Annex G Thermalito Water and Sewer District

G.1 Introduction

This Annex details the hazard mitigation planning elements specific to Thermalito Water and Sewer District (TWSD or District), a previously participating jurisdiction to the 2014 Butte County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to the TWSD, with a focus on providing additional details on the risk assessment and mitigation strategy for the District.

G.2 Planning Process

As described above, the TWSD followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Butte County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table G-1. Additional details on plan participation and TWSD representatives are included in Appendix A.

Table G-1 TWSD Planning Team

Name	Position/Title	How Participated
Christopher Heindell	District Engineer	Data Compilation and Document Support
Jayme Boucher	General Manager	Document Support and Outreach
Carolyn Padilla	Office Manager	Document Support

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP. This section provides information on how the TWSD integrated the previously approved 2014 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2014 LHMP through other plans and programs shown in Table G-2.

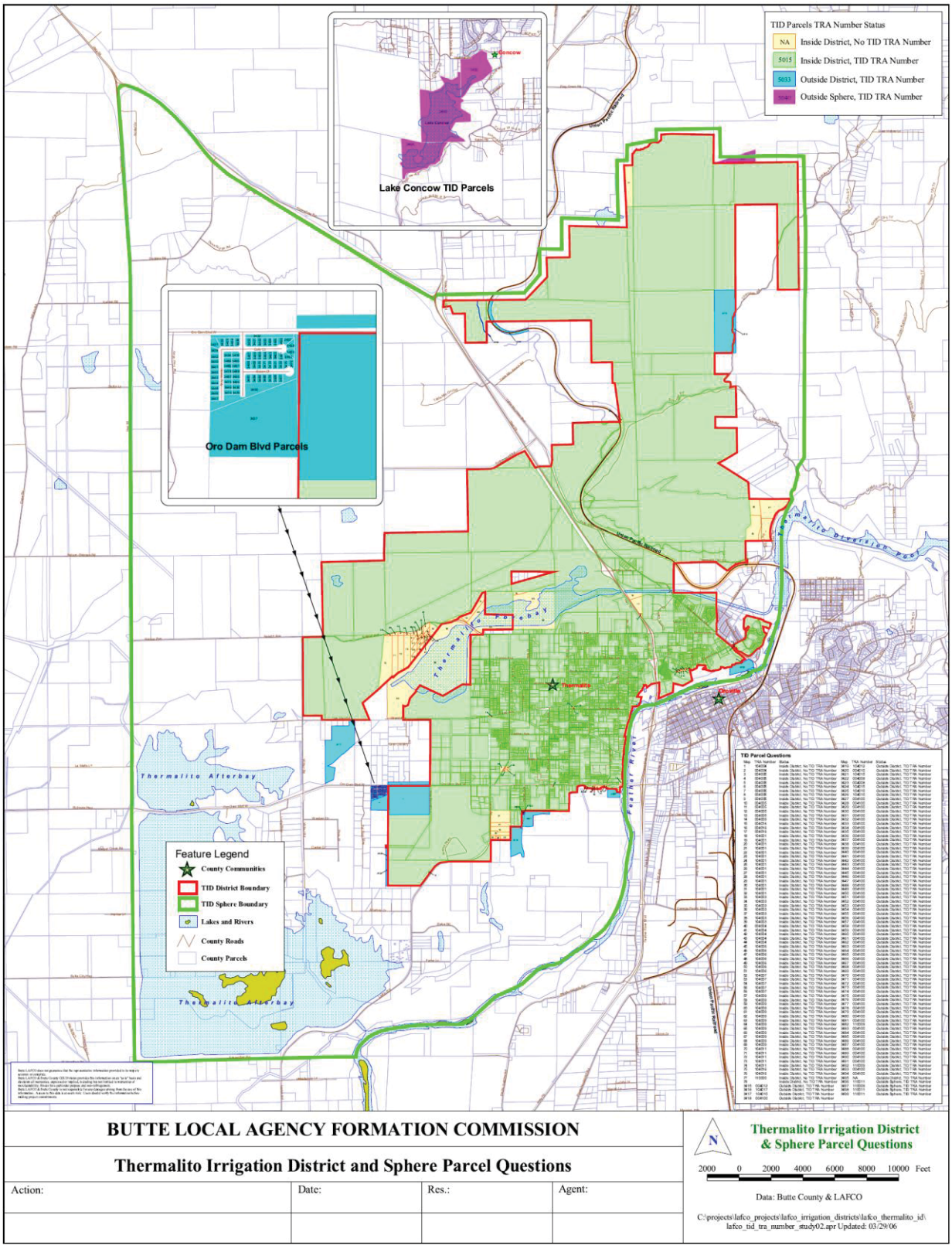
Table G-2 2014 LHMP Incorporation

Planning Mechanism 2014 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
None	District had no hazard related planning since the 2014 Plan.

G.3 District Profile

The community profile for the TWSD is detailed in the following sections. Figure G-1 shows the District's service area boundaries and sphere of influence as adopted by the Butte County Local Agency Formation Commission (LAFCo). As shown, the urban portion of the District is relatively condensed in the southern extent of its boundaries with large tracts of open and/or sparsely developed lands to the west and north. In addition, the District encompasses large areas of State lands, including the Thermalito Power Canal, Thermalito Forebay and State Park, and the Oroville Wildlife Area.

Figure G-1 Thermalito Water and Sewer District Boundaries



Source: TWSD 2015 Urban Water Management Plan

G.3.1. Overview and Background

Located in southern Butte County, California, the Thermalito Water and Sewer District was established in April 3, 1922 as Thermalito Irrigation District and supplied water to an area of approximately 3,164 acres with a service population of approximately 360 properties owners. The District's initial boundaries were much larger but only 3,164 acres could be served with water by the existing distribution system. The District was formed with the express purpose of providing agricultural water to the Thermalito community. The District was authorized to operate by the California Water Code, Division 11, Section 20500 to 29978 derived from the 1897 Irrigation District law. The District was organized to bond itself to the extent of $270,000.00 to finance the construction or purchasing the necessary irrigation canals and acquiring the necessary property, water, water rights, reservoirs, reservoir sites and other property necessary for the purposes of the District. On July 1, 2008 the District changed its name to Thermalito Water and Sewer District.

In August 1923, for the sum of $10,000, the District purchased land from the Pacific Gas & Electric Company for the purpose of development of a reservoir. Construction of the Concow Dam on Concow Creek began in November of 1923 and was completed in December 1924. The Concow watershed was chosen because it was part of the original water distribution system owned by Pacific Gas & Electric Company and was not included when Thermalito Irrigation District incorporated. PG&E did not provide the Wilnore/Concow water storage system, and it was essential the District acquire the old Wilnore dam and land for the water rights needed. During the early years, Wilnore/Concow Reservoir water was used almost solely for irrigation; almost all residences used the District water for domestic purposes. There were a few private wells in the District, but the majority of residences could not afford to dig for water as the hard pan layers under Thermalito made it cost prohibitive to dig.

The Concow Reservoir, also known as the Wilnore Reservoir, has a capacity of 7,225-acre feet. Under the original appropriative water rights licenses issued in 1928 and 1929, TID/TWSD held title to 45% of the water and the remaining 55% was held by TMID (Table Mountain Irrigation District). Water released from the reservoir was diverted into the Wilnore Ditch through the Wilnore siphon under the West Branch of the Feather River and into the Pacific Gas & Electric Company's Miocene Ditch. The water was then used to generate power at PG&E's powerhouses at Lime Saddle and Coal Canyon and was conveyed from the Coal Canyon powerhouse to the Miocene Ditch (also referred to as the Powers Canal, owned by California Water Service), and delivered to the TID/TWSD service area at the site of the present water storage tank.

Construction of the Oroville Dam and appurtenant facilities of the State Water Project in the 1960's provided an alternative means of conveying the District's Concow water to the service area. In 1965 TID/TWSD entered into an agreement with the California Department of Water Resources (DWR) to release its share of Concow water into the West Branch of the Feather River, either by way of Concow Creek or through the PG&E Lime Saddle power plant. In 1966 Oroville Dam and Thermalito Diversion Dam were added to the water rights license as points of power diversion and re-diversion to the District.

The condition of the Wilnore and Spring Valley Ditch system gradually declined over the years until it became so dry that its water retention capacity was questionable and seepage losses were becoming prohibitive. TID/TWSD's agreement with the Department of Water Resources was amended in 1971 to allow delivery of Concow water via Concow Creek to Lake Oroville. The earthquake of August 1975 so

damaged the ditch system that it was imperative that the District utilize the new contractual agreement. DWR gives credit for water delivered and provides an equivalent amount of Lake Oroville water to the District delivered through the Thermalito Power Canal.

The primary agricultural crops within the area, when the District was formed, were olive and orange orchards, irrigated pasture, grapes and a couple of dairy operations. The District has a water right of 8,200 acre-feet from the Concow watershed and at no time shall the reservoir capacity drop below 1,000 acre-feet to accommodate the fish population. When full, the Concow Lake has a capacity of 7,225 acre-feet.

In addition to the District's surface water, groundwater supplies were developed from six wells located throughout the District. Wells #1 & #6 where abandoned and a new well site was grant deeded for the future replacement of Well #1. Although these wells have been used to supply a majority of domestic water demands in the past, they are used as a supplemental source at present; surface water from the Concow system provides the primary supplies. In April 2008 the District constructed a membrane filtration system to meet state health standards and began to phase out the old pressure vessel system. It was found that the wells would be needed to reduce the effects of disinfectant byproducts that pass through the membrane filtration system so Wells #4 and #5 are used during the year to dilute the concentration of the production seasons. The water supply capacity of the District was further enhanced by a 1995 decision of the State Water Resources Control Board, which allowed TID/TWSD consumptive water use of 8,200-acre feet of Concow Reservoir water.

G.4 Hazard Identification

TWSD's planning team identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to the District (see Table G-3).

Table G-3 Thermalito Water and Sewer District – Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Limited	Unlikely	Catastrophic	High	Medium
Drought & Water shortage	Extensive	Likely	Critical	High	High
Earthquake	Extensive	Unlikely	Catastrophic	High	Low
Floods: 100/200/500 year	Extensive	Unlikely	Critical	Medium	Medium
Floods: Localized Stormwater	Limited	Likely	Limited	Medium	Medium
Hazardous Materials Transportation	Limited	Unlikely	Limited	Low	Low
Invasive Species: Aquatic	Significant	Occasional	Catastrophic	Medium	Medium
Invasive Species: Pests/Plants	Limited	Likely	Limited	Low	Low
Landslide, Mudslide, and Debris Flow	Limited	Likely	Limited	Low	Low
Levee Failure	Significant	Highly Likely	Critical	High	Medium
Severe Weather: Extreme Heat	Extensive	Likely	Limited	Low	High
Severe Weather: Freeze and Winter Storm	Extensive	Likely	Limited	Low	Medium
Severe Weather: Heavy Rain and Storms (Hail, Lightning)	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Likely	Limited	Low	Low
Stream Bank Erosion	Limited	Highly Likely	Critical	High	Low
Volcano	Limited	Unlikely	Catastrophic	Low	Low
Wildfire	Significant	Highly Likely	Catastrophic	High	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

G.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile TWSD's hazards and assess the TWSD's vulnerability separate from that of the Planning Area as a whole, which has already been assessed in Sections 4.2 Hazard Profiles and 4.3 Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Planning Area and describes the hazard problem description, hazard extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

G.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section G.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard affects the TWSD and includes information on past hazard occurrences. The intent of this section is to provide jurisdictional specific information on hazards and further describe how the hazards and risks differ across the Planning Area.

G.5.2. Vulnerability Assessment and Assets at Risk

This section identifies TWSD's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the TWSD's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-Risk Populations Facilities, and (3) Hazardous Materials Facilities, as discussed in Section 4.3.1 of the Base Plan.

Table G-4 lists critical facilities and other District assets identified by the TWSD planning team as important to protect in the event of a disaster. TWSD's physical assets, valued at over $111 million, consist of the buildings and infrastructure to support TWSD's operations.

Table G-4 Thermalito Water and Sewer District Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Concow Reservoir & Dam	97' High arch cement dam	$30,000,000	Body contact with the Lake is unsafe
Water Treatment plant	Micro Membrane system	$7,320,000	Some chemicals are stored at plant high voltage
Office and maintenance yard	Office and equipment storage & repair	$1,100,000	High voltage, petroleum, heavy equipment
Four deep water wells	Three wells are centrifugal 1submersable	$3,000,000	High voltage, 12.5% Bleach
Clearwell Storage	Water Storage tank	$770,000	Fall Hazard
2.5 MG Storage	Water Storage Reservoir	$1,500,000	Fall Hazard
59 Mile Distribution Pipe system	2" to 30" pipe for water Delivery	$38,940,000	None
34.7 Miles of sewer Collector system	6" to 18" pipe for sewer collection	$27,482,400	None
Sewer Lift Station	Pump station	$110,000	High Voltage
Water Treatment Plant	Pressure Vessel Treatment plant	$1,000,000	Some chemicals are stored at plant and high voltage
Total		**$111,222,400**	

Source: TWSD

Natural Resources

TWSD has a variety of natural resources of value to the District. These natural resources parallels that of the Butte County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Historic and Cultural Resources

TWSD has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of the County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Growth and Development Trends

The District Planning Team noted that the Thermalito area has seen a growth rate less than 1% over the last 10 years.

Special Populations

There are special populations within the District that could be affected:

- Roseleaf 1912 20th Street phone # 514-4394 is a RCFE (Rest home) with 50 residents living there. They would need buses to move their residents if an evacuation were required.
- Heritage House 1882 Tehama Avenue phone # 533-7664 is a RCFE (Rest home) with 15 residents living there. They would need a bus to move their residents if an evacuation were required.
- Sizemore rest home 2067 7th Street phone # 533-7001 is a RCFE (Rest home) with 7 residents living there. They would need a bus to move their residents if an evacuation were required.
- Cottage Rest Home 1059 Nevada Avenue phone # 592-5357 is a RCFE (Rest home) with 12 residents living there. They would need a bus to move their residents if an evacuation were required.
- Alexander Rest Home 1169 Plumas Avenue phone # 624-1124 is a RCFE (Rest home) with 12 residents living there. They would need a bus to move their residents if an evacuation were required.
- Daniela's Country Home Care 17 Country Wood Lane phone #532-1577 is a RCFE (Rest Home) with 6 residents living there. They would need a van to move their residents if an evacuation were required.

Development since 2014

The District looked at additional facilities that have been added in the TWSD since 2014. These new hookups added to the TWSD service area can be seen in Table G-5.

Table G-5 Development in Thermalito Water and Sewer District Service Area since 2014

Property Use	2014	2015	2016	2017	2018
Residential	23	4	28	16	6
Commercial	0	0	0	0	0
Industrial	0	0	0	0	0
Other	0	0	0	0	0
Total	**23**	**4**	**28**	**16**	**6**

Source: Permit Records

Future Development

The District has no control over future development in areas the District provides services in. Future development in these areas parallels that of the County as a whole. More general information on growth and development in Butte County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Butte County Vulnerability and Assets at Risk of the Base Plan.

The District anticipates that growth in the near future will occur within several partially un-finished subdivisions (Linkside, Vista Del Oro, Orchard Crest, etc.). Once those small pockets of development have been completed, growth can continue West and South-west towards Highway 99. As development moves West infrastructure will need to be installed to facilitate services.

G.5.3. Vulnerability to Specific Hazards

This section provides the hazard profile discussion and vulnerability assessment for those hazards identified above in Table G-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Butte County Planning Area).

An estimate of the vulnerability of the TWSD to each identified priority hazard, in addition to the estimate of risk of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change is the distinct change in measures of weather patterns over a long period of time, ranging from decades to millions of years. More specifically, it may be a change in average weather conditions such as temperature, rainfall, snow, ocean and atmospheric circulation, or in the distribution of weather around the average. While the Earth's climate has cycled over its 4.5-billion-year age, these natural cycles have taken place gradually over millennia, and the Holocene, the most recent epoch in which human civilization developed, has been characterized by a highly stable climate – until recently.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the County, including the District. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known but is feared to be tens to hundreds of years.

Past Occurrences

The District Planning Team noted no past occurrences of climate change but did note that the strength of storms does seem to be increasing and the temperatures seem to be getting hotter.

Vulnerability and Impacts to Climate Change

The APG: Defining Local and Regional Impacts focuses on understanding the ways in which climate change can affect a community. According to this APG, climate change impacts (temperature, precipitation, sea level rise, ocean acidification, and wind) affect a wide range of community structures, functions and populations. These impacts further defined by regional and local characteristics are discussed by secondary impacts and seven sectors found in local communities: Public Health, Socioeconomic, and equity impacts; Ocean and Coastal Resources; Water Management; Forest and Rangeland; Biodiversity and Habitat; Agriculture; and Infrastructure. District specific impacts would include increased or decreased water usage due to droughts or increased temperature levels. Similarly, in periods of extreme droughts, Concow Reservoir becomes impacted due to low stream flow.

Impacts

The APG: Understanding Regional Characteristics identified the following impacts specific to the Northern Central Valley region in which the Butte County Planning Area is part of:

- Temperature increases – particularly nighttime temperature
- Reduced precipitation
- Flooding – increase flows, snowmelt, levee failure in the Delta
- Reduced agricultural productivity (e.g., nut trees, dairy)
- Reduced water supply
- Wildfire in the Sierra foothills
- Public health and heat
- Reduced tourism
- Groundwater depletion
- Stream-flow degradation (Concow Reservoir)

Assets at Risk

All of the District assets listed in Table G-4 would be impacted by climate changes. The most critical being Concow Reservoir and the groundwater wells.

Future Development

Should the District need to place additional wells within its service area, the locations would have to be selected to provide the most insulation to aquifer over drafting. Lowering the water table permanently could severely hinder the District's ability to provide adequate water during periods of high demand.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–High

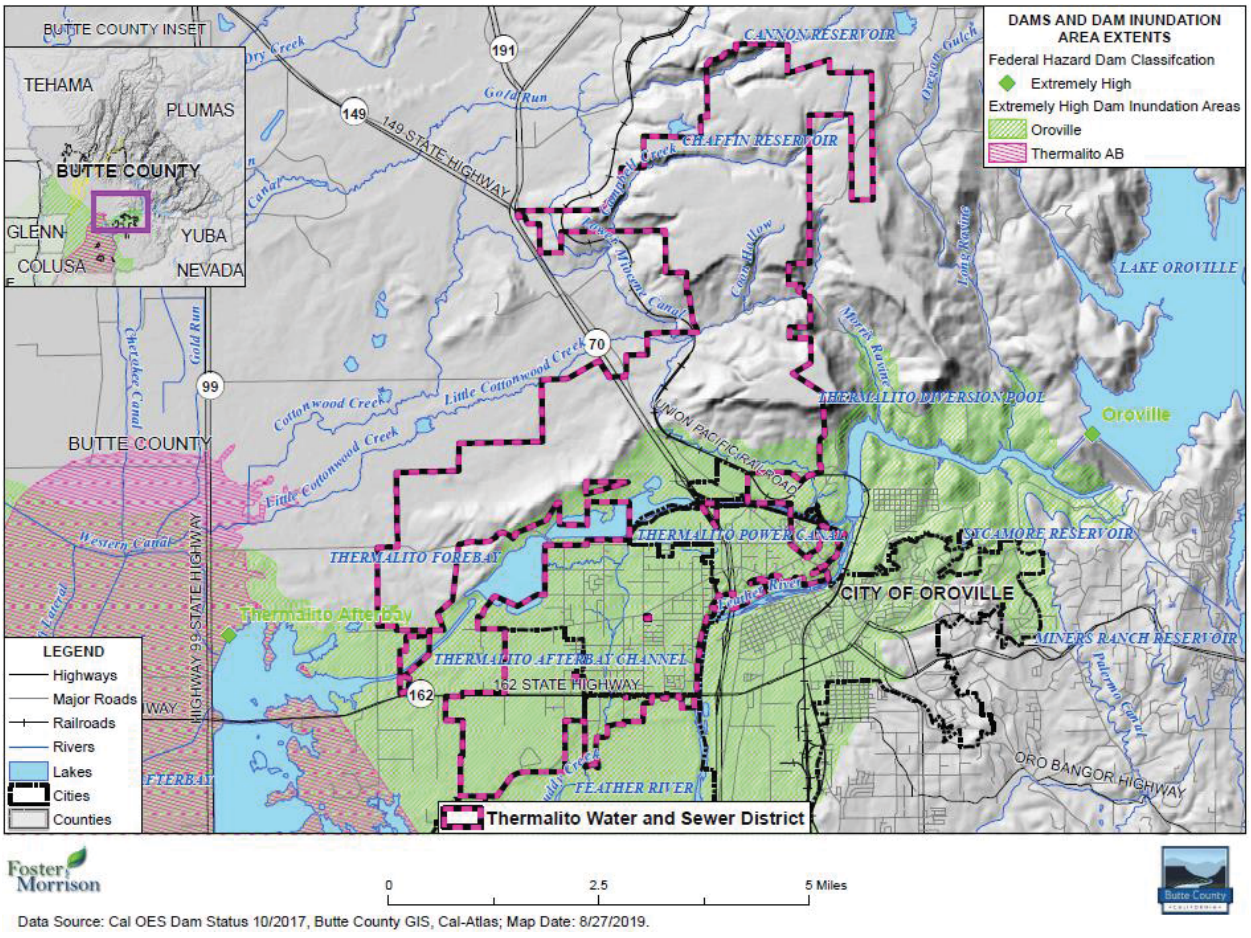
Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

Location and Extent

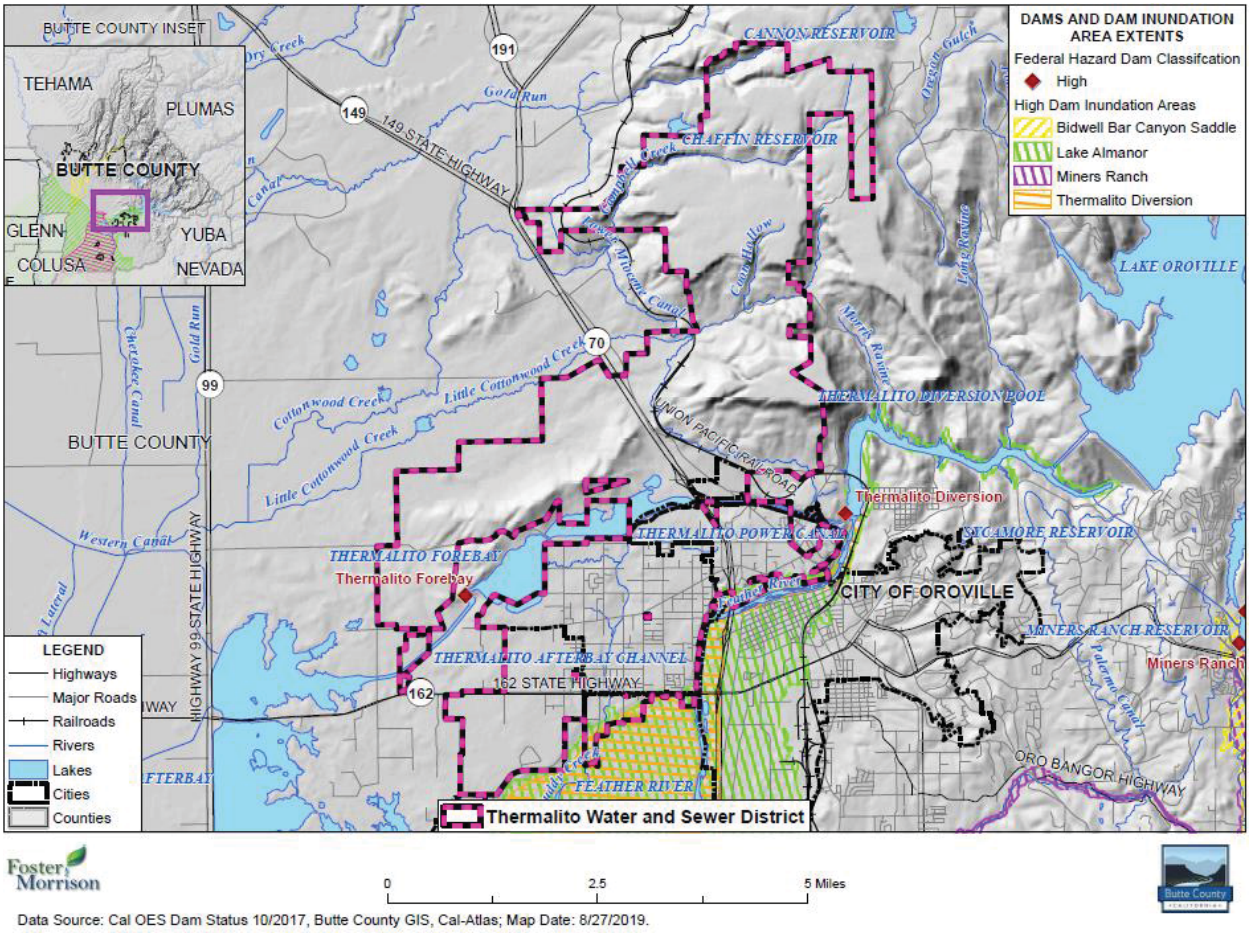
The District is at risk to a breach of the Oroville dam, as well as from other dams in the area. District borders and dam inundation areas can be seen on Figure G-2 and Figure G-3.

Figure G-2 Thermalito Water and Sewer District – Extremely High Hazard Dam Inundation Areas



Data Source: Cal OES Dam Status 10/2017, Butte County GIS, Cal-Atlas; Map Date: 8/27/2019.

Figure G-3 Thermalito Water and Sewer District – High Hazard Dam Inundation Areas



Data Source: Cal OES Dam Status 10/2017, Butte County GIS, Cal-Atlas; Map Date: 8/27/2019.

There is no scale with which to measure dam failure, just the Hazard Classification system for each individual dam. While a dam may fill slowly with runoff from winter storms, a dam break can have a very quick speed of onset. The duration of dam failure can vary depending on the nature of the dam break or failure.

Past Occurrences

The District noted the past occurrences of dam failure:

- **1975** – The earthquake of 1975 caused the same dam to move and destroy two earthquake sensors.
- **Winter 1996-1997** – California DWR issued an evacuation alert for the low-lying areas of Oroville, as overtopping of the Oroville Dam was imminent. It never happened.
- **2017** – District areas were evacuated in 2017 when the Oroville Dam threatened to overtop. Additionally, prior to the evacuation, during the spillway failure in 2017 there was massive erosion at the spillway site. This caused mud and debris within the powers canal to such an extent that the District discontinued operation of its filtration plant until the turbidity decreased to manageable levels.

Vulnerability and Impacts to Dam Failure

Dam failure flooding can occur as the result of partial or complete collapse of an impoundment. Dam failures often result from prolonged rainfall and flooding. The primary danger associated with dam failure is the high velocity flooding of those properties downstream of the dam.

A dam failure can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to dam failures is generally confined to the areas subject to inundation downstream of the facility. Secondary losses would include loss of the multi-use functions of the facility and associated revenues that accompany those functions. Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding.

The District does own and maintain the Concow dam and reservoir. This is a high Hazard dam, meaning property and at least one person downstream would be at risk should the dam overtop or fail.

Impacts to the TWSD from dam failure include damage to property and critical facilities, as well as potential loss of life. Other impacts include the costs to TWSD to rebuild the Concow dam if it failed. The District would lose its ability to store/convey surface water per its DWR contract.

Assets at Risk

No District facilities would be at risk except for the Concow Dam.

Future Development

Future development would include preventative maintenance and any upgrades necessary to maintain the integrity of Concow Dam.

Drought & Water Shortage

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or wildfires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends. Water districts normally require at least a 10-year planning horizon to implement a multiagency improvement project to mitigate the effects of a drought and water supply shortage.

Location and Extent

As discussed in the Base Plan, drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the TWSD, is at risk. Drought has a slow speed of onset and a variable

duration. Drought can last for a short period of time, which does not usually affect water shortages. Should a drought last for a long period of time, water shortage becomes a larger issue.

Past Occurrences

Since drought is a regional phenomenon, past occurrences of drought for TWSD are the similar to those for the County. Those past occurrences can be found in Section 4.2.8 of the Base Plan.

Vulnerability and Impacts to Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including Butte County, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts is often extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. The vulnerability of the TWSD to drought is District-wide, but impacts may vary and include reduction in water supply and an increase in dry fuels. The increased dry fuels result in an increased fire danger.

The most significant qualitative impacts associated with drought in the planning area are those related to water intensive activities such as wildfire protection, municipal usage, commerce, tourism, and recreation. Voluntary conservation measures are typically implemented during extended droughts. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. During extended droughts, over drafting of aquifers can cause groundwater levels to drop which may adversely affect the Districts wells.

Assets at Risk

Assets at risk would be the District's treatment plant as well as its groundwater wells.

Future Development

Future development considerations would be additional water storage capabilities as well as upgrading wells to reach lower groundwater depths.

Earthquake and Liquefaction

Likelihood of Future Occurrence–Unlikely
Vulnerability–High

Hazard Profile and Problem Description

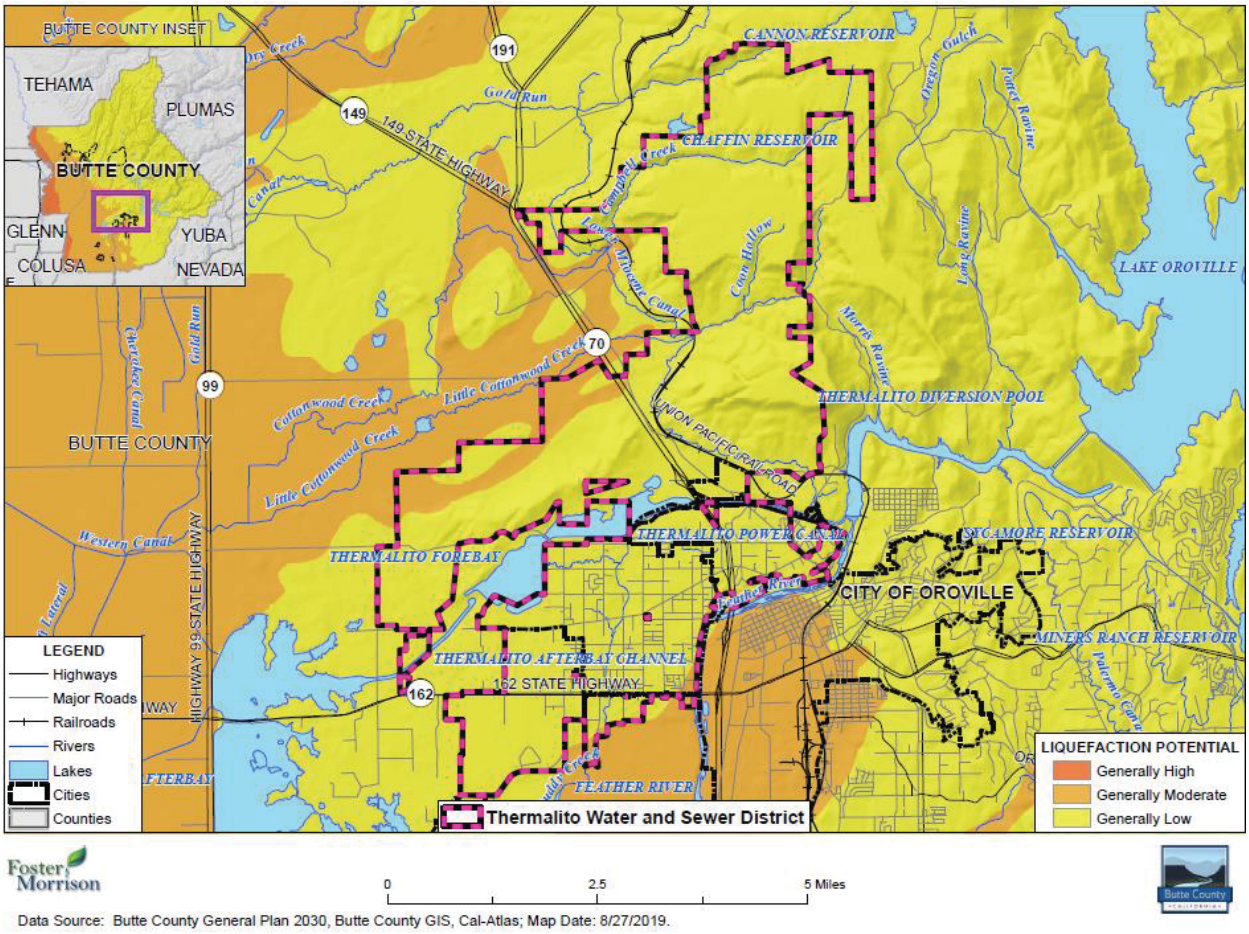
The State of California has identified five areas of critical seismic concern including surface ruptures, ground shaking, ground failure, tsunamis, and seiches. Each of these is caused by earthquake activity thereby creating hazards for life and property, which has the potential anywhere in California. The District is not at risk for tsunamis or seiches due to its inland location and the absence of nearby large bodies of

water. Due to the proximity of the District to the Cleveland Hills Fault, the District can expect low to medium intensity shocks from time to time. These earthquakes can cause liquefaction within the District. Liquefaction is a process whereby soil is temporarily transformed to a fluid formed during intense and prolonged ground shaking.

Location and Extent

TWSD and the surrounding area are relatively free from significant seismic and geologic hazards. Since earthquakes are regional events, the whole of the District is at risk to earthquake. TWSD and the surrounding area is located in a region of relatively low to moderate risk of earthquake occurrence. The only known active fault in Butte County is the Cleveland Hills fault, the site of the August 1975 5.7 Richter magnitude Oroville earthquake. Additionally, the District is potentially at risk to liquefaction from earthquake shaking. A map of liquefaction potential and District locations is shown on Figure G-4.

Figure G-4 Thermalito Water and Sewer District – Liquefaction Areas



Data Source: Butte County General Plan 2030, Butte County GIS, Cal-Atlas; Map Date: 8/27/2019.

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.2.10 of the Base Plan. Earthquake and liquefaction both have a short onset period, and the duration of shaking and liquefaction is short as well.

Past Occurrences

As shown in the Base Plan, only the 1975 federal disaster declaration has occurred in the County due to Oroville earthquake. The District experienced several water and sewer pipeline failures due to the earthquake. The treatment plant structures also experienced some structural issues. The HMPC noted no other past occurrences of earthquakes or liquefaction that affected the District in any meaningful way.

Vulnerability and Impacts to Earthquake and Liquefaction

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable. The primary impacts of concern are life safety, property damage, and impacts to critical facilities and infrastructure, including the road system.

Ground shaking is the primary earthquake hazard. Many factors affect the survivability of structures and systems from earthquake-caused ground motions. These factors include proximity to the fault, direction of rupture, epicentral location and depth, magnitude, local geologic and soils conditions, types and quality of construction, building configurations and heights, and comparable factors that relate to utility, transportation, and other network systems.

Seismic events can have particularly negative effects on older buildings constructed of unreinforced masonry (URM), including materials such as brick, concrete and stone. The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. Butte County is within the less hazardous Zone 3. There are no URM or soft story buildings in the District.

Impacts to the District included damage to facilities and distribution lines. Concow Dam could also be impacted. District sewer infrastructure including lift stations, collection lines and manholes could also be damaged during an earthquake.

Assets at Risk

The assets at risk include the following: water treatment plant, wells, distribution lines, sewer collection lines, the sewer lift station, manholes and District offices.

Future Development

All District building construction and pipeline installation will be to the current California Seismic Code.

Flood: 100/500-year

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–Medium

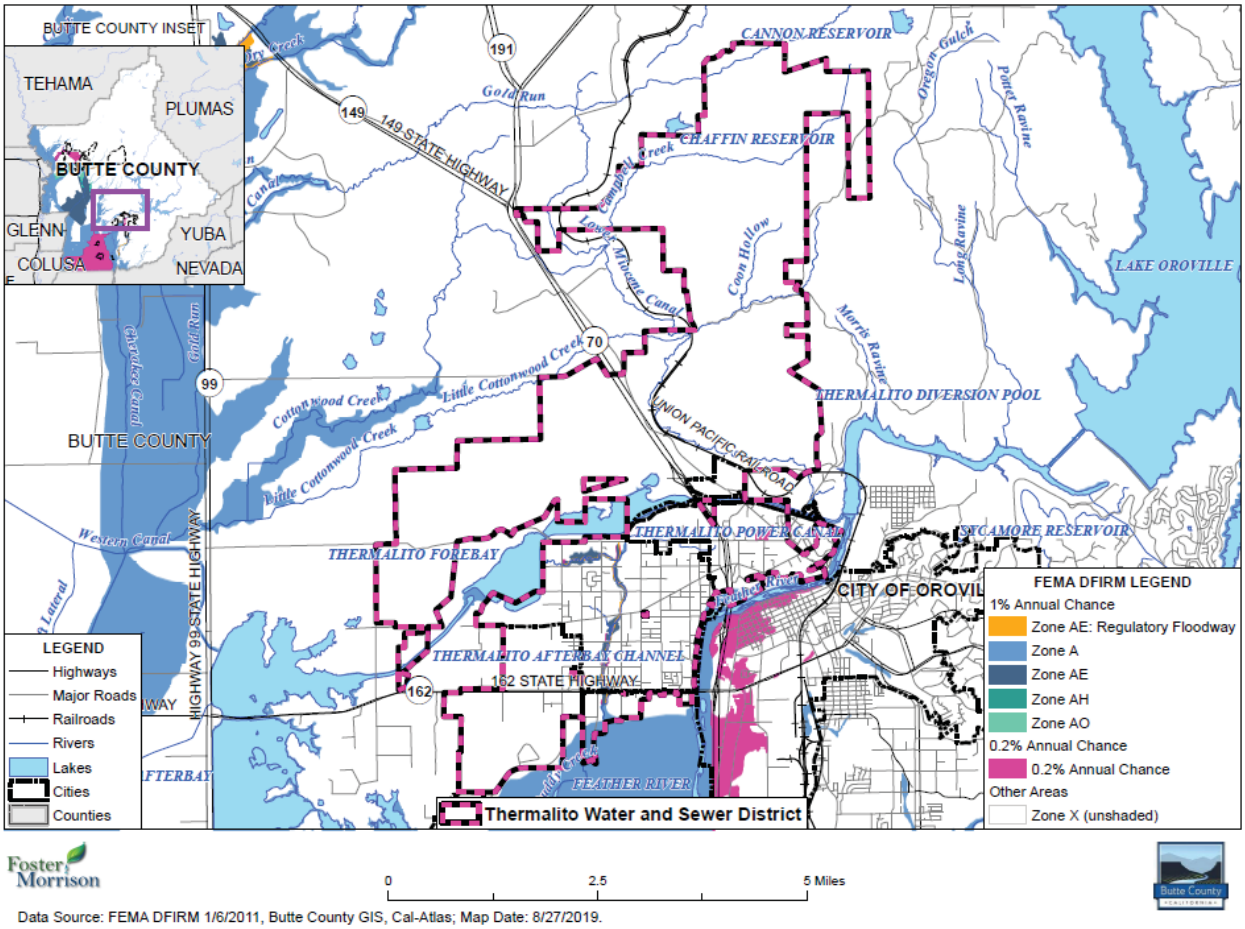
Hazard Profile and Problem Description

As previously described in Section 4.2.11 of the Base Plan, the Butte County Planning Area, the City of Oroville, and portions of TWSD have been subject to historical flooding. The District is traversed by several stream systems and are at risk to the 1% and 0.2% flood.

Location and Extent

Areas of the TWSD fall in the 1% and 0.2% annual chance floodplains. These areas of the District and its flood zones are shown on Figure G-5.

Figure G-5 Thermalito Water and Sewer District – DFIRM Flood Zones



Data Source: FEMA DFIRM 1/6/2011, Butte County GIS, Cal-Atlas; Map Date: 8/27/2019.

Flood extents can be measured by flood zones and in depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

No records of flooding events or damages were identified by the TWSD.

Vulnerability and Impacts to Flood

The Oroville General Plan Safety Element noted that within the Oroville area that the TWSD services has historically been subject to flooding from various rivers and creeks found within the District, most particularly from the Feather River and its tributaries. However, based on TWSD records, past flood damages to the District have been limited.

However, flooding remains an issue which regulatory agencies, the City and Butte County are seeking to address, in part through mapping of flood hazard areas and study of flooding hazards. Locally, Butte County, in consultation with the City of Oroville, has completed an assessment of flooding hazards as part of the Flood Mitigation Plan. This includes the Feather River and Lower Honcut Creek Watersheds.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines, interrupt services, and cause damage to roadways.

Flooding has occurred both within the 1% and 0.2% annual chance floodplains and in other localized areas. Impacts to the District from flooding can result in property damage, environmental, and economic impacts to the District.

Flooding can also cause severe inflow and infiltration issues within the sewer system. When the sewer system becomes inundated with surface water, capacity issues often arise. Pump stations can be maxed out and cause sewer overflows. Additionally, the Oroville sewer treatment plant has an outfall in the Feather River which has been damaged in previous flood events.

Assets at Risk

The assets at risk to large flood events include the following: water treatment plant, wells, distribution lines, sewer collection lines, the sewer lift station, manholes and District offices.

Future Development

Future developments will meet all current California Building Codes as they pertain to drainage.

Floods: Localized Stormwater

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Localized flooding and other issues caused by severe weather events, primarily heavy rains and severe storms, are an annual occurrence in the District. Normally storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that overwhelm the drainage system. Primary concerns include impacts to infrastructure and roadways that provides a means of ingress and egress throughout the District.

Location and Extent

Local flooding was much more prevalent prior to the construction of the Oroville Dam and its related flood control projects, which have helped to protect Oroville and many other areas of the County from serious flooding in recent years. However, TWSD is subject to localized flooding throughout the District. The extent of localized flooding can be measured in volumes, velocity, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the area around the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

During prolonged rain events, multiple areas within the TWSD flood due to unmaintained or blocked drainage ways. Many of these areas have nearby sewer manholes which become inundated with water and case inflow/infiltration issues within the sewer system. The most severe incidences occur along Ruddy Creek. Additionally, flooding occurs regularly at the Hoffman Road crossing at the inlet of Concow Creek into the Concow Reservoir. This is due to the aged infrastructure of the crossing and lack of maintenance.

Past Occurrences

Localized flooding occurs most wet winters. During periods of heavy rainfall the creeks and drainage crossing overflow and cause inflow/infiltration issues with the sewer system.

Vulnerability and Impacts to Localized Flood

Localized flooding occurs throughout the District primarily during the winter and spring months during periods of heavy rains. Localize flooding can cause road closures, pavement deterioration, washouts, landslides/mudslides, debris areas, and downed trees. The amount and type of damage or flooding that occurs varies from year to year and storm to storm, depending on the quantity of runoff. Heavy rains may produce ponding around storm drains and in low lying areas, but these events are short in duration and do not typically cause property damage.

During prolonged rain events, multiple areas within the TWSD flood due to unmaintained or blocked drainage ways. Many of these areas have nearby sewer manholes which become inundated with water and

case inflow/infiltration issues within the sewer system. The most severe incidences occur along Ruddy Creek. Additionally, flooding occurs regularly at the Hoffman Road crossing at the inlet of Concow Creek into the Concow Reservoir. This is due to the aged infrastructure of the crossing and lack of maintenance.

Impacts to the District from localized flood include possible damage to facilities and infrastructure. Localized flooding can also affect transportation routes that District personnel must take to get to District facilities.

Assets at Risk

The assets at risk include the following: water treatment plant, wells, distribution lines, sewer collection lines, the sewer lift station, manholes and District offices.

Future Development

Future developments will meet all current California Building Codes as they pertain to drainage.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Location and Extent

The majority of levees in the Butte County Planning Area are non-federal levees, and they are concentrated along the Feather River, the western and southern fringes of the Thermalito Afterbay, and the southern fringes of the Thermalito Forebay. Federal levees are located in the southwest portion of the Butte County Planning Area, between the Feather River and the Thermalito Afterbay.

Past Occurrences

No records of levee breaches which affected the District were identified.

Vulnerability and Impacts to Levee Failure

Levee failure flooding can occur as the result of partial or complete collapse of an impoundment, and often results from prolonged rainfall and flooding. The primary danger associated with dam or levee failure is the high velocity flooding of those properties downstream of the breach. Impacts from this include property damage, critical facility damage, and life safety issues.

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to levee failures is generally confined to the areas subject to inundation downstream of the facility. Secondary losses would include loss of the multi-use functions of the facility and associated revenues that accompany those functions. Levee failure flooding would vary in the District depending on which structure fails and the nature and extent of the failure and associated flooding.

Should levees fail, areas protected by the levees would be at risk to flooding causing property damage and infrastructure damage to the District and, depending on the nature and extent of failure, create a life safety issue. District sewer facilities would take massive amounts of inflow and infiltration which could cause sewer overflows and water contamination.

Flooding can also cause severe inflow and infiltration issues within the sewer system. When the sewer system become inundated with surface water, capacity issues often arise. Pump stations can be maxed out and cause sewer overflows. Additionally, the Oroville sewer treatment plant has an outfall in the Feather River which has been damaged in previous flood events.

Assets at Risk

The TWSD assets at risk to a levee failure include the following: water treatment plant, wells, distribution lines, sewer collection lines, the sewer lift station, manholes and District offices.

Future Development

Future developments will meet all current California Building Codes as they pertain to flooding and drainage.

Severe Weather: Heavy Rain and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the winter months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in amount of rainfall and damages. The speed of onset of heavy rains can be short, but

accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Butte County, and the District is often short, ranging from minutes to hours. In some cases, rains can continue for days at a time. Information on precipitation extremes can be found in Section 4.2.4 of the Base Plan.

Past Occurrences

In the winter of 1993, extreme heavy rain fell from the southeast with high winds of 40 mph or tornados. The District service area and the south Oroville area was affected. Customer damage to homes and outbuildings in the Middlehoff and Orchard Crest areas of the District were reported.

There has also been a history of tornados with high wind and rain coming from the southeast direction of the County. 1239 10th St. had a barn picked up and apricot trees carried from one lot to another property. In March 2012 a funnel cloud was photographed over the District. This can be seen in Figure G-6.

Figure G-6 March 2012 Funnel Cloud

Source: TWSD

Vulnerability and Impacts to Heavy Rain and Storms

According to historical hazard data, severe weather is an annual occurrence in the County and District. Damage and disaster declarations related to severe storms and floods have occurred and will continue to occur in the future. Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. Wind and lightning often accompany these storms and have caused damage in the past. Hail is rare in the District.

Actual damage associated with the primary effects of heavy rains and storms have been limited. It is the secondary hazards caused by severe storms, such as floods, that have had the greatest impact on the District. Impacts to property, critical facilities (such as utilities), and life safety often occur during these storm events. The risk and vulnerability associated with these secondary hazards are discussed in the flood and localized flood sections of this Annex.

Flooding can also cause severe inflow and infiltration issues within the sewer system. When the sewer system become inundated with surface water, capacity issues often arise. Pump stations can be maxed out and cause sewer overflows. Additionally, the Oroville sewer treatment plant has an outfall in the Feather River which has been damaged in previous flood events.

Assets at Risk

The TWSD assets at risk to heavy rains and storms include the following: water treatment plant, wells, distribution lines, sewer collection lines, the sewer lift station, manholes and District offices.

Future Development

Future developments will meet all current California Building Codes as they pertain to heavy rains and drainage.

Streambank Erosion

Likelihood of Future Occurrence–Highly Likely
Vulnerability–High

Hazard Profile and Problem Description

Erosion is the general process whereby rocks and soils are broken down, removed by weathering, or fragmented and then deposited in other places by water or air. Stream bank erosion poses problems for Butte County and the District. Stream flows vary tremendously with time; the volume and velocity of stream flow usually determine the impact or damage to streambanks in the form of erosion. Many factors affect the nature and extent of stream bank erosion such as the amount of rainfall and snowmelt contributing to full streams as well as stream bank characteristics such as soil type, slope and vegetation.

Location and Extent

Stream bank erosion occurs on rivers, streams, and other moving waterways, including leveed areas (shown in Section 4.2.16 of the Base Plan), in the County. As noted above, since the construction of the Oroville Dam and Thermalito Afterbay, sediment loads from waters discharged from the dams into the Feather River have decreased significantly. This lack of suspended sediment in the river has caused the river to become more erosive in the northern portion of the alignment, transporting the mining debris and older alluvium downstream. The speed of onset of this erosion is slow, as the erosion takes place over periods of years. Duration of erosion is extended. Greater erosion occurs during periods of high stream flow and during storm and wind events when wave action contributes to the extent and speed of streambank erosion.

Past Occurrences

At the Hoffman Road crossing (in Concow) there have been several issues associated with debris flow and sedimentation buildup within the inlet to Concow Reservoir. This causes issues with streamflow and water quality degradation. Most notably, there has been significant debris flow and sedimentation buildup following the Camp Fire. An Emergency Stream-Bed Alteration Permit was issued to the District to clear the debris before damage to the crossing occurred.

Vulnerability and Impacts to Streambank Erosion

Erosion increases with increasing slope and precipitation and with decreasing vegetative cover, which includes areas where protective vegetation has been removed by fire, construction, or cultivation. Butte County and the District is traversed by waterways, including leveed areas. These locations are all subject to bank erosion. Levees are at risk to erosion as well, due to the channelization due to narrow river channels. Significant erosion can cause degradation and loss of levee and streambank stability.

Assets at Risk

Concow Reservoir is especially susceptible to erosion as well as all District infrastructure within the Thermalito drainage ways.

Future Development

The District will continue to work with Butte County to maintain their drainage ways to reduce streambank erosion as much as possible.

Wildfire

Likelihood of Future Occurrence–Highly Likely
Vulnerability–High

Hazard Profile and Problem Description

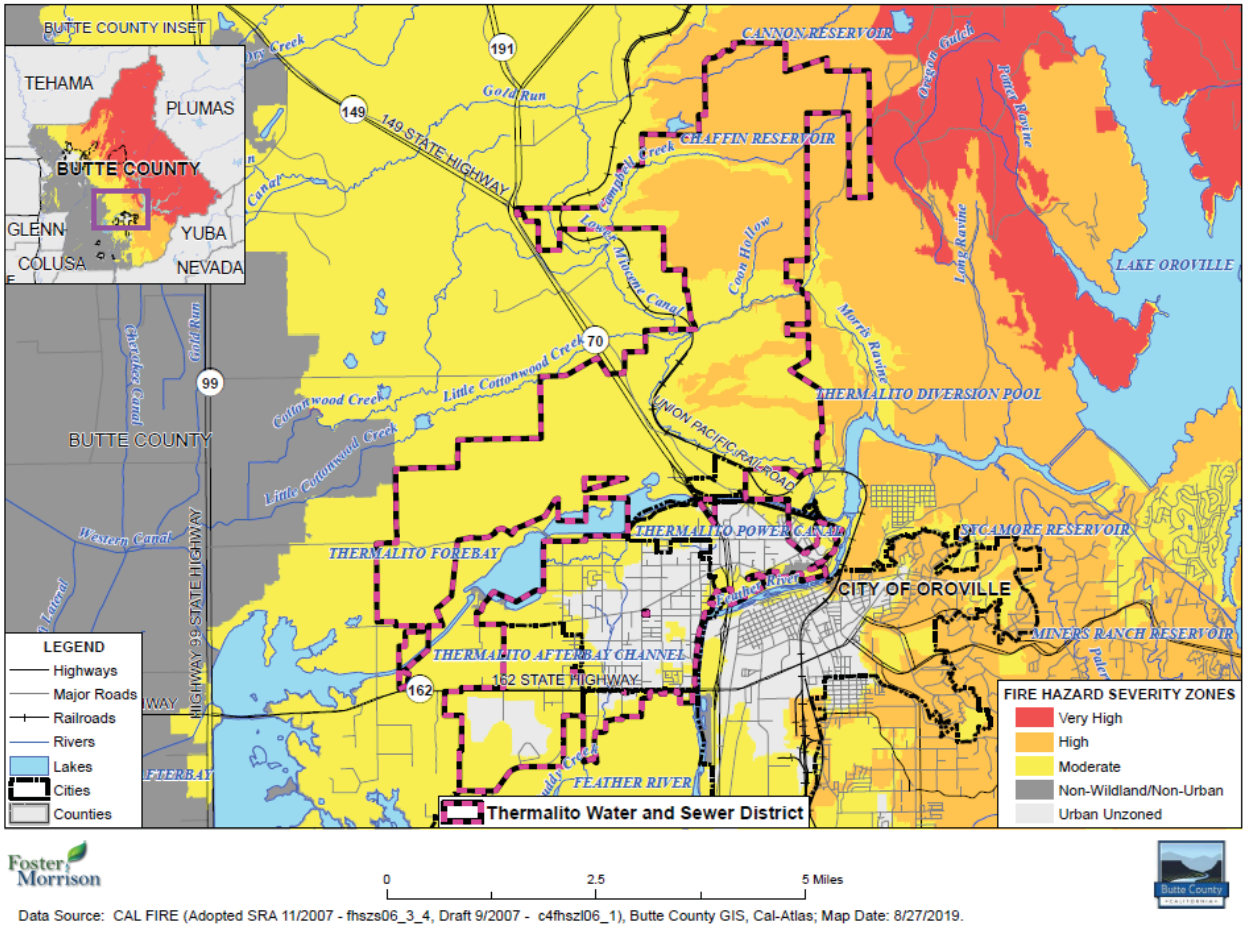
Wildland fire is an ongoing concern for the District. Generally, the fire season extends from early spring through late fall of each year during the hotter, dryer months. Fire conditions arise from a combination of

high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire suppression practices have affected the natural cycle of the ecosystem. While the fire season was considered to be predominantly May through October, it has now become a year around concern. Complicating the issue, PG&E shutdowns can occur during red flag days, which affects the District. The District has generators and auto-transfer equipment in the event of PG&E shutdowns.

Location and Extent

The whole of the District lies either in a Moderate to High Fire Hazard Severity Zone. District locations and FHSZ are shown on Figure G-7.

Figure G-7 Thermalito Water and Sewer District – FHSZs in District



Data Source: CAL FIRE (Adopted SRA 11/2007 - fhszs06_3_4, Draft 9/2007 - c4fhszl06_1), Butte County GIS, Cal-Atlas; Map Date: 8/27/2019.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought. Fires can burn for a short period of time or may have durations lasting for a week or more.

Past Occurrences

An event in summer of **1998** was of concern to the District. Wildfires in the Concow watershed affected both the District and those that the District serves. Concow road was closed for the duration of the fire. Many homeowners lost their homes. One death was reported. The District lost all timber on TWSD property and to this day due to the lack of trees and plants, the Concow Reservoir receives an excessive amount of sedimentation.

In **November of 2018**, the Camp Fire started in Pulga California and burned the majority of the Town of Paradise and a considerable portion of Concow. Concow Dam itself was not impacted, but Concow reservoir was. Due to loss of vegetation, during the subsequent rain events, massive amounts of sediment and debris were carried into the lake. Additionally, burned trees have caused safety issues surrounding the lake.

Vulnerability and Impacts to Wildfire

Risk and vulnerability to the Butte County Planning Area and the District from wildfire is of significant concern, with some areas of the planning area being at greater risk than others. High fuel loads in the planning area, along with geographical and topographical features, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. During the May to November fire season, the dry vegetation and hot and sometimes windy weather, combined with continued growth in the WUI areas, results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the Planning Area, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

The area around the District is not immune to numerous types of grass and brush fires and any one of them may accelerate into an urban interface wildfire. Such a situation could lead to evacuation of large portions of the population and the potential for significant loss of property, structures, and rangeland. The natural fuels available in or near the District vary greatly in the rate and intensity of burning. Fires in heavy brush and stands of trees burn with great intensity but more slowly than in dry grass and leaves. Dense fuels will propagate fire better than sparse fuels.

Wildfires can cause short-term and long-term disruption to the County and District, as evidenced by the Camp Fire in Paradise and the resultant increase in the population in other incorporated and unincorporated areas. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the County by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can result in casualties and can destroy buildings and infrastructure.

Although the physical damages and casualties arising from wildland urban interface fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. In some cases, the economic impact of this loss of services may be comparable to the economic impact of physical damages or, in some cases, even greater. Economic impacts

of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Fires can also cause major damage to power plants and power lines needed to distribute electricity to operate District facilities. Power can also be shut off to the District during Public Safety Power Shutdown events.

Assets at Risk

The fire hazard is a continual problem in the Concow watershed and will continue to affect the District. Concow Dam, the Lake, and all land that the District owns are annexed into the District. This area of the District is High Risk. The District does have a home for the Caretaker, and it is at high risk in the event of a wildfire.

Future Development

Future development in and around Concow lake will be built to the current California Building Code and Fire Code.

G.6 Capability Assessment

Capabilities are the programs and policies currently in place to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

G.6.1. Regulatory Mitigation Capabilities

Table G-6 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the District.

Table G-6 Thermalito Water and Sewer District – Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
General Plan	N	N/A
Capital Improvements Plan	Y	Y
Economic Development Plan	N	N/A
Local Emergency Operations Plan	Y	Y
Continuity of Operations Plan	N	N/A
Transportation Plan	N	N/A
Stormwater Management Plan/Program		N
Engineering Studies for Streams		N

Community Wildfire Protection Plan		N
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)		N
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Y
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	N
Fire department ISO rating:	N	N
Site plan review requirements	Y	Y
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N	N/A
Subdivision ordinance	N	N/A
Floodplain ordinance	N	N/A
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	N/A
Flood insurance rate maps	N	N/A
Elevation Certificates	N	N/A
Acquisition of land for open space and public recreation uses	N	N/A
Erosion or sediment control program	N	N/A
Other		
How can these capabilities be expanded and improved to reduce risk?		
Regular updates to address any concerns that have arisen.		

Source: TWSD

G.6.2. Administrative/Technical Mitigation Capabilities

Table G-7 identifies the District staff/roles responsible for activities related to mitigation and loss prevention in the District.

Table G-7 Thermalito Water and Sewer District – Administrative and Technical Mitigation Capabilities

Administration	**Y/N**	**Describe capability Is coordination effective?**
Planning Commission		
Mitigation Planning Committee		

Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	
Mutual aid agreements	Y	
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N/A	N/A
Floodplain Administrator	N/A	N/A
Emergency Manager	Y	Y
Community Planner	N/A	N/A
Civil Engineer	Y	Y
GIS Coordinator	N/A	N/A
Other		
Technical	**Y/N**	**Describe capability Has capability been used to assess/mitigate risk in the past?**
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Alarms and telemetry
Hazard data and information	N	N/A
Grant writing	N	N/A
Hazus analysis	N	N/A
Other		
How can these capabilities be expanded and improved to reduce risk?		
Regular updates to address any concerns that have arisen.		

Source: TWSD

G.6.3. Fiscal Mitigation Capabilities

Table G-8 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table G-8 Thermalito Water and Sewer District – Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	N, Y
Authority to levy taxes for specific purposes	N	N/A
Fees for water, sewer, gas, or electric services	Y	N, Y
Impact fees for new development	Y	Y, Y

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Storm water utility fee	N	N/A
Incur debt through general obligation bonds and/or special tax bonds	Y	N, N
Incur debt through private activities	N/A	N/A
Community Development Block Grant		
Other federal funding programs		
State funding programs		
Other		
How can these capabilities be expanded and improved to reduce risk?		
Regular updates to address any concerns that have arisen.		

Source: TWSD

G.6.4. Mitigation Education, Outreach, and Partnerships

Table G-9 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information. More information can be found below the table.

Table G-9 Thermalito Water and Sewer District – Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	N	
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Regular updates to address any concerns that have arisen.		

Source: TWSD

The District partners with Butte County and the City of Oroville on mitigation issues.

G.6.5. Other Mitigation Efforts

In 2012, the TWSD completed a fuels elimination program at Concow Reservoir fishing sites and utilized a Cal Fire inmate program. The District is working with the Yankee Hill Fire Safety council on future projects.

In 2006, the District installed a 30" Ductile Iron trunk line for redundancy. The single 24" Trunk line is 84 years old and a failure on this line would have caused a health hazard. Late fall of 2006 the 24" main failed and the 30" Ductile iron pipe was able to maintain the water supply without the need of the 24" old steel pipe.

In 2017 the existing 24" trunk line was replaced. Both main lines from the Treatment Plant to the 2.5-million-gallon storage tank have been replaced.

G.7 Mitigation Strategy

G.7.1. Mitigation Goals and Objectives

TWSD adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

G.7.2. Mitigation Actions

The planning team for the District identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Dam Failure
- Drought and Water Shortage
- Earthquake and Liquefaction
- Floods: 100/500 year
- Floods: Localized Stormwater
- Levee Failure
- Severe Weather: Heavy Rain and Storms (Hail, Lightning, Wind)
- Streambank Erosion
- Wildfire

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless

of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan.

Multi-Hazard Actions

Action 1. Management of Fuels and non-Native Flora Intrusion

Hazards Addressed: Drought & Water Storage, Invasive Species and Wildfire

Goals Addressed: 1, 2, 3, 4, 5, 7, 9

Issue/Background: The Concow area has had several wildfires within the last decade. As an ongoing preventative measure, fuel must be reduced in these hazard areas to reduce the reoccurrence of fires. Additionally, invasive species of plants have continued to threaten the native flora and fauna within the bank zones of Concow Reservoir

Project Description: Removal of invasive species of plants to the bank area of Concow Reservoir provides reduced fuel for wildfires as well as protects the native flora and fauna of the area.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: Local Hazard Mitigation Plan

Responsible Office/Partners: Thermalito Water & Sewer District

Cost Estimate: $50,000.00

Benefits (Losses Avoided): Removal of the invasive species of plants would provide reduced fuel for a wildfire as well as protection of the native flora and fauna. Additionally, removal of the invasive plants would reduce the amount of sediment which builds up around the bank, reducing the storage capacity of Concow Reservoir

Potential Funding: FEMA Grants, Capital Improvement Program, Cal OES, USDA

Timeline: 2 Years

Project Priority: High

Action 2. Steel Main Replacement

Hazards Addressed: Drought & Water Storage, Earthquake, Floods and Stormwater

Goals Addressed: 1, 2, 3, 4, 7, 9

Issue/Background: The District has approximately 5 miles of steel mains which are 50+ years old. These mains have been known to be severely corroded in some instances and in need of replacement.

Project Description: Removal of the steel mains within the District would remove a critical hazard which could be compromised by an earthquake or ground erosion during flooding. Should these critical pieces of infrastructure be compromised, water service would be intermittent to several portions of the District.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: Local Hazard Mitigation Plan

Responsible Office/Partners: Thermalito Water & Sewer District

Cost Estimate: $5,000,000.00

Benefits (Losses Avoided): Replacement of the existing steel mains would provide a reliable source for the distribution of drinking water throughout Thermalito. Additionally, the need for constant repair on steel mains would provide relief to the District's O&M budget.

Potential Funding: FEMA Grants, Capital Improvement Program, Cal OES, USDA

Timeline: 5 Years

Project Priority: High

Action 3. Well Emergency Generators

Hazards Addressed: Climate Change, Drought & Water Shortage, Earthquake, Floods, Severe Weather and Wildfire

Goals Addressed: 1, 2, 3, 4, 5, 7, 9

Issue/Background: The District currently has four wells it uses to supplement surface water sources for drinking water. Only one of the wells has emergency generation and would remain online during a power outage.

Project Description: Installation of automatic transfer switches as well as emergency generators at the remaining three well sites, would ensure that during a power outage, there would be no disruption of service to the residents of Thermalito.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: Local Hazard Mitigation Plan

Responsible Office/Partners: Thermalito Water & Sewer District

Cost Estimate: $100,000.00

Benefits (Losses Avoided): The District's alternative water supply would remain operational during a disaster event. Should the main treatment plant be out of commission, the wells could provide drinking water.

Potential Funding: FEMA Grants, Capital Improvement Program, Cal OES, USDA

Timeline: 2 Years

Project Priority: High

Action 4. Toleman Ravine Sewer Crossing

Hazards Addressed: Earthquake, Flooding, Landslide, Severe Weather and Stream Bank Erosion

Goals Addressed: 1, 2, 3, 4, 7, 9

Issue/Background: The Toleman Ravine Sewer Crossing is a suspended sewer pipeline crossing over Toleman Ravine. Should the pipe be damaged or impaired in some way, sewer could contaminate the ravine (if water is flowing).

Project Description: Replacement of the existing suspended gravity sewer line with an underground pressure line between the two nearest manholes. This would include the installation of a pump station and directional boring beneath Toleman Ravine.

Other Alternatives: None

E**xisting Planning Mechanism(s) through which Action Will Be Implemented**: Sanitary Sewer Maintenance Plan

Responsible Office/Partners: Thermalito Water & Sewer District

Cost Estimate: $150,000.00

Benefits (Losses Avoided): Replacement of the Toleman Ravine crossing would prevent the hazard associated with a sewer infrastructure failure. If the pipeline was damaged, contamination of the surrounding drainage way could occur. Benefits would be protection of the associated waterways as well as continuity of service.

Potential Funding: FEMA Grants, Capital Improvement Program, Cal OES, USDA

Timeline: 2 Years

Project Priority: High