

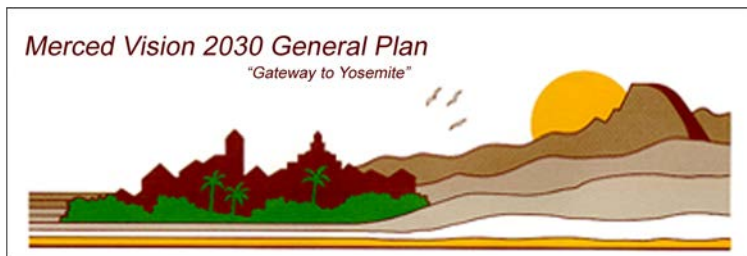
# Chapter 11--Safety

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11.1	Introduction.....	11-1
11.1.1	Scope of the Safety Element.....	11-1
11.1.2	City of Merced Emergency Response/Disaster Plan.....	11-1
11.1.3	Merced Hazard Mitigation Plan .....	11-1
11.2	Relevant Issues .....	11-2
11.2.1	Seismically Induced Ground Shaking.....	11-2
11.2.2	Ground Failure.....	11-5
11.2.3	Dam Failure/Seiche .....	11-8
11.2.4	Flooding.....	11-10
11.2.5	Urban Fires & Wildland Fires .....	11-16
11.2.6	Airport Safety Zones.....	11-24
11.2.7	Crime & Policing.....	11-27
11.2.8	Hazardous Materials & Waste.....	11-29
11.3	Safety Goals, Policies, and Actions.....	11-30
11.4	Technical Data.....	11-41
11.4.1	Definitions .....	11-41
11.4.2	Dam Failure Characteristics .....	11-41
11.4.3	Hazards Unknown in the Merced Planning Area .....	11-42







## *Chapter 11*

# *Safety*

### ***11.1 INTRODUCTION***

The main purpose of the Safety Element is to provide policies and implementing actions aimed at reducing injuries, death, property damage, and the economic and social dislocation resulting from natural hazards. The Safety Element is based on an analysis of geologic and other hazards relevant to Merced and on ways of protecting the community from any unreasonable risk associated with such hazards.

#### ***11.1.1 Scope of the Safety Element***

The Safety Element provides a systematic approach for responding to hazards relevant to the City of Merced through a set of goals, policies, and actions designed to deal with those hazards. This report recognizes that hazards are an unavoidable aspect of society and that, therefore, some degree of risk is inherent in everyday life.

The proposed Merced growth boundary (or SUDP/SOI) has no known history of, or known geographical conditions for, surface rupture, tsunamis, or hydro-compaction. All other hazards relevant to Merced, however, are addressed in more detail in other sections of this Element. This introduction includes an overview of the City's Emergency Response/Disaster Plan and Hazard Mitigation Plan. Section 11.2 presents an

analysis of the relevant issues as well as hazard response. Section 11.2 includes the goals, policies, and implementing actions. Section 11.4 contains technical information and support data of the hazards analysis. The Safety Element is one of the seven required elements of the General Plan per State law.

#### ***11.1.2 City of Merced Emergency Response/Disaster Plan***

In 2011, the City of Merced updated its Emergency Operations Plan. The plan is updated on a regular basis to meet the evolving emergency response needs and to address new hazards. The Plan addresses mitigation, planning, response, and recovery activities for various emergency situations. The Plan is compliant with the emergency management requirements of the Standardized Emergency Management System (SEMS), the Incident Command System (ICS), and the National Incident Management System (NIMS). The plan is designed to prepare the community for responding to an emergency situation in a highly organized and efficient manner.

#### ***11.1.3 Merced Hazard Mitigation Plan***

The Merced Hazard Mitigation Plan presents a comprehensive risk assessment of natural hazards that have the potential to affect the City of Merced. The Local Hazard

Mitigation Plan recommends possible mitigation measures for reducing the effects of the potential hazards. It is incorporated by this reference into the Safety Element, and should be consulted when addressing known hazards to ensure the general health and safety of people within the City of Merced. The goals and policies within this Safety Elements support and are consistent with the recommended mitigation strategy within the Local Hazard Mitigation Plan.

## ***11.2 RELEVANT ISSUES***

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Seismically induced ground shaking, ground failure, dam failure/seiche, flooding, urban and wildland fires, airport safety, crime and policing, and hazardous materials are considered the relevant hazards to the City of Merced.

### ***11.2.1 Seismically Induced Ground Shaking***

Seismic safety has traditionally been looked at as an individual/family responsibility; however, because we are spending increasing amounts of time in public areas and because of our increased reliance on public services, our personal safety in an earthquake may depend in large part on what our City, employer, or local merchant has done to prepare. Earthquake activity can include severe ground settling, dam failure, and landslides, but most people equate earthquakes with the movement of the earth along a fault or fracture zone. Merced is vulnerable to possible earthquake damage from earthquake epicenters in other portions of the State, earthquakes on “nearby” faults, and earthquakes on what are now undiscovered faults within the Central Valley.

Historically, Merced has received several jolts a year from earthquakes in surrounding parts of the State. Typically, it has been the larger earthquakes from these areas that

cause damage. Because earthquakes run in “cycles of frequency and intensity” where a period of long inactivity is followed by several medium and large quakes it is theorized that Merced, along with the rest of California, may experience rising earthquake risks

The amount of damage to structures from an earthquake is determined by several factors: (1) Distance from the earthquake epicenter; (2) nature of the ground; (3) type of construction; and (4) the duration of the shaking.



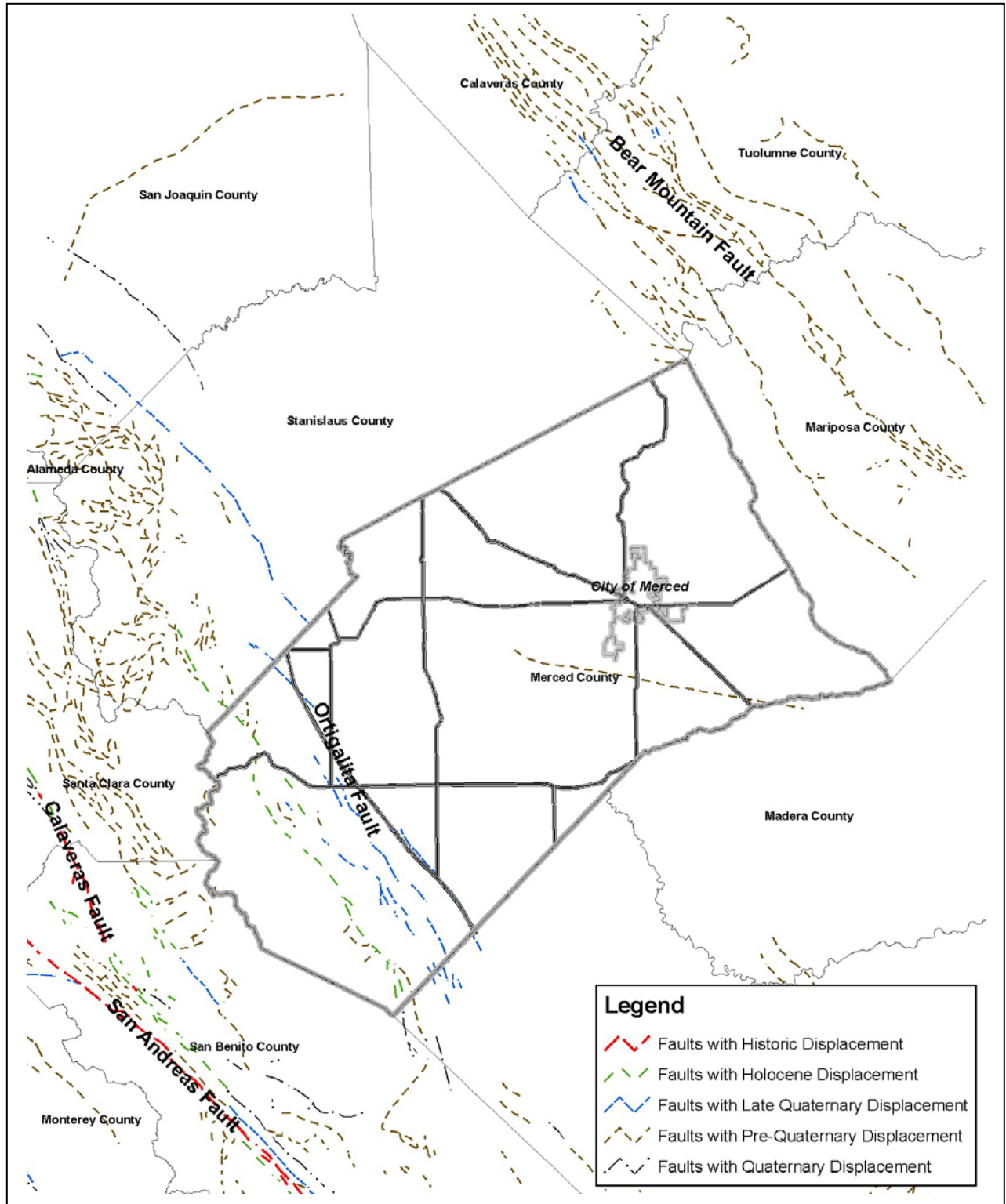
#### The Distance from the Epicenter

Merced is vulnerable to shaking from a number of faults that run through the mountains to our east and west. These have shaken Merced in the past. Of most notoriety is the San Andreas Fault, 58 miles away. There are, however, four active faults closer to Merced than the San Andreas. These faults are shown in **Figure 11.1**.

#### The Nature of the Ground

Earthquake shockwaves are “carried” by the relatively loose, wet soils that exist between Los Banos and Merced. For this reason, Merced is somewhat more likely to experience heavy shaking from surrounding parts of the state as will some of its neighbors. Areas of Merced with high water tables and loose soils are likely to experience damage because of the shockwave carrying ability of the ground. Next to damage from ground shaking, liquefaction is the most serious earthquake hazard.





GEOLOGIC FAULTS IN AND AROUND  
MERCED COUNTY

Figure  
11.1

### The Type of Construction Used

Typically, buildings designed and constructed since the mid-1970's and according to modern codes, have generally performed very well during earthquakes. However, the following construction types have garnered some concern within the seismologist community regarding their safety in earthquakes:

a. Concrete-Frame Structures Built Before 1976

Although Merced has relatively few buildings of this type, the cost of strengthening the necessary connections is a relatively inexpensive procedure, while potential benefit is great. These buildings generally house industrial activities and their collapse could cause severe economic loss and possibly the release of hazardous materials.

b. Un-reinforced Masonry Buildings

Although Merced has relatively few buildings of un-reinforced masonry, it will be necessary to reinforce these structures as modifications are proposed. If structures of this type are identified as unsafe or a potential risk to the general public, repairs/upgrades could be required.

It has been determined that an earthquake of 5.0 magnitude or greater on any of the surrounding faults could definitely damage some Downtown buildings and subject the general public to potential life-threatening concerns.

c. Un-braced Parapets/Architectural Trim

Although a particular building may be structurally sound enough to withstand a particular earthquake, its architectural trim may prove hazardous if not adequately braced or secured.

### Hazard Response -- Ground Shaking

When ground shaking occurs, people are generally encouraged to stay where they are and to prepare themselves for any aftershocks that may take place. For these reasons, the discussion in this chapter will not involve evacuation routes and minimum road widths as they pertain to evacuation.

Merced currently has 21 wells throughout the City. Eight of these wells pump directly into the water main system, and 10 of these wells pump into the City's four water towers. It is Merced's current policy to place one well in each square mile of the City, reinforce each of the well stations beyond required seismic standards, supply each well with standby power to last about three normal-use days, interloop the water main system, and construct water piping of flexible ductile iron. For these reasons, it is reasonable to expect newer parts of the City to retain much of its water supply capacity in the event of an earthquake.



Older areas of Merced and those neighborhoods which were supplied water while under County jurisdiction are much less prepared. Many of these areas are supplied by the four water towers and use iron piping which has become brittle. The four water towers were built in 1917, 1934, 1951, and 1969, and each is supplied by one to three wells which ring the tower. In recent years, the City has taken extensive measures to insure that the towers and wells are inspected regularly and are properly maintained.

### 11.2.2 Ground Failure

As introduced in the “Ground Shaking” portion of this section, ground failure can be a significant concern under seismic conditions. The shaking caused by an earthquake may cause relatively loose soil to compact, creating depressions which may cause a myriad of septic, well, pipe, and foundation problems. If the loose soil happens to be saturated with water, the water could be squeezed to the surface where it interacts with the top layers to produce a weak gelatin-like substance of dirt and water. This mixture lends no supporting capability to the buildings that stand on it and is known as liquefaction. Likewise, seismic activity may be the impetus for landslides in those areas with unstable slopes where retaining barriers are destroyed in the ground shaking, or where liquefaction occurs on what would otherwise be stable slopes.

Differential settlement, resulting in the compaction of loose, less cohesive soils, may be caused by earthquakes and could occur in parts of Merced. The most likely areas are those in which the groundwater surface is deep (otherwise liquefaction would be more likely), the soils are loose to medium-dense, and the soil profile includes strata of loose and uniformly graded sand. The potential for ground subsidence due to earthquake motion is largely dependent on the magnitude, duration, and frequency of the earthquake waves.

Although no liquefaction hazard areas have been identified to date in the SUDP/SOI, the future potential of liquefaction is recognized because unconsolidated sediments and a high water table do coincide in many areas. The California Office of Emergency Services has indicated that those areas at the

time of an earthquake with the combination of fine-grain, sandy soils and perched, or a water table at a depth of 25 feet or less, may experience liquefaction providing that the shaking is of a magnitude and duration that would collapse the ground and the water is able to percolate to the upper soil levels. A deep, thick, unbroken hardpan may prohibit the necessary percolation, and thus prevent liquefaction from occurring where other conditions are present.



Liquefaction may have occurred in the newly organized town of Merced during the San Francisco Earthquake of 1906. The *Merced County Sun* of April 20, 1906 gave the following description:

*“... At the Troy Laundry on Main Street where there is a brick oil tank under construction, the excavation filled with two feet of water and the walls of the tank were disturbed. Pools of water on vacant lots throughout the City rose. The earth was separated from some buildings...”*



The appearance of pools of water, the “disturbance” of the tank walls, and the earth separating from the building are common to liquefaction.

Seismic activity, however, is not the only cause of ground failure. Subsidence, land and mud slides, and hydro-compaction all have non-seismic causes.

Unlike tectonic or seismically stimulated subsidence which occurs suddenly, most of the various cases of subsidence happen slowly over a long period of time. The west side of the San Joaquin Valley has been recognized as the world’s largest area of subsidence due to groundwater withdrawal. Approximately 423 square miles have settled more than one foot since the 1950’s. Up to recently, the County’s subsiding area has been in the vicinity of Los Banos; however, a new subsiding area has been discovered near El Nido east of the San Joaquin River. As shown in **Figure 11.2**, no known subsidence has occurred in the Merced area or has accompanied our groundwater withdrawal as yet.

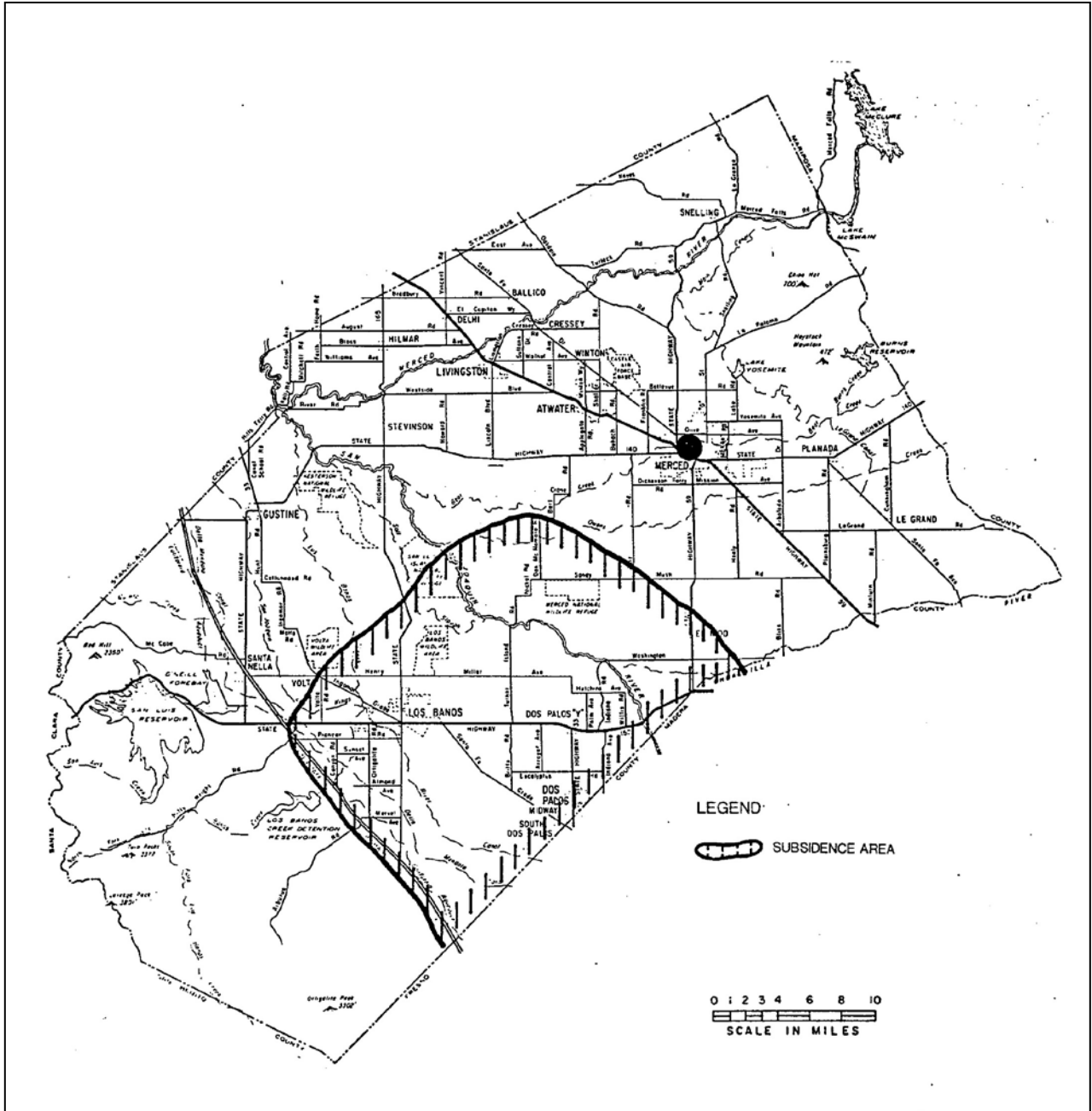
A landslide is the downhill movement of masses of earth material under the force of gravity. Movement may be very rapid, or so slow that a change of position can be noted only over a period of weeks or years. The size of a landslide can range from several square feet to several square miles. Landslides generally occur on slopes of 15 percent or greater. Merced’s topography is generally of slopes between 0 and 3 percent. These slopes are considered insufficient to produce other than sliding associated with seismic activity. However, in those instances where oversteepening or excessive watering occurs, some landslides may occur.

Small landslides covering several square feet have occurred along the banks of both Bear Creek and Black Rascal Creek as part of the natural erosion of the streams, and also as a result of human activity along the banks. Areas beyond the proposed Specific Urban Development Plan/Sphere of Influence boundary may have a potential for landslide activity where the slopes are covered with deep soils or are heavily saturated with groundwater.

### **Hazard Response -- Ground Failure**

In both seismically and otherwise caused ground failure, engineering treatment of either the ground or structures, or both, can sometimes stabilize hazards such as liquefaction. However, these solutions are often temporary and high cost may not justify their use. Other alternatives include land use restrictions or controls through special ordinances. Regulating the type and density of use, or prohibiting building construction that is particularly susceptible to devastation in the event of ground failure in a given area, can be effective in handling potential hazards. Currently, the City has a policy of requiring a minimum of 50 feet from any creek’s centerline or 25 feet from the crown of the creek, whichever is greater.





**SOURCE: Urban Geology Master Plan, California Division of Mines and Geology, 1973  
and Merced County Year 2000 General Plan, 1990**



### SUBSIDENCE AREAS IN MERCED COUNTY

Figure 11.2



### 11.2.3 Dam Failure/Seiche

Dam failures can result from a number of natural or man-made causes such as earthquakes (creating a “seiche” or an overtopping of a dam), erosion, improper siting, rapidly rising flood waters, and structural/design flaws.

There are three general types of dams: earth and rock-fill, concrete arch, or concrete gravity. Each of these types of dams has different failure characteristics. Merced is presently in the inundation area of two dams, Bear Reservoir Dam and Lake Yosemite Dam. Both of these dams are earthen-fill which makes them more flexible and, therefore, more resistant to earthquake. However, they are more likely to fail if overtopped. In 1968, Yosemite Dam was in danger of failure because of heavy rains and flooding that had swollen the flood control canals that lead into Lake Yosemite. Reportedly, the canal dikes were dynamited and the incoming canal water was diverted to surrounding fields to prevent dam failure.



An earthen dam may fail due to erosion of the breach created during over-topping. A dam failure can cause loss of life, damage to property, and other ensuing hazards, as well as displacement of residents, the loss or partial loss of critical mass care facilities, and the destruction of bridges (evacuation routes) in the inundation path.

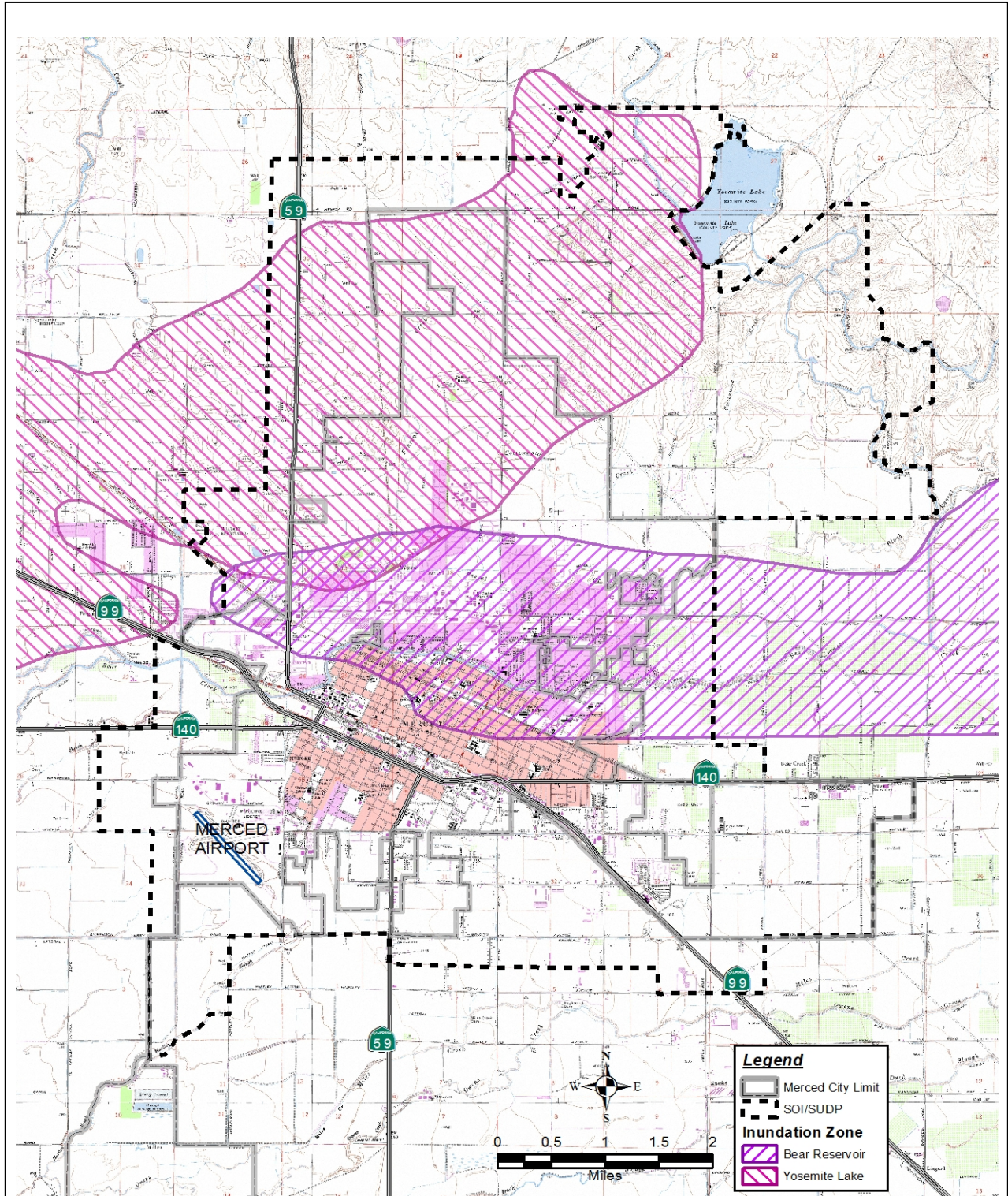
The effects of a possible dam failure upon Merced, and the ability of the local community to respond, seem to vary greatly by which dam would fail. Lake Yosemite’s inundation area covers a large portion of the City’s planning SUDP/SOI in North Merced, an area that is primarily residential or that is being considered for planned village developments (see *Figure 11.3*). The UC Merced Campus and proposed University Community are outside the inundation area.

The Merced Streams Group Project and Flood Control Plan authorized by Congress in 1970, but has only been partially completed due to lack of funds and other reasons, would divert the flood waters from the flood control canals which created problems in 1968, thus reducing the risk of Yosemite Dam failure. Castle Dam is complete; and a diversion structure, which diverts more than 1,200 cubic feet of water per second from MID’s main canal is also complete. This reduces the flow in Fahrens Creek, thus reducing the likelihood of flooding within a given event.



The Bear Reservoir Dam inundation area, unlike the inundation area of Lake Yosemite Dam, covers most of Merced north of Highway 99. The dam, also being earthen, could fail due to the erosion of the breach if over-topped. The flood wave would build gradually to a peak and then decline (see *Figure 11.3* on the next page).





DAM FAILURE INUNDATION AREAS

Figure  
11.3

### **Hazard Response -- Dam Failure**

The damage control and disaster relief efforts, in the case of inundation from Bear Creek Reservoir, would most likely be required from local governments, private organizations, and from State and Federal governments. This “mutual aid” could consist of mass evacuation of the inundation areas, search and rescue operations, emergency medical care, food distribution, and temporary shelter for injured or displaced persons. State and Federal assistance could be useful to remove debris and clear roadways, assist in re-establishing public services and utilities, and provide continuing care and welfare for the affected population, including temporary housing of displaced persons.

#### **Evacuation Routes and Water Supply**

The County Evacuation Plan for both dams shows the Merced County Fairgrounds as the evacuee assembly points and addresses what evacuation routes, priorities, and procedures should be followed. The City’s ability to supply the potable water requirements during this time will depend on which dam failed and the height of the inundation wave in relationship to the height of the 100-year and 200-year flood. The current City policy on well facility construction as it relates to inundation is that the well facility entrance be one-foot higher than the 100-year flood elevation, that one facility be placed in each square mile, and that a three-day energy reserve be present at the pump.

There are currently only a few wells in the Lake Yosemite inundation area because the area is mostly undeveloped at this time. Furthermore, those existing wells that would be subject to inundation are in an area of relatively shallow inundation elevations.

Bear Lake inundation, however, would be much more serious provided that actions were not taken to protect the wells within the six-plus hours prior to inundation.

#### ***11.2.4 Flooding***

Flooding continues to be the most widespread weather-related safety hazard in the United States, and accounts for greater average annual property losses than any other single hazard. Flooding can be especially troublesome in the Central Valley because it is a natural event.

Approximately 25 square miles of land in the Merced area are subject to 100-year or more frequent floods. This is illustrated by **Figure 11.5**. The Flood Insurance Rate Maps (F.I.R.M.) identify flood-prone areas which were required to be recognized by the Federal Flood Disaster Protection Act. These maps are the source of more detailed flood information for the planning area, and are periodically updated to reflect new information.

The State of California has adopted legislation that requires jurisdictions to prepare maps, goals, policies, implementation measures and regulations based on a 200-year flood event. This standard is distinct from federal flood protection efforts. Portions of the City are subject to the 200-year standard. One such area (as shown in **Figure 11.4**) is the State Levee Flood Projection Zone of Black Rascal Creek located downstream of a state levee. The effect of the state’s flood-related legislation on the City of Merced is described in the November 2015 Summary Report on Urban Level of Flood Protection adopted by reference as part of the General Plan. This report includes a map that depicts the state’s regulatory requirements



for flood protection, and is also presented in *Figure 11.5a*.

Changes in land use from agriculture to urban have profound effects on runoff and erosion of the land surface. The City has teamed up with Merced County, Merced Irrigation District and The City of Atwater to form a Stormwater Group with a Stormwater Management Plan to address erosion, sedimentation and other non-point pollutants of concern in order to protect water ways.

Urbanization is commonly accompanied by paved and other impervious surfaces, and the construction of storm sewers. Impervious surfaces and storm drains increase the frequency of floods and the size of flood peaks. The volume of runoff from new urban areas is far greater than under pre-existing conditions unless detention basins are constructed, as required in Merced. Most floods in Merced are produced by extended periods of rainfall during the winter months. Dam failure is another source of flooding which was addressed separately in Section 11.2.3 of this chapter.

#### Merced County Streams Group Project

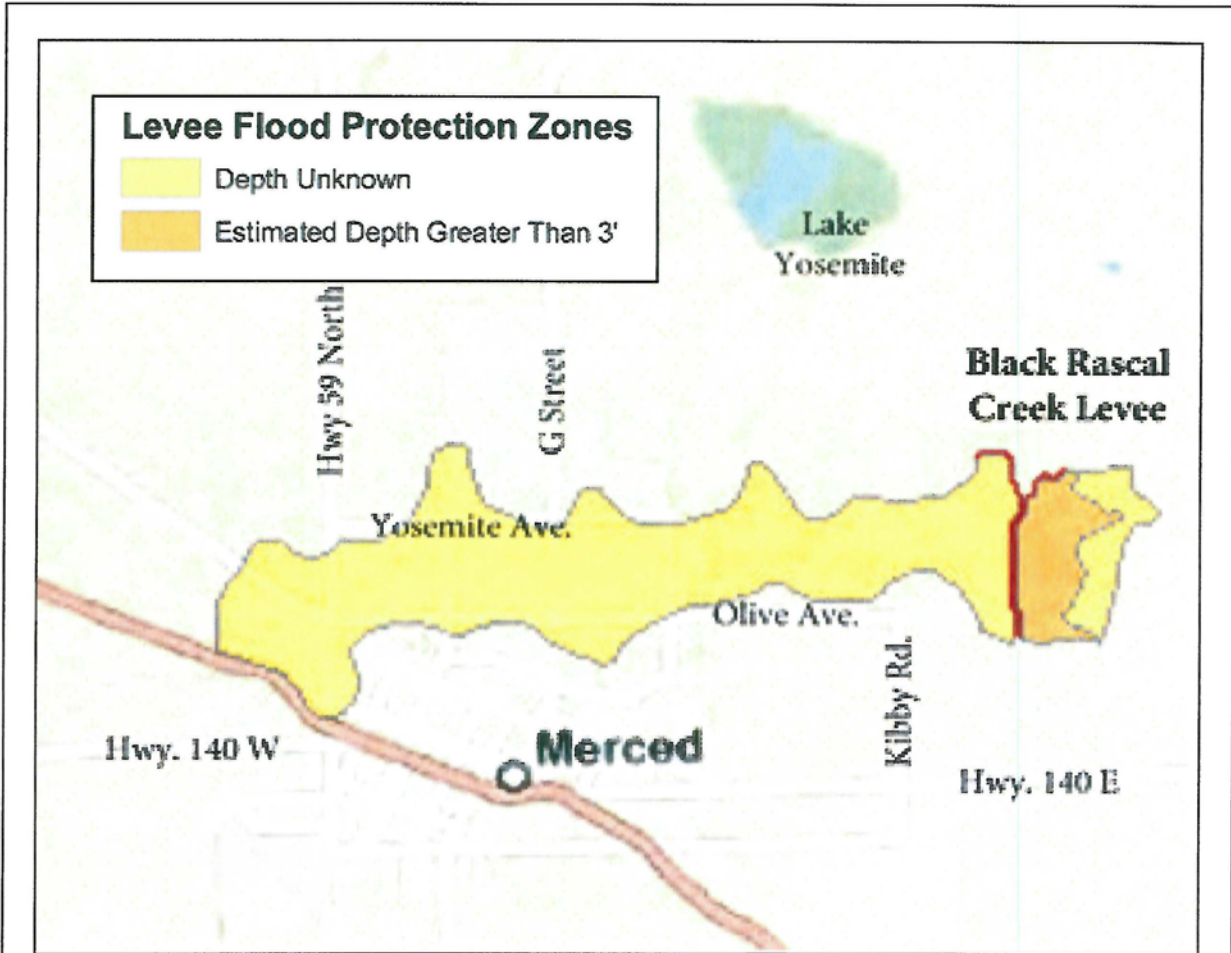
The Merced County Streams Group Project was approved by Congress in 1970. The project was re-evaluated by the U.S. Corps of Engineers in 1980 and some construction has been completed, but the entire project currently lacks funding commitments. The project, as laid out in 1980, entailed construction of two new detention dams (Castle on Canal Creek and Haystack Mountain on Black Rascal Creek), the enlargement and modification of the Bear Creek detention dam, and construction and modification of 32 miles of levees and channels on the Bear Creek Stream Group (Fahrens, Black Rascal, Cottonwood, and

Bear Creeks, Black Rascal Slough, and El Capitan Canal).

Castle Dam and a diversion structure from MID's main canal has been completed to date. Approximately 24 square miles in the planning area would be removed from the 100-year or more floodplain by this project. *Figure 11.5* illustrates the change in area covered by the 100-year floodplain that could be attributed to the construction of the project.



Due to environmental considerations, it is unlikely that Haystack Mountain dam will be constructed. The proposed Haystack Mountain reservoir area has significant vernal pool areas. In 2004, the Army Corps of Engineers began considering as an alternative an East side bypass, extending from the Black Rascal Diversion at Bear Creek south past Hwy 99 to the Miles and Owens Creek drainages. This would divert both Black Rascal and Bear Creek flood flows away from the City of Merced. However, there is insufficient capacity in Miles and Owens Creeks to carry flows down to the San Joaquin River, so that this solution is problematical, without an expensive further extension of a flood bypass.



Levee Flood Protection Zones estimate the maximum area that may be inundated if a project levee fails when water surface elevation is at the top of a project levee. Zones depicted on this map were created utilizing methods and assumptions described in the accompanying technical manual, and do not necessarily depict areas likely to be protected from flow events for which project levees were designed.

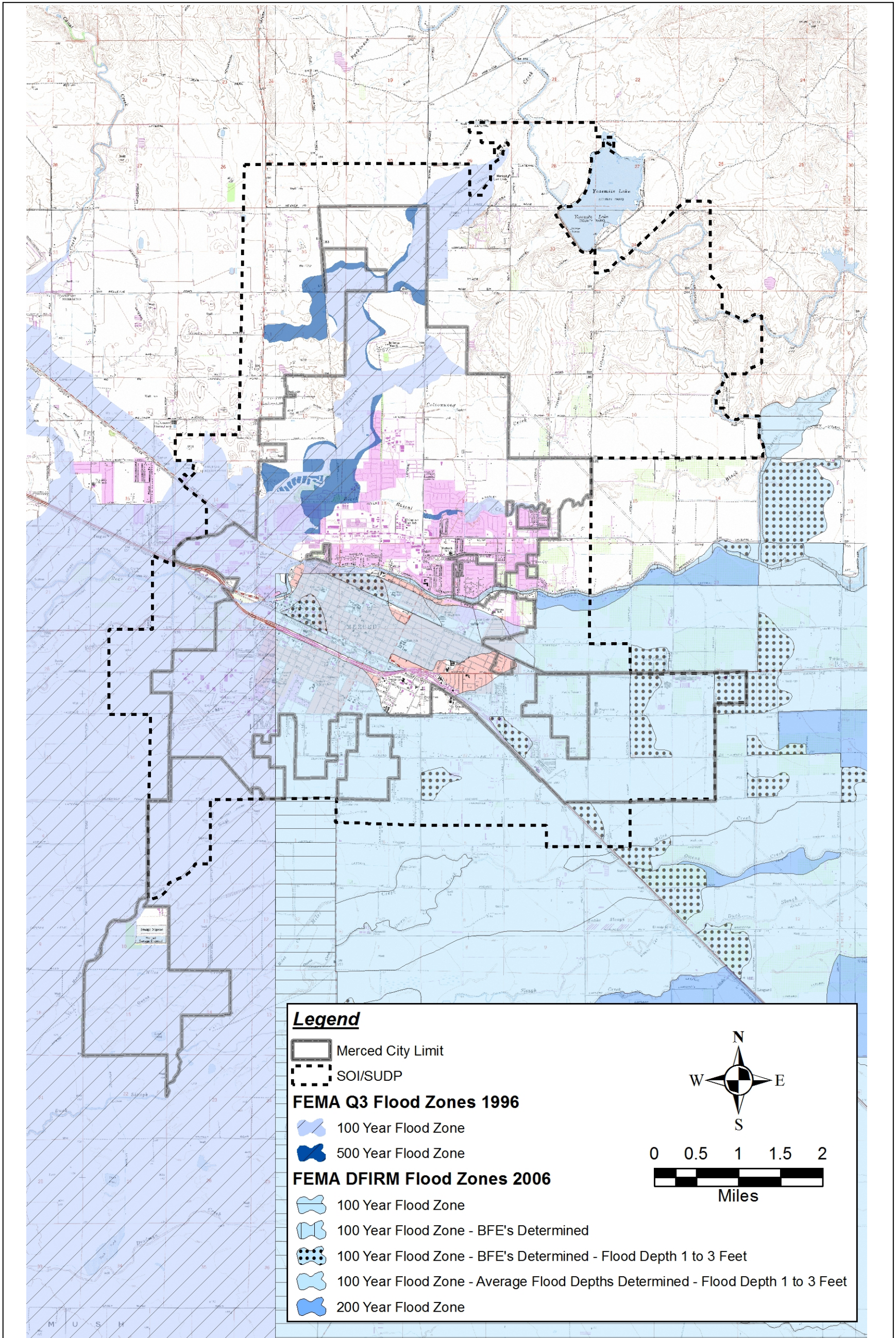
Lands within the Levee Flood Protection Zones may be subject to flooding due to various factors, including the failure or overtopping of project or non-project levees, flows that exceed the design capacity of project or non-project levees, and flows from water sources not specifically protected against by project levees. Lands not mapped within a Levee Flood Protection Zone are not invulnerable to flood risk, and some may also experience flooding from those or other processes.



CITY OF MERCED  
 STATE LEVEE FLOOD PROTECTION ZONE

Figure  
 11.4



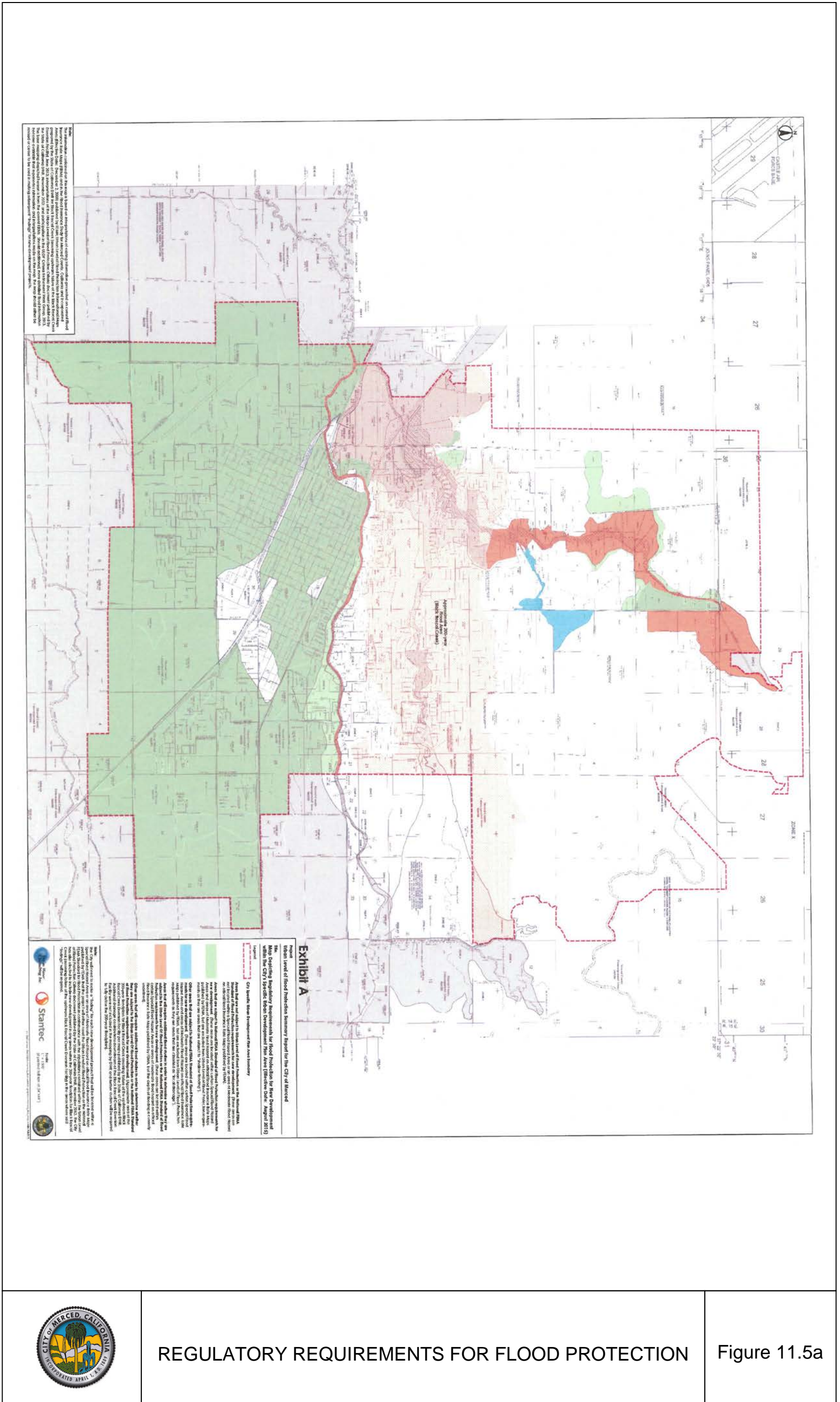


FLOOD PRONE AREAS

Figure 11.5



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REGULATORY REQUIREMENTS FOR FLOOD PROTECTION

Figure 11.5a



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The City requires the construction of storm water percolation/detention basins with new development per the City's Storm Water Master Plan. Percolation basins are designed to collect storm water and filter it before it is absorbed into the soil and reaches groundwater tables. Detention basins are designed to temporarily collect runoff so it can be metered at acceptable rates into canals and streams. The disposal system is mainly composed of Merced Irrigation District facilities, including water distribution canals and laterals, drains, and natural channels that traverse the area.

When all plans are fully implemented, the resulting system should offer a fully integrated, compatible drainage and flood control facility. Until the projects are completed, federally-subsidized insurance is available in flood-prone areas of Merced. In 2008, the City's Flood Damage Prevention Ordinance was updated to make it compliant with new Federal regulations governing the National Flood Insurance Program. Should the City fail to enforce restrictions and standards, it runs the risk of losing Federal insurance monies.

Stricter evaluation of development in all flood hazard zones would strengthen the Flood Insurance Program and provide greater protection from future flooding. As an example of regulated development, certain future higher occupancy or critical facilities such as schools and hospitals, could be discouraged in floodplains and should be strictly reviewed where placement within a floodplain is necessary. Recreation areas and parks represent the most logical uses of floodways in particular.

The Merced Streams Group Project and FEMA regulations, which are embodied in the City's Flood Damage Prevention

Ordinance (MMC 17.48), approach flooding from different perspectives. The Streams Group Project is designed to control flood waters. The FEMA approach is to prohibit construction in floodways and to encourage construction in low risk areas. Construction in floodplains is acceptable provided that floors are elevated to minimize the risk of damage and the adverse consequences of putting obstacles in the way are minimized.



If the Streams Group Project, or an acceptable updated project, is ever completed, most of the areas which are now identified by FEMA as flood-prone will no longer be classified that way. As a result, the cost of construction of homes and businesses would decrease. The largest benefit of the Streams Group Project is that the FEMA approach only protects new construction while the Streams project would provide flood control benefits to virtually the entire community. The most significant benefit of the Streams Group Project is the protection offered to the older homes and businesses built before the FEMA flood maps were developed.



## **Hazard Response -- Flooding**

### Evacuation Routes

As indicated previously, flooding could have extensive impacts upon the Merced SUDP/SOI. Two particular concerns relating to flooding are the potential that evacuation from South and Central Merced to the dry areas to the north could get cut-off by rising waters on the bridges over Bear Creek, and that most of the City's emergency facilities are in the floodplain and could become inundated.

### Water Supply

The ability of the City to provide potable water under such circumstances, however, seems to be good because of the City's policy of keeping the entrances to the pump facilities above the 100-year flood elevation.

### ***11.2.5 Urban Fires & Wildland Fires***

The continued growth of Merced as a whole, the increased use of hazardous materials, geographic constraints such as creeks, the condition of older buildings in Downtown Merced, and the extensive use of shake shingle roofs create a wide spectrum of fire safety concerns. When planning for urban fires protection, fire risk factors and their mitigation, as well as hazard response factors must be considered.

### Risk Factors and Mitigations

Urban fire risks include personal safety practices, construction materials and methods, built-in fire protection systems, site planning, and overall land use. In order to mitigate the risk and impact of fire within Merced, the City uses a master planning process that identifies potential risks and/or hazards and then proposes methods to address those risks.

This master planning process has been used since 1982 to provide fire protection planning with a goal of a "fire safe community." Fire protection planning requires involvement of all City agencies, individuals, and organizations that have input and support community health, safety, development, and stability.

As a system, the master planning process states that fire protection planning requires involvement of all City agencies, individuals, and organizations that have input and support community health, safety, development, and stability.



### Personal Safety Practices

The number one cause of residential fires is cooking. Kitchen safety revolves mainly around an individual's safety practices. For this reason, the Fire Department has developed and is conducting several public education programs. These programs stress emphasis on children and senior citizens who have been identified by the National Fire Protection Agency as high-risk groups for fire death and injuries. Within the scope of the *Merced Vision 2030 General Plan*, the Fire Department will be committing resources toward educating the adult population about the risks of fire.

### Construction Materials, Methods and Site Planning

The California Building Code and the California Fire Codes work together to regulate building construction and related items such as the care of vacant lots and the storage of flammable liquids. On average, each year, the Fire Department conducts in excess of 4,000 inspections and eliminated approximately 8,000 Fire Code violations which could attribute to the cause and severity of a fire. The inspection program primarily targets the high and medium hazard occupancies identified in the “Hazards and Risks” section on the following pages. To provide effective fire prevention activities for low hazard occupancies, the Fire Department conducts seasonal hazard removal programs (primarily weed abatement).



### Vacant Lots

Vacant lots that are overgrown with weeds or allow the buildup of refuse are a fire hazard, especially during the hot, dry summer season.

The City of Merced employs a weed abatement program, which requires property owners to eliminate flammable vegetation and rubbish from their properties. Each property within the City is surveyed each spring and notices are sent to the owners of property that has been identified to pose a fire risk. Since inception of this program in 1992, grass or brush related fires within the

City have been greatly reduced. The City also picks up abandoned vehicles, and a “Spring Clean-up” conducted annually allows people to have bulky refuse picked up at transfer stations without charge.

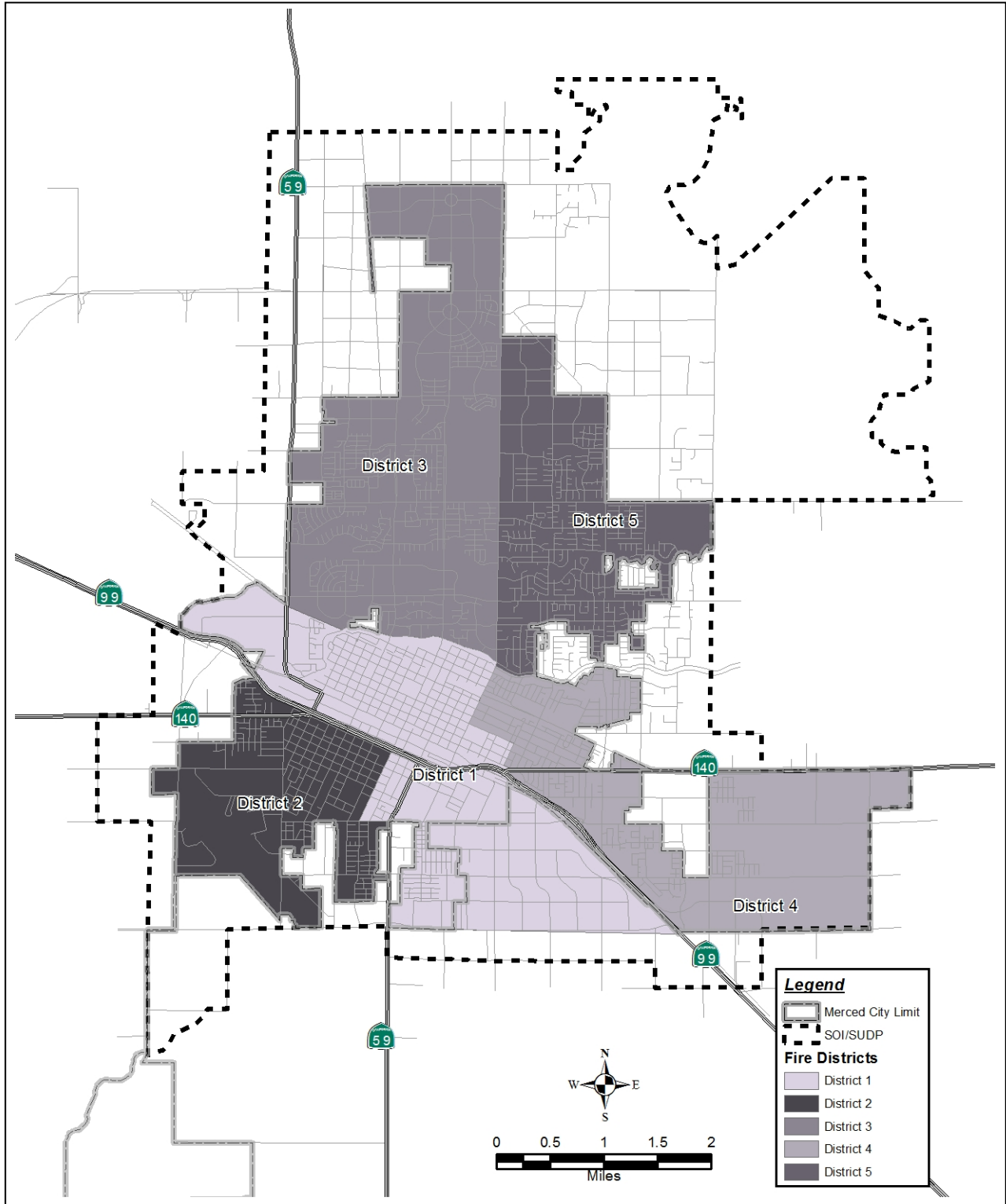
Naturally, the use of built-in protection such as fire resistant materials and automatic sprinklers in all new structures as required by the Building and Fire Codes significantly reduces the risk of urban fires and may reduce the City’s reliance upon fire suppression crews.

### Hazards and Risks

Merced has a variety of occupancy types. Some of these require tailored fire protection considerations. These occupancies are included as follows:

- *Special Risk Occupancies*  
(Schools, hospitals, nursing homes, and other high life hazard or large fire potential occupancies)
- *High Risk Occupancies*  
(Apartments, offices, mercantile and industrial occupancies)
- *Medium Risk Occupancies*  
(One-, two-, or three-family dwellings and scattered small businesses)
- *Low Risk Occupancies*  
(Vehicles, vacant land, storage shed, and outbuildings)





FIRE STATION SERVICE AREAS

Figure 11.6

The Fire Department's response objective is to arrive at the scene of an emergency within 4 to 6 minutes 90-percent of the time within the resource constraints of the City. The Merced Fire Department also strives to provide adequate resources to mitigate emergency incidents within the City. Therefore, it is important that industries using hazardous materials, large facilities, or special or high risk occupancies being developed in new areas of the City be accompanied by additional fire department facilities, equipment, and/or personnel.

The current fire first-alarm assignment consists of three engines, one truck, and a one chief officer. The increased awareness and use of hazardous materials, and the need for heavy, confined space, and water rescue services, however, have led the Fire Department to develop programs to provide expanded services.

#### Wildland and Vegetation Fires

Wildland and vegetation fire hazards exist in Merced County, mostly outside urban areas. The Valley's long, hot, dry summers and extensive vegetation creates a fire season that extends from late spring to early fall. More than one hundred wildland fires can occur in Merced County on an annual basis. Irrigated agricultural land, however, is less susceptible to wildland fires than grazing areas.

As the City has annexed large blocks of undeveloped land, the potential for wildland and vegetation fires within the City has increased. The City Fire Department responds to 50-75 vegetation fires per year. The Fire Department is also frequently called to provide mutual aid to the Merced County Fire Department for vegetation fires in the wider Merced area.

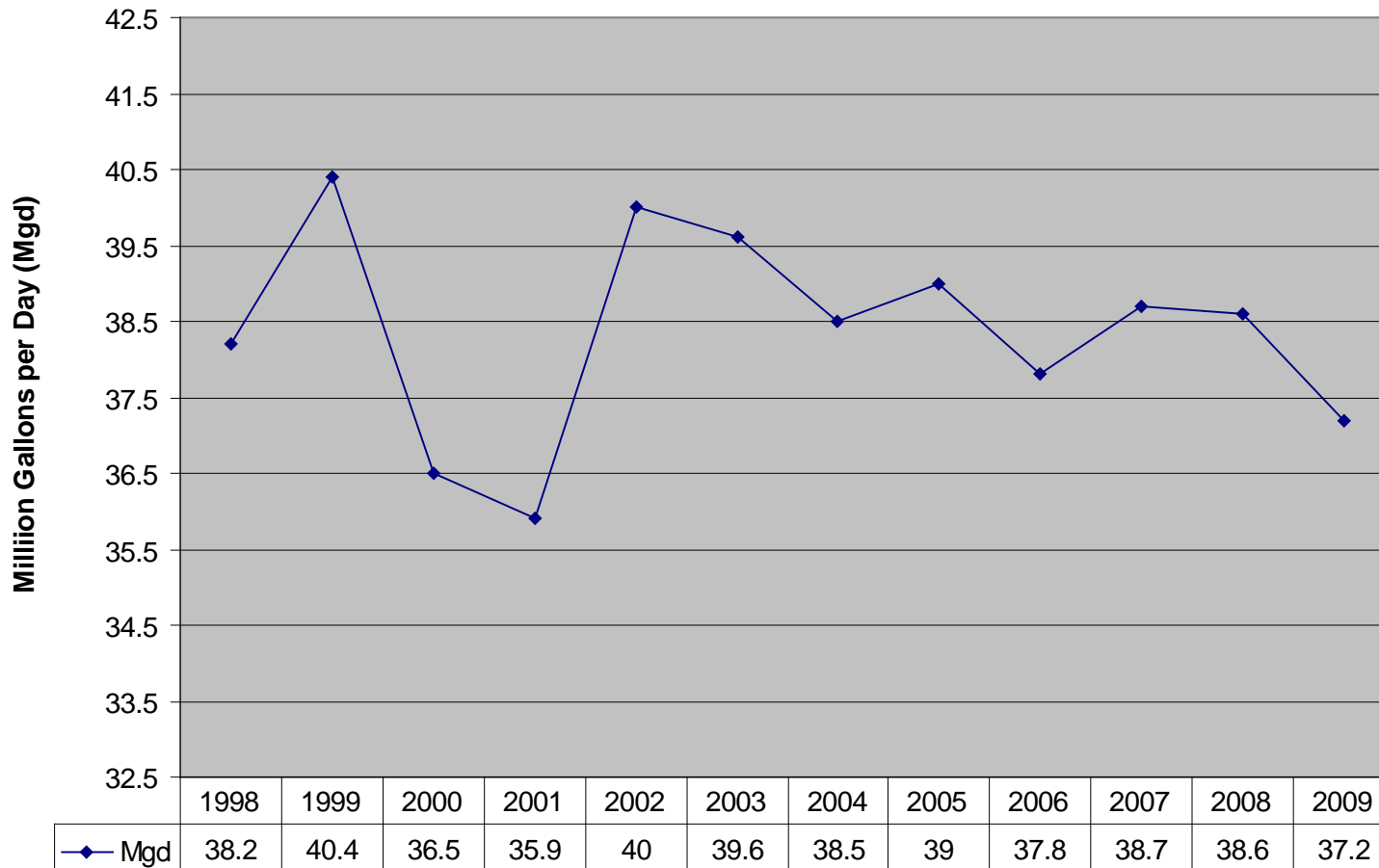
### Hazard Response --Urban and Wildland Fires

#### Access

Access, as it relates to urban fires, is promoted or restricted based on three factors: (1) the geographical proximity of fire resources, (2) the location of physical boundaries in relationship to the station and fire, and (3) the road system. The location of the physical boundaries in relationship to the station and fire is addressed in a station service area plan (see *Figure 11.6*). Fire station location planning allows for the distribution of stations and resources to provide protection for areas geographically separated by physical boundaries, such as creeks and railways, and also protects against the elimination of all of the fire response resources by an earthquake, flood, or other disaster.

A well-defined system of local streets and roads is also important to provide emergency access for firefighting equipment and evacuation routes for the public. The circulation system is a critical part of the Fire Department's ability to maintain a desired response time of four to six minutes-to any area of the City, 90-percent of the time. To provide adequate access and room for firefighting operations, the National Fire Protection Association standards recommend minimum roadway widths of 28 feet with parking on one side only and 36 feet if parking is allowed on both sides. Provision of bridges over creeks and grade separated railroad crossings are also critical elements in meeting response times.

The access system will also serve as an evacuation route for the population in the event of a hazardous materials incident, flood, or other disaster.



Source: City of Merced Public Works Department, 2010



MERCED PEAK DAY WATER PRODUCTION

Figure 11.7



## Water Supply

The ability to provide an adequate water supply during peak load hours is critical for firefighting operations. This is especially important in large commercial and industrial occupancies. The water supply system currently consists of four elevated storage tanks with a combined storage capacity of approximately 1.4 million gallons, and 21 wells and equipped with variable speed pumps that attempt to maintain 45 to 50 psi (pounds per square inch) nominal water pressure. The City is required to meet State Health pressure requirements, which call for a minimum of 20 psi at every service connection under the annual peak hour condition and maintaining the annual average day demand plus fire flow. **Figure 11.7** illustrates the maximum peak day water demand for the last several years. Through the Capital Improvement Program, the City plans to increase water wells to match the requirements of development, generally one well per square mile.

The importance of expanding the water supply and distribution system increases greatly as the City expands. In addition to providing water supplies for fire suppression operations, the effectiveness of automatic fire sprinkler systems is dependent upon the water service. Fire sprinkler systems are designed based on pressures and water flow from the public water main. If the minimum required pressure and available water supply are not maintained, the sprinkler system will not operate properly. The City maintains a computer model to assist in the analysis of water system changes, so we can add production facilities in the most appropriate locations, identify system improvements needed to support specific development projects, and improve maintenance and reconstruction techniques.



## City of Merced Fire Department

As of 2011, the City of Merced Fire Department's resources consisted of five first-line engine companies, one ladder company (85 feet), two reserve engines, one reserve truck, technical rescue and mass decontamination trailers, and command and support vehicles, that respond out of five fire stations within the City.

The Fire Department personnel, as of 2011, totals 64.5 personnel, all of whom are paid professionals, who provide City coverage 24 hours a day, seven days a week.

The City of Merced Fire Department has a mutual aid agreement with the Atwater and Merced County Fire Departments. Moreover, the Fire Department is a member of the California Master Mutual Aid Plan. These agreements enable the different jurisdictions to request aid from each other when necessary.

The Merced Fire Department holds a Class II ISO rating. The Fire Protection Rating Schedule is used by the Insurance Service Organization (ISO) to measure a fire department's capabilities, which are used to establish insurance rates for commercial and residential properties.

## Evacuation Routes

Evacuation routes have been discussed for particular hazards under each of the previous hazard response sections, but some general

items must be noted. Earthquakes, fires, and flooding can all necessitate evacuation. However, it is not possible to know with certainty how many people will actually need to be evacuated in any given situation.

Similarly, the rate at which people will evacuate and their specific routes of travel and ultimate destinations are subject to wide variation. Therefore, in the case of an emergency, it is necessary to evaluate each situation on an individual basis and respond accordingly.



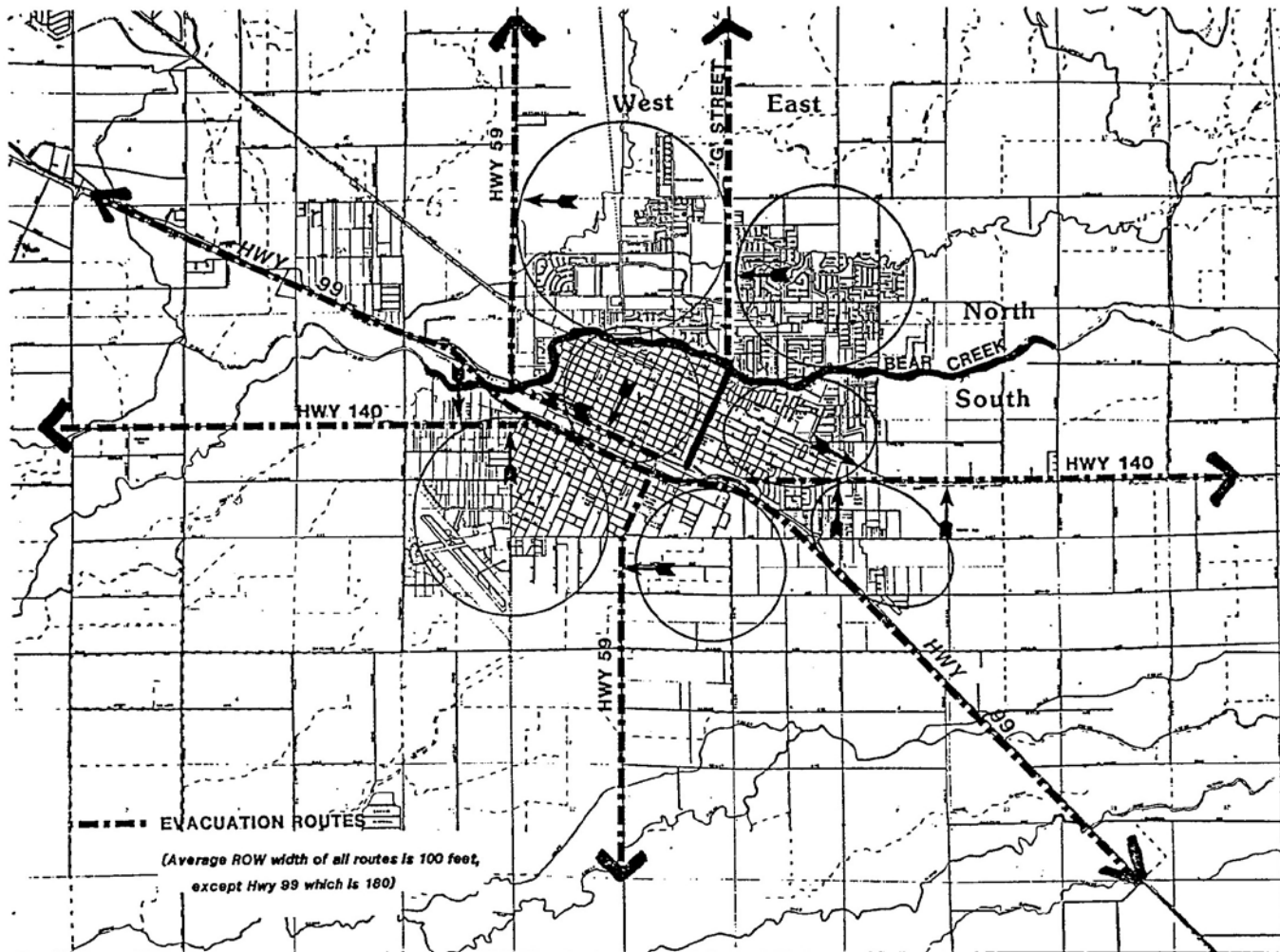
The *City of Merced Emergency Operations Plan* addresses various emergency situations and identifies a Care and Shelter Branch Director who is responsible for supporting and coordinating the evacuation efforts in the field. At the time of an emergency, the Care and Shelter Branch Director will evaluate the situation, access various routes, determine the best routes, alert the public via radio and/or TV of evacuation routes and procedures, and coordinate the evacuation with state and local officials, such as the Highway Patrol, Caltrans, etc. Evacuation routes for most emergencies can be seen in **Figure 11.8.**”

### **Hazard Response--Wildland Fires**

The City's response to fighting wildland and vegetation fires is much the same as the response to urban fires. Typically, the Fire Department will dispatch two engines and one chief officer to vegetation fires and evaluate whether there is a need for additional resources.- The Fire Department needs to consider obtaining fire apparatus that are designed for off-road operations in order to better combat vegetation fires, where water supply can be limited and off-road response may be necessary. Most wildland fires outside the City limits are responded to by Merced County or the California Department of Forestry and Fire Protection.



In order to prevent wildland fires before they start, the City's weed abatement program requires that flammable vegetation be plowed under or mowed down. The Police, Fire, and Inspection Services Departments combine to make sure that abandoned vehicles or building (potential fire hazards) are removed.



EVACUATION ROUTES

Figure  
11.8





### 11.2.6 Airport Safety Zones

The continued operation of the Merced Regional Airport involves various hazards both above and on the ground. These include hazards to flight (physical obstructions in the airspace or land use characteristics which affect flight safety) and safety on the ground (damage due to an aircraft accident).

The City's growth towards the northwest bring it into areas affected by land use restrictions associated with Castle Airport.

#### Hazards to Flight

Potential hazards to flight include physical obstructions and other land use characteristics that can affect flight safety, which include: visual hazards such as distracting lights, glare, and sources of smoke; electronic interference with aircraft instruments or radio communications; and uses which may attract flocks of birds. In order to safeguard an airport's long-term usability, preventing encroachment of objects into the surrounding airspace is imperative.

#### Hazard Response--Flight Safety

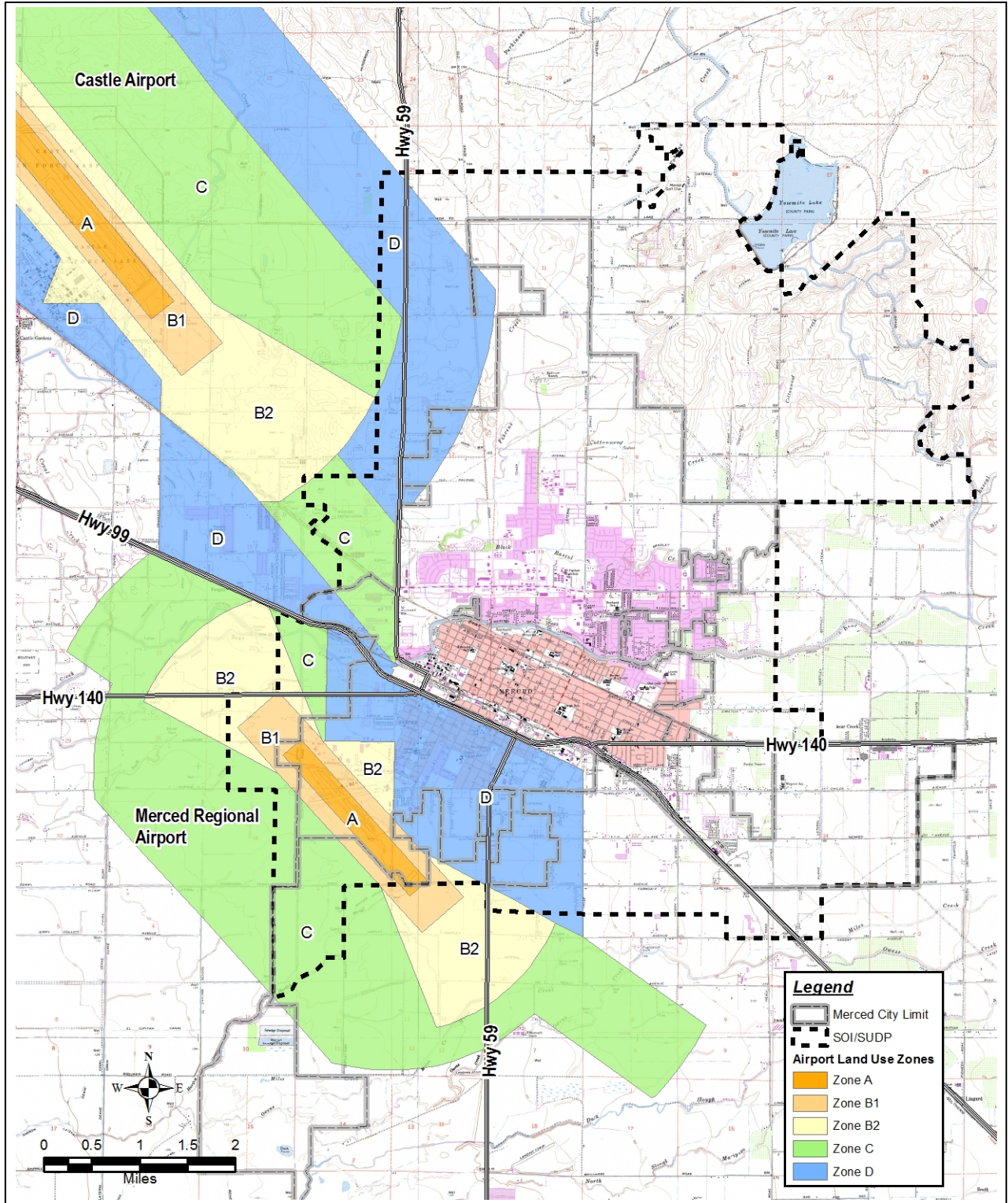
Standards for the maximum allowable height of structures and other objects around airports are set forth in Federal Aviation

Regulations. These standards reflect, with a margin of safety, the lowest altitudes at which an aircraft may be flown while approaching or departing an airport. The most critical area with regard to flight hazards are within the approaches to the airport's runway. These approaches are defined by imaginary surfaces which slope upwards from a point near the end of the runway. These approaches for Merced Regional Airport and Castle Airport are illustrated in the *Merced County Airport Land Use Compatibility Plan*, adopted in 1999 and being updated in 2010-11. See **Figure 11.9** for Merced Regional Airport's and Castle Airport's Land Use Compatibility Zones.



#### Safety on the Ground

Accident probabilities increase with closer proximity to the runway ends, in large part because of the greater concentration of aircraft over a given area. The risk is also greater because at low altitudes a pilot has little choice over where to make an emergency landing. Greater restrictions are thus advisable within the approach protection zones and approach zones than in other areas surrounding an airport (**Figure 11.9**).



MERCED REGIONAL AIRPORT &  
CASTLE AIRPORT LAND USE  
COMPATIBILITY ZONES

Figure  
11.9





The Federal Aviation Administration (FAA) suggests that all runway protection zone (Zone A) property should ideally be airport owned and free of structures. Within approach zones (Zone B1 and B2), it is desirable to have as much open land as possible to minimize the number of people occupying an area. Where development occurs, clustering maximizes the amount of open land available for emergency landings; and a maximum net occupancy level can be set to limit the number of people at risk if a crash should occur. Within traffic pattern areas (Zone C), aircraft will normally be at altitudes high enough to allow pilots a choice of where to put down in an emergency landing. Therefore, evenly distributed open spaces usable for emergency landing sites are adequate safety measures in these areas.



### **Hazard Response--Airport Ground Safety**

Merced County's Airport Land Use Compatibility Plan calls for approach protection through land use restrictions in Zone A areas, a maximum occupancy level for commercial/ industrial uses, and density restrictions on residential uses in Zone C and the retention of existing agricultural uses and the discouragement of residential land uses in Zones B1 and B2.



### 11.2.7 Crime & Policing



Police officers are among the most visible representatives of City government and largely influence public attitude toward the quality of City services. They are responsible for maintaining the quality of life by protecting people and property, promoting community order through crime prevention and educational programs, apprehending and prosecuting criminals, and regulating non-criminal activities.

It is difficult to measure crime's effect on society, but clearly crime is a burden. Crime affects people in many different ways. People who fear crime cannot move around as freely. Crime victims suffer physically and emotionally and are less productive at work. Crime is extremely expensive--causing insurance costs to rise, making consumer goods more expensive, and making the public pay for maintaining public police departments and jails, hiring private security, and upholding the entire judicial system.

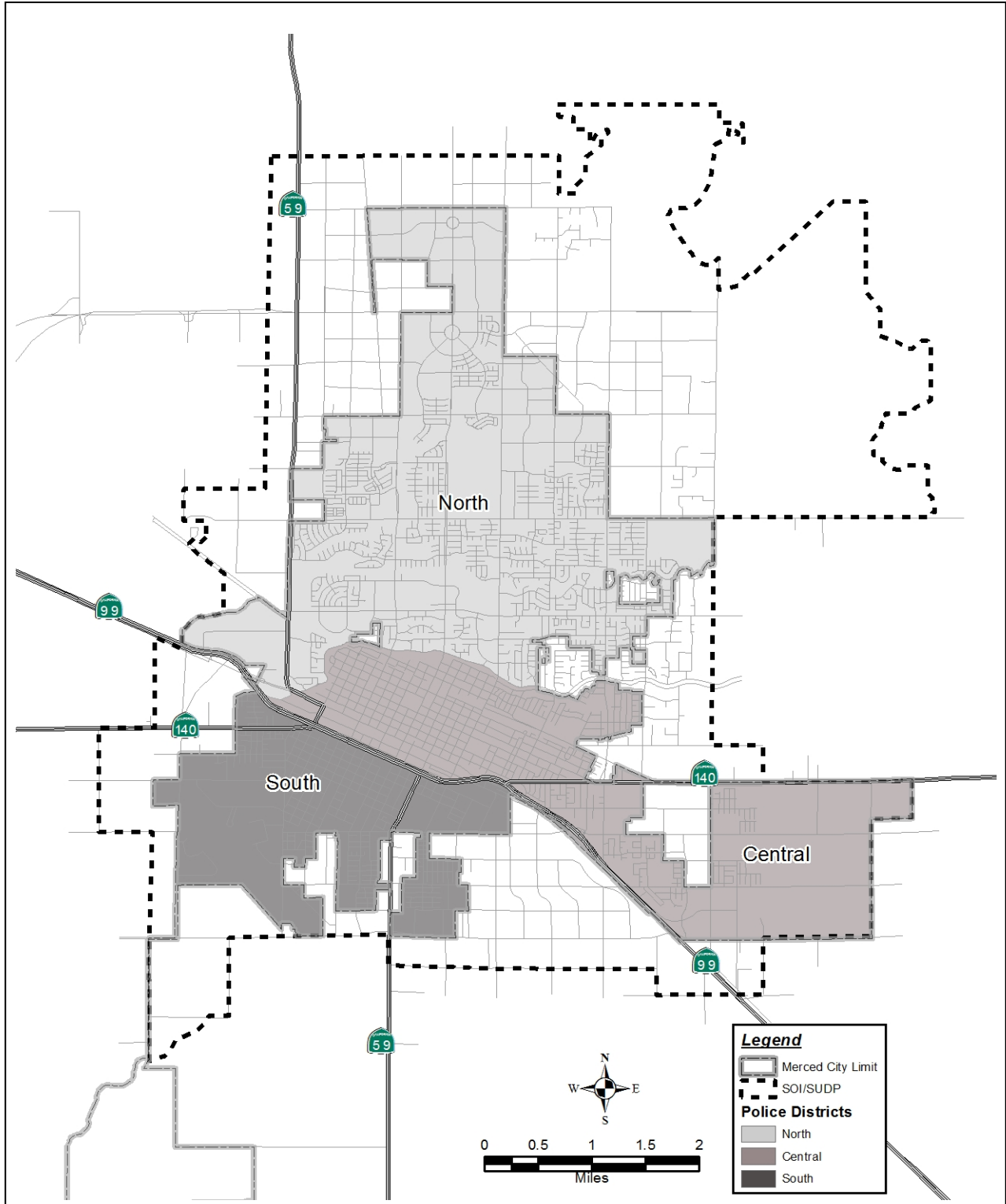
#### **Hazard Response--Crime**

There are many different causes of crime, requiring many different approaches. Continuing crime prevention programs in Merced include Neighborhood Watch, educational outreach, the VIP volunteer program, and data tracking to identify high-crime areas, traffic problems, and service requirements of various neighborhoods. Merced is divided into three police districts,

each with its own police facility and officers (*Figure 11.10*). District One serves the area north of Bear Creek, District Two serves the area between Highway 99 to the south and Bear Creek to the north, and District Three serves the area south of Highway 99. In 2009, the Merced Police Department had 111 sworn officers. Based on a population of 80,608 in 2009, the ratio of one officer for every 726 citizens compares favorably with the standard of 1 per 1,000 citizens typically used elsewhere.



The primary reason for the three districts is to place police officers closer to the neighborhoods and citizens they serve. Close interaction and collaboration between officers and citizens is the best and most successful way to a healthy community. The Police Department feels that this "community policing" concept will be successful in combating a growing incidence of crime, violence, and disorder in the City. The Department has also been actively promoting new ordinances to combat graffiti, aggressive panhandling, loitering with the intent to sell drugs, and the maintenance of property in a state that attracts or harbors criminal activity. Citizen councils will also be established in each district to meet regularly with area commanders to develop collaborative strategies and outcomes. Bicycle patrols are also now beginning to be used in order to bring police officers "closer" to those they are assigned to protect.



POLICE DISTRICTS

Figure 11.10

### 11.2.8 Hazardous Materials & Waste

California's economic well-being and quality of life depend in many ways on the production and use of manufactured goods. However, manufacturing often requires large volumes of chemicals and generates hazardous waste. Hazardous waste ranges from familiar substances, such as solvents and waste oil, to sophisticated compounds such as polychlorinated biphenyls and dioxins. More than 10 million tons of hazardous waste are generated in California each year.

In 1986, the California legislature passed legislation requiring each county to develop a hazardous waste management plan and requiring all cities to either adopt the County plan by reference in their general plans or adopt their own plan. In 1989, the Merced County Board of Supervisors and Merced City Council adopted the *Merced County Hazardous Waste Management Plan* and is responsible for updating the plan when needed. The plan addresses waste reduction and onsite treatment, the siting of off-site hazardous waste facilities, public and industry education, transportation of hazardous wastes, cleanup of contaminated sites, and emergency response procedures. The plan also recommends a series of goals, policies, and implementation actions to deal with hazardous waste throughout the County.

The Merced County Environmental Health Division, which oversees the enforcement of the plan, maintains an up-to-date list of known hazardous waste sites within the County. In 2009, there were approximately 63 known hazardous waste sites within the City of Merced. Cleanup of sites that exceed State standards for contamination by toxic materials is required prior to

development or reuse of the site. The cleanup process is monitored by the State Department of Health Services.

#### Hazard Response--Hazardous Materials And Waste

The Merced City Fire Department and Environmental Health Division work with the County to prevent the uncontrolled release of toxic substances into the environment by conducting inspections of toxic materials facilities, enforcing storage and use requirements, and educating local businesses on proper storage and handling of hazardous materials. The Merced City Fire Department responds to uncontrolled releases within the City limits, identifies the category of chemicals involved, contains the spill if possible, oversees cleanup activities, and makes sure that the site is safe to be occupied again.

The City's Emergency Plan and the County Hazardous Waste Management Plan both deal with detailed emergency response procedures under various conditions for hazardous materials spills. The City also works with the State Department of Health Services to establish cleanup plans and to monitor the cleanup of known hazardous waste sites within the City.





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## 11.3 SAFETY GOALS, POLICIES, AND ACTIONS

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### ***Goal Area S-1: Disaster Preparedness***

#### **GOAL**

- **General Disaster Preparedness**

#### **POLICY**

**S-1.1** Develop and maintain emergency preparedness procedures for the City.

#### ***Policy S-1.1***

#### ***Develop and Maintain Emergency Preparedness Procedures for the City.***

##### ***Implementing Actions:***

- 1.1.a** Keep up-to-date through annual review the City's existing Emergency Plan and coordinate with the countywide Emergency Plan.
- 1.1.b** Prepare route capacity studies and determine evacuation procedures and routes for different types of disasters, including means for notifying residents of a need to evacuate because of a severe hazard as soon as possible.
- 1.1.c** Require that all new annexation areas be incorporated into the City's emergency plan at the time of annexation.
- 1.1.d** Establish a process whereby the City of Merced systematically encourages review of and familiarity with the most current community disaster plan by those in local government and other local residents who hold responsible positions. Maintain a list of other public agencies that can be called upon for assistance
- 1.1.e** Continue to adopt and respect agreements with the County and adjacent communities for mutual aid assistance.
- 1.1.f** Implement the policies and procedures recommended in the Incident Command System (ICS)/National Incident Management System (NIMS), including continued training for City staff in these practices.
- 1.1.g** Adopt and update the *Merced Hazard Mitigation Plan* as needed, and consult it when addressing known hazards to ensure the general health and safety of people within the City of Merced.

The City of Merced Local Hazard Mitigation Plan presents a comprehensive risk assessment of natural hazards that have the potential to affect the City of Merced. The Local Mitigation Plan was developed by the City in accordance with the Federal Disaster Mitigation Act of 2000, adopted in 2015 by the City of Merced, and approved by the Federal Emergency Management Agency. The Local Hazard Mitigation Plan suggests possible mitigation measures for reducing the effects of the potential hazards. The goals and policies within this Safety Element support and are consistent with the recommended mitigation strategy within the Local Hazard Mitigation Plan.

***Goal Area S-2: Seismic Safety***

**GOAL**

- **Reasonable Safety for City Residents from the Hazards of Earthquake and Other Geologic Activity**

**POLICIES**

- S-2.1** Reduce the potential danger from earthquake and seismic-related activity from existing buildings where necessary.
- S-2.2** Encourage the improvement of all public facilities and infrastructure such as natural gas, fuel, sewer, water, electricity, and railroad lines and equipment with up-to-date seismic safety features.
- S-2.3** Restrict urban development in all areas with potential ground failure characteristics.

***Policy S-2.1***

***Reduce the Potential Danger from Earthquake and Seismic-Related Activity from Existing Buildings Where Necessary.***

***Implementing Actions:***

- 2.1.a** Evaluate the need for and the cost of setting up an enforcement program for eliminating any unreasonable risk associated with seismically unsafe buildings through reinforcement or removal where necessary.
- 2.1.b** Study the possibility of obtaining State Historic Preservation, Community Development Block Grant, Redevelopment, or other available money to assist with repairs of unsafe buildings.
- 2.1.c** Continue to require that new development meet the seismic design requirements in the Building Codes.
- 2.1.d** Pursue uniform infrastructure, building, and land use requirements and policies regarding disaster avoidance within the City's Specific Urban Development Plan/Sphere of Influence boundaries.
- 2.1.e** Review all possible new additions to the City's Building and Fire Codes based on up-to-date technology every three years.
- 2.1.f** Continue to implement the State laws requiring seismic retrofitting of existing buildings when there is a change of use, additions, or remodeling that affects unreinforced masonry portions of the structure.

The above Implementing Actions are designed to ensure that new and existing development in the City of Merced meet seismic safety standards as adopted by the State of California.

***Policy S-2.2***

***Encourage the Improvement of All Public Facilities and Infrastructure, Such as Natural Gas, Fuel, Sewer, Water, Electricity, and Railroad Lines and Equipment with Up-To-Date Seismic Safety Features.***

***Implementing Actions:***

**2.2.a Work with Caltrans to review and, where possible, increase the earthquake stability of grade-separated transportation structures such as highway bridges and overpasses within the City's planning area.**

**2.2.b Provide adequate storage facilities to insure an adequate supply of water in the event of seismic activity. An evaluation of the seismic safety of the water system, including the elevated water towers, should be completed as part of the update of the Water Master Plan.**

The City of Merced will address the seismic safety of public facilities and infrastructure through the above Implementing Actions. For non-City facilities, the City will work with the appropriate agency to address any issues.

***Policy S-2.3***

***Restrict Urban Development in All Areas with Potential Ground Failure Characteristics.***

***Implementing Actions:***

**2.3.a Investigate the feasibility of performing an inventory of areas with generally unstable ground within the SUDP/SOI area and work with the County to restrict or prohibit their development. In the Merced planning area, most of the unstable ground are in old streams beds, near embankments, and adjacent to streams with sufficient velocities to erode the bank.**

**2.3.b Retain a high level of groundwater supply in order to reduce the possibility of land subsidence, including the initiation of an educational program to discourage excessive, inefficient uses of water.**

The City of Merced will work with other affected agencies to address areas with potential ground failure characteristics through the above Implementing Actions. Ground failure and subsidence is not a widespread issue in the Merced area, but still needs to be monitored.

***Goal Area S-3: Flooding***

**GOAL**

**■ Protect People and Property from Flood Risk**

**POLICIES**

**S-3.1** Avoid or minimize the risks of flooding to new development.

**S-3.2** Implement appropriate land use planning practices to improve flood risk management and reduce the consequence of flooding.

**S-3.3** Maintain essential City services in the event of flooding or dam failure.

**S-3.4** Locate and design essential facilities to minimize flood risk

**S-3.5** Coordinate with other local, regional, State, and federal agencies to improve flood risk management.

***Policy S-3.1***

***Avoid or Minimize the Risks of Flooding to New Development.***

***Implementing Actions:***

- 3.1.a** Limit future development in areas with high flooding risk to the extent feasible to open space, green belts, and other natural areas, recreational use or agricultural use. Maintain public safety and sustainable development in areas prone to risk of flooding.
- 3.1.b** Require that roadway systems for areas protected by levees and dams be designed to provide multiple escape routes for residents and access for emergency services in the event of a levee or dam failure.
- 3.1.c** Encourage multi-purpose flood management projects that incorporate recreation, resource conservation, preservation of natural riparian habitat, and scenic values of the community's watercourses, creeks, and streams.

The City will continue to review its own infrastructure facilities to make sure that they are protected from flooding so they will continue to function and provide service to City residents in the event of a flood. The City will also work with other jurisdictions to address flood issues and to limit development to the extent feasible in flood hazard areas.

***Policy S-3.2***

***Implement Appropriate Land Use Planning Practices to Improve Flood Risk Management and Reduce the Consequence of Flooding.***

***Implementing Action:***

- 3.2.a** Require evaluation of potential flood hazards prior to approval of development projects to determine whether the proposed development is reasonably safe from flooding and consistent with the State of California Department of Water Resources' (DWR) *Urban Level of Flood Protection Criteria* for an urban level of flood protection standard (200-year) in urban and urbanizing areas. The City will not approve new development or a subdivision or enter into a development agreement for any property within a flood hazard zone, unless the adequacy of flood protection specific to the area has been demonstrated.
- 3.2.b** Require that new development and substantial improvements or upgrades in identified FEMA flood hazard zones (i.e., 100- and 500-year floodplains) be constructed in accordance with applicable city, State, and federal regulations, including compliance with the minimum standards of the Federal Emergency Management Agency and the National Flood Improvement Program to avoid or minimize the risk of flood damage.
- 3.2.c** Require new development in dam or levee inundation areas to consider risk from failure of these facilities and to include mitigations to bring this risk to a reasonable level.
- 3.2.d** Review annually and update, as necessary, appropriate General Plan elements to reflect current floodplain mapping data available from local, regional, State, and federal agencies to ensure the best available flood risk mapping information is contained in the General Plan.
- 3.2.e** Amend the Merced Municipal Code (Flood Damage Prevention Ordinance) pursuant to state law to provide consistency with amendments made to the General Plan pursuant to flood risk management.



***Policy S-3.3***

***Maintain Essential City Services in the Event of Flooding or Dam Failure.***

***Implementing Actions:***

- 3.3.a Continue to build all pump stations (both sewer and water) entryways at one (1) foot above the 200-year flood elevation, and continue to implement additional standards to address flooding due to dam failure.**
- 3.3.b Continue the "flood-proofing" of high-value or important City infrastructure, such as lift stations and signal control functions, as required by the City's Flood Damage Prevention Ordinance.**
- 3.3.c Maintain and update emergency response plans, including evacuation routes, that address potential flooding in flood hazard zones, in areas protected by levees and dam inundation areas. Maintain, update, and make available to the public, as appropriate, community flood evacuation and rescue maps.**

In times of flooding, when evacuation routes will be essential, the availability of a popular road may be submerged, while the availability of another lesser known road may become the viable evacuation route. Preparation and dissemination of emergency response plans and evacuation routes will benefit individuals and the community.

***Policy S-3.4***

***Locate and Design Essential Facilities to Minimize Flood Risk***

***Implementing Actions:***

- 3.4.a Essential facilities (i.e., hospitals and health care facilities, emergency shelters, fire stations and police stations, emergency command centers, and emergency communications facilities), when feasible, shall be located outside of 100- and 200-year floodplains, or implement design and construction methods to minimize damage from flood hazards identified, so that structural and operational integrity is maintained during flooding.**

Protection of the City's essential services will be key to provision of services during times of emergency. As described below, the City will evaluate and deploy a variety of means to accomplish this implementing action (see below).

- 3.4.b The City shall develop a program with criteria to determine when construction of essential public facilities and other critical facilities will be permitted in flood hazard zones or areas with other geologic hazards.**

This program will be developed in conjunction with the Engineering Division's effort to craft a policy reflective set of codes (see below).

- 3.4.c Review the municipal code and amend as necessary to require the location of new critical facilities (e.g., hospitals, emergency command centers, communication facilities, fire stations, and police stations) outside of 100- and 200-year floodplains. Where such location is not feasible, include exceptions through appropriate mitigation methods to minimize the potential flood damage to the facility.**

Following adoption of the City's General Plan Amendment, the City's Engineering Division will develop and process an applicable code amendment.

**Policy S-3.5**

**Coordinate with other Local, Regional, State, and Federal Agencies to Improve Flood Risk Management.**

**Implementing Actions:**

**3.5.a The City shall develop and maintain relationships with local jurisdictions, water districts, state agencies, and federal agencies for the purposes of: 1) providing information for the public; 2) utilizing current data (e.g., National Flood Insurance Program maps); and, 3) determining appropriate regulatory requirements for development in high hazard areas.**

Establishment and development of partnerships, collaborative efforts and communication are important elements of a successful program and safe community.

**3.5.b Cooperate with local, regional, State, and federal agencies in securing funding to obtain the maximum level of flood protection that is practical, with a minimum goal of achieving at least 200-year flood protection for urban and urbanizing areas.**

Working with its local partners and being aware of state and federal funding opportunities, the City will seek grant funds to improve its flood-related infrastructure.

**3.5.c Work with responsible parties to ensure flood management facilities and structures (e.g., pump stations, levees, canals, channels, and dams) in the community are properly maintained and/or improved.**

The Merced Irrigation District maintains and improves these features within the planning area.

**3.5.d Annually maintain and implement the community's Federal Emergency Management Agency (FEMA)-approved local hazard mitigation plan in order to apply for and/or receive project grants under FEMA's hazard mitigation assistance programs (e.g., Hazard Mitigation Grant Program, Pre-Disaster Mitigation, Flood Mitigation Assistance, or Severe Repetitive Loss).**

The 2015 Local Hazard Mitigation Plan has a life of 5-years and includes nine projects that are eligible for grant funds. Annual updates and maintenance of the plan are part of the duties of the City's Disaster Council.

**Goal Area S-4: Fire Protection**

**GOAL**

- **Fire and Hazardous Material Safety for the Residents of the City and For Those Working in Fire Suppression**

**POLICIES**

**S-4.1** Promote the concept of fire protection master planning with fire safety goals, missions, and supporting objectives for the community.

**S-4.2** Maintain a reasonable level of accessibility and infrastructure support for fire suppression, disaster, and other emergency services.

***Policy S-4.1***

***Promote the Concept of Fire Protection Master Planning with Fire Safety Goals, Missions, and Supporting Objectives for the Community.***

***Implementing Actions:***

- 4.1.a Provide additional fire station locations as expansion of the City occurs in order to maintain a response time objective of 4 to 6 minutes citywide 90 percent of the time, within the financial constraints of the City.**
- 4.1.b Work with the Fire Department and the Environmental Health Division to identify fire districts that will require specialized manpower and equipment, such as businesses that use hazardous materials, and request that land uses or structures with similar needs be confined to these districts.**

The planning of future fire stations is also addressed in Public Facilities Policy P-2.1 in the Public Facilities Chapter (Chapter 5), but the Implementing Actions above will also be taken into consideration when planning new fire facilities.

***Policy S-4.2***

***Maintain a Reasonable Level of Accessibility and Infrastructure Support for Fire Suppression, Disaster, and Other Emergency Services.***

***Implementing Actions:***

- 4.2.a Continue to use 8-inch or larger pipe in high-value districts. In residential districts, additional "looping" or completion of water main grids shall continue to be provided where possible so that lengths of 6-inch pipe on the long side of the block will not exceed 600 feet.**
- 4.2.b Maintain current standards defined in the Fire Code and City Standards for the spacing of fire hydrants. In general, these standards call for 500-foot spacing in residential areas and 300-foot spacing in commercial and industrial areas.**
- 4.2.c Continue to provide fire prevention and disaster preparedness information through the schools, public interest groups, and other facilities and people.**
- 4.2.d Continue close collaboration between Inspection Services, Fire Prevention, and Fire Suppression support personnel to ensure public safety and improve construction safety through the building permit and life safety inspections process.**
- 4.2.e Continue to enforce the present nuisance abatement program regarding a height limit on weeds during the dry season (mid-April through mid-November) in both vacant and developed lots, abandoned vehicles, and vacant buildings.**

The City Fire Department has several on-going fire prevention programs that have reduced fire incidents in the City, which are addressed in the Implementing Actions above and include requiring adequate water flow for fire hydrants and sprinkler systems, maintaining standards for fire hydrant locations, performing annual fire inspections of businesses, the annual Weed Abatement program, and other various educational programs. These programs should be continued and expanded as needed.

**Goal Area S-5: Airport Safety**

**GOAL**

- **A Safe Airport Environment Both Above and On the Ground**

**POLICIES**

- S-5.1** Continue to protect approach areas and control zones for both existing and future runway systems through land use regulations and property acquisition where necessary.
- S-5.2** Prevent the encroachment of potential hazards to flight within the Airport's airspace.

**Policy S-5.1**

***Continue to Protect Approach Areas and Control Zones for Both Existing and Future Runway Systems Through Land Use Regulations and Property Acquisition Where Necessary.***

**Implementing Actions:**

- 5.1.a** Retain existing agricultural land uses and discourage residential land use designations within the Merced Regional Airport Land Use Compatibility Zones A and B1 as defined in the Merced County Airport Land Use Compatibility Plan. Restrict densities within other Zones per Table 2A of the Merced County Airport Land Use Compatibility Plan.
- 5.1.b** Limit the peak occupancy levels of industrial/commercial uses per Table 2A of the Merced County Airport Land Use Compatibility Plan. Occupancy levels and density vary within each of the Land Use Compatibility Zones.
- 5.1.c** Continue to utilize various alternatives for acquiring approach protection easements and overflight easements for properties within the vicinity of the Merced Regional Airport as defined in the Airport Master Plan.
- 5.1.d** Work with the County of Merced on land use and master planning issues in the vicinity of Castle Airport and its Land Use Compatibility Zones.”

Noise impacts associated with the Merced Regional Airport are addressed in Noise Policy N-1.1 in Chapter 10, and the importance of maintaining airport service to the community are addressed in Transportation Policies T-3.1, 3.2, and 3.3 in Chapter 4. The Implementing Actions above are to ensure that adequate measures are taken to protect residents and businesses on the ground from air crashes that could occur in and around the airport. This will include implementing the policies of the Merced County Airport Land Use Compatibility Plan regarding restricting residential land uses, prohibiting the location of inappropriate land uses, such as hospitals, schools, etc., and limiting the peak occupancy of industrial and commercial uses within certain compatibility zones as well as acquiring approach protection and overflight easements in the vicinity of the runways. The City currently has land designated for agricultural use only at the ends of the runways for this purpose.

The City of Merced recognizes that Castle Airport is a County asset with the potential to generate job growth within the County of Merced. Merced County is currently in the process of developing a new Castle Airport Master Plan, which would outline Castle's proposed development over the next 20 years. Merced County has expressed an interest in expanding Castle's current role as mostly a general aviation airport (the County's website in 2011 indicates that general aviation uses are 99% of current operations) to include air cargo, military exercises, and commercial air service. If such a Master Plan was approved, the Land



Use Compatibility Zones for Castle Airport would need to be modified to reflect those changes. If modified, Castle Airport's Land Use Compatibility Zones could affect development within the existing City and the proposed SUDP/SOI. (Long time residents will remember the significant noise impacts of Castle's military operations until Castle Air Force Base closed in 1995.) Therefore, the City wants to continue to work with the County on ensuring that any adopted Castle Airport Master Plan contains realistic aircraft operation projections that do not hinder both existing and future development within the City.

***Policy S-5.2***

***Prevent the Encroachment of Potential Hazards to Flight Within the Airport's Airspace.***

***Implementing Action:***

**5.2.a Continue to follow Federal Aviation Regulation standards regarding the maximum height of structures and other objects within the Merced Regional Airport Land Use Compatibility Zones.**

The above Implementing Action will ensure that objects that might pose hazards to flight due to height are not allowed adjacent to the Merced Regional Airport.

***Goal Area S-6: Crime***

**GOAL**

- **Reduced Criminal Activity and An Increased Feeling of Safety and Security in the Community**

**POLICIES**

**S-6.1** Provide superior community-based police services within the resource constraints of the City.

**S-6.2** Provide services and personnel necessary to maintain community order and public safety.

***Policy S-6.1***

***Provide Superior Community-Based Police Services Within the Resource Constraints of the City.***

***Implementing Actions:***

**6.1.a** Continue programs, such as "Neighborhood Watch" which increase residents' involvement in, and ownership of, police operations.

**6.1.b** Direct services and outreach programs towards youths in the community.

**6.1.c** Locate future police facilities to enhance the "community policing" concept through the expansion of existing or the addition of new police service districts as the City grows.

Crime is an important safety issue within any community and Merced is no different. The Merced Police Department has several on-going programs that seek to prevent crime, which are addressed in the above Implementing Actions. The City uses "community policing," which seeks to make sure that the Police are visible and engaged throughout the community. The City has two police stations and will continue to expand police facilities, perhaps in conjunction with fire facilities, as the City grows.

***Policy S-6.2***

***Provide Services and Personnel Necessary to Maintain Community Order and Public Safety.***

***Implementing Actions:***

- 6.2.a Maintain a police force sufficiently staffed and deployed to ensure quick response times to emergency calls, within the financial constraints of the City.**
- 6.2.b Encourage approaches to crime prevention to be designed into new buildings and subdivisions.**
- 6.2.c Identify changes to current laws and ordinances or create new ones to help carry out crime prevention strategies.**

In addition to maintaining sufficient Police staffing levels, the City can use other methods as described above to help prevent crime. Special attention should be paid to crime prevention through the design of new buildings, subdivisions, and public places. Design issues that need to be addressed include lighting, “hiding places,” graffiti prevention, the location of doors and windows “on the street,” etc. Various ordinances are in place to address crime prevention strategies, which include curfew laws, restrictions on the sale of spray paint, etc, but new ones should be added as needed.

***Goal Area S-7: Hazardous Materials***

**GOAL**

- **Hazardous Materials Safety for City Residents**

**POLICIES**

- S-7.1 Prevent injuries and environmental contamination due to the uncontrolled release of hazardous materials.**
- S-7.2 Ensure that hazardous materials are cleaned up before a property is developed or redeveloped.**

***Policy S-7.1***

***Prevent Injuries and Environmental Contamination Due to the Uncontrolled Release of Hazardous Materials.***

***Implementing Actions:***

- 7.1.a Support Merced County in carrying out and enforcing the Merced County Hazardous Waste Management Plan.**
- 7.1.b Continue to update and enforce local ordinances regulating the permitted use and storage of hazardous gases, liquids, and solids.**
- 7.1.c Continue to make sure underground storage tanks containing hazardous materials are properly installed, used, and removed.**
- 7.1.d Provide continuing training for hazardous materials enforcement and response personnel.**

**7.1.e To the extent feasible, encourage new residential developments and other projects to locate an adequate distance from potential existing sources of toxic emissions, such as freeways, heavy industrial sites, and other hazardous material locations.**

The above Implementing Actions are designed to prevent injuries and environmental contamination due to hazardous materials. The City and County have several existing programs to ensure that personnel are adequately trained to handle the uncontrolled release of hazardous materials and enforcement of various regulations regarding the storage of hazardous materials are enforced. The City will encourage residential development and other sensitive receptors from location too near sites with potential for hazardous materials.

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***Policy S-7.2***

***Ensure that Hazardous Materials are Cleaned Up Before a Property is Developed or Redeveloped.***

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***Implementing Actions:***

**7.2.a Continue to work with the State Department of Health Services and Merced County in developing cleanup programs for known hazardous waste sites within the Merced planning area.**

Prior to the development or redevelopment of a piece of property, the City routinely works with the appropriate State and local agencies to ensure that any hazardous materials contamination is eliminated.

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## 11.4 TECHNICAL DATA

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### 11.4.1 Definitions

#### Earthquake:

An earthquake is a perceptible trembling to violent shaking of the ground produced by the sudden displacement of rocks below the earth's surface.

#### Epicenter:

An epicenter is the point directly above the segment of a fault that shifts in an earthquake. Surface rupture can be the result in the areas immediately surrounding a fault or the epicenter.

#### Fault:

A fracture along which rocks on one side have been displaced with respect to those on the other side. An "active fault" is one that has exhibited surface displacement within the past 11,000 years. A "potentially active fault" has shown such displacement during the last two million years.

#### Mercalli Scale:

The Mercalli scale measures the earthquake's effect on humans and real property.

#### Richter Scale:

The Richter scale is a function of the energy expended in an earthquake, and is based on logarithmic (base 10) measurement. (For example, an earth-quake of "6" in the Richter scale expends 10 times the energy of an earthquake measured at "5").

#### Seiche:

A seiche is an earthquake-related event where the sudden shifting of the ground creates a wave. In an earthen dam, if the

wave is large enough, it can overtop it and result in the failure of the dam.

#### Liquefaction:

The behavior of soils that, when loaded, suddenly suffer a transition from a solid state to a liquefied state, or having the consistency of a heavy liquid. Liquefaction is more likely to occur in loose to moderately saturated granular soils with poor drainage, such as silty sands or sands and gravels capped or containing seams of impermeable sediments.

### 11.4.2 Dam Failure Characteristics

#### Yosemite Lake Dam

- Earthfill
- East and northeast of the City limits
- Within the SUDP/SOI
- Failure would be gradual
- Initial flood wave to reach SUDP/SOI 20 minutes after failure
- Initial flood wave to pass out of the SUDP/SOI two hours after failure
- Floodway center inundation depths of approximately 20 to 30 feet
- 3 "major" facilities in SUDP/SOI inundation area:
  - 1 community college
  - 1 future high school (at G and Farmland)
  - 1 new hospital (at G & Mercy)





Bear Reservoir Dam

- Earthfill
- East and northeast of SUDP/SOI
- 20 miles from SUDP/SOI (estimated)
- Failure would be gradual
- Initial flood wave to reach SUDP/SOI six hours after failure
- Initial flood wave to pass out of SUDP/SOI nine hours after failure
- 26 “major” facilities (existing) in inundation area, including:
  - 10 K through 12 schools
  - 1 jail
  - 4 hospitals (1 community)
  - 4 of the City’s 5 Bear Creek bridges

***11.4.3 Hazards Unknown in the Merced Planning Area***

The following geologic or other hazards are unknown in the Merced SUDP/SOI:

- **Hydrocompaction:** Hydrocompaction occurs when open-textured soils become saturated with water for the first time, lose their strength, and consolidate under their own weight. In California, about 124 square miles of land surface has experienced, or is subject to, subsidence due to hydrocompaction. Subsidence of three to five feet is common and has damaged ditches, canals, roads, pipelines, electric transmission towers, and buildings. Hydro-compaction on the west side of the San Joaquin Valley required special consideration and engineering treatment during construction of the California Aqueduct. In contrast, the Delta-Mendota Canal was built without knowledge of the problem, and subsidence of certain portions has required extensive repair.

- **Seismically Induced Surface Rupture:** A break in the ground's surface and associated deformation resulting in the movement of a fault.
- **Tsunami:** A wave, commonly called a tidal wave, caused by an underwater seismic disturbance, such as sudden faulting, landslide, or volcanic activity.

