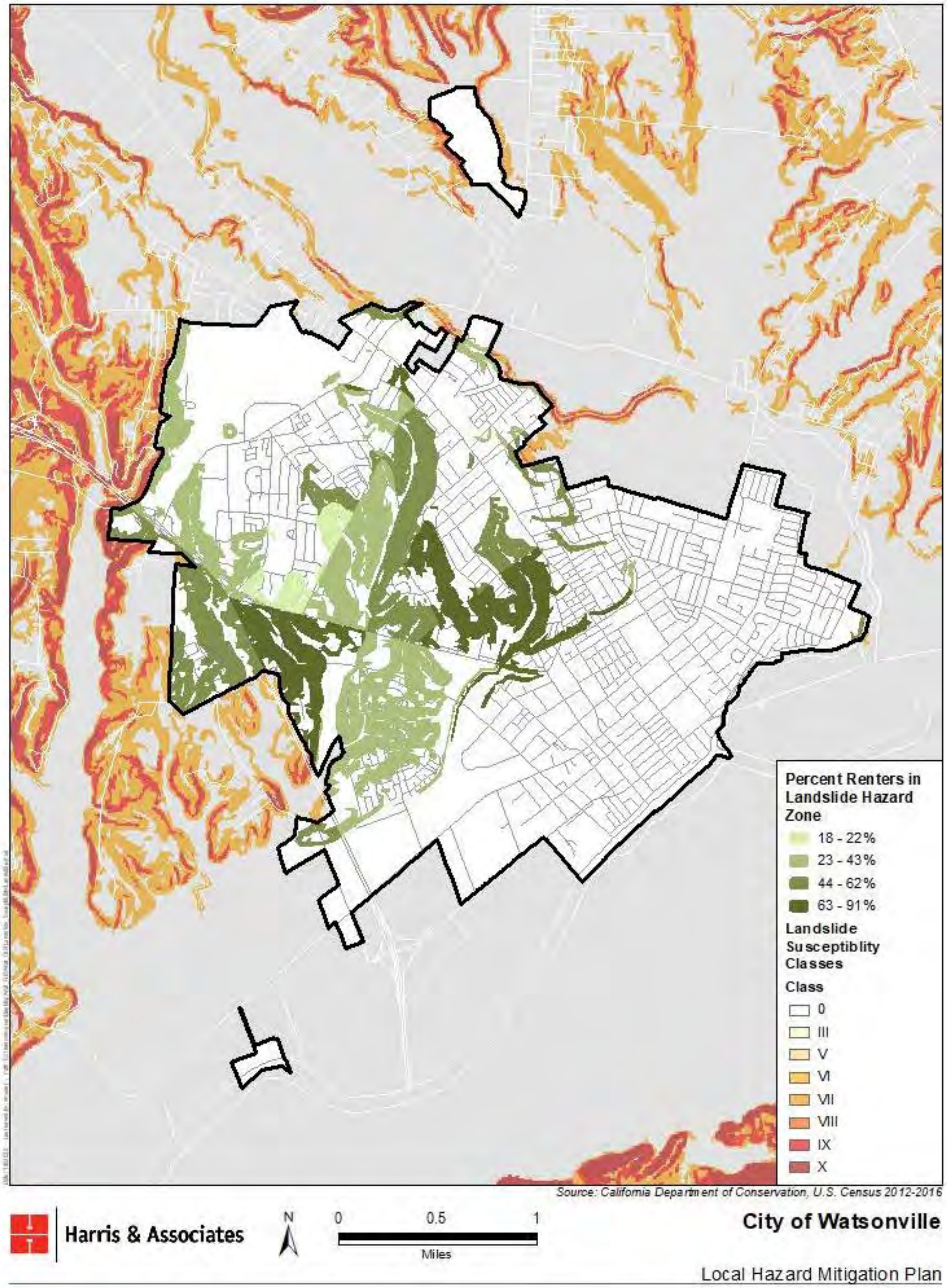

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Figure B-36. Critical Facilities in Liquefaction Hazard Zone

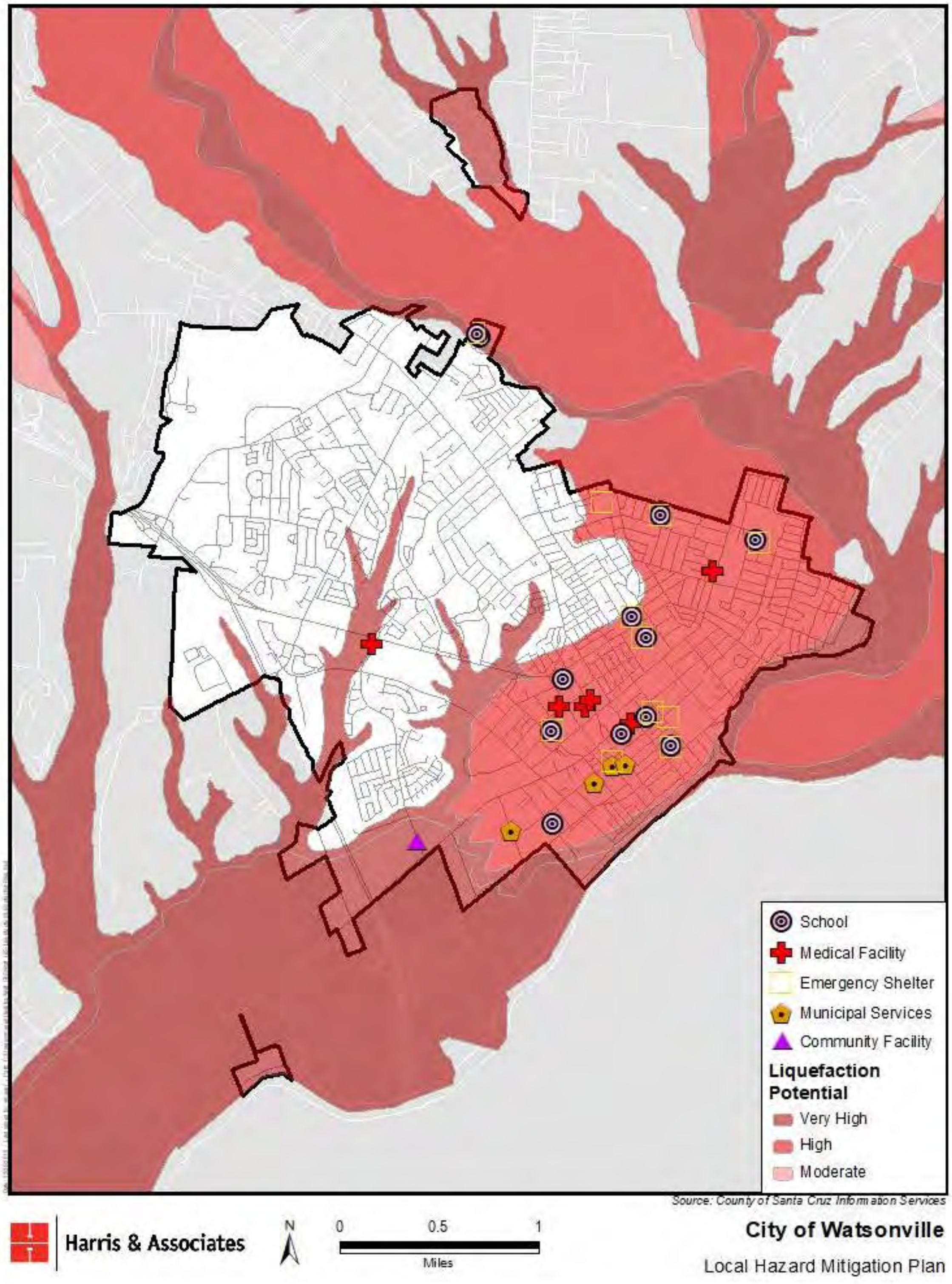

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Figure B-37. Critical infrastructure in Liquefaction Hazard Zone

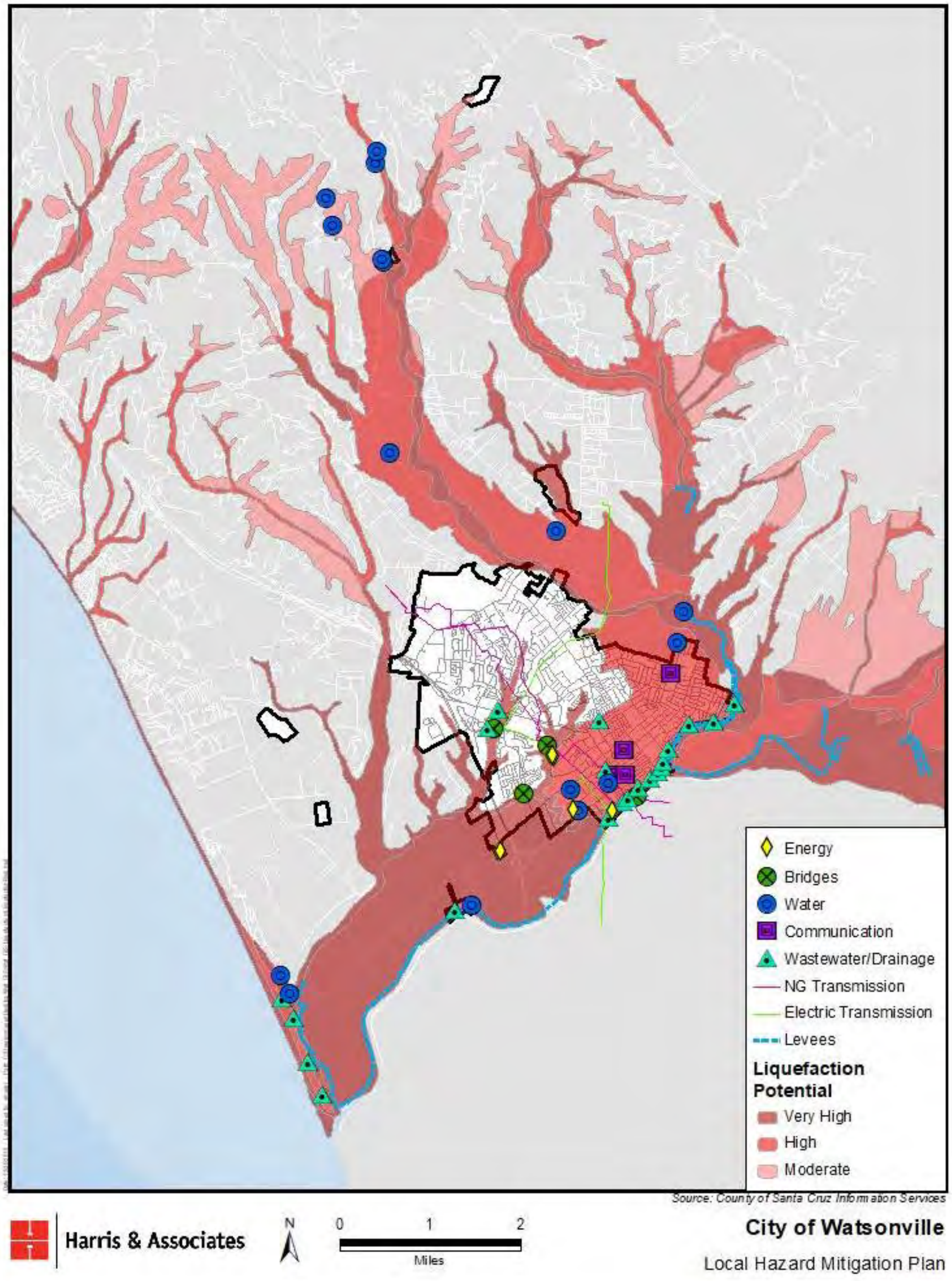

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Figure B-38. Economically Disadvantaged Population in Liquefaction Hazard Zone

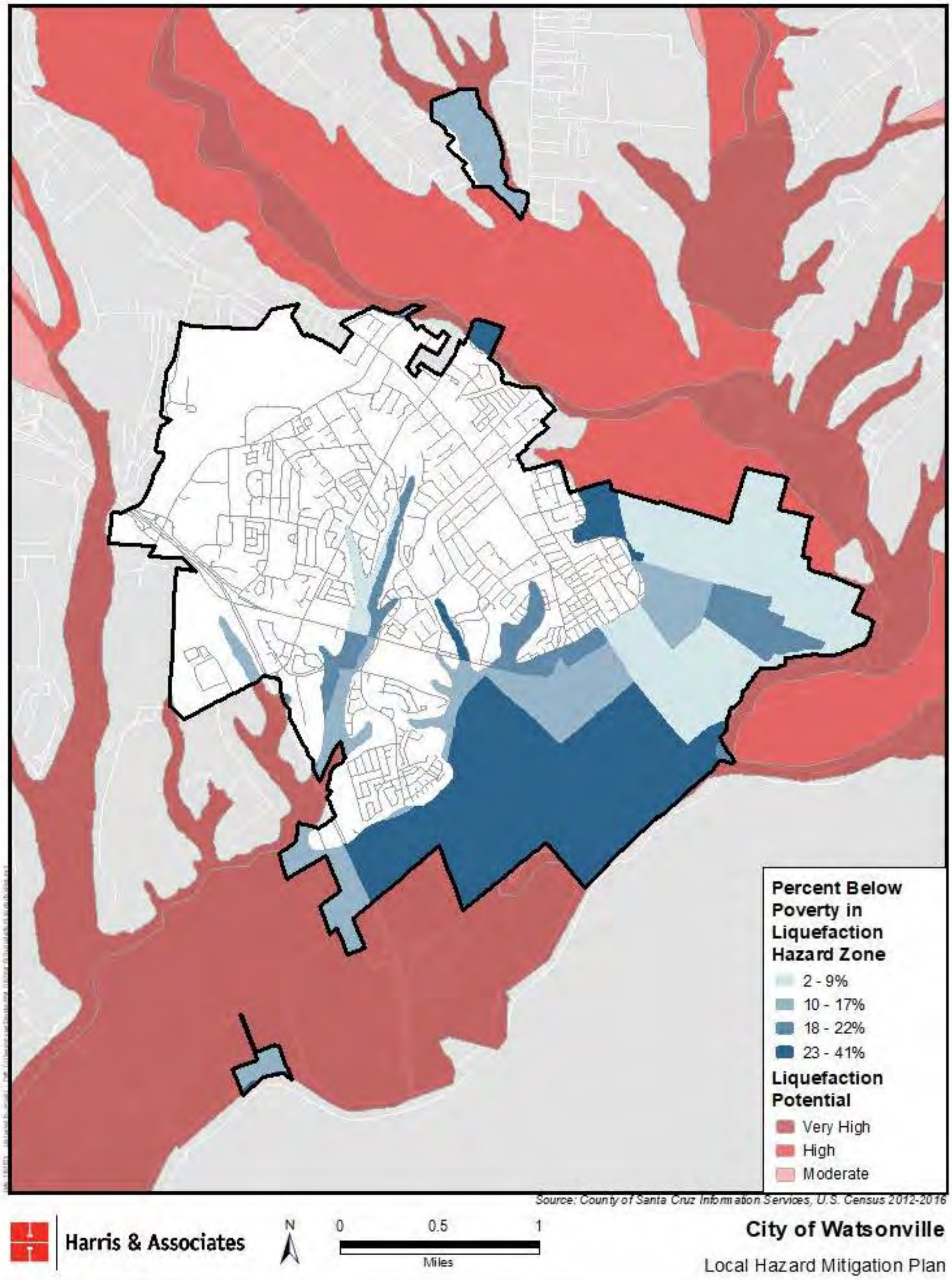

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Figure B-39. 65+ Population in Liquefaction Hazard Zone

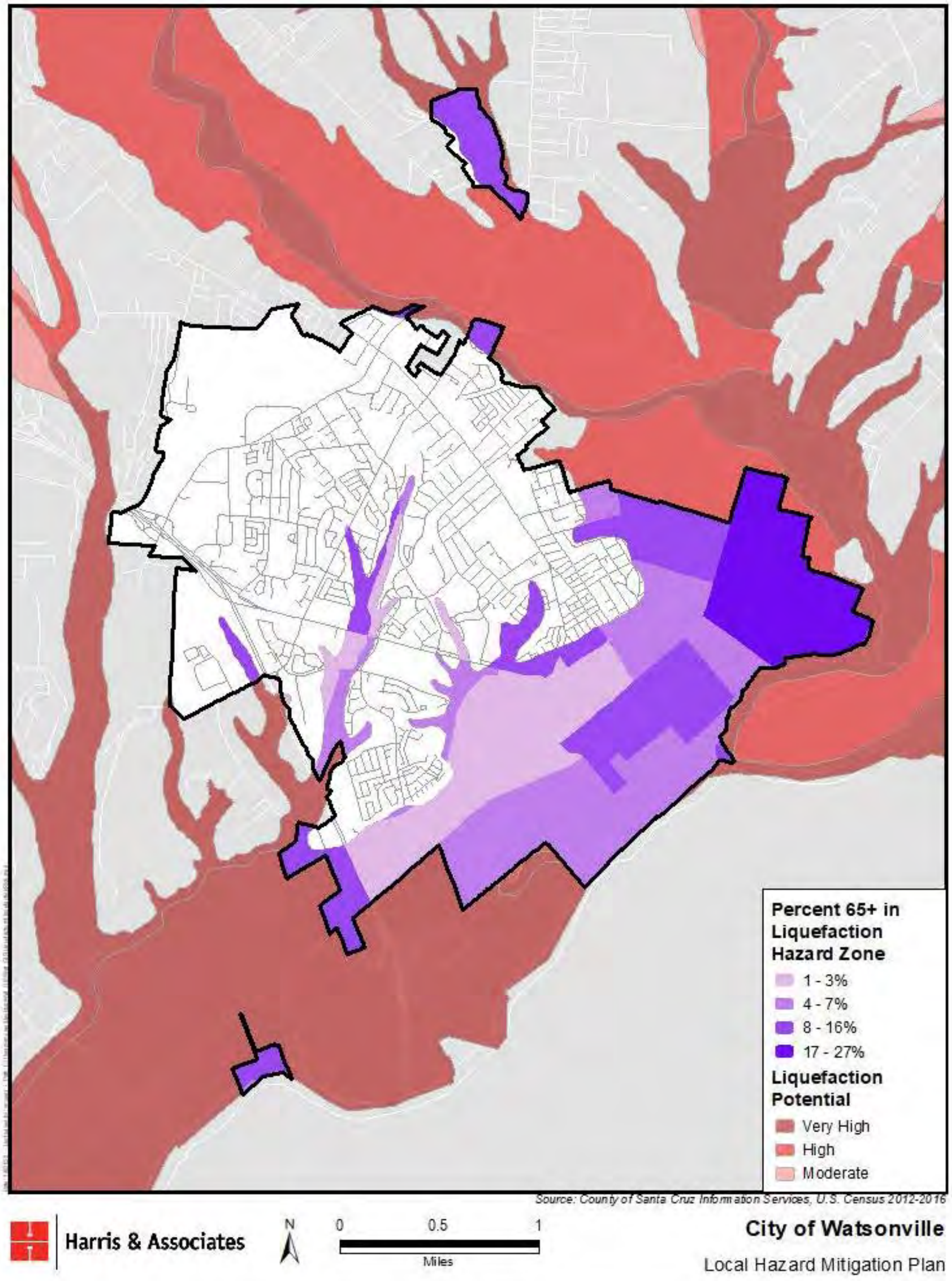

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Figure B-40. Linguistically Isolated Population in Liquefaction Hazard Zone

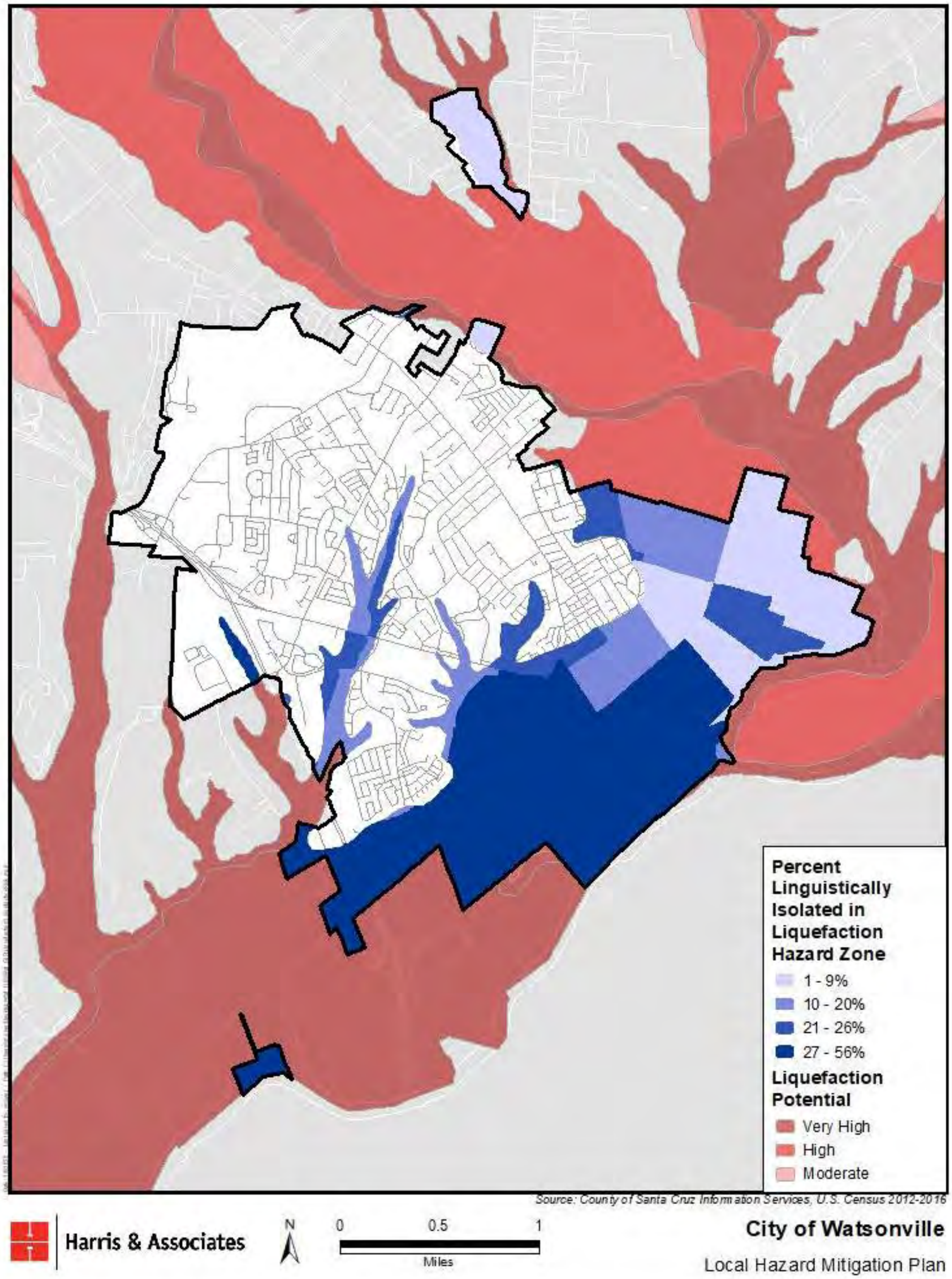

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Figure B-41. Population Without Health Insurance in Liquefaction Hazard Zone

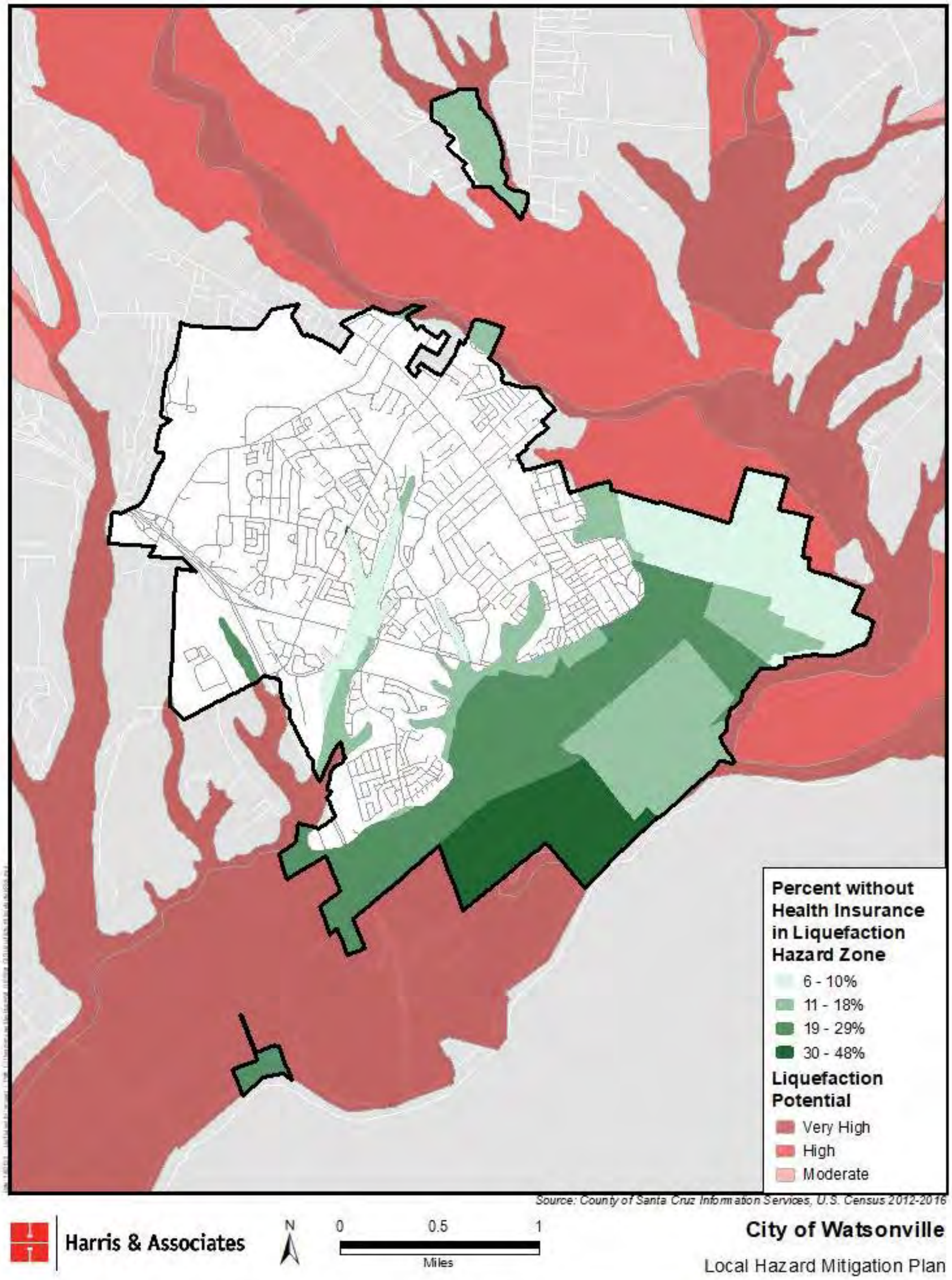

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Figure B-42. Mobile Home Population in Liquefaction Hazard Zone

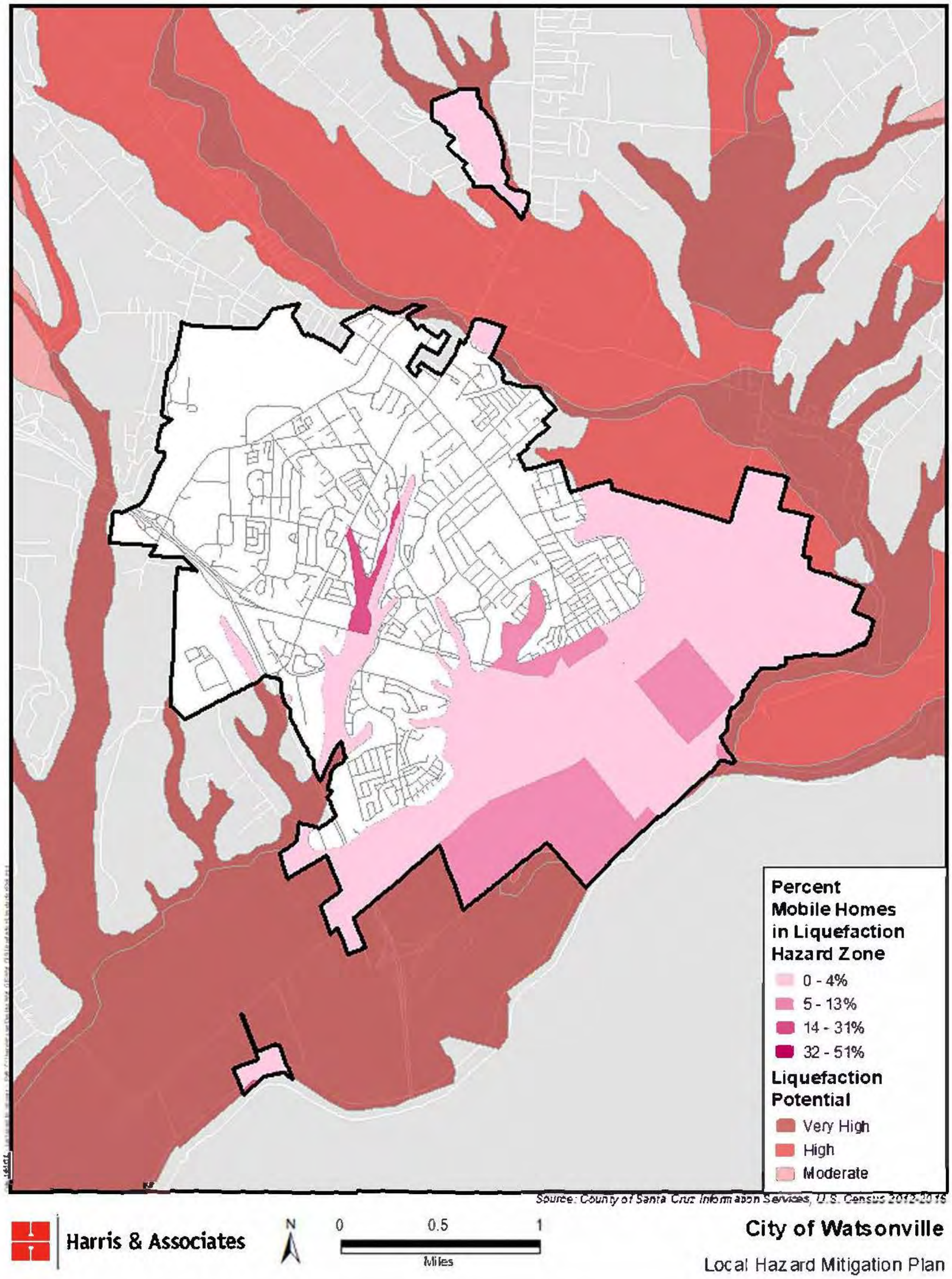

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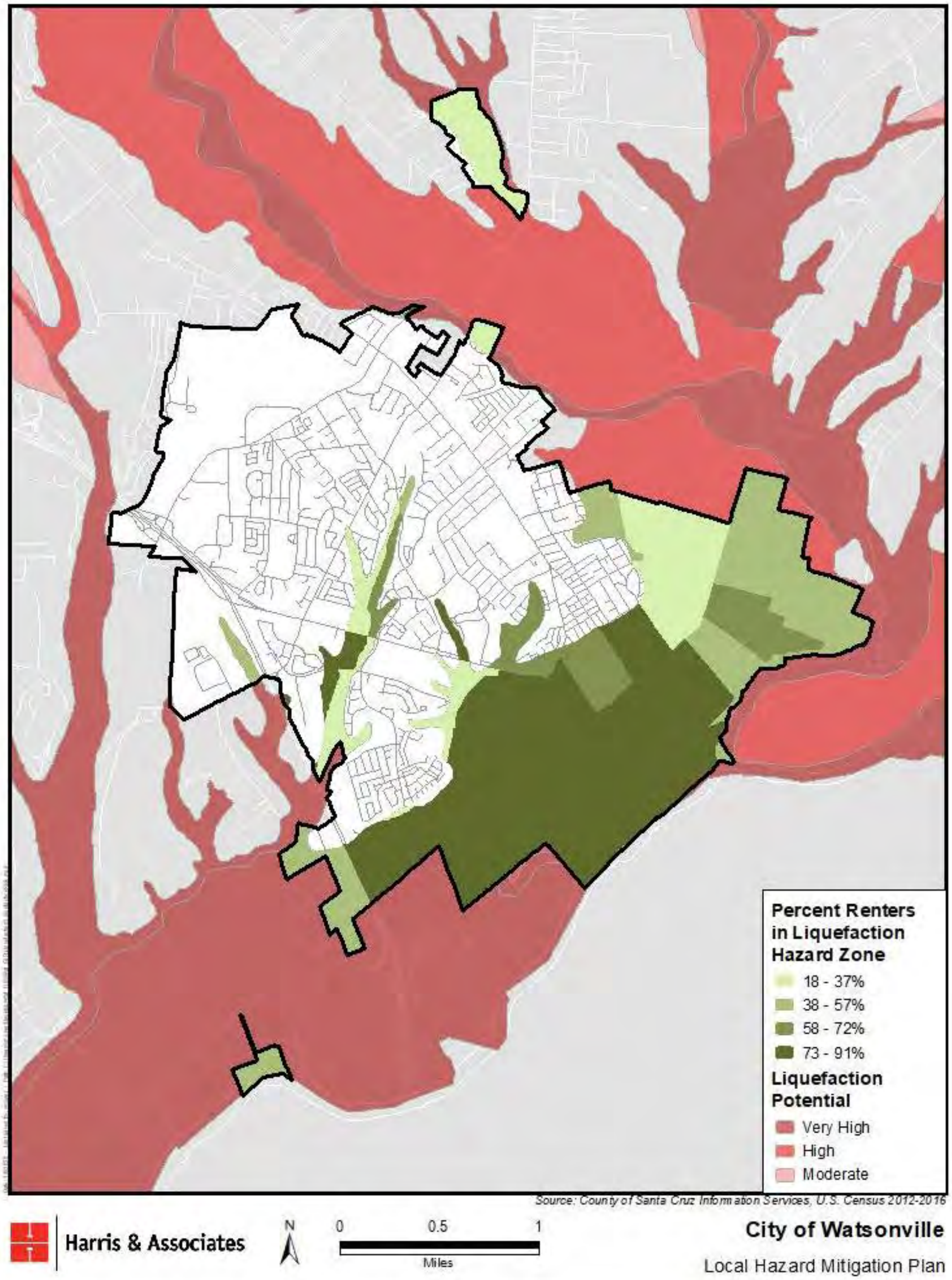
Figure B-43. Renters in Liquefaction Hazard Zone



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Wildfire

1. Physical Vulnerability

There is potential for significant damage to life and property in areas designated as "wildland-urban interface areas," where development is adjacent to densely vegetated areas. The California Department of Forestry and Fire Protection's Fire Resource and Assessment Program (CDF-FRAP) has developed fire hazard severity zones. The zones were developed using a field-tested model that assigns a hazard score based on several factors that influence fire likelihood and fire behavior, including fire history, natural vegetation, flame length, blowing embers, terrain, and typical weather for the area. The hazard zones are moderate, high, and very high. Tables B-38, B-39, and B-40 identify the critical facilities, critical infrastructure, and loss estimates for parcels in these hazard zones. Facilities north of the City, including the Corralitos Creek Water Filter Plant, are particularly at risk to wildfires due to their proximity to open, vegetated areas (Figures B-44, Critical Facilities in Fire Hazard Zone, and B-45, Critical Infrastructure in Fire Hazard Zone).

Table B-38. Critical Facilities in Fire Hazard Severity Zones

Category	Moderate	High	Very High
Community Facility	0	1	0
Emergency Shelter	1	0	0
Municipal Services	0	1	0
Medical Facility	2	1	0
School	2	0	0

Table B-39. Critical Infrastructure in Fire Hazard Severity Zones

Category	High	Moderate	Very High
Bridge	0	1	0
Communication	0	3	0
Energy	0	0	0
Water	7	16	0

Table B-40. Wildfire Loss Estimates

Loss Estimate	Moderate	High	Very High	Total in Hazard Zones
Total Parcels Impacted	1,186	21	1	1,208
Improvement Value ($)	370,690,328	29,633,469	0	400,323,797

2. Social Vulnerability

Wildfires can have a significant impact on air quality, which can, in turn, impact public health, especially the health of those who work outdoors, such as farmers and construction workers, who are more exposed to air pollution. Approximately 24 percent of the City's workforce is employed in the farming, fishing, forestry, or construction/extraction sectors, where employees typically work outdoors (U.S. Census 2019).

Additionally, many City residents are at risk of direct exposure to wildfires. Table B-41 shows the population and number of residential units in the City in each fire hazard severity zone.

Table B-41. Population and Residential Units in Wildfire Risk Areas

Fire Hazard Severity Zone	Population	No. of Residential Units
Moderate	5061	1343
High	705	193
Very High	0	0
Total	**5766**	**1536**

Source: Urban Footprint 2020.

Although wildfires can threaten the entire City, certain areas are more vulnerable based on the distribution of climate-sensitive populations. Figures B-46 through B-51 highlight the social vulnerability in the wildfire hazard zones. Those with limited mobility and resources are more likely to be impacted in the event of a wildfire. Also, those who are linguistically isolated are at greater risk if information regarding preparedness and evacuation is not distributed in their language.

3. Environmental Vulnerability

Pollutants released by large-scale wildfires can influence healthy plant growth in areas beyond the boundaries of the disaster. Fire emissions generate air pollutants ozone and aerosols that influence the land carbon cycle and potentially threaten agricultural productivity.

Wildfire hazards also present a considerable risk to native vegetation and wildlife habitats. The City is in the Monterey Bay Plains and Terraces ecoregion. The ecoregion is characterized by woodlands and native perennial grasslands. Increasing fire frequency prevents recovery and seed regeneration, creating conditions favorable for invasive, non-native species and potential vegetation conversion to annual grassland (EcoAdapt 2016). This type of type conversion can result in a loss of native biodiversity. Furthermore, a change from deeply rooted shrubs to shallow rooted grasses and forbs further increases fire frequency and reduces carbon storage. In total, 38 percent (257 acres) of the City's critical habitat is in a moderate or high fire risk area (Figure B-52, Critical Habitat in Fire Hazard Zone).

Secondary Impacts

Secondary impacts of wildfires, including erosion, landslides, introduction of invasive species, and changes in water quality, can sometimes be more disastrous than the wildfire itself because they may take more time to recover from.

Figure B-44. Critical Facilities in Fire Hazard Zone

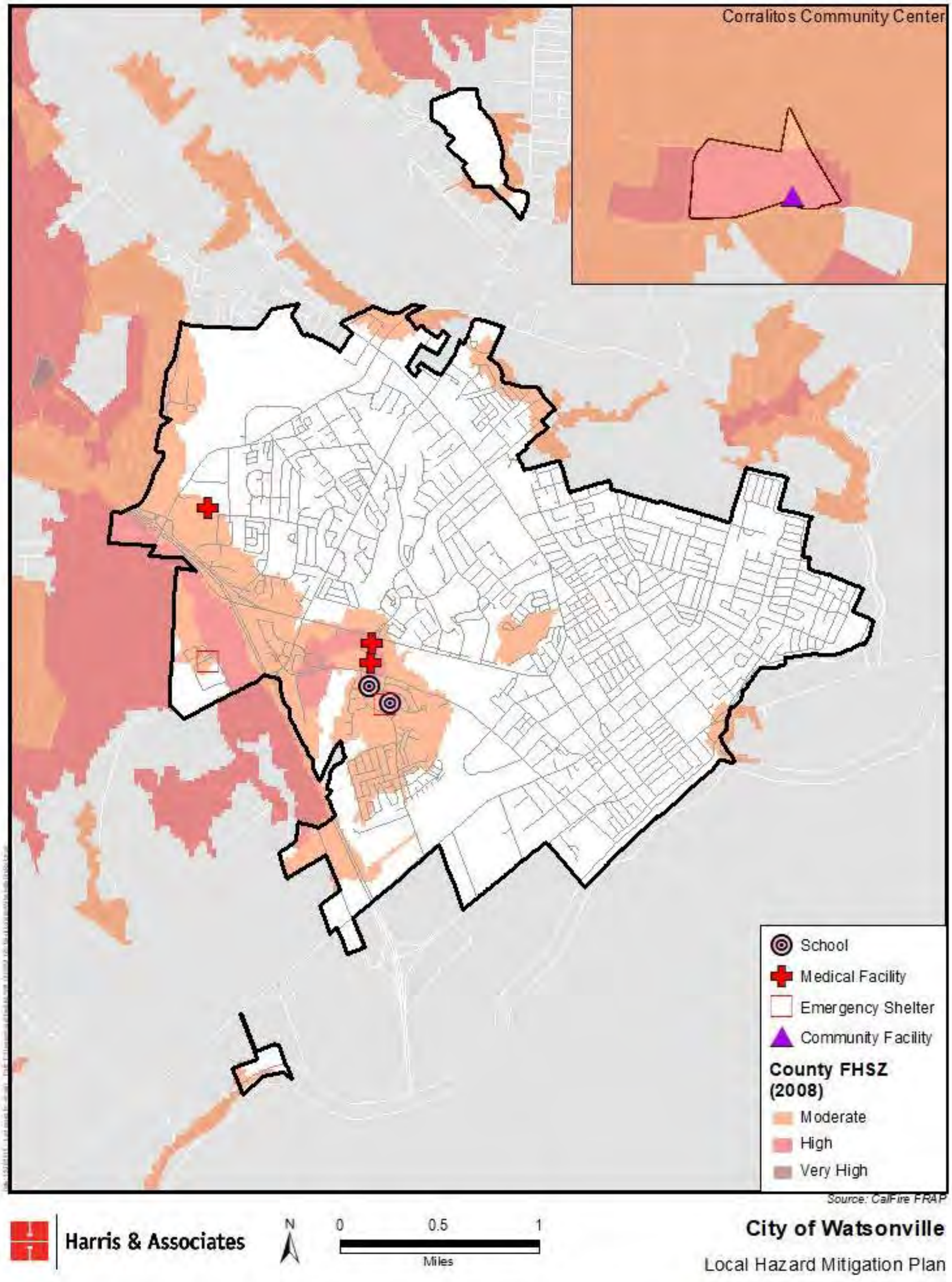

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Figure B-45. Critical Infrastructure in Fire Hazard Zone

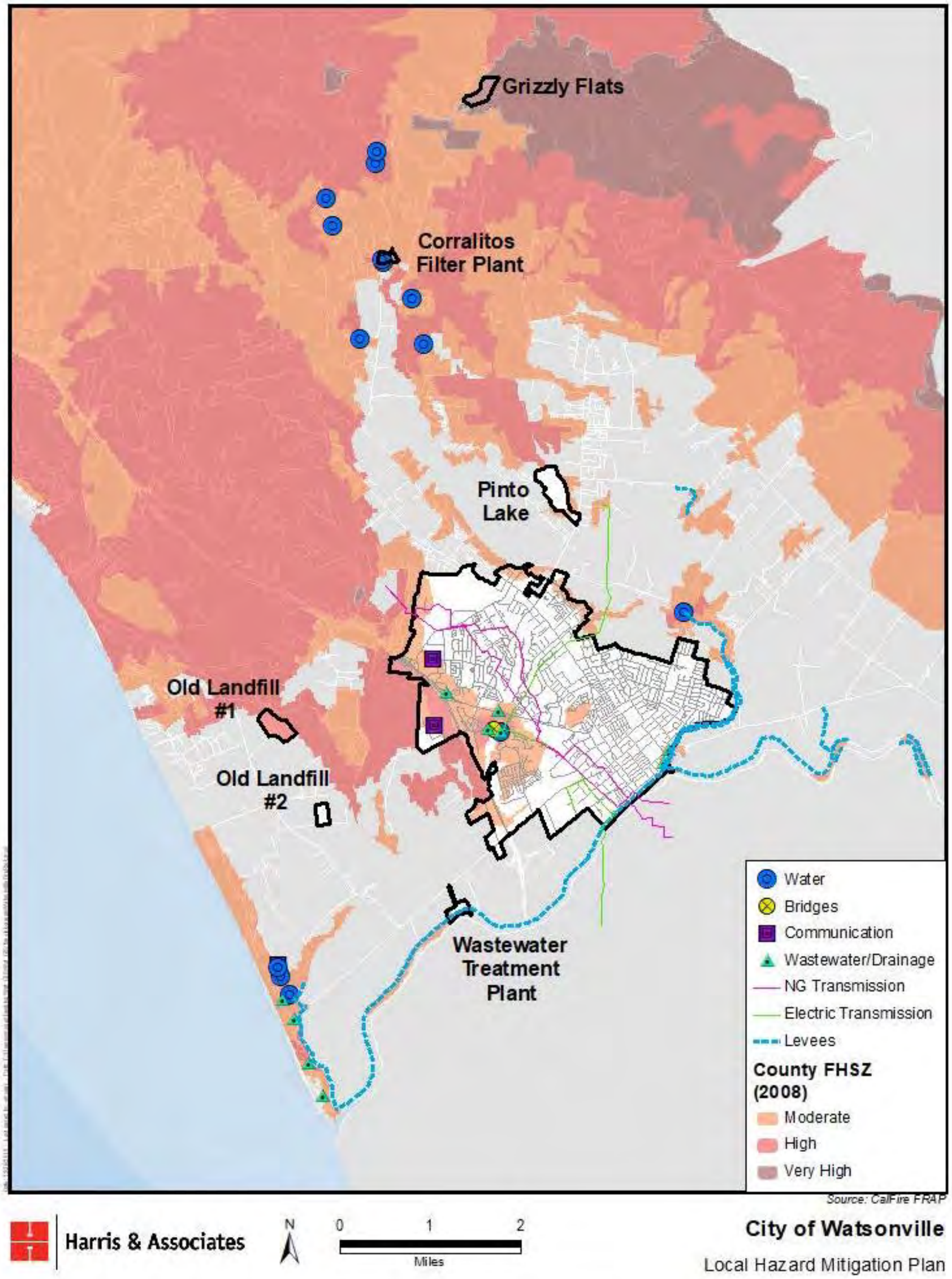

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Figure B-46. Economically Disadvantaged Population in Fire Hazard Zone

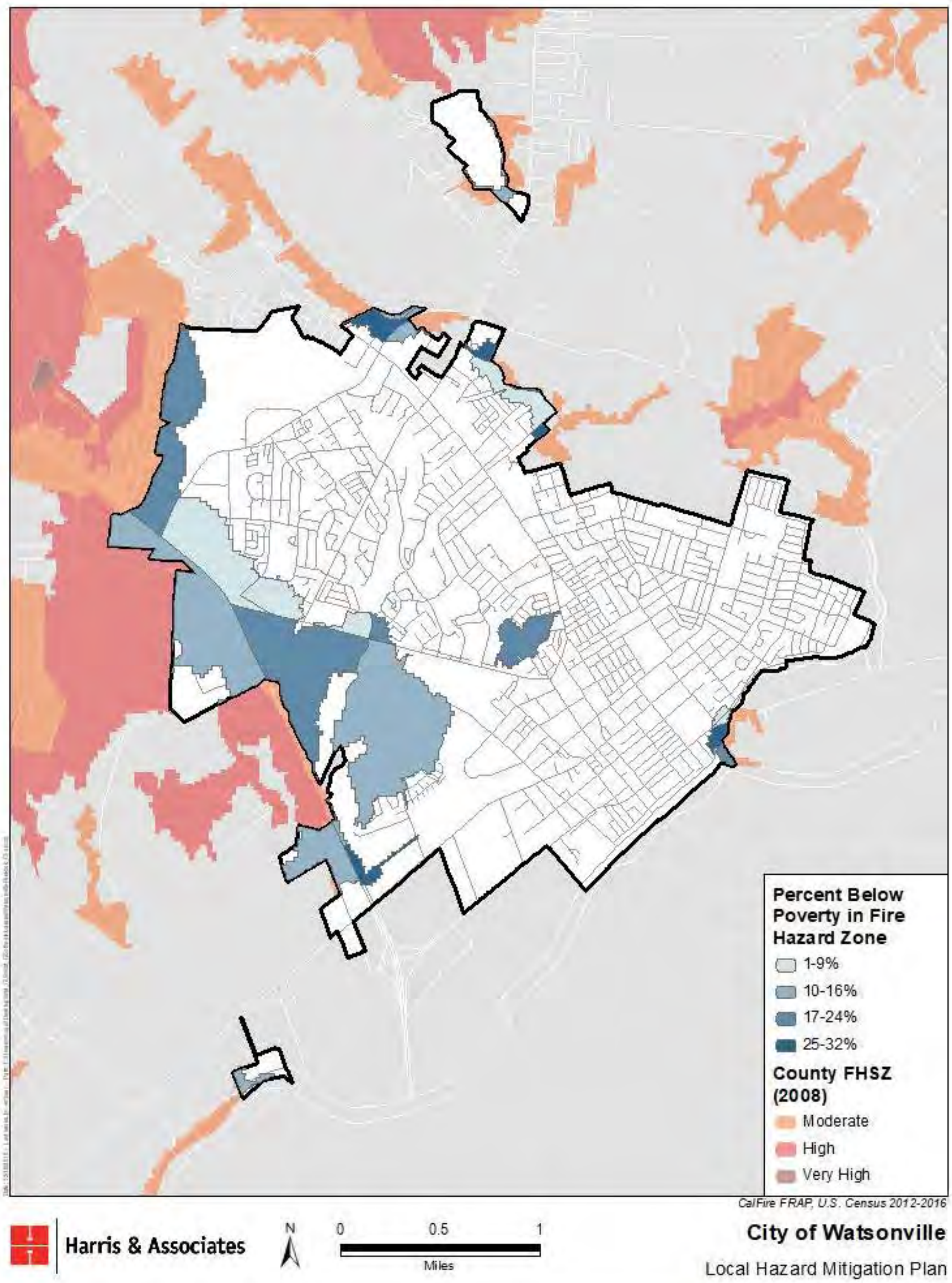

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Figure B-47. 65+ Population in Fire Hazard Zone

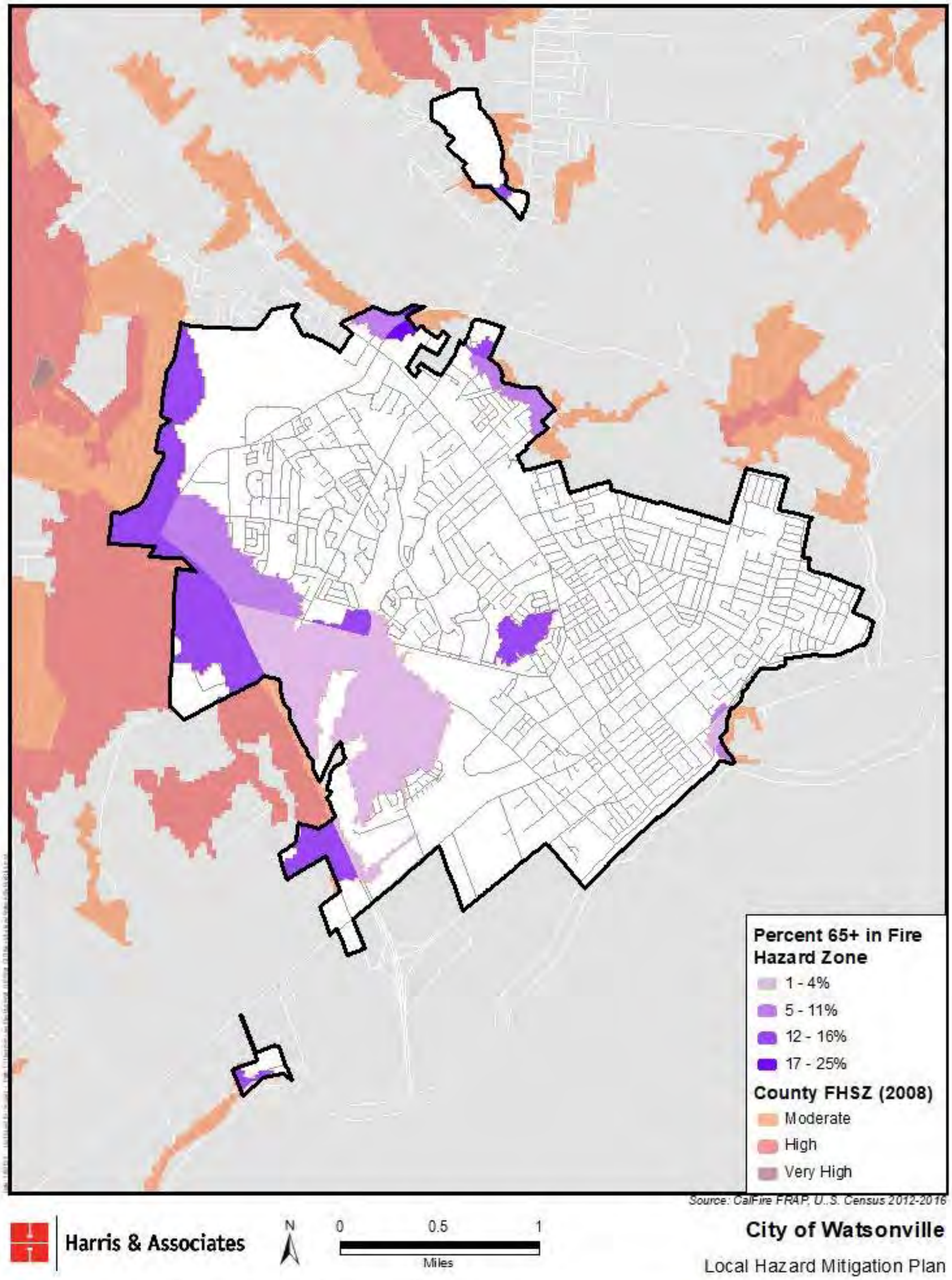

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Figure B-48. Linguistically Isolated Population in Fire Hazard Zone

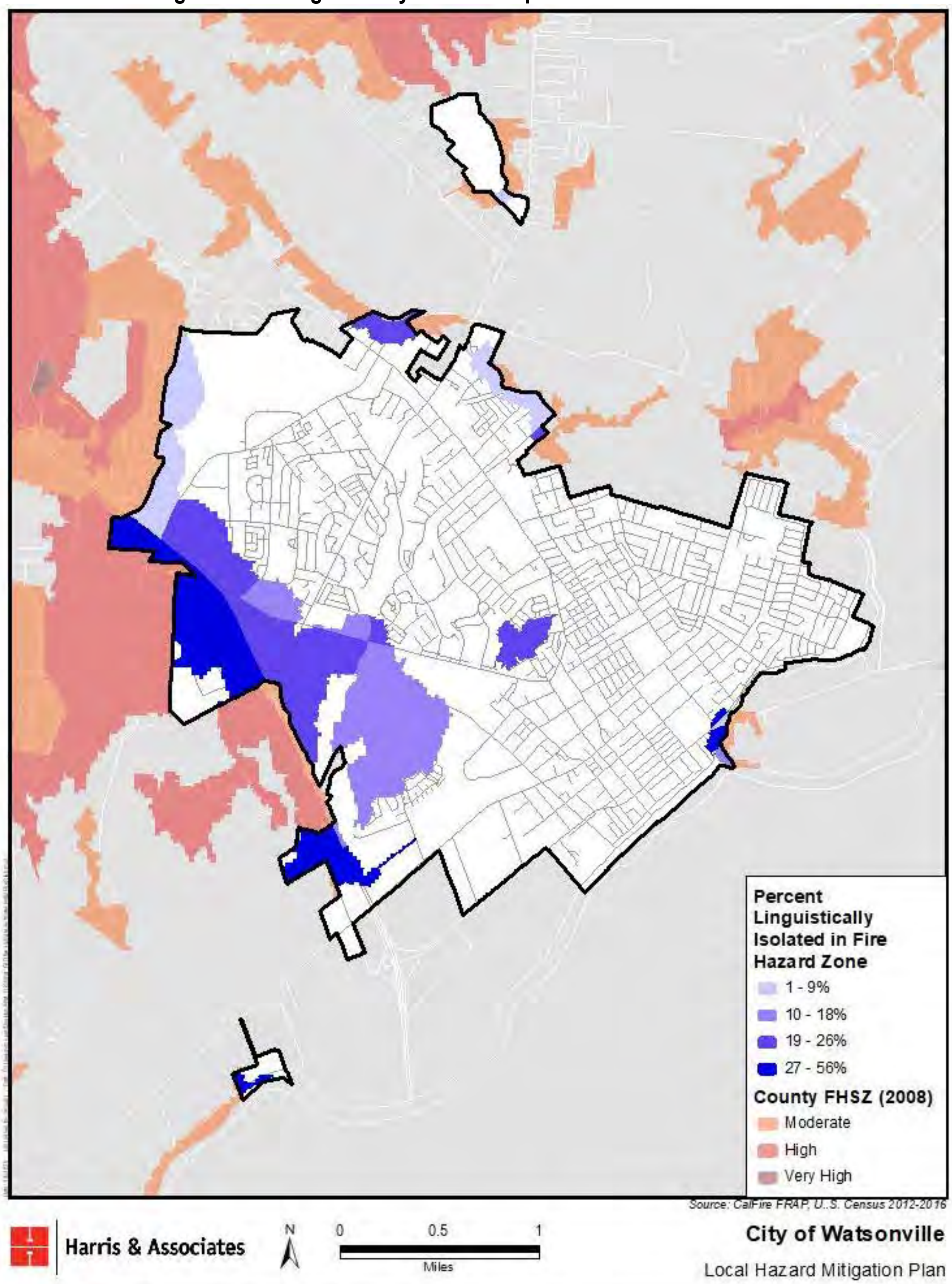

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Figure B-49. Population Without Health Insurance in Fire Hazard Zone

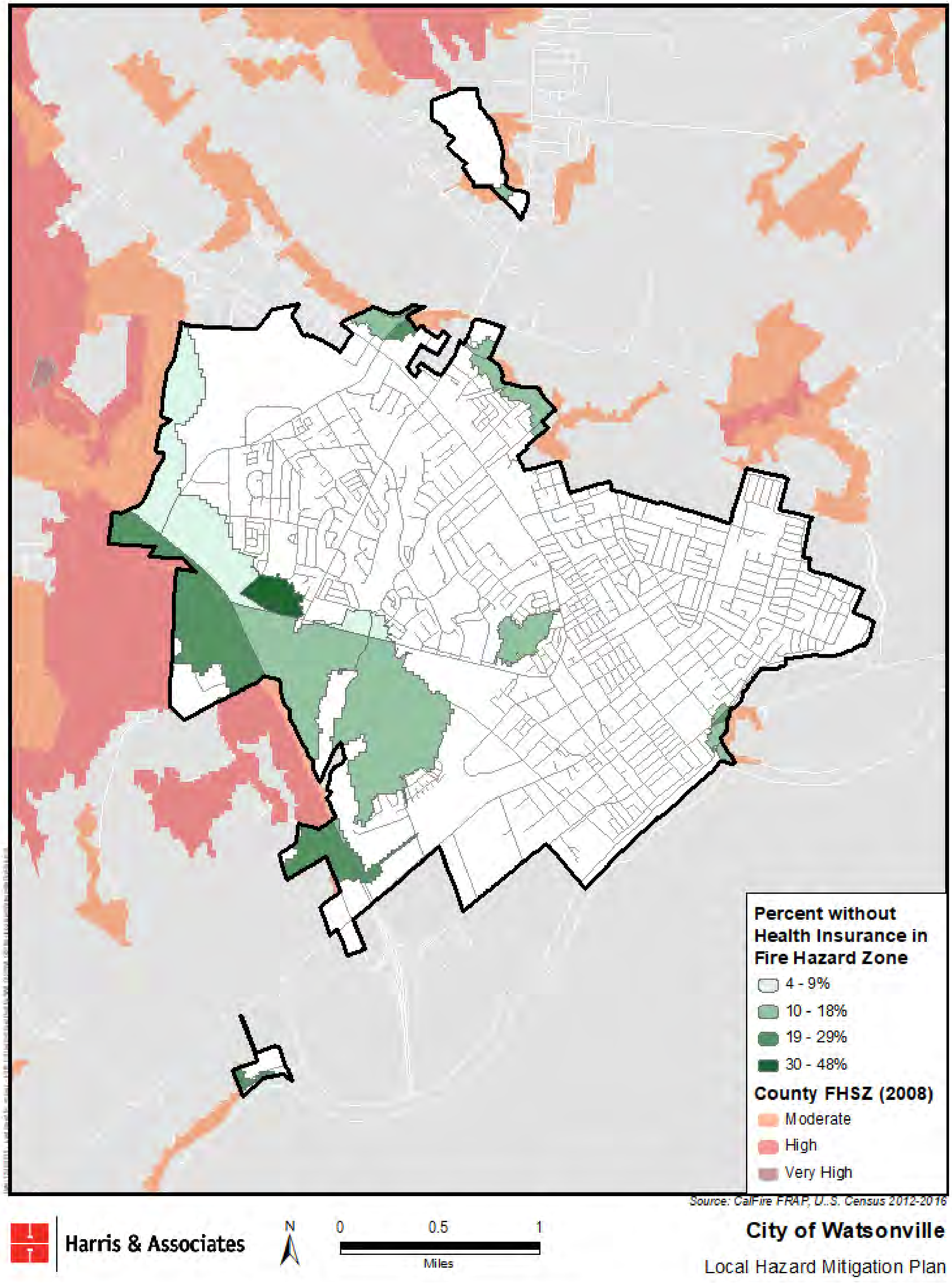

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Figure B-50. Mobile Home Population in Fire Hazard Zone

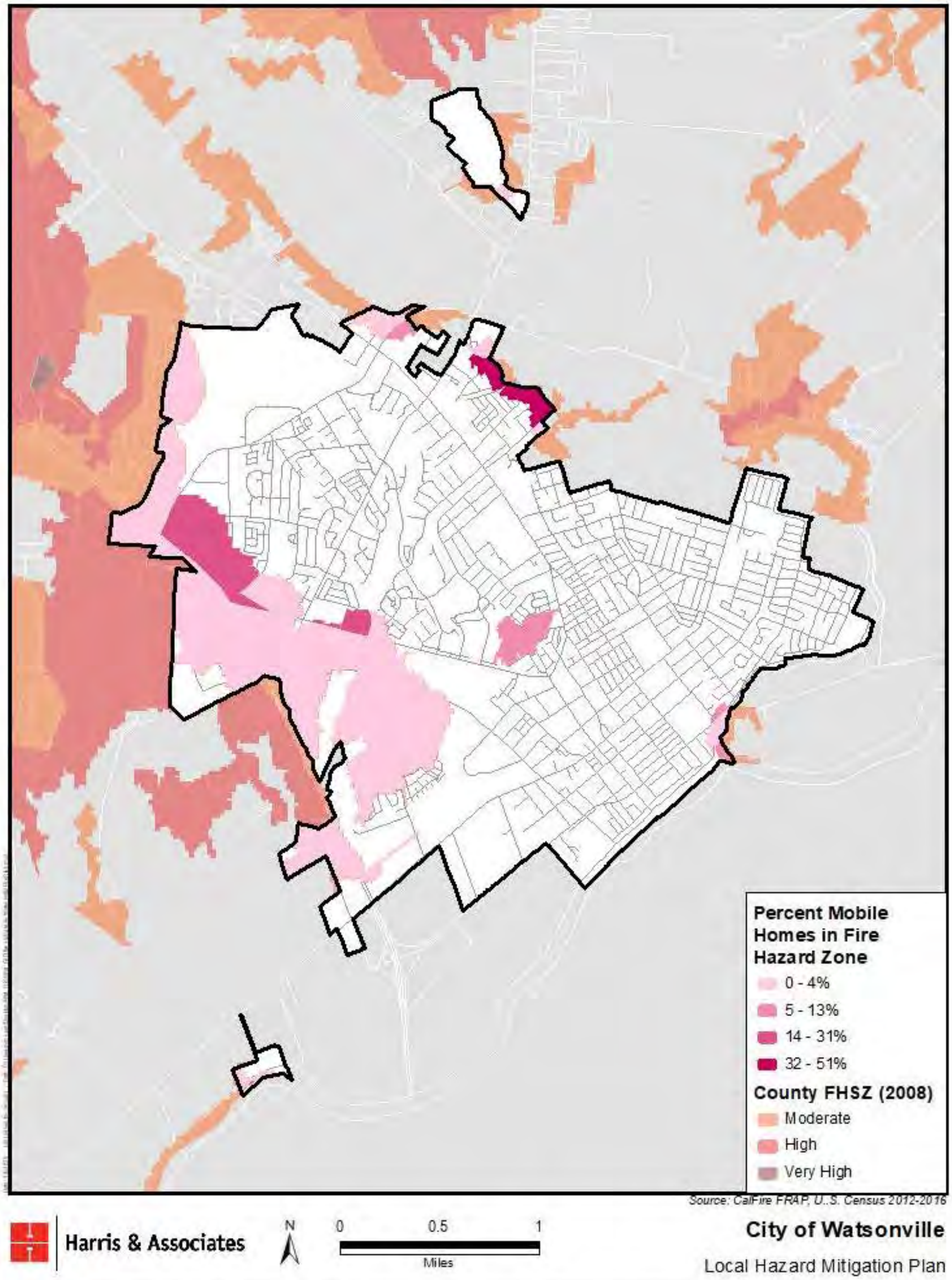

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Figure B-51. Renters in Fire Hazard Zone

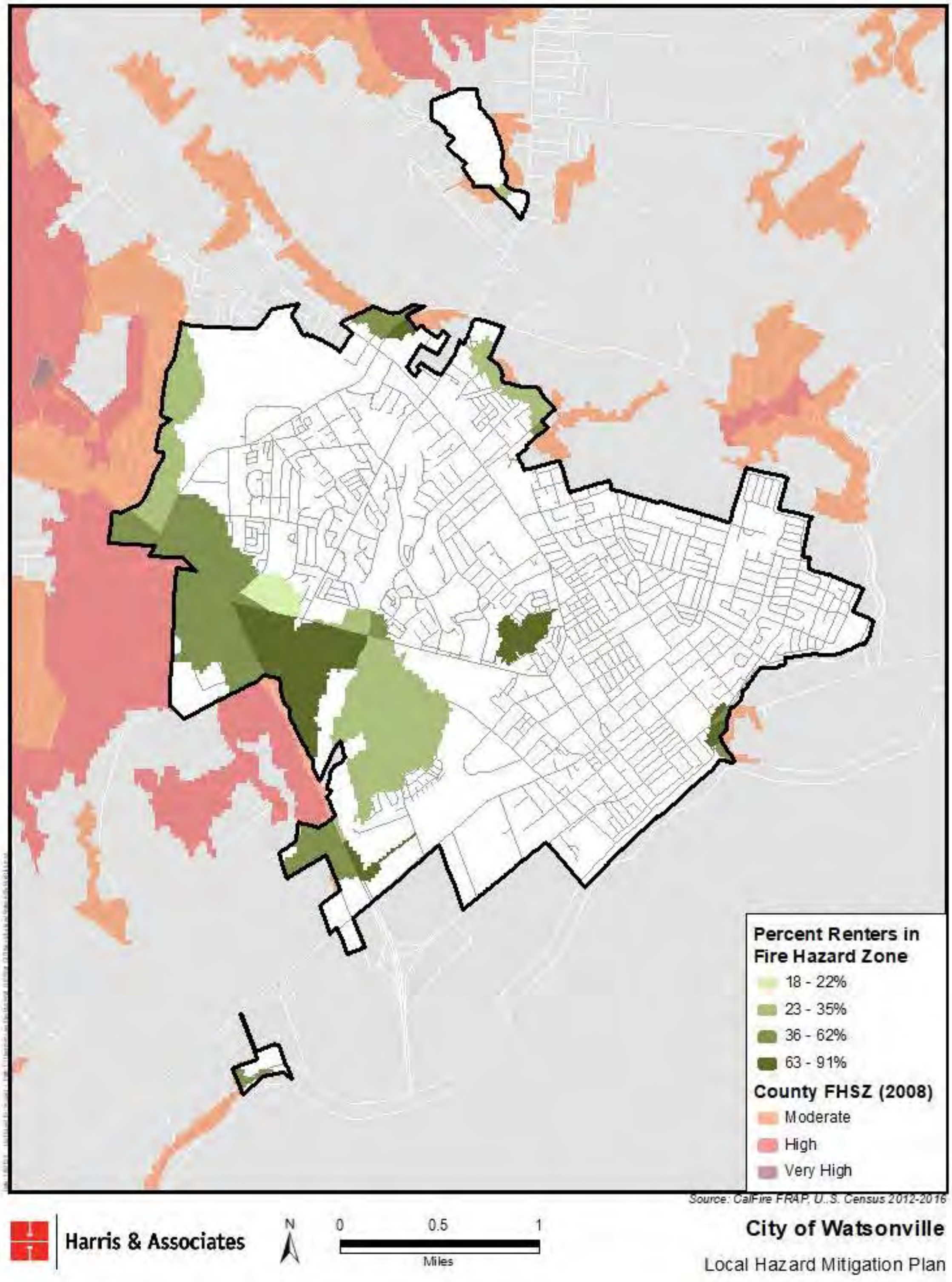

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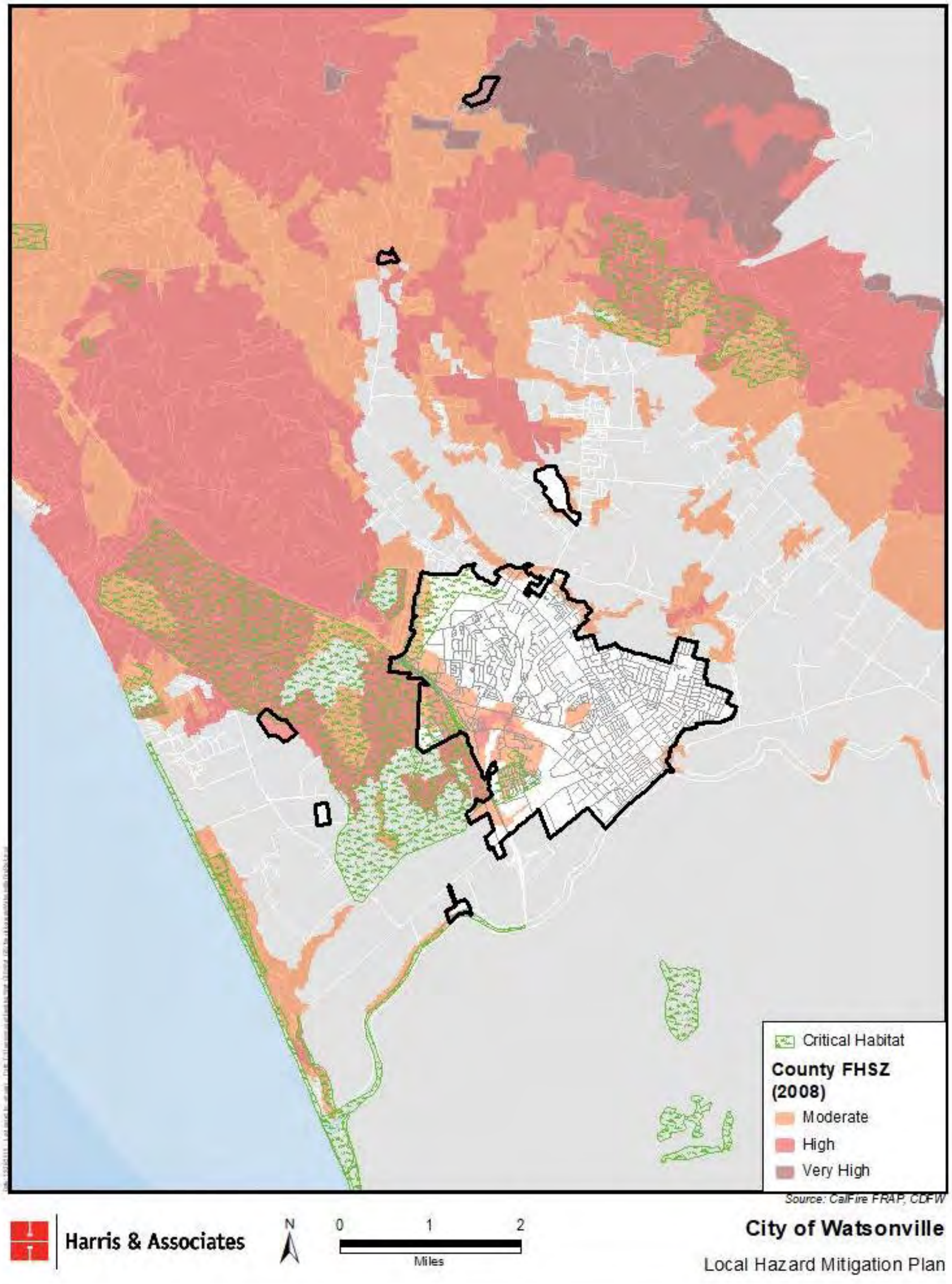
Figure B-52. Critical Habitat in Fire Hazard Zone



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Supplemental Evacuation Analysis

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Supplementary Evacuation Routes Assessment

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 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

Assumptions & Definitions

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.

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

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, outbound, 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 outbound 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]
    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.

[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.

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

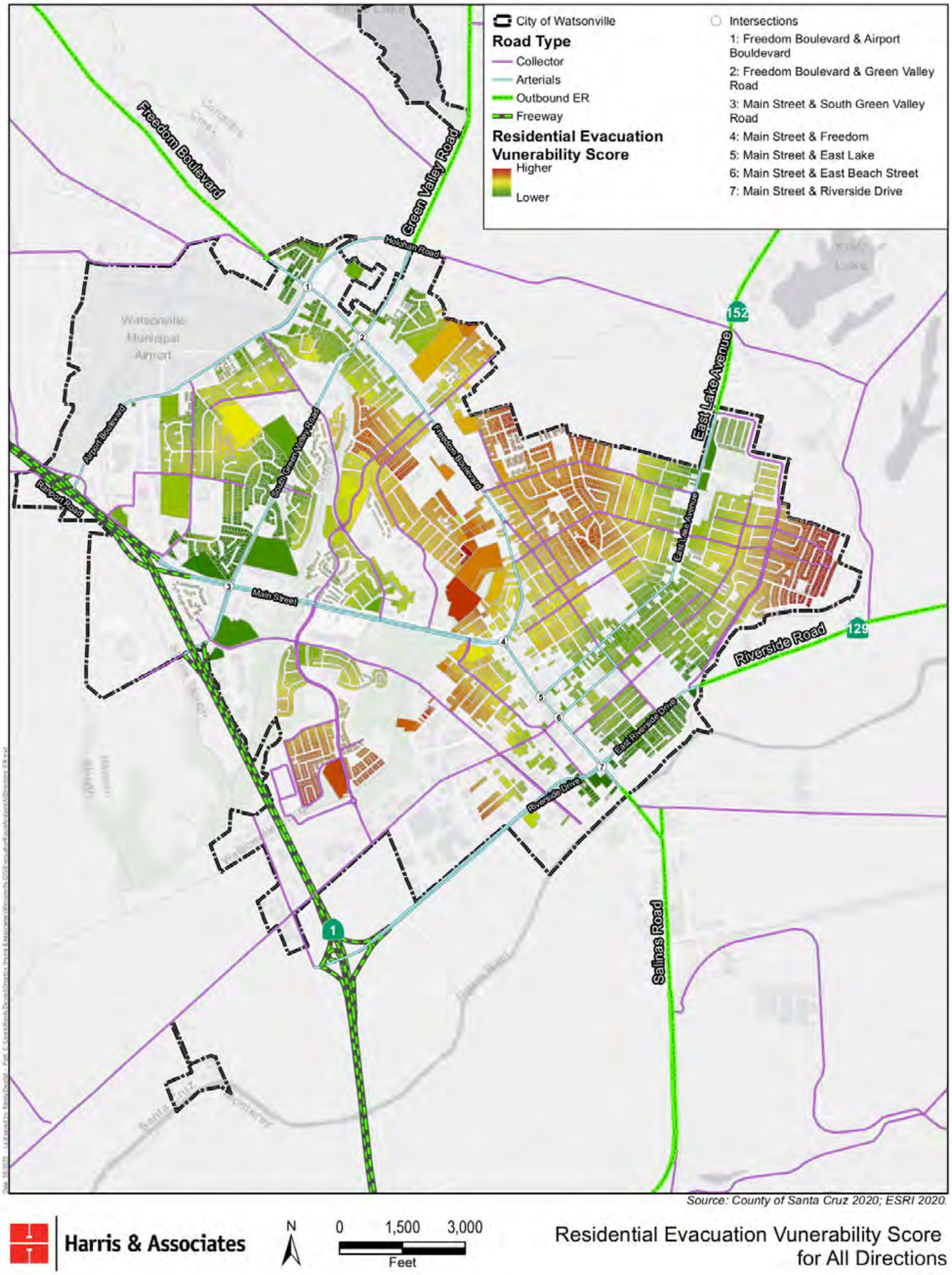
5. For each hazard scenario, identify residential parcels whose evacuation route vulnerability has changed (increased or decreased) from the baseline, and determine if there are less than two evacuation routes for residential areas.

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.

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.



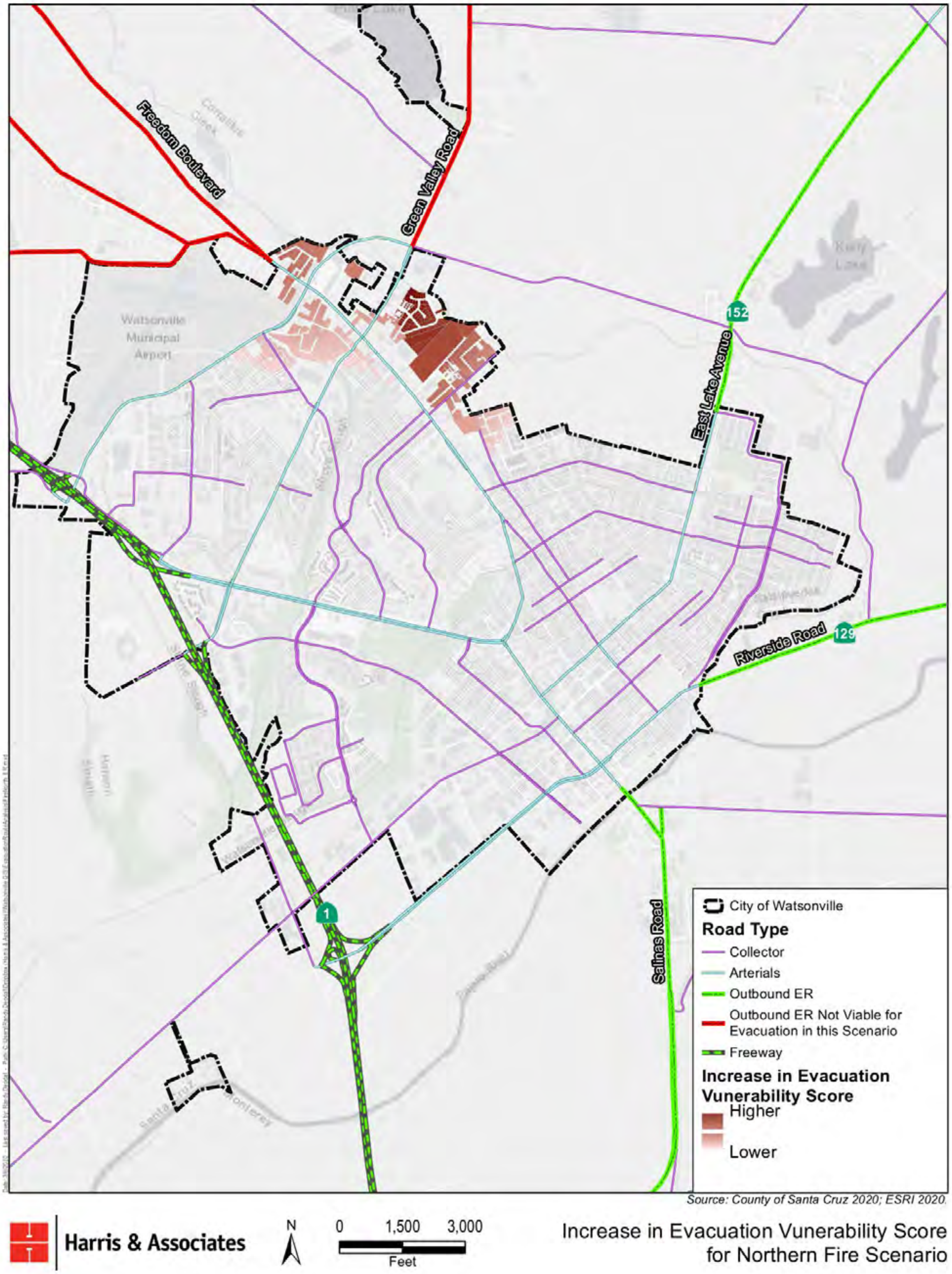
Source: County of Santa Cruz 2020; ESRI 2020.

Harris & Associates

Residential Evacuation Vunerability Score for All Directions

2. Wildfire (North)

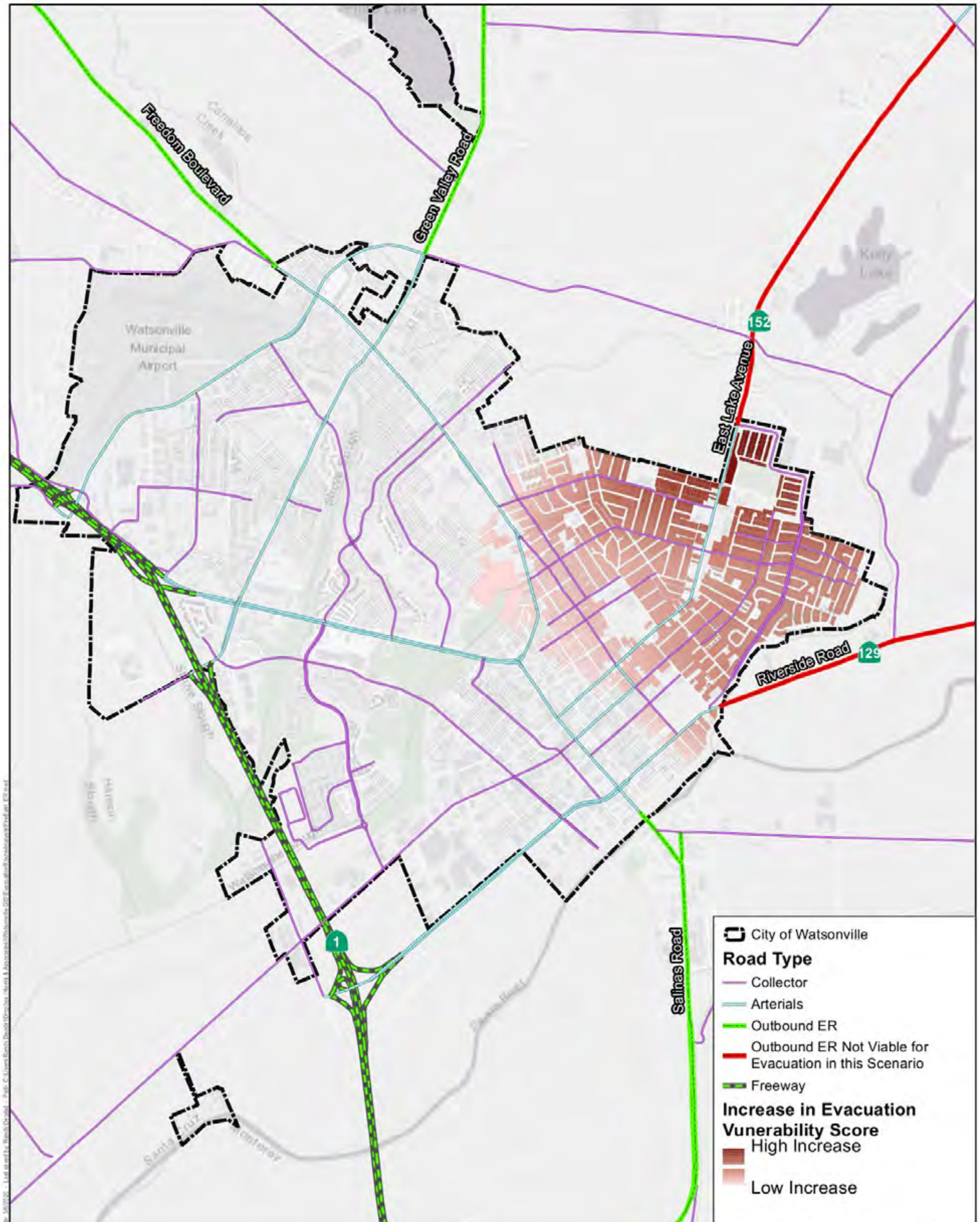
This scenario assumes a wildfire north of the City. Outbound roads leading north are not viable, including Freedom Boulevard and Green Valley Road. Evacuation route vulnerability scores are re-calculated to account for the increased distance to the next closest, viable outbound road. The map below highlights residential parcels with evacuation route vulnerability 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 contraflow 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.



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 southeast corner of the City because of the reduced mobility of the population that resides in those neighborhoods (higher percent of elderly population).



Source: County of Santa Cruz 2020; ESRI 2020.

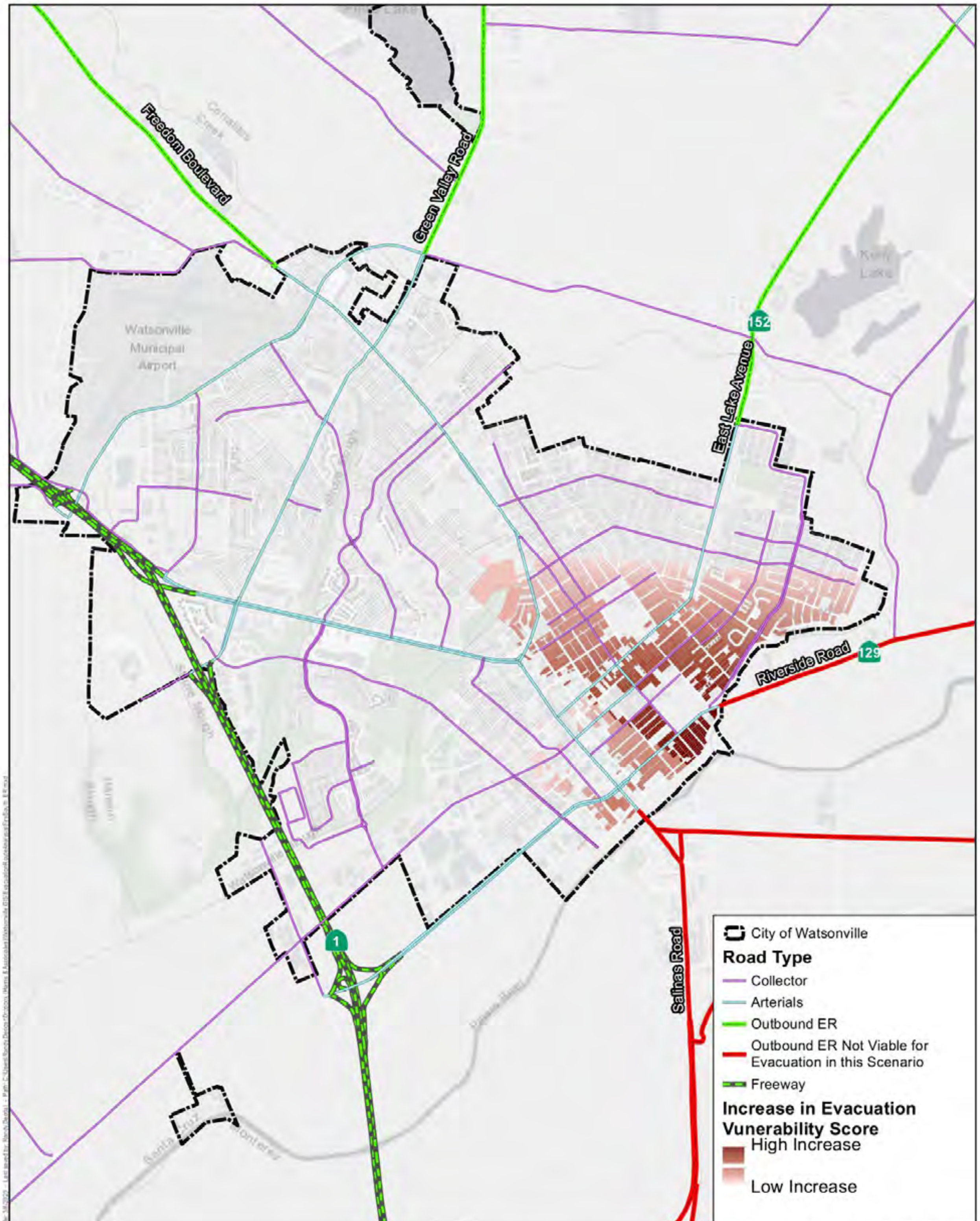
Harris & Associates

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 contraflow 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.



Source: County of Santa Cruz 2020; ESRI 2020.

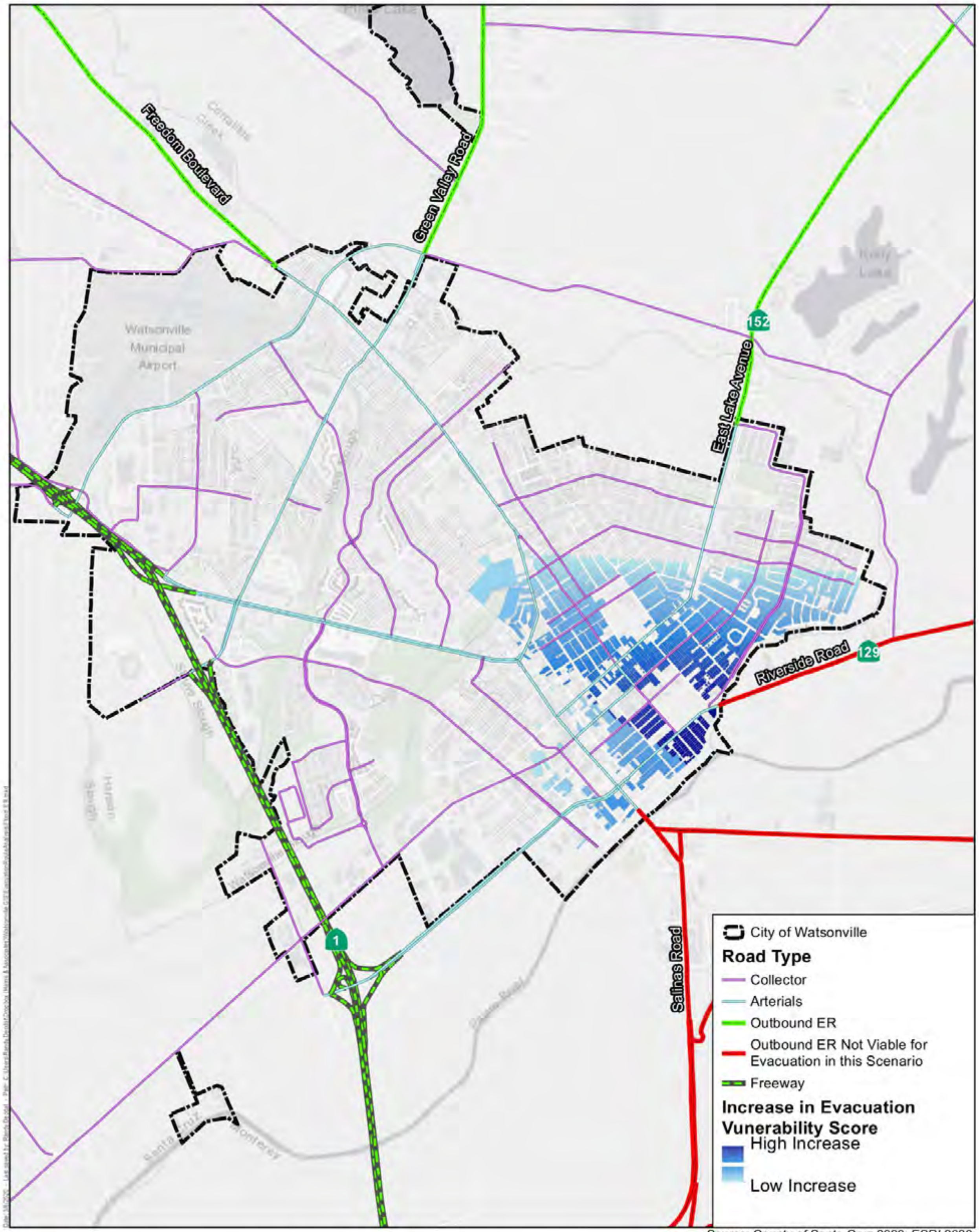
Harris & Associates

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.



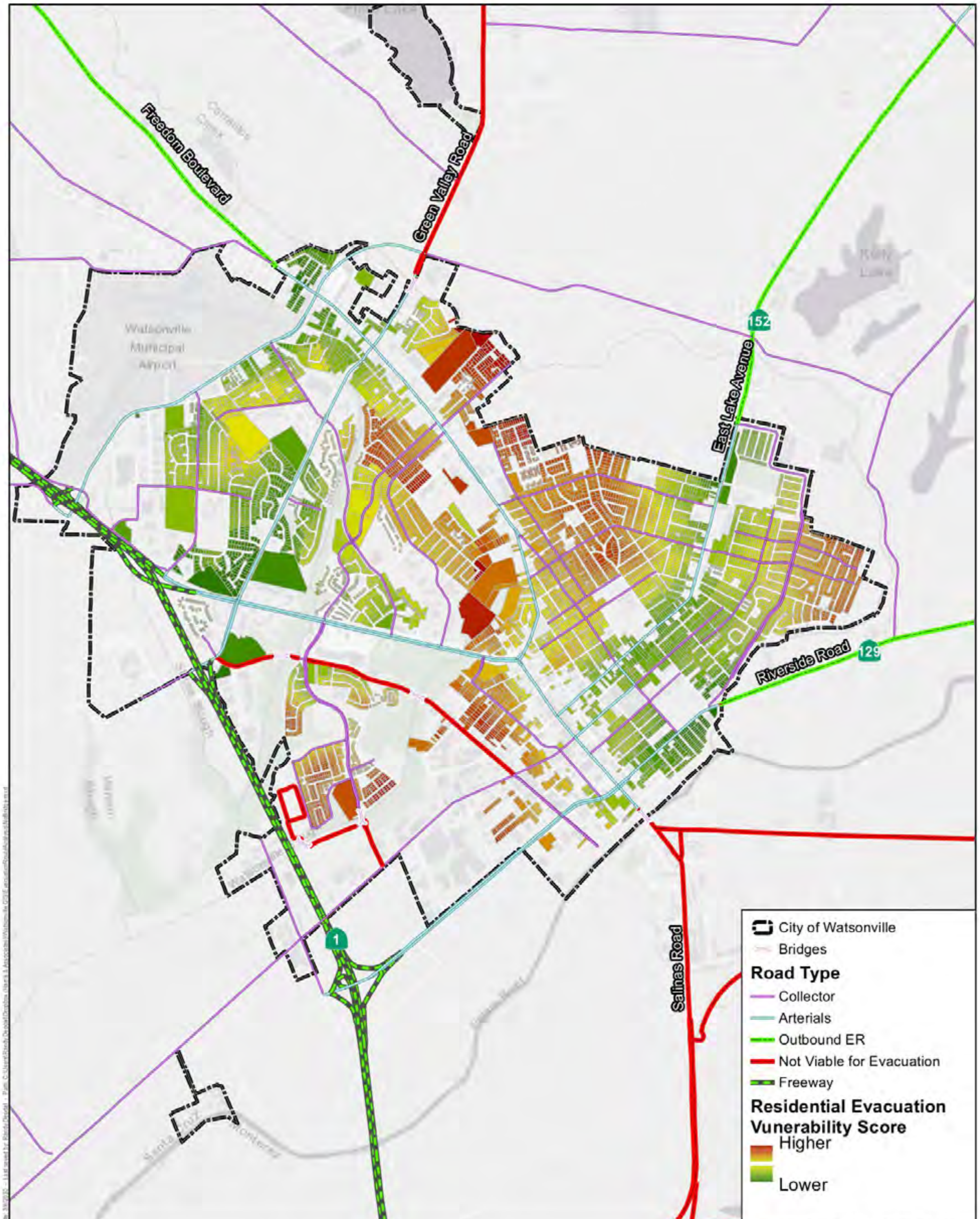
Source: County of Santa Cruz 2020; ESRI 2020.

Harris & Associates

Increase in Evacuation Vunerability Scores for Flood Scenario

6. Earthquake

Because earthquakes can damage bridges, two assumptions were made: 1) residential parcels that require a bridge crossing to access their most efficient evacuation route are more vulnerable compared to those that do not need to cross a bridge, and 2) outbound roads that require a bridge crossing may not be viable evacuation routes after an earthquake. To account for the first assumption, residential parcels that require a bridge crossing to access their otherwise most efficient evacuation route have a higher weight assigned to the road segment with the bridge. The second assumption removes two potential evacuation routes from the analysis; Green Valley Rd. and Salinas Rd. both have bridge crossings. More vulnerable residential parcels are highlighted in red on the map below. Residents in the city center remain vulnerable due to the distance they must travel to access any outbound road, consistent with the baseline scenario. Compared to the baseline, more parcels are vulnerable near bridges, including the southwest corner of the City along the Watsonville Slough and area to the south of Main street bordering the Slough and Beach Street. Residential parcels located along the eastern border of the City are also more vulnerable, as the closest evacuation route (Green Valley Rd.) may be closed. Residents in this area would be re-routed to either East Lake Ave. or Freedom Blvd., the next two closest outbound roads. Emergency responders should consider the possibility of bridge failure, and encourage residents to pre-determine routes without bridge crossings that lead out of the City.



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 (Preliminary)

The evacuation route analysis did not identify any residential parcels that lack two evacuation routes. 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.

Recommendations (Preliminary)

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. Two of the six outbound evacuation routes rely on a bridge. These bridges should be inspected and fortified 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.

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Chapter C Mitigation Strategy

Introduction

The City of Watsonville's (City's) mitigation strategy is a blueprint for reducing the potential losses identified in Chapter C, Risk Assessment. This chapter encompasses the City's mitigation strategy, including the mitigation goals, actions, action plan, capabilities assessment and National Flood Insurance Program (NFIP) compliance, and mitigation plan integration mechanisms. These subsections provide the framework for which the City will identify, prioritize, and implement actions to reduce risk from the identified hazards.

C.1 The existing authorities, policies, programs and resources and the City's ability to expand on and improve these existing policies and programs (Requirement Section 201.6[c][3])

a. Existing authorities, policies, programs and resources

The foundation of the mitigation action implementation strategy is the City's capabilities assessment. The capabilities assessment identifies existing authorities, policies, programs, and resources, as well as the ability to expand on and improve these tools, capable of implementing actions to reduce the City's long-term vulnerability to the identified hazards. The capabilities assessment presents a toolkit for implementation of the Local Hazard Mitigation Plan (LHMP).

The LHMP Planning Committee (planning committee) conducted an inventory of the existing authorities, policies, programs, and resources as detailed in Tables C-1, C-2, C-3, and C-4. The City is equipped with a range of administrative, financial, regulatory, and outreach tools and resources that can promote and implement hazard mitigation actions throughout the City. Where possible, the City will implement the mitigation action through existing tools, resources, and planning mechanisms.

Table C-1. Administrative and Technical Capabilities

Resource	Available?	Department/Agency
1. Planners or engineers with knowledge of land development and land management practices	Yes	Community Development (Building, Planning, Engineering, Housing), Public Works and Utilities (Water, Solid Waste, Engineering, Wastewater, Stormwater), Parks and Community Services
2. Engineers or professionals trained in construction practices related to buildings or infrastructure	Yes	Community Development (Building, Planning, Engineering, Housing), Public Works and Utilities (Water, Solid Waste, Engineering, Wastewater, Stormwater)
3. Planners or engineers with an understanding of natural hazards	Yes	Community Development (Building, Planning, Engineering, Housing), Public Works and Utilities (Water, Solid Waste, Engineering, Wastewater, Stormwater)
4. Floodplain manager	Yes	Public Works and Utilities

Table C-1. Administrative and Technical Capabilities

Resource	Available?	Department/Agency
5. Surveyors	Yes	City has an existing on-call contract with a surveyor for work on an as-needed basis
6. Personnel skilled or trained in GIS applications	Yes	Community Development (Planning), Public Works and Utilities
7. Scientist familiar with local natural hazards	No	N/A
8. Emergency services	No	Fire (Emergency Management Services, Emergency Operations Center), Police, Public Works and Utilities
9. Grant writers	Yes	Public Works and Utilities, Community Development Department, Police and Fire
10. Staff with expertise or training in benefit/cost analysis	No	N/A
11. Financial Officers	Yes	Finance (Budgeting, Financial Reporting)
12. City Mayor	Yes	Mayor's Office
13. Police Department	Yes	Dispatch, alarm system registration, alarm information, post-incident team
14. Fire Department	Yes	Emergency Preparedness, Fire Inspections, Emergency Operations
15. General Services	No	N/A
16. Agricultural Commissioner	No	N/A

Notes: City = City of Watsonville; GIS = Geographic Information System

Table C-2. Budget and Fiscal Capabilities

Resource	Available?	Department/Agency	Expansion/Improvement Capability
1. Budgeted Allocation	Possible in Future	City-Wide	Yes
2. General Funds	Possible in Future		Yes
3. Hazard Mitigation Grant Fund	Possible in Future	City-Wide	Yes
4. Emergency Management Performance Grant	Possible in Future	City-Wide	Yes
5. Community Development Block Grants	Yes	City-Wide	Yes
6. Capital Improvements Project Funding	Yes	City-Wide	Yes
7. Authority to Levy Taxes for Specific Purposes	Yes	City-Wide	Yes
8. User Fees For Water, Sewer, Gas or Electric Service	Yes	City-Wide	Yes
9. Impact Fees for Buyers or Developers of New Development/Homes	Yes	City-Wide	Yes
10. Incurring of Debt through General Obligation Bonds	Yes	City-Wide	

Table C-2. Budget and Fiscal Capabilities

Resource	Available?	Department/Agency	Expansion/Improvement Capability
11. Incurring of Debt through Special Tax Bonds	Yes	City-Wide	
12. Incurring of Debt through Private Activity Bonds	No	City-Wide	
13. Withholding of Public Expenditures in Hazard-Prone Areas	No	City-Wide	
14. State-Sponsored Grant Programs	Yes	City-Wide	

Table C-3. Planning, Building, and Regulatory Authorities

Resource	Available?	Department/Agency	Expansion/Improvement Capability
General Plan	Yes	Community Development	
Capital Improvement Plans	Yes	Public Works and Utilities	
Climate Action Plan	Yes	Public Works and Utilities	
Emergency/Disaster Plans	Yes	Public Works and Utilities	
Coastal Zone Implementation Plan	Yes	Community Development	
Specific Plans	Yes	Community Development, Downtown Specific Plan in progress	
Stormwater Program	Yes	Public Works and Utilities	
Emergency Operations Plan	No		
Continuity of Operations Plan	No		
Specific Hazard Plans (Fire, Drought, Flood Plans)	No		
Building Codes	Yes	Community Development	
Fire Codes	Yes	Fire and Community Development	
City Ordinances	Yes	City Clerk's Office	
County Ordinances	Yes	Office of the Clerk of the Board	

Table C-4. Training and Outreach Capabilities

Resource	Available?	Department/Agency	Expansion/Improvement Capability
Table top exercises	Yes	City wide	Yes
Dam Inundation exercises	Possible in Future	City-wide	Yes
Social media outreach (Twitter, Facebook, YouTube, etc.)	Yes	City wide	Yes

b. Ability to expand on and improve existing policies and programs

Capabilities and abilities to expand or improve existing policies and programs will be re-evaluated during the next LHMP update and annual plan review meetings.

The City reviews and updates different types of plans on an annual basis. Staff participate in training, exercises, and drills, such as the Citywide Emergency Operations Center training. If budget allows, the City will have the ability to hire additional staff either permanently or temporarily, which will expand on and/or improve existing policies and programs. The City is continuously researching grant opportunities for emergency management, hazard mitigation, and infrastructure and community development.

C.2 Participation in the NFIP and continued compliance with NFIP requirements, as appropriate (Requirement Section 201.6[c][3][ii])

The City entered into the NFIP on June 15, 1984, and the date of the City's current effective flood insurance rate map (FIRM) is May 16, 2012. As a participant in the NFIP, the City must, at a minimum, regulate development in its floodplain areas in accordance with NFIP regulations. Before a permit to build in a floodplain area is issued, the City must ensure that the following two basic criteria of NFIP compliance are met:

- All new buildings and developments undergoing substantial improvement must, at a minimum, be elevated to protect against damage by the 100-year flood.
- New floodplain development must not worsen existing flood problems or increase damage to other properties.

The City will continue to comply with NFIP through the following activities:

- Regulate development in the 100-year floodplain area in accordance with NFIP requirements
- Interpret flood zones shown on the FIRM upon request from residents, realtors, and insurance agents to help determine if flood insurance is required
- Provide, at no charge, copies of elevation certificates for new structures and substantially improved structures that have been constructed since 1992

According to the City's geographic information system (GIS) data, 2,461 structures are in the Special Flood Hazard Area. Structures built before the FIRM was adopted (pre-FIRM buildings) may be more vulnerable to flooding and related damage because they might not meet the NFIP regulations and the City's flood damage prevention codes and ordinances. The first FIRMs for the City were available in 1984. According to County of Santa Cruz Assessor records, 1,214 pre-FIRM buildings and 201 post-FIRM structures exist in the City.

In addition, the City participates in the Community Rating System (CRS), a voluntary incentive program in the NFIP. The CRS encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from the City's actions to meet the following three goals of the CRS:

- Reduce flood damage to insurable property
- Strengthen and support the insurance aspects of the NFIP
- Encourage a comprehensive approach to floodplain management

The City joined the CRS in October 1992 and maintains a Class 7 rating, which provides a 15 percent reduction in flood insurance premiums to flood insurance policy holders in the City and represents an annual savings of $156,088 in flood insurance premiums, or an average of $244 per year for each policy in force.

C.3 Goals to reduce/avoid long-term vulnerabilities to the identified hazards (Requirement Section 201.6[c][3][i])

The planning committee, with input from the LHMP Steering Committee, stakeholders, and the public, identified the following goals to envision the City's future and guide the development and implementation of hazard mitigation actions. The goals are consistent with the hazards previously identified in the risk assessment.

City goals to reduce or avoid long-term vulnerabilities to the identified hazards:

1. Reduce the potential for loss of life, injury, and property damage in the City from natural hazards
2. Prioritize risk reduction for the most vulnerable populations
3. Improve the capacity of City government and the community to prevent, protect against, respond to, mitigate, and recover from hazards
4. Promote and administer public, private, and community collaboration and partnerships to provide effective risk reduction solutions and data to support decisions

C.4 Identification and analysis of a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure (Requirement Section 201.6[c][3][ii])

a. Identification and analysis of a comprehensive range of specific mitigation actions and projects to reduce the impacts from hazards

Table C-5 identifies the actions (projects, activities and programs, or processes) the planning committee developed that will reduce or eliminate risk to the community from hazards and their impacts. Mitigation actions take several forms, such as projects, activities and programs, or processes. The planning committee identified and reviewed a variety of mitigation action types, including local plans and regulations; building structure and infrastructure projects; natural systems protections; and education, awareness, and outreach programs. As identified in Table C-5, many of the actions identified by the planning committee are grouped by their focus on building and structures, infrastructure, earthquake protection, fire defense, flood mitigation and capacity, green infrastructure and natural systems, public outreach, and food availability and essential needs.

Table C-5. Mitigation Actions

No.	Category	Initiative	Hazard	Benefit	Responsible Dept./Agency	Timeline[1]	Priority	Cost Estimate	Funding Source	Notes
1	Structures	Develop and implement seismic retrofit program options for home and business owners, including through public-private partnerships	Earthquake	Reduce potential loss of life and damage to private structures	Building, Fire	2023	Medium	$500,000	Hazard mitigation grants, loans, bonds, CDBG, CBSC state fees	—
2	Infrastructure	Strengthen and stabilize public facilities and infrastructure, including but limited to non-reinforced masonry buildings, non-ductile concrete buildings and facilities, storm lines, sloughs, storm culverts, channels, streets, and bridges	Earthquake	Reduce potential loss of life and damage to public structures	Public Works and Utilities, Building, Fire	2024	Medium	$5M	Hazard mitigation grants, loans, bonds, General Fund	—
3	Earthquake Protection for Utilities/Infrastructure	Convert earthen reservoirs to above ground	Earthquake	Reduce risk of water supply disruption	Public Works and Utilities	2025	Medium	$20M	State Revolving Fund loan and grants	—
4	Infrastructure	Protect roads, including in downtown and green valley corridors	Earthquake	Protect evacuation routes from potential damages	Public Works and Utilities	—	Medium	$3.5M	—	This is based on an estimate from Assistant Public Works Director
5	Fire Defense	Develop an eave construction program for homes	Wildfire, Climate Change	Reduce residences' vulnerability to both ember and direct flame contact exposures	Building and Fire	2022	Medium	$25,000	Grant where residents pay for 25% of cost	—
6	Fire Defense	Develop or improve defensible space for critical facilities, including wells, pump stations, reservoirs, booster tanks, and filter plant	Wildfire, Climate Change	Reduce risk of service disruptions	Public Works and Utilities	2022	Medium	$50,000	Water Fund	—
7	Flood Capacity	Assess and develop a plan to implement a 100-foot buffer for sloughs within City limits	Flood, Climate Change (Sea-Level Rise)	Reduce sea-level rise risk and flood risk and secure social and environmental co-benefits	Planning, Public Works and Utilities	2025	Medium	$50,000	Ordinance update; therefore, it would be staff time from planning and engineering	—
8	Flood Capacity	Develop or improve stormwater system BMPs, including but not limited to flood attenuation ponds, bio-retention, detention basins, gutters, storm drain inlets, culverts, culvert outfalls, bio swales, catch basins, and storm outfall dissipaters	Flood, Climate Change	Reduce flood risk, better protect against more intense rain events, and secure social and environmental co-benefits	Public Works and Utilities	2025	High	$5M	Federal and state grants and State Revolving Fund	—
9	Flood Capacity	Develop and implement watershed improvements and habitat enhancements for sloughs, storm culverts, and channels	Flood, Wildfire, Climate Change	Reduce flood risk and secure social and environmental co-benefits	Public Works and Utilities	2025	Medium	$3M	—	—
10	Flood Mitigation	Protect (elevate, armor, or relocate) critical infrastructure, facilities, and systems from sea-level rise, including but not limited to pump stations, wells, and the wastewater treatment facility	Flood, Climate Change (Sea-Level Rise)	Reduce risk of service disruptions	Public Works and Utilities	2025	High	$10M	Enterprise Funds and federal and state grants	—

Table C-5. Mitigation Actions

No.	Category	Initiative	Hazard	Benefit	Responsible Dept./Agency	Timeline[1]	Priority	Cost Estimate	Funding Source	Notes
11	Flood Mitigation	Promote and sponsor programs to buy out, relocate, elevate, and flood-proof existing flood-prone structures	Flood, Climate Change (Sea-Level Rise)	Reduce potential loss of life and damage to private structures	Planning; Building	2025	Low	$20M to $40M	Hazard mitigation grants 75% federal, 25% state/local Special bonds, loans, CDBG, General Fund	This is based on moving the levee back to create a wider channel. This is a rough estimate of the property value in this area.
12	Food Availability	Assess and increase the development and use of community gardens to support local food production, including through partnerships	Climate Change	Improve community resilience in case of event that interrupts supply chains and secure social and environmental co-benefits	Public Works and Utilities	2025	Low	$500,000	—	This cost is for the program only and does not include any purchase of land. It is assumed that land for the program is currently owned by City.
13	Building	Develop and implement upgrades to City properties and facilities with features that would improve stormwater runoff, provide water saving opportunities, and incorporate low-impact development strategies—all moving toward a more green infrastructure	Flood, Drought, Climate Change	Reduce urban flood risk and secure social and environmental co-benefits	Planning, Public Works and Utilities	2024	Medium	$2M	—	This cost is based on four projects, each averaging $500,000.
14	Green	Develop and implement natural resource protection and management policies and programs, including tree planting programs, monitoring of invasive species, and support for native plants	Wildfire, Flood, Climate Change (Extreme Heat)	Reduce vulnerability, improve quality of the environment and wildlife habitat, and secure social and environmental co-benefits	Parks and Community Services, Conservation Agencies	2024	High	$3.6M	—	—
15	Infrastructure	Develop redundancy in communications systems for water, storm pump stations, sewer lift stations, and critical airport facilities	Flood, Earthquake, Wildfire, High Wind, Climate Change	Facilitate response and recovery activities in the event of a disaster	IT	2022	High	$550,000	—	This is for redundant radios at 70 sites; backup power is addressed in row 21.
16	Outreach	Conduct a flood outreach program, including increased signage in flood-prone areas and improvements to the Flood Alert System	Flood, Climate Change	Improve community response to flood events	Public Works and Utilities	2025	High	$5,000	—	—
17	Outreach	Develop community empowerment programs that promote hazard mitigation leadership and action	Flood, Wildfire, High Wind, Earthquake, Climate Change (Extreme Heat)	Improve public engagement in hazard mitigation	—	—	—	—	—	—
18	Power	Develop and implement energy efficiency policies and programs, including through public-private partnerships	Climate Change (Extreme Heat)	Reduce load on energy infrastructure and likelihood of power outages	Planning and Building	2023	Low	$25,000	Energy grants from state and federal, General Fund	—

Table C-5. Mitigation Actions

No.	Category	Initiative	Hazard	Benefit	Responsible Dept./Agency	Timeline[1]	Priority	Cost Estimate	Funding Source	Notes
19	Power	Develop and implement policies and programs that increase investments in local energy production, distribution, and storage, including through microgrid development	Wildfire, High Wind, Climate Change (Extreme Heat)	Increase community resilience to wildfire, heat, and other events that may result in power outages	Planning	—	—	—	—	—
20	Power	Assess and provide backup power for critical infrastructure and facilities, including but not limited to wells, pump stations, reservoirs, booster tanks, and traffic control facilities	Flood, Wildfire, High Wind, Earthquake, Climate Change (Extreme Heat)	Reduce risk of critical services disruptions	Public Works and Utilities	2025	High	$1.3M	Water/Wastewater Fund and grants	This is based on nine generators of different sizes—3 larger generators each around $200,000 and six smaller generators each around $70,000 with contingency and permitting costs.
21	Studies	Assess the vulnerability of public facilities, infrastructure, and structures to seismic risk	Earthquake	Reduce loss of life and property damage	Public Works and Utilities, Building, Fire	2025	Medium	$750,000– $1M	General Fund, Enterprise Fund	—
22	Studies	Develop an inventory of private structures and identify the types that are at greatest seismic risk	Earthquake	Reduce loss of life and property damage	Public Works and Utilities, Building, Fire	2025	Medium	$250,000	General Fund	—
23	Studies	Evaluate current policies that relate to stormwater and flood control to accommodate and mitigate expected future impacts to property, infrastructure, and community well-being	Flood	Reduce flood risk	Public Works and Utilities	2025	High	$2M	—	—
24	Studies	Develop and implement a drought plan that includes monitoring groundwater levels and supply and increasing aquifer storage and recovery	Drought, Climate Change	Reduce impacts of drought on water security	Public Works and Utilities	2025	Medium	$50,000	—	This includes a partnership with Pajaro Valley Water Management Agency and grants.
25	Studies	Assess current capacity of food banks and develop strategies to increase their functionality during disasters	Earthquake, Flood, Wildfire	Increase disaster response and recovery	Planning	2025	Medium	$125,000	—	This includes a partnership with Mesa Verde Gardens, Parks Fund, and pre-disaster mitigation grant funding.
26	Incident Command System Training – City Wide	Trains and prepares City employees with the skills needed to properly manage any natural disaster or major critical incident	All	Increase CM, City Manager, Police, Fire, Public Works – primary	—	Ongoing	—	—	—	—

Notes: BMP = best management practice; City = City of Watsonville

[1] In years and not more than 5.

b. Identification of mitigation actions for every hazard posing a threat to each participating jurisdiction

This is a single, local jurisdiction plan; therefore, the mitigation actions for every identified hazard address the threats in the City. Chapter B, Risk Assessment, identifies and evaluates 10 hazards of concern that could affect the City. In this chapter, the City identifies mitigation actions for 6 of the 10 hazards of concern (Table C-6). The planning committee considered and evaluated four hazards—dam failure, landslide, liquefaction, and tsunami—but did not prioritize mitigation actions for them because of factors such as distance from the City and low probability of event. Priority was given to mitigation actions for hazards with a higher probability of event.

Table C-6. Mitigation Actions for Hazards Posting Threat to City

Hazard of Concern	Mitigation Action Identified/Not Identified
Climate Change	Mitigation actions identified
Dam Failure	Considered in risk assessment but low probability of event due to the remote location of the nearest dam facility
Drought	Mitigation actions identified
Earthquake	Mitigation actions identified
Flood	Mitigation actions identified
High Wind	Mitigation actions identified
Landslide	Considered in risk assessment but low probability of event
Liquefaction	Considered in risk assessment but probability of earthquakes at nearby faults is relatively low and higher probability earthquakes at farther fault lines are less likely to trigger liquefaction
Tsunami	Considered in risk assessment, but City has not experienced any events; considered low probability of event
Wildfire	Mitigation actions identified

c. Identification of mitigation actions and projects have an emphasis on new and existing buildings and infrastructure

The mitigation actions emphasize new and existing buildings and infrastructure. For example, the planning committee identified a seismic retrofit program for existing buildings and a stabilization program for existing public facilities and infrastructure to mitigate impacts from earthquakes. Other mitigation actions, such as the stormwater system best practices project, watershed improvements project, and natural resource protection project, will create new, nature-based infrastructure.

C.5 Action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction (Requirement Section 201.6[c][3][iv]); (Requirement Section 201.6[c][3][iii])

a. How the mitigation actions will be prioritized (including cost benefit review)

The mitigation action spreadsheet (Appendix B) identifies the estimated cost, priority, and potential funding source of each action. Mitigation actions are prioritized based on a ranking of high, medium, or low.

The planning committee took into consideration all public input when prioritizing actions related to natural hazards of concern to the community. The project manager then had each City department review programs and projects that aligned with preventing the natural hazards within the community. From these two processes, a prioritization was created that addressed the communities concerns related to natural hazards and could be implemented by City departments.

b. Identification of the position, office, department, or agency responsible for implementing and administering the action, potential funding sources and expected timeframes for completion

The mitigation action spreadsheet (Appendix B) identifies the responsible agency or department, timeline for completion, and potential funding sources. Many of the identified mitigation actions fall under the responsibility of the City's Public Works and Utilities Department, Community Development Department (Planning and Building Division), and Fire Department, followed by Parks and Community Services Department.

C.6 A process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate (Requirement §201.6(c)(4)(ii))

a. Identification of the local planning mechanisms where hazard mitigation information and/or actions may be incorporated

The hazard analysis maps can be used in other planning documents, such as the Climate Action and Adaptation Plan, Fire Plan, and Urban Water Management Plan. Some of the mitigation actions can be used for the Capital Improvement Plan. The hazard analysis and risk assessment can help develop the General Plan, Emergency/Disaster Plan, Coastal Zone Implementation Plan, and Capital Improvement Plan. The majority of the information in the LHMP can be reviewed to help develop new plans or update other plans.

b. The process to integrate the data, information, and hazard mitigation goals and actions into other planning mechanisms

The planning committee will identify the planning mechanisms where hazard mitigation information can be integrated and will direct the respective department staff to integrate it where feasible. As the City creates and updates the Climate Action Plan, Fire Plan, Urban Water Management Plan, Capital Improvement Plan, General Plan, Disaster Plan, and Coastal Zone Implementation Plan, City staff can review the LHMP to identify data, information, and relevant goals and actions. This information can then be integrated into the planning updates.

c. How the jurisdiction(s) incorporated the mitigation plan, when appropriate, into other planning mechanisms as a demonstration of progress in local hazard mitigation efforts

When the City updates the LHMP in 5 years to maintain eligibility, the planning committee will provide an updated explanation of how it incorporated the LHMP and demonstrate progress in local hazard mitigation planning efforts.

Chapter D Plan Review, Evaluation, and Implementation

D.1 The plan must be revised to reflect changes in development (Requirement Section 201.6[d][3])

This is the City of Watsonville's (City's) first Local Hazard Mitigation Plan (LHMP). Therefore, this chapter does not apply. It will be addressed in the next update.

D.2 The plan must be revised to reflect progress in local mitigation efforts (Requirement Section 201.6[d][3])

This is the City's first LHMP. Therefore, this chapter does not apply. It will be addressed in the next update.

D.3 The plan must be revised to reflect changes in priorities (Requirement Section 201.6[d][3])

This is the City's first LHMP. Therefore, this chapter does not apply. It will be addressed in the next update.

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Chapter E Plan Adoption

E.1 The plan must include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval (Requirement Section 201.6[c][5])

The City of Watsonville will adopt the Local Hazard Mitigation Plan once it receives the Federal Emergency Management Agency-approved pending adoption letter.

E.2 For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document formal plan adoption (Requirement Section 201.6[c][5])

This is a single jurisdictional plan and, therefore, does not apply.

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