Chapter 5 – RISK ASSESSMENT

Section A. Identifying and Profiling Hazards

Identification of Natural and Manmade Hazards

The MRWPCA Local Hazard Mitigation Plan Committee has completed a review of a comprehensive listing of natural hazards (See Figure 5-1, Profiling Hazards Checklist). After analyzing historical data and utilizing the expertise of the group, the following natural hazards were identified as those which could affect MRWPCA facilities: Coastal Erosion; Coastal Storm; Drought; Earthquake; Expansive Soils; Flood; Land Subsidence; Landslide; Tsunami; and Wildfire. In addition, the group has done a less rigorous review of the Bomb Threat and Hazardous Material Incidents manmade hazards. Following are descriptions of these hazards, along with the locations, extents, previous occurrences, and probabilities of future events.

Description of Locations, Extents, Previous Occurrences and Probability of Future Events for Hazards

NATURAL HAZARDS

Coastal Storm and Coastal Erosion

- County of Monterey Office of Emergency Services, Winter Storm, www.co.monterey.ca.us/oes/winterstorm.htm
- City of Seaside Emergency Operation Plan, Draft Working Copy Revision 1.1.0 June 2004

Intense storms often produce abnormally high waves and an elevated sea level, causing extensive beach erosion and shoreline retreat. The worst erosion generally occurs when multiple storms hit during periods of especially high tides. Several years may pass between storms intense enough to cause shoreline erosion that results in significant damage. Although waves rebuild beaches after such storms, this seaward accretion may not return a beach to its pre-storm position. Powerful coastal storms can cause severe damage to coastal areas.

During the winters of 1982-83 and 1997-98, two of the most severe El Niños of the 20th century produced intense storms that pounded the Central Coast. These storms followed more southerly tracks than usual and combined with periods of high tides to intensify the normal winter erosion cycle, causing tens of millions of dollars in damage along the central California coast. On Monterey Bay, coastal cliffs, dunes, and manmade structures suffered serious damage.

The extent of beach erosion or accretion is measured by landward or seaward shifts in the position of the shoreline at mean sea level (MSL). Storm waves during the 1982-83 El Niño stripped significant volumes of sand from Monterey Bay beaches, leaving dunes exposed to direct wave attack. By the end of the 1982-83 El Niño storms, Monterey Bay beaches were distinctly narrower than before.

During the 1997-98 El Niño, several intense winter storms from the south struck the Monterey Bay coastline. For two years, through September 1997, all but two Monterey Bay beaches remained stable except for normal seasonal fluctuations. However, beach erosion along the bay was less than in the 1982-83 El Niño.

Several of MRWPCA's pump stations are near the ocean and are susceptible to coastal storms and erosion. In fact, the Agency's greatest concern is that their pump stations could be inundated by a heavy storm or by a tsunami. They have an emergency response plan in place, which includes the use of generator power.

Because of the history of coastal storms and erosion, there is a high probability of these natural hazards occurring in the future. This LHMP will explore mitigation measures for coastal storms and erosion.

Drought

- Department of Water Resources, Drought Preparedness Section, (www.water.ca.gov)
- National Drought Mitigation Center http://www.drought.unl.edu/whatis/what.htm
- California- American Water Company
- Monterey Peninsula Water Management District

Drought originates from a deficiency of precipitation over an extended period of time, resulting in a water shortage. One dry year does not normally constitute a drought in California. Drought is a gradual phenomenon. In fact, droughts occur slowly, over a period of several years and there is no universal definition of when a drought begins or ends. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

The State of California has a long history of droughts. Droughts exceeding three years are relatively rare in Northern California, which is the source of much of the State's developed water supply. The driest single year of California's measured hydrologic record was 1977. California's most recent multi-year drought was 1987-92. Measured hydrologic data for droughts prior to 1900 are minimal. Multi-year dry periods in the second half of the 19th century can be qualitatively identified from the limited records available combined with historical accounts, but the severity of the dry periods cannot be directly quantified. The historical record of California hydrology is brief in comparison to geologically modern climatic conditions. In fact, investigations into historical records indicate that California has been subject to droughts more severe and more prolonged than those witnessed in the brief historical record, going as far back as 11,000 years.

Although droughts are sometimes characterized as emergencies, they differ from typical emergency events since they develop over a long period of time. Droughts affect everyone within the MRWPCA service area. Given the long history of droughts in the State of California, the probability of a drought occurring in the future is high. The Monterey Peninsula Water Management District, in cooperation with California-American Water Company also have a drought mitigation plan in place. While droughts do not adversely affect the MRWPCA's facilities, MRWPCA actually has programs in place to mitigate for drought which benefit all within the service area.

Earthquake

- Earthquake Glossary, USGS Earthquake Hazards Program, United States Department of the Interior, United States Geological Survey (USGS)
- Seismic Vulnerability Evaluation Wastewater Collection System, Monterey Regional Water Pollution Control Agency, Monterey, California, was completed in 1998 by Dames and Moore
- Enhanced Spill Prevention Plan submitted to the Monterey Regional Water Pollution Control Agency, prepared by CH2MHill, April 18, 199l

An earthquake is a sudden motion or trembling in the earth caused by the abrupt release of slowly accumulated strain by volcanic activity or by faulting (movement which produces relative displacement of adjacent rock masses along a fracture). This energy comes from stresses built up during interaction between the earth's crust and the interior of the earth.

The *Seismic Vulnerability Evaluation Wastewater Collection System, Monterey Regional Water Pollution Control Agency, Monterey, California*, was completed in 1998 by Dames and Moore. Local geology, seismic setting and historic seismicity were evaluated, and an inspection and structural audit of MRWPCA facilities was completed (including pump station buildings, equipment, piping and tanks). The study concluded that while there is a very low life safety risk due to earthquake, there could be economic and environmental impacts to MRWPCA facilities caused by an earthquake. This study is summarized below.

Local Geology

The northeastern third of the MRWPCA area is underlain by terrace and basin deposits consisting of sand, silt and clay with interbedded gravel. Coastal terrace deposits are located along the northwestern end of the project area and consist of partially lithified sands with a few thin, relatively continuous gravel layers. In the center part of the area, Holocene young floodplain deposits are associated with the Salinas River and consist of sand and silt, commonly interbedded with thin discontinuous clay layers. Lastly, coastal sand dunes border the Salinas River to the southwest portion of the area. These dunes consist of poorly lithified fine to medium-grained sands, which have a moderate to high susceptibility to liquefaction where a shallow groundwater is encountered.

Seismic Setting

The major active faults in the project vicinity are considered to be part of the San Andreas Fault System, which delineates the interaction between the Pacific and North American tectonic plates. The main faults from this system include, from west to east, the San Gregorio-Hosgri, Rinconada/King City, and San Andreas. Smaller, less active local faults of the Monterey Bay fault zone also occur in this region around MRWPCA facilities. Faults within this zone include the Tularcitos-Navy, Chupines, Ord Terrace and Seaside faults. These have lower slip rates, longer recurrence intervals, and lower Maximum Credible Earthquake (MCE) magnitudes than the main faults. Refer to Figures 5-2, Probability of Earthquake Shaking Intensity and 5-3, Regional Fault Location Map.

Historic Seismicity

The entire MRWPCA area is located in a tectonically active region, classified as Seismic Zone 4 in the Uniform Building Code (UBC). Ongoing tectonic activity within the area is reflected by historic large earthquakes (1906 San Francisco, 1989 Loma Prieta), microseismicity, and Quaternary displacements along faults. Holocene age displacements have also been documented on the San Andreas and San Gregorio faults and are associated with youthful geomorphic features of tectonic origin.

In comparison with other sites within coastal California, the Monterey area in the immediate project vicinity has experienced a relatively lower level of historic seismic activity. Seismic activity has been concentrated along the San Andreas fault, located 33 kilometers northeast of the MRWPCA's Wastewater Collection System (WCS) principal elements.

Findings

According to the Dames and Moore study, geologic hazards to the WCS of the MRWPCA facilities include principally fault rupture and liquefaction. The risk of landslides and slope failures is locally extremely low.

Fault Rupture

Fault rupture hazard maps (Figures 5-4, Fault Rupture Hazard Map, Southern MRWPCA Area and 5-5, Fault Rupture Hazard Map, North-Central MRWPCA Area) were prepared for the southern and north central portions of the MRWPCA system. Faults crossed by pipelines appear to have long recurrence intervals, on the order of thousands of years, and therefore have a low probability of rupture during a design life of 50 years (considered reasonable for MRWPCA system).

Liquefaction Susceptibility

The potential for liquefaction along the pipelines and at the various pump stations was estimated using geological and geotechnical data. Estimated depth to groundwater, soils textural characteristics, penetration resistance, and historic occurrence of liquefaction were also considered for the purpose of developing liquefaction susceptibility maps.

Refer to Figures 5-6, Liquefaction Susceptibiliity, Southern MRWPCA Area and 5-7, Liquefaction Susceptibiliity, North-Central MRWPCA Area The most critical locations within the MRWPCA area are those underlain by geologically young (Holocene) floodplain deposits along the margins of the Salinas River, small drainages, beaches and sloughs. Moderate liquefaction susceptibility is characteristic of older floodplain deposits, alluvial fan deposits and channel fill deposits. Other areas have typically low to very low liquefaction susceptibility.

The two Salinas River crossings of the Castroville and the Salinas interceptors are most vulnerable to liquefaction-induced failures. In addition, the pipeline may be highly susceptible to liquefaction near Castroville and Moss Landing. Liquefaction would be accompanied by settlement and lateral spreading of the soils supporting the pipeline. Preliminary data indicate that most of the pump stations are located on rock or stiff soils, except the Salinas, Castroville and Moss Landing pump stations. Liquefaction hazard is summarized below for the various pump stations included in this study:

Pump Station Name	Liquefaction Hazard
Coral Street	None
Fountain Avenue	None
Reeside	None
Monterey	Moderate
Seaside	Moderate
Fort Ord	Unknown (presumably moderate)
Marina	Moderate
Salinas	Moderate-to-high
Moss Landing	Moderate-to-high
Castroville	Moderate-to-high

Another study commissioned by MRWPCA, the *Enhanced Spill Prevention Plan submitted to the Monterey Regional Water Pollution Control Agency*, prepared by CH2MHill, April 18, 199l, concluded that seismic events are more likely to impact large stations than small stations. Below is a summary of the findings from this study:

The MRWPCA stations were built to comply with the seismic requirements of the Uniform Building Code in effect at the time of their design in the late 1970s and early 1980s. Since that time, there have been significant advances in understanding the nature of seismic forces and ground accelerations and in the response of structures to these accelerations. Building Codes have also been revised during this period.

Seismic events are more of a concern for the large stations-Monterey, Seaside, Fort Ord and Salinas-because of the potential for a high-volume spill. These stations cannot be pumped around, because flow rates exceed the capacity of portable pumps. The site inspections indicated that existing seismic bracing for discharge headers and pumps, and for ancillary equipment including control panels, fuel tanks and fuel piping, surge equipment, and chemical feed tanks may not meet current code requirements and may not adequately protect these components from seismic damage.

Seismic events are less of a concern for small stations, because of the small mass of the equipment and their relative mechanical simplicity. Failure of small station could result in a prolonged spill, if it occurred in conjunction with a large station failure, since MRWPCA resources may not be sufficient for concurrent response to multiple locations.

Because of the history of earthquakes in the MRWPCA area, there is a very high probability of the occurrence of future earthquake events. Recommendations from the two studies described above will be used in the development of mitigation goals, actions and implementation measures for the MRWPCA Local Hazard Mitigation Plan, Chapter 6.

Expansive Soils

- Seismic Vulnerability Evaluation Wastewater Collection System, Monterey Regional Water Pollution Control Agency, Monterey, California, was completed in 1998 by Dames and Moore
- Foundations in Problem Soils, Steven J. Greenfield and C.K. Shen, 1992

Certain clay soils are able to “take on water” and subsequently expand when they come into contact with it. The presence of expansive soil deposits is one of the more challenging site conditions encountered in construction. In fact, estimates of total damage (to lightly loaded structures, highways and streets, underground utilities and concrete flat work) due to expansive soil movement in 2000 was estimated to be $4.5 billion. While natural disasters can cause much more catastrophic and significant damage, expansive soil movements affect a very large number structures in the United

States. Expansive soil movement differs from natural disasters in the following ways: expansive soil movement is not catastrophic, it usually occurs over a relatively long period of time; damage from expansive soils is a continual process; expansive soils are locally erratic, making it impractical to delineate levels of damage potential.

An extensive geologic investigation done by Dames and Moore found that some areas of the MRWPCA service area may be susceptible to expansive soils. The "Seismic Vulnerability Evaluation Wastewater Collection System", included a geologic investigation which consisted of literature compilation and review, a detailed review of applicable geologic maps and a facility walk-down. Findings concluded that Pleistocene terrace deposits and Holocene basin deposits found in the northern one-third of the area:

- Pleistocene terrace deposits low susceptibility to flooding and liquefaction, and may contain expansive soils.
- Holocene basin deposits have a high susceptibility to flooding, a moderate to high susceptibility to liquefaction where groundwater is within about 35 feet of the surface, and contain highly expansive soils.

Since there is evidence that expansive soils may be encountered, they will be considered in this local hazard mitigation plan.

Flood

- Understanding '100-year flood' by Carol Kimbrell, (http://www.lcra.org/featurestory/2003/2003_3_25_flood_sidebar.html)
- Enhanced Spill Prevention Plan submitted to the Monterey Regional Water Pollution Control Agency, prepared by CH2MHill. April 18, 1991

The term "100-year flood" means that there is a 1 percent (one in 100) chance that a flood of that magnitude will occur in any given year. Contrary to popular belief, it does not mean that it is a flood that occurs only once every century. The term describes the magnitude of flood and has nothing to do with how often such floods occur. In fact, several 100-year floods can occur within the same year, or a region may go several hundred years without experiencing a 100-year flood. A 100-year flood is often used as a benchmark for catastrophic flooding. A 500-year flood, which is a greater flood, has a 0.2 percent (one in 500) chance of occurring in any given year.

The *Enhanced Spill Prevention Plan submitted to the Monterey Regional Water Pollution Control Agency*, prepared by CH2MHill in April of 1991, explored the risk of damage to MRWPCA facilities due to flooding.

According to the plan, MRWPCA's Salinas and Castroville pump stations are within the flood plain of major rivers or their tributaries and are designed to prevent inundation in a 100-year flood. Flooding in 1995, estimated to exceed a 150-year recurrence interval, inundated the Castroville station and nearly isolated the Salinas station. Since then, the MRWPCA has taken steps to avert future flooding, including stockpiling of sand bagging materials and improved sealing of station doors, vents and other openings. Given the relatively rare nature of floods of this magnitude, it does not appear that major investment into further modification at these stations is warranted.

The MRWPCA's Coral Street Pump Station has been flooded by wave runup from Monterey Bay.

The remaining large stations are not in flood-prone areas. Flooding of tile smaller stations, like Moss Landing, is also less of a concern, as they are generally equipped with submersible pumps which would not he damaged by inundation. Refer to Figure 5-8, which shows the flood zones affecting MRWPCA.

In any one year, the probability of the occurrence of a 100- or 500-year flood affecting MRWPCA facilities is low. There is, however, a high probability that localized flooding will occur in areas that could affect pump stations such as Coral Street. This document will address mitigation measures for localized flooding and for 100-year floods. Mitigation goals, actions and implementation measures for flooding hazards will be developed in Chapter 6 of this Local Hazard Mitigation Plan, using recommendations from the *Enhanced Spill Prevention Plan.*

Land Subsidence

- from Gamma Remote Sensing, www.gamma-rs.ch
- Review of Potential Damage to Force Mains at 10 Pump Stations due to Long-Term Settlement for Monterey Regional Water Pollution Control Agency, Monterey, California, by MMI Engineering, Inc., March 28, 2003

Subsidence can occur as the result of the natural compaction of sediments. In particular, most areas of known subsidence are along coasts where the phenomenon becomes quite obvious when the ocean or lake waters start coming further up on the shore. Surface sinking is a slow event and hazards associated with subsidence are different from those caused by sudden and catastrophic natural events like floods and earthquakes. However, extremely expansive damages can still occur.

The *Review of Potential Damage to Force Mains at 10 Pump Stations due to Long-Term Settlement for Monterey Regional Water Pollution Control Agency, Monterey, California* was completed by MMI Engineering, Inc., in 2003. This report was the result of a system vulnerability study for MRWPCA's ten pump stations in an effort to reduce the risk of potential sewerage spills. The study focused on non-seismic issues such as internal and external corrosion, operating pressures and foundation settlement. The focus of the study was to evaluate the potential for damage due to long-term settlement of underlying soils. Following is a summary of the study's conclusions.

According to the MMI report, damage to force mains due to long-term settlement of the underlying soil because of poorly compacted backfill is not very common. This is especially true for structures that have been in existence for over 10 to 20 years built using well constructed engineered subgrade. The original construction specifications and geotechnical reports for the pump stations were reviewed and nothing was found that would suggest a potential problem. Construction specifications for the pump stations required that the subgrade and backfill be compacted to 90% to 95% relative compaction, which is not likely to exhibit significant long-term settlement. Therefore, the probability of force main rupturing from settlement of backfill during static (i.e., non-seismic) conditions is very low and it does not warrant the disruption in service and the cost associated with either adding flexibility to the force mains or performing additional investigations to further reduce the probability of failure.

Signs of settlement were noted at the Salinas Pump Station some years ago and MRWPCA retained the services of two geotechnical engineers to determine the cause of settlement. The force main was exposed at that time and the coupling was inspected by a representative of the coupling manufacturer who did not find any evidence of distress. The geotechnical engineers did not come to a general consensus regarding the causes of settlement.

Therefore, while there is little evidence of land subsidence affecting MRWPCA facilities, this LHMP will consider recommending monitoring for any signs of excessive settlement to force mains.

Landslide

- U.S. Geological Survey, U.S. Department of the Interior, http://landslides.usgs.gov
- *Seismic Vulnerability Evaluation Wastewater Collection System*, Monterey Regional Water Pollution Control Agency, Monterey, California, was completed in 1998 by Dames and Moore

The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over steepened slope is the primary reason for a landslide, there are other contributing factors such as soil failure due to saturation from heavy rainfall, excess weight from man-made structures that stress weaken a slope, and earthquakes of magnitudes as small as 4.0. Slope material that becomes saturated with water may develop a debris flow or mud flow. The resulting slurry of rock and mud may pick up trees, houses, and cars, thus blocking bridges and tributaries causing flooding along its path.

The coastal areas of California are among the primary regions of landslide occurrence and potential in the United States. Sandy soils are susceptible to earthflows (where dry granular slope materials liquefy and run out, forming a bowl or depression at the head), mudflows (an earthflow consisting of material that is wet enough to flow rapidly and that contains at least 50 % sand-, silt- or clay-sized particles), and lateral spreads (which occur on very gentle slopes or flat terrain, caused by liquefaction, the process whereby saturated, loose, sandy soils are transformed from a solid into a liquefied state). Landslides can be caused by slope saturation by water or seismic activity.

Soils investigations were done in 1998 by Dames and Moore for the *Seismic Vulnerability Evaluation Wastewater Collection System.* Based on field inspection, facility walk-down , and of compilation and review of applicable maps and literature, it was concluded that for the majority of the system, the risk of landslides and slope failures is locally extremely low. However, one exception is the Salinas interceptor, where landslides had been identified. The Salinas Interceptor between the Salinas River crossing and southeast of the Regional Treatment Facility, and along the western margin of the Salinas River are susceptible to landsliding. Along this part of the Salinas Interceptor, several shallow to moderately deep landslides within the older dune deposits exist to the east of the pipeline. These slides do not currently affect the pipeline which is located 10- to 15 feet away from the slide areas, but these slides and adjacent steep slopes could be subject to movement during an earthquake. Landslides will not be included in the mitigation section of this document, but the Salinas Interceptor's susceptibility of landsliding will be addressed under Earthquake in the mitigation section.

Tsunami

- Tsunami Hazard Mitigation, A Report to the Senate Appropriations Committee, prepared by the National Oceanic and Atmospheric Administration Pacific Marine Environmental Laboratory, March 31, 1995 (www.pmel.noaa.gov)
- California Office of Emergency Services
- Monterey County Office of Emergency Services, (www.co.monterey.ca.us/oes/tsunamis.htm)

A tsunami, sometimes incorrectly called a tidal wave, is actually a series of enormous waves created by an underwater disturbance or earthquake. Tsunamis can move hundreds of miles per hour in the open ocean and crash into land with waves that are more than 100 feet high.

MRWPCA facilities are located within Tsunami Zone 2, which is characterized as having a potential for 5-15 foot wave crests. U.S. coastal areas are threatened by tsunamis that are generated by both local earthquakes and distant earthquakes.

Local tsunamis give people only a few minutes to seek safety. Tsunamis of distant origins give people more time to evacuate threatened coastal areas but increase the need for timely and accurate assessment of the tsunami hazard to avoid costly false alarms. Thus, the west coast could be affected by a local tsunami that may also have an impact on the distant states of Alaska and Hawaii. Of the two, local tsunamis are more devastating.

The greatest threat is local tsunamis generated off the U.S. Coast. In fact, in this century, there have been more than 200 tsunamis recorded in the Pacific Ocean. The Cascadia Subduction Zone threatens California, Oregon, and Washington with devastating local tsunamis (Refer to Figure 5-9, Tsunami Hazard for the United States) that could strike the coast within minutes. There is increasing geological and seismological evidence that: earthquakes of Richter scale magnitude 8 and more have previously occurred in this region; at least one segment of the subduction zone may be approaching the end of a seismic cycle culminating in such an earthquake; and, these earthquakes have generated tsunamis that have caused extensive flooding along the coastline of California (Heaton and Hartzell, 1987; Weaver and Shedlock, 1992). Recent articles (Waethrich, 1994) indicate that the probability of a Cascadia earthquake occurring is comparable to that of large earthquakes in southern California (i.e., 35% probability of magnitude of 8 or above between 1995-2045). A reminder of this threat occurred in April 1992 when a small tsunami was generated at the southern end of the Cascadia Subduction Zone by a large (7.1 MS) earthquake near Cape Mendocino, California (Gonzalez and Bernard, 1992). This tsunami arrived at Eureka, California only 15 minutes after the earthquake origin time.

The silent threat, however, is a tsunami generated at a distance. The United States has suffered major damage from tsunamis originating in Chile, Japan, Russia, and Alaska. If an earthquake in Alaska generated a major tsunami, Alaskan shores would be flooded within 15 minutes, while the coast of California would be hit within 5 hours after the event.

There is a history of tsunamis off the coast of California and specifically in the Monterey Bay area. In March of 1964, there was a small tsunami that affected the Monterey Bay area. This was the same event that killed 11 people and did much damage to the City of Crescent City to the north. An 11-foot wave came ashore in Santa Cruz harbor, which damaged boats and harbor facilities. At Monterey Harbor, a wave estimated at 5-6 feet in height caused little damage other than to some boats and caused minor flooding in the low-lying harbor area. Other tsunami events in 1960, December 2004 and June 2005 produced negligible (less than a foot) waves, and no recorded damage to the Monterey Bay area.

In response the tsunami threat, the Monterey County Office of Emergency Services has organized Tsunami Incident Response Plan Planning Group. The intent of the plan is to develop procedures to follow in the event of a tsunami watch or warning, beginning with the receipt and dissemination of the watch or warning message. The planning group has members from all coastal jurisdictions in Monterey County, along with state and federal government. Specifically, there is representation from: the Cities of Seaside, Marina, Sand City, Monterey, Pacific Grove, and Carmel (law enforcement, fire, or both); the Monterey County unincorporated county areas of North County Fire, Big Sur Volunteer Fire, Sheriff's Office, the Pebble Beach Company, and Monterey County Office of Emergency Services; state level representatives from California Department of Forestry (Pebble Beach Fire, Cypress Fire, Carmel Highlands Fire) and State Parks, along with both the Moss Landing and Monterey Harbor Districts; and Federal level representation from the United States Coast Guard. There are Geographical Information System (GIS)-derived maps in place that show which areas may need to be evacuated in the event of a tsunami warning. Depending on the jurisdiction type, each jurisdiction will develop procedures for responding to a tsunami warning, including evacuating people in low-lying areas, clearing the beaches and harbors, and sending boats out to sea. There will be pre-designated shelters and/or safe zones to which people can evacuate, and evacuation routes. Public education is a key issue in the planning process, since this will significantly reduce confusion, panic, and congestion in the evacuation zones. For near-shore events, public education is the only tool that will work, since there will not be enough time to organize an evacuation with a wave potentially approaching the shore in less than a half an hour. People will simply have to know what to do. A goal is to have tsunami information in phone books, at kiosks or information booths or on signs in high traffic pedestrian areas (Laguna Grande and El Estero Parks, Cannery Row, Fisherman's Wharf, beaches, etc.). The resulting Tsunami Incident Response Plan will be integrated with the previously developed Coastal Incident Response Plan.

In fact, MRWPCA's greatest concern is when their pump stations are inundated by a heavy storm or by a tsunami. They have an emergency response plan in place, which includes the use of generator power. This plan was in place for the earthquakes of 1995 and 1997.

There is a high probability that an earthquake will occur either locally or from a distance. An earthquake could trigger a tsunami in the Monterey Bay area. If a tsunami were to hit there, damage could be extensive. Refer to the Tsunami Evacuation Areas Map, Figure 5-10, prepared by the County of Monterey Office of Emergency Services. Mitigation for the tsunami hazard will be discussed later in this document.

Wildfire

- Monterey Regional Water Pollution Control Agency Wildland Fire Threat Categories Map, prepared by the Office of Emergency Services

The State of California Department of Forestry rates some areas in Monterey County as extreme wildfire hazard areas based on slope characteristics, climate, fuel loading, and water availability. This occurs in areas of undeveloped hilly terrain, which contain a mix of brush, scrub, and tree cover. This type of fuel and terrain poses the threat of rapid-fire development and spread. According to Figure 5-11, Wildfire Hazards, prepared by the Monterey County Office of Emergency Services (OES), none of the MRWPCA facilities are in areas of high wildfire danger.

Therefore, mitigation for wildfires will not be explored later in this LHMP.

MANMADE HAZARDS

Bomb Threat

- MRWPCA Business Response Plan, Procedure No. BRP-006 Bomb Threat

The MRWPCA Business Response Plan outlines procedures for dealing a bomb threat, including a checklist for dealing with a person who calls in a bomb threat.

Hazardous Material Incidents

- MRWPCA Business Response Plan, Procedure No. BRP-007 Hazardous Material Incidents

The MRWPCA Business Response Plan outlines procedures for responding to a hazardous material incident. The plan describes the hazardous materials used in the processes and equipment which support the treatment of wastewater and how to safely handle, store, and control hazardous materials in order not to endanger the public, the environment or MRWPCA employees

Section B. Assessing Vulnerability

Overall Summary of Vulnerabilities

Section A, Identifying and Profiling Hazards, describes the MRWPCA LHMP Committee's analysis of the list of possible natural hazards. Based on locations, extents, previous occurrences, and probabilities of future events, the group determined that MRWPCA facilities are vulnerable to the following natural hazards: Coastal Erosion, Coastal Storm, Earthquake, Expansive Soils, Flood, and Tsunami.

As discussed in Chapter 3, the MRWPCA service area includes the member communities of Pacific Grove, Monterey, Del Rey Oaks, Seaside, Sand City, Fort Ord, Marina, Castroville and Moss Landing. This section explores the vulnerabilities of MRWPCA facilities to the natural hazards listed above by looking at the impacts each hazard would have on specific sections of the system to each section's buildings and infrastructure.

Methodology for Determining Impact of Hazards

The MRWPCA service area has been divided into four sections, based on similar geological characteristics. Refer to Figure 5-12, Map Showing MRWPCA Mitigation Planning Areas. Each of these mitigation planning areas is described below. The types of assets that would be at risk in the event of a hazard are also given for each area. The extent of the projected impacts on each area for each of the four hazards identified (in terms of percentage damaged) are listed in Appendix 5-A, Estimated Impacts for Each Hazard.

Area Descriptions and Types of Assets at Risk for Each Area

Figure 5-12 shows how the MRWPCA service area has been divided into the following sections:

Oceanside Pump Stations and Pipelines: This area includes the Coral Street, Fountain Avenue, Reeside, Monterey, Seaside, Fort Ord, Marina and Moss Landing Pump Stations and associated pipelines. Assets at risk include these pump stations and pipelines. With the exception of the Reeside Pump Station, which was built in 1942, they were built between 1977 and 1991. Also at risk are MRWPCA personnel who may be working on the facilities at the time disaster hits.

Inland Pump Stations and Pipelines: The Castroville and Salinas Pump Stations, along with their pipelines make up this area. These pump stations and pipelines, built between 1981 and 1983, are vulnerable to natural hazards. MRWPCA personnel who may be working on the facilities when a hazard occurs would also be vulnerable.

Regional Treatment Plant (RTP): This area includes the Regional Treatment Plant complex, located at 14201 Del Monte Blvd, in Marina. Though the facility could be at risk during a natural hazard. It was built in 1990 to current seismic zone 4 requirements. Also, there are 55 employees at the RTP who also be at risk.

Administrative Offices: The administrative offices for the Monterey Regional Pollution Control Agency are located at 5 Harris Court in Monterey. 20 full-time and 2 temporary employees work at this MRWPCA office. They, along with the building itself, are vulnerable in the event of a hazard. The building was built in 1990 to current seismic zone 4 requirements.

Extent of Impacts

The extent of the impacts for Coastal Erosion, Coastal Storm, Earthquake, Expansive Soils, Flood, and Tsunami are given for each of the above areas (in terms of percentage damaged) in Appendix 5-A.

Data for estimating potential dollar losses to vulnerable infrastructure are not yet available. These values will be included in future updates of the Local Hazard Mitigation Plan as data become available.

Figures

Appendix